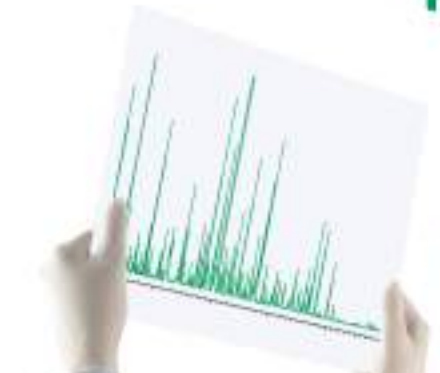
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accuracy.
precision.
consistency.

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Supelco®
Analytical Products

The life science business of Merck operates as MilliporeSigma in the U.S. and Canada.

Supelco is...





Your chromatography problem-solving partner...

Beyond being the leader in supplying chromatography products worldwide, we are your single best source for the technical know-how for sample preparation, analysis, and purification.

As a member of the Sigma-Aldrich family we have strength in size, but it is our 30+ years of experience in using and developing breakthrough technologies in chromatography that truly sets us apart. Every contact with any of our team members gives you access to the best knowledge in the business... All for the asking.

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Our customer support is standing by to solve your challenges—large and small! Doing so is the central core of all that we do. Service and support are the extra value added to every purchase from Supelco.



The performance you demand...
The servicethat you deserve...
from the company you trust.



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What's New for 2003-2004
Liquid Chromatography Products

What's New...

Liquid Chromatography Products



Discovery **and *Discovery HS* HPLC Columns for Small Molecules**
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Discovery **BIO Wide HPLC Columns for Biopolymers**
Beginning on page 56…



Büchner Funnels now packed with *Discovery* DSC SPE Packings
Beginning on page 150…



Discovery **96-Well SPE Plates**
See page 150…



Fluka **Buffers for HPLC and Capillary Electrophoresis**
Beginning on page 67…



New Discovery **DSC SPE Packings for Solid Phase Extraction**
Beginning on page 150…



New Agilent Technologies Packed Columns—Supelco Exclusive
Beginning on page 236…



New Equity Capillary Columns
Beginning on page 208…

What's New…

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SPME *StableFlex* Fiber Assemblies and Assortments
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Ferrules and Inlet Accessories for Agilent Technologies, Perkin-Elmer, and Varian GCs
Beginning on page 252…



Exceptional Service & Support

Expert Technical Support Before and After the Sale

Technical Service

Supelco Technical Service representatives represent over 100 years of combined technical expertise.

For solutions to all your chromatography needs, contact Supelco's Technical Service. Technical Service representatives help you choose the right product for your analysis and make sure that it works the way it should, worldwide.

- Assistance developing a method using Supelco chromatography products, and in choosing the right Supelco product before you buy
- Expert advice on using the chromatography product after the sale
- Help trouble shooting product performance problems should they occur

For expert assistance with all of your chromatography needs, contact Supelco Technical Service at techservice@sial.com.

Before joining Supelco Technical Service, chemists worked in such diverse industries as environmental testing, clinical analysis, pharmaceutical, life sciences, and veterinary medicine.

Supelco Technical Service representatives have extensive analytical backgrounds in QA/QC, R&D, new product development.

Supelco Technical Service chemists number one goal is to make sure you have the right product for the analysis, and if things do not work as expected, they will help you trouble shoot the problem quickly and professionally

Working closely with Sigma-Aldrich Technical Service, Supelco and Sigma-Aldrich provide before and after sale chromatography product support anywhere in the world

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Supelco takes pride in coupling quality products with excellent customer service. Through any of our Sigma-Aldrich Call Centers, Supelco handles your chromatography products order with prompt, accurate, and courteous service. Your order is processed quickly, and then shipped locally from warehouse locations, worldwide. Through our worldwide Sigma-Aldrich distribution network, Supelco chromatography products are available practically anywhere.

- Utilizing SAP, Order Processing representatives quickly book and process your order for any off-the-shelf or custom Supelco chromatography product
- Customer Service representatives are always available to assist with ordering problems whenever they occur
- Processed orders print directly in our warehouses to insure the fastest possible delivery of your chromatography products

"Call Center representatives are committed to giving every customer the friendliest, most helpful service—every call, every day. We strive to make each contact a pleasant experience. We look forward to talking with you!"

Alana Rose—Manager,
Order Processing/Customer Service,
Supelco, Bellefonte

Once your order is placed, our goal is to ship it to you the same day.

Supelco is committed to providing the best possible technical and order processing support in the industry.

Using Sigma-Aldrich Order Processing Call Centers, getting a product almost anywhere in the world is fast and easy.

We problem solve, listen to our customers, and care about their success.

General Information

Opening a Supelco/Sigma-Aldrich Account

When you are ready to place your order, call our Order/Customer Service number and supply the service representative with your shipping and billing information. You will be asked a few questions about your general business, along with the products for your order. Our New Account Department will then verify this information, as well as validate your intended use of our products if necessary. You may be contacted for further clarification; however, we will take quick and suitable action to establish your new account. To further expedite our process, please have a credit card available to prepay your first order. For information regarding the appropriate uses of our products, please read the following.

Use of Chemical Products

Supelco/Sigma-Aldrich chemical products are intended primarily for laboratory research purposes and, unless otherwise stated on product labels, in this catalog or in other literature furnished to Buyer, are not to be used for any other purposes, including but not limited to, *in vitro* diagnostic purposes, in foods, drugs, medical devices or cosmetics for humans or animals or for commercial purposes.

Buyer acknowledges that the products have not been tested by Supelco/Sigma-Aldrich for safety and efficacy in food, drug, medical device, cosmetic, commercial or any other use, unless otherwise stated in Supelco/Sigma-Aldrich literature furnished to Buyer. Buyer expressly represents and warrants to Supelco/Sigma-Aldrich that Buyer will properly test, use, manufacture and market any products purchased from Supelco/Sigma-Aldrich and/or materials produced with products purchased from Supelco/Sigma-Aldrich in accordance with the practices of a reasonable person who is an expert in the field and in strict compliance with all applicable laws and regulations, now and hereinafter enacted.

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Pricing

Prices shown are in U.S. dollars and are subject to change. Please visit us at **sigma-aldrich.com/supelco** for current prices. We guarantee our written quotations for 90 days. When placing your order, please reference our quotation number. If you place your order by phone, we will confirm our current price at that time.

Price Changes

Shipment will be made promptly if price increase is under $5.00 per unit. Otherwise, shipment will be delayed until Buyer is reached for approval. Price reductions will be automatically applied to your invoice.

General Information

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Supelco/Sigma-Aldrich warrants that its products shall conform to the description of such products as provided by Supelco/Sigma-Aldrich through this catalog, analytical data or other literature. **This warranty is exclusive, and Supelco/Sigma-Aldrich makes no other warranty, express or implied, including any implied warranty of merchantability or fitness for any particular purpose.** Supelco/Sigma-Aldrich warranties made in connection with any sale shall not be effective if Supelco/Sigma-Aldrich has determined, in its sole discretion, that Buyer has misused the products in any manner, has failed to use the products in accordance with industry standards and practices, or has failed to use the products in accordance with instructions, if any, furnished by Supelco/Sigma-Aldrich.

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Supelco/Sigma-Aldrich shall not in any event be liable for incidental, consequential or special damages of any kind resulting from any use or failure of the products, even if Supelco/Sigma-Aldrich has been advised of the possibility of such damage including, without limitation, liability for loss of use, loss of work in progress, down time, loss of revenue or profits, failure to realize savings, loss of products of buyer or other use or any liability of buyer to a third party on account of such loss, or for any labor or any other expense, damage or loss occasioned by such product including personal injury or property damage unless such personal injury or property damage is caused by Supelco/Sigma-Aldrich's gross negligence. All claims must be brought within one (1) year of shipment, regardless of their nature.

For more information about Supelco/Sigma-Aldrich's terms and conditions of sale, you should review our invoices and packing slips, or you may obtain a copy of our terms and conditions by contacting our Customer Service Department.



Return Policy

Our Customer Service Department is available to assist you should a problem arise with your order. Please inspect your packages immediately upon receipt and notify us promptly of any damage or discrepancies. Should an item be shipped to you incorrectly, as the result of an error on our part, we will take quick and appropriate action to correct the problem.

Prior to returning any items, please contact the Customer Service Department to obtain a Return Material Authorization (RMA) and shipping instructions. A return authorization will ensure the safe and proper handling of material and enable us to expedite a resolution. Items returned without prior authorization may not be accepted. Shipment of authorized returns should be made within 30 days of the issuance of the RMA. We will do our best to fulfill requests to return material. However, in order to maintain the quality of our products and continue to provide competitive prices, certain items may not be returned for credit. These items include: diagnostic reagents; refrigerated or frozen products; reagents and standards which have passed their expiration dates; custom products or special orders; products missing labels, parts or instruction manuals; books, computer software and equipment removed from their original packaging. Returns accepted for items ordered in error may be subject to a 20% processing fee.

Domestic Shipping Information

All orders are shipped FCA shipping point. Transportation charges will vary with the destination, weight, and content of each shipment. Special packaging, such as poison packs or metal over-pack cans, may be necessary for safe delivery of certain hazardous chemicals. All special packaging, administrative, and freight charges are available upon request at order entry and are indicated on our invoices.

We reserve the right to change a requested method of shipment if it does not comply with regulations or, in our judgment, will not deliver a product safely.

Any transportation and handling charges quoted or invoiced include charges in addition to actual freight costs. For collect shipments, please include your account number with your preferred carrier to ensure proper billing.

Backordered items are shipped and invoiced separately as they become available.



General Information

International Shipping Information

Numerous restrictions and regulations govern the international transport of chemical products. We strive to ship all orders without delay and to minimize delivery costs within these regulatory guidelines.

All orders prepared for shipment outside the contiguous USA are FCA shipping point. The volume of our international shipments results in very competitive rates from our freight forwarders. For orders shipped through our designated carriers, we pay the transportation and handling costs in advance. These costs are added to your invoice. You can choose other forwarders to handle your orders; however, such orders are delivered on a collect basis. Please note, we will ship our products only through an IATA-approved freight forwarder.

Backordered items are shipped FCA shipping point when they become available, unless alternative instructions are provided when the original order is placed. To minimize freight costs, backorders can be consolidated with future shipments.

You can help us process your orders quickly and efficiently in a variety of ways:

- *Include a contact name, telephone number, and fax number on your purchase order. If you use a broker or agent to clear your shipments through customs, include the broker's name, telephone number, and fax number as well.*
- *Consolidate your orders. Minimize the number of shipments by consolidating the products that require air freight shipment.*
- *Consolidate orders from different departments within your institution. We can bill individual departments separately, if necessary. Please instruct us accordingly when placing your order.*
- *Confirm your acceptance of air freight costs on your order.*
- *For collect shipments, include your account number with your designated carrier.*
- *Place orders through your nearest Supelco/Sigma-Aldrich office.*
- *Submit orders once to avoid duplication. If you place orders by mail, fax or email, it is unnecessary to send a confirmation copy. Our Service Representatives are happy to assist you with the status of your order.*



Dry Ice Shipping Information

Products requiring dry ice shipment will be shipped to you as such at no additional charge.

Not all items requiring long-term cold storage need to be shipped in ice. Shipping conditions may differ from our recommended storage temperatures. We will ship under conditions that ensure the quality of the product. We try to estimate the amount of dry ice needed, but we cannot predict time lost in Customs offices or en route. The customer is responsible for prompt Customs clearance. If you cannot ensure prompt Customs clearance, be sure to order additional ice, and specify which airport you prefer.



To help prevent delays in Customs, please include name and telephone or fax number of person to contact upon arrival.

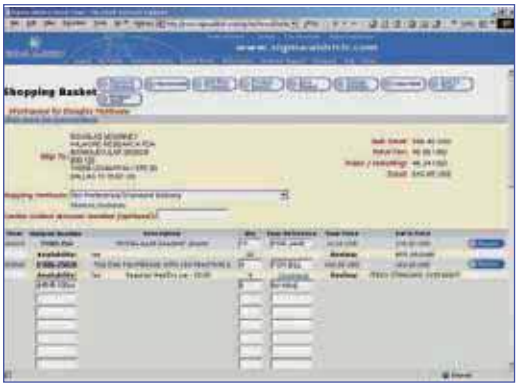
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Your Real-Time Source for E-Commerce

*Real-time product availability. Current order status. Total delivered price.** The e-Commerce solution, called PipeLine™ at **sigma-aldrich.com** truly integrates the over 200,000 products available from Supelco/Sigma-Aldrich. PipeLine is personalized to research, order and deliver the tools you need. From convenient ordering profiles to the assurance of a secured transaction, PipeLine is the most comprehensive, real-time e-Commerce resource in the industry.

Use the Order Center for Fast, Efficient Ordering

Sign on to **sigma-aldrich.com**. After a quick, first-time registration, your private and secure profile will hold your account information for retrieval upon future access. Create your order using one or a combination of the methods below. *You receive real-time product stock availability, full order costs (including shipping fees) and order confirmation instantly.** And, you can conveniently pay by credit card, procurement card, or through a purchase order number. Choose from:



EZ Order – Simply enter the product numbers of the products you wish to purchase. Select the package size and quantity, then submit.

Product Shelf – Create personal list of products that you frequently purchase and can easily access with any order. When reordering, check off the designated products, click a button and send.

Product Search – Use the searching capabilities available on the site to find the right product. Select the package size and price, then click to add the product to your shopping basket.

Easy Ordering Tips

- *Check pricing and availability to verify that product is in stock for immediate delivery.*
- *Use the "Save Order" feature to place an order on hold. The order can be activated later, plus products can be added or deleted. You'll save money by consolidating your multiple orders into one.*
- *You can check the status of any order online – whether you placed the order via phone, fax, Web, or EDI.**
- *Customize your profile for multiple ship-to locations.**

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You can be assured that the information you give us to process your order is both private and secure. **Sigma-aldrich.com** is registered with Verisign™ and data sent between Supelco/Sigma-Aldrich Web servers and your computer is encrypted using the Secure Socket Layer (SSL) protocol. This protects the data while it travels over the Internet and is unencrypted for display by your computer. In addition, all transactions that you initiate with Supelco/Sigma-Aldrich are confidential. Services such as "Suspended Orders" and "Product Shelf" are provided solely for customer convenience. Your name will not be added to the Supelco/Sigma-Aldrich mailing list unless you request it.

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Whether you've placed your order online, over the phone, via EDI or by fax, information regarding order status is immediately available via **sigma-aldrich.com**. *All order information is populated and updated in real-time. Once your package has been bar-coded, you can track the delivery from our location, through shipment, to your doorstep by clicking on the tracking number. Our direct links to shippers' tracking-detail pages will give you up-to-the-minute status of your order. Log on today to* **sigma-aldrich.com**.

* Online technology may not be available in all countries.

DISCOVERY

Did you know...

The Discovery Line of HPLC Products is recognized worldwide as being the standard for superior performance.



- The Discovery suite of functionalized reversed-phase enables the development of better separations in less time.
- Discovery BIO Wide PORE 300A HPLC columns and capillaries provide sensitive, stable, efficient, reproducible, separations of proteins and peptides

Liquid Chromatography

Supelco services include...

- Custom Capabilities

If you have special column needs beyond what is listed, please inquire about a custom order.

- Every Column Tested for Quality
- Column is Available When You Need It
- Easy Ordering
- On-Time Delivery
- Superior Support

TechTip

The use of a guard column protects and extends the lifetime of column investment.

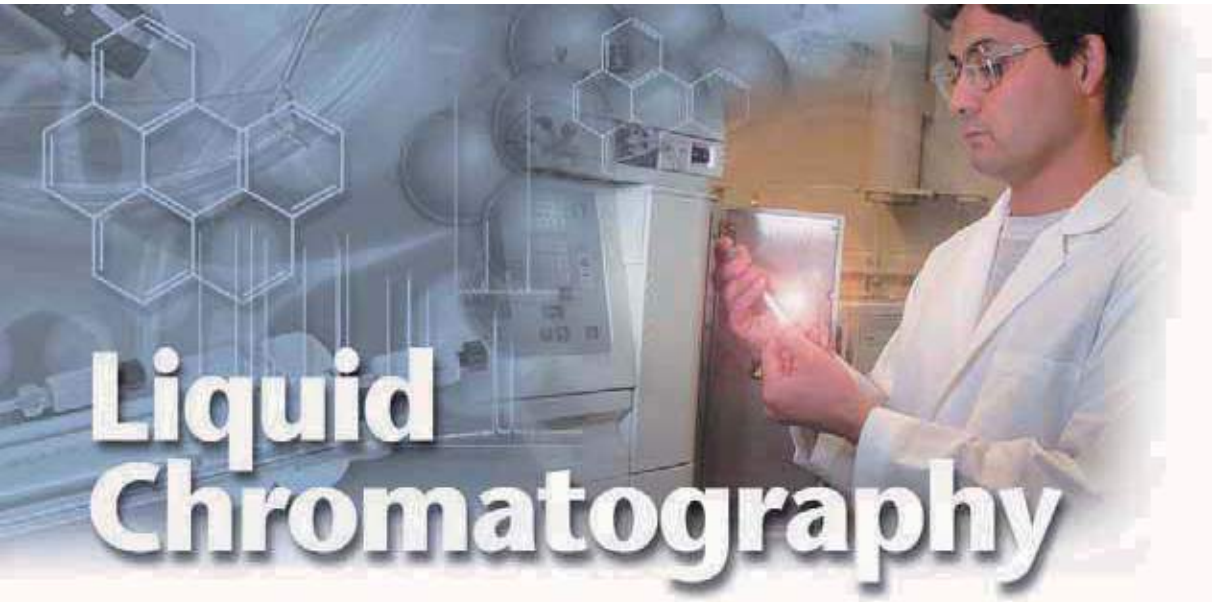
Not using a guard column can result in...

more frequent analytical column changes

instrument downtime

instrument damage (in some cases e.g. LC/MS)

All of which cost you time and money.
Corresponding guard columns are available for most Supelco analytical columns.



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DISCOVERY

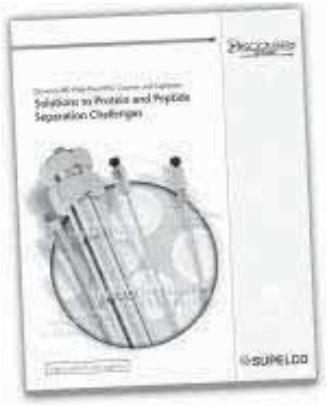
HPLC Columns for Pharmaceutical Analysis and Purification

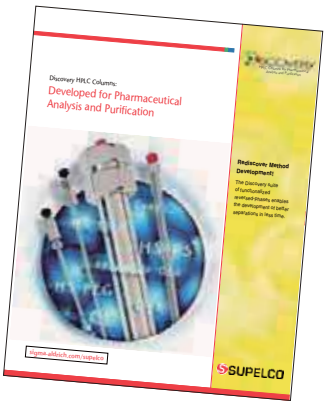


Rediscover HPLC method development with Supelco's Discovery alkyl and functionalized reversed-phases.

The Discovery suite of functionalized reversed-phases, including C18, HS C18, C8, Cyano, RP-AmideC16, HS F5, and HS PEG, enables the development of better separations in less time. You'll see better peak shape, shorter analysis time, optimal peak spacing and retention with simple, LC/MS-compatible mobile phases.

For more information see our Website or Request the following guides: T402038 or T402075







*View the continually expanding line of Discovery products on our website at:
sigma-aldrich.com/Supelco-discovery

sigma-aldrich.com/supelco

*We are committed to the success of our Customers, Employees and Shareholders through leadership in **Life Science**, **High Technology** and **Service**.*

SUPELCO

US $

HPLC Column Selection: Small Molecules (<2000 mw)

This chart is meant to be a starting point for choosing an HPLC column. In some cases, more than one column can be used for an analysis. Although general rules apply, you should first consult the technical literature, official methodology, or our Technical Service chemists for definitive recommendations.

For column choices for peptides, proteins, and other biopolymers, see pages 54-55.

ANALYTE CHARACTERISTICS		TECHNIQUE	ANALYTE CLASS	COLUMN
water soluble	nonionic	reversed phase	GENERAL (pH 2-7.5)	Discovery C18, C8, RP-AmideC16; Discovery Cyano, Discovery HS C18, HS F5, HS PEG
			GENERAL (pH 2-13)	SUPELCOGEL ODP-50, TPR-100
			acids, organic	Discovery C18, C8, RP-AmideC16
			acids, amino	Discovery C18, RP-AmideC16; SUPELCOSIL LC-DABS
			amines, organic	Discovery C18, RP-AmideC16; Discovery Cyano, Discovery HS F5; SUPELCOGEL TPR-100
			amines, quaternary (pH≥7.5)	SUPELCOGEL TPR-100, ODP-50
			chelating compounds	Discovery C18, C8, RP-AmideC16; SUPELCOGEL TPR-100, ODP-50
			drugs, basic	Discovery C18, C8, RP-AmideC16; Discovery Cyano, Discovery HS F5
			drugs in serum	Hisep; Discovery C18, RP-AmideC16, C8; Discovery HS F5
			explosives	Discovery C18, C8, RP-AmideC16; Discovery Cyano
			nucleosides	SUPELCOSIL LC-18-S; Discovery C18, RP-AmideC16
			nucleotides	SUPELCOSIL LC-18-T; Discovery C18, RP-AmideC16
			peptides	Discovery C18, C8, RP-AmideC16
			sugars	SUPELCOSIL LC-NH_2
			taxol, taxanes	SUPELCOSIL LC-F
			tricyclic antidepressants	SUPELCOSIL LC-PCN; Discovery C8; Discovery Cyano
			vitamins, water soluble	Discovery C18, C8, RP-AmideC16
		hydrophobic interaction	peptides	TSK-GEL
		size exclusion	oligosaccharides	SUPELCOGEL Ag1, Ag2; TSK-GEL Oligo-PW
			polymers/oligomers, hydrophilic	TSK-GEL PW_{XL}
	ionic	ion exchange	anions, organic (- charge)	SUPELCOSIL SAX1
			cations, organic (+ charge)	SUPELCOSIL LC-SCX
		ion pairing	acids, organic	Discovery C18, Discovery HS C18
			amines, organic	Discovery C18, Discovery HS C18
		ion exclusion	acids, organic	SUPELCOGEL H, C610H
			carbohydrates, sugars	SUPELCOGEL C611, K, Pb, Ag1, Ag2, Ca
organic soluble		normal phase	GENERAL	Discovery Cyano, LC-NH_2-NP, LC-Si, Discovery HS PEG
			aflatoxins	SUPELCOSIL LC-Si
			steroids	SUPELCOSIL LC-Diol
			vitamins, fat soluble	SUPELCOSIL LC-NH_2-NP
		reversed phase	fatty acids	SUPELCOSIL LC-18
			polyaromatic hydrocarbons	SUPELCOSIL LC-PAH
			polymers, hydrophobic	SUPELCOSIL LC-18
			triglycerides	SUPELCOSIL LC-18
			vitamins, fat soluble	Discovery C18, C8, RP-AmideC16, SUPELCOSIL LC-8
		size exclusion	polymers/oligomers, hydrophilic	TSK-GEL H_{HR}

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

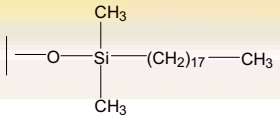
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HPLC: Small Molecules
Discovery Reversed-Phases

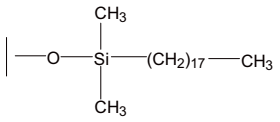
US $

Comprehensive Suite of Alkyl and Functionalized Phases

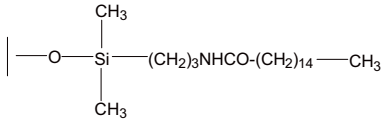
HS C18



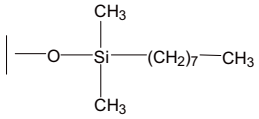
C18



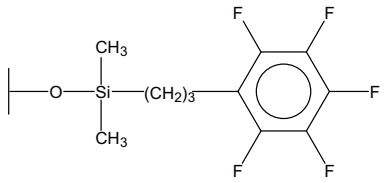
RP-AmideC16



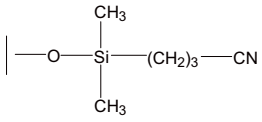
C8



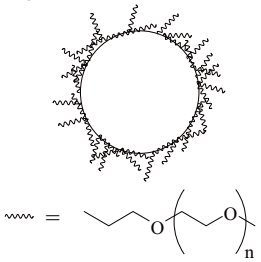
HS F5



Cyano



HS PEG



Valuable, Different Separations versus C18

While C18's from different sources can provide significant differences in retention and selectivity, these differences are frequently small and not sufficient to produce really valuable, improved separations. The Discovery suite of reversed-phases is designed to be complimentary to C18 by combining "polar" functionality with the standard alkyl/hydrophobic phase. The result – It's much more likely to achieve an improved, valuable separation with a polar functionalized reversed-phase than with "another" C18.

Ideal for all "small molecule" HPLC applications

Designed to meet the exacting requirements of pharmaceutical analysis and purification, Discovery columns are also ideal for all other application segments requiring reversed-phase HPLC, including:

- food and beverage
- agriculture
- environmental
- consumer products
- clinical
- industrial chemical
- petrochemical
- and more .....

Characteristics of Discovery Reversed-Phases

Phase	Coverage µmole/m²	%C	Endcapped	Pore Diameter Angstroms	Surface Area m²/g
HS C18	3.8	20%	yes	120	300
C18	3.0	12%	yes	180	200
RP-AmideC16	2.6	11%	yes	180	200
C8	3.4	7.5%	yes	180	200
HS F5	4.0	12%	yes	120	300
Cyano	3.5	4.5%	yes	180	200
HS PEG	3.8	12%	no	120	300

On the next page, begin to rediscover method development...

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Take Advantage of the Discovery Suite of Reversed-Phases

Whether you're developing a separation that must be perfect, or you're just not satisfied with your reversed-phase separation...

Turn to Discovery!

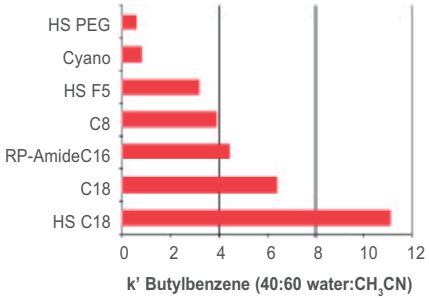
a suite of HPLC columns featuring functionalized reversed-phases designed to provide differentiated separations vs. C18 based on unique combinations of polar and hydrophobic retention.

The Discovery suite of reversed-phases enables you to optimize your separation..., e.g.

- retention
- selectivity
- resolution
- analysis time

...while minimizing method development time.

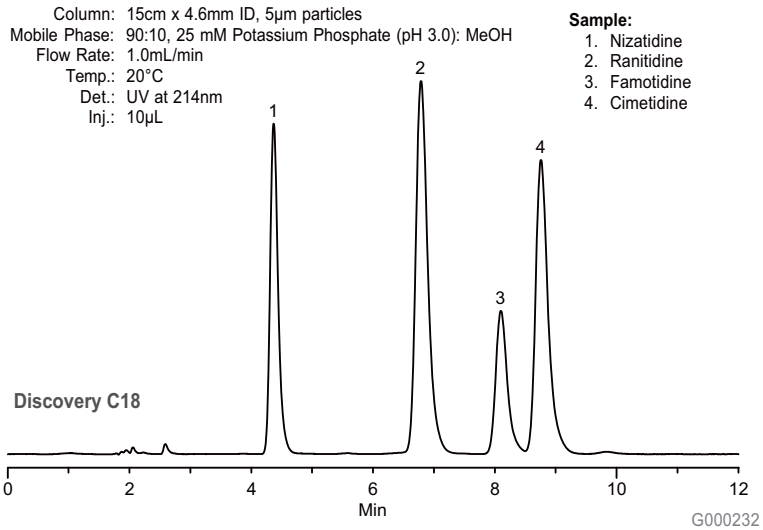
Hydrophobicity: Discovery Reversed-Phases

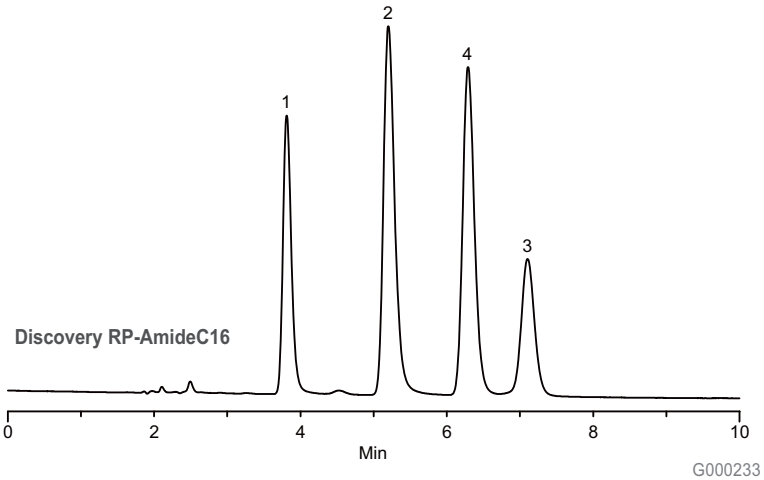


Discovery RP-AmideC16 Delivers Better Peak Spacing and Faster Analysis!

Scientists have long known polar embedded phases such as Discovery RP-AmideC16 provide unique retention and selectivity compared to C18's. Taking advantage of Discovery RP-AmideC16's unique retention and selectivity results in a better separation vs. C18.

- Unique selectivity - peak reversal of compounds 3 and 4
- Better peak spacing - less dead space between peaks 1 and 2
- Higher assay throughput - 20% reduction in analysis time
- Improved resolution of critical peak pair 3 and 4





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HPLC: Small Molecules

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Deliver Better Separations in Less Time

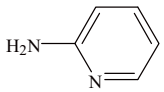
Unique retention and selectivity of Discovery HS F5 enables rapid development of simple impurity assay where C18 fails!

Impurity methods requiring retention and resolution of vastly differing analytes may not be suitably obtained using simple C18-based systems. By simply changing the stationary phase the method development scientist can avoid:

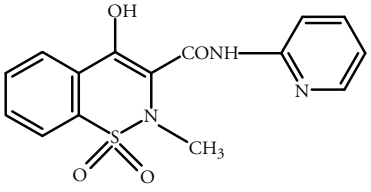
- complicated or forbidden gradients
- complex mobile phases
- long, drawn-out method development

On Discovery HS F5, it took just a few hours to develop an excellent separation.

2-Aminopyridine



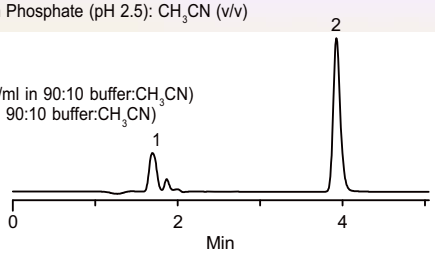
Piroxicam



2-Aminopyridine (2-AMP) is Unretained on C18 Under Mobile Phase Conditions Used to Assay Piroxicam

Column: Discovery C18 15cm x 4.6mm ID, 5µm particles
Mobile Phase: 45:55, 10 mM Potassium Phosphate (pH 2.5): CH_3CN (v/v)
Flow Rate: 1.0mL/min
Det.: UV at 220nm
Inj.: 5µL
Sample: 1. 2-Aminopyridine (10µg/ml in 90:10 buffer:CH_3CN)
2. Piroxicam (100µg/ml in 90:10 buffer:CH_3CN)

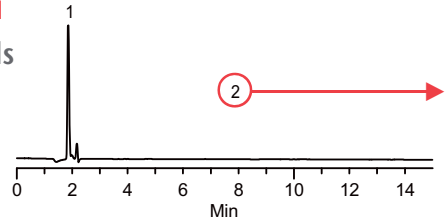
1. 2-Aminopyridine
2. Piroxicam



Decreasing the % Acetonitrile Results in Excessive Piroxicam Retention and 2-AMP is Still Unretained

C18 Fails

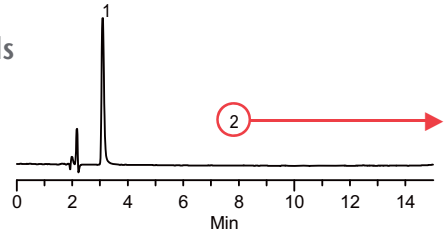
Same buffer but with lower organic: 85:15, 10 mM Potassium Phosphate (pH 2.5): CH_3CN (v/v)



Increasing pH to 6.8 Retains the 2-AMP but Piroxicam Retention is Still Excessive

C18 Fails

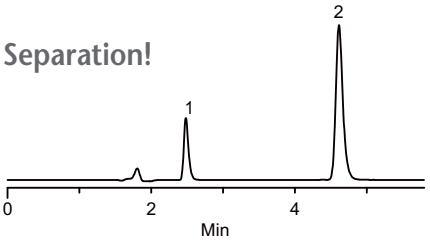
Same %organic, but changing the pH to 6.8: 85:15, 10 mM Potassium Phosphate (pH 6.8): CH_3CN (v/v)



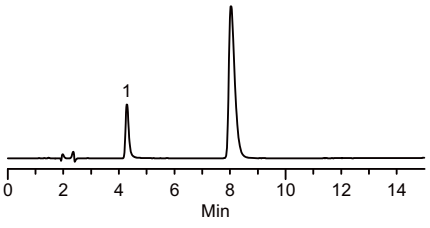
The Unique Retention and Selectivity of Discovery HS F5 Produces Excellent Separation at Both pH's

F5 Delivers Excellent Separation!

85:15, 10 mM Potassium Phosphate (pH 2.5): CH_3CN (v/v)



85:15, 10 mM Potassium Phosphate (pH 6.8): CH_3CN (v/v)



Different Retention is a General and Valuable Characteristic of Functionalized Reversed-Phases

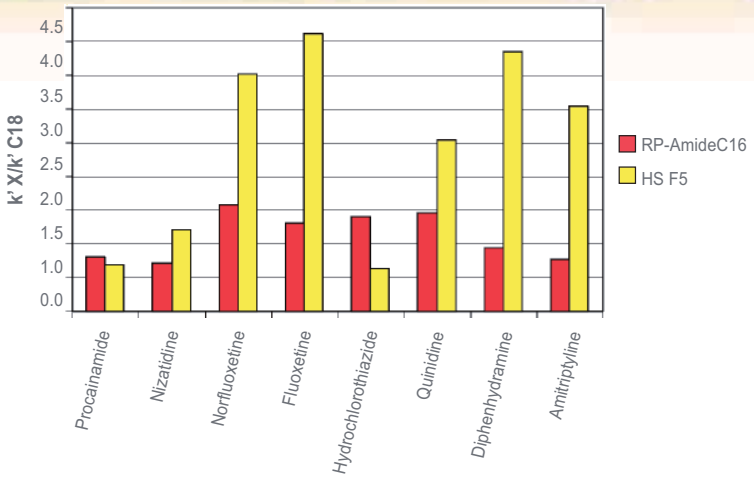
Unique retention vs. C18

Retention of several basic drugs is compared on C18, RP-AmideC16 and F5. (F5 mobile phase %organic is +30% vs. C18 and RP-AmideC16.)

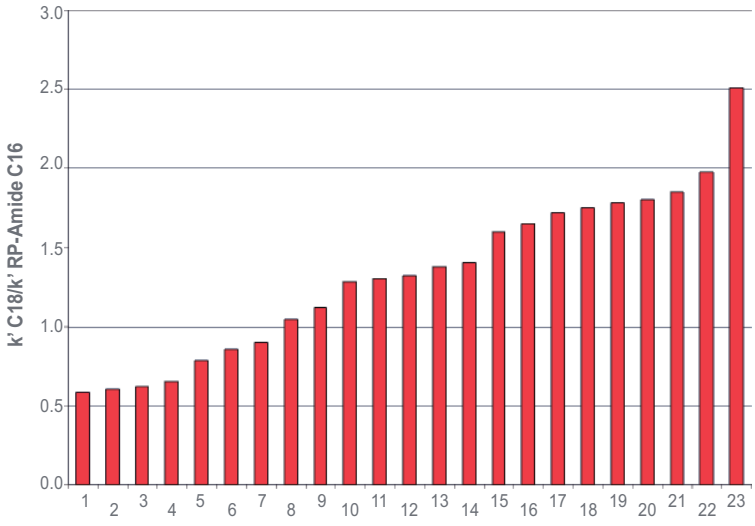
- Both F5 and RP-AmideC16 deliver valuable, different retention compared to C18.
- F5 is significantly more retentive for most compounds tested vs. both C18 and RP-AmideC16
- Retention on functionalized reversed-phases is almost always different than retention on C18!

NOTE: k' ratios not equal to 1.0 mean different retention.

Retention on RP-AmideC16 and F5 Relative to C18



Retention on C18 Relative to RP-AmideC16



1. Acetaminophen
2. Methyl Paraben
3. Ethyl Paraben
4. Naproxen
5. Ketoprofen
6. Propyl Paraben
7. Butyl Paraben
8. Quinidine
9. Quinine
10. Desacetyldiltiazem
11. Clonazepam
12. Cimetidine
13. Diltiazem
14. Strychnine
15. Nizatidine
16. Clorazepate
17. Ranitidine
18. Desmethyldiltiazem
19. Famotodine
20. Codeine
21. Diazepam
22. Papaverine
23. Noscapine

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HPLC: Small Molecules
Rediscover Method Development

Different Selectivity is a General and Valuable Characteristic of Functionalized Reversed-Phases

Key to interpreting results

When a color aligns, the selectivity is similar.

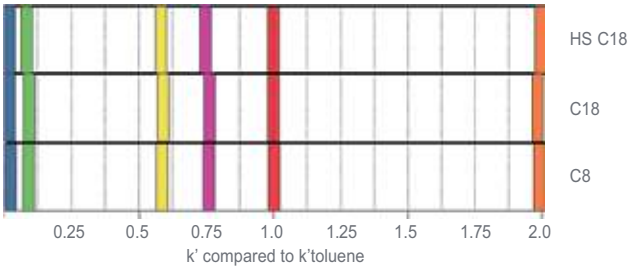
When a color does not align, the selectivity is different.

- Aniline
- Phenol
- Toluene
- N,N-Dimethylaniline
- Ethylbenzoate
- Ethylbenzene

Mobile phase: 45:55 25 mM Potassium Phosphate (pH 7.0):MeOH (All columns except HS PEG run at 75:25 25 mM Potassium Phosphate (pH 7.0):MeOH).
Flow Rate: 1.0mL/min

Similar Phases (C18's and C8's) - Similar Selectivities

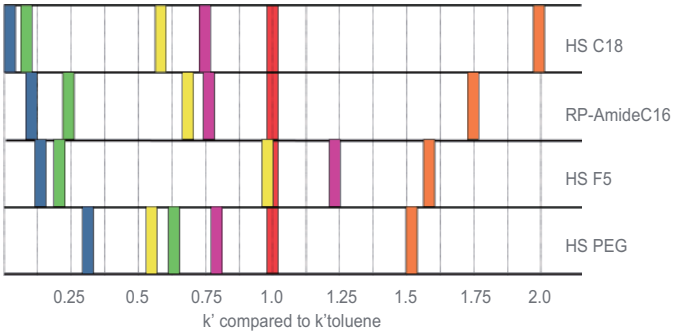
The near-perfect alignment of the colors clearly illustrates the similar selectivities of the C18 and C8 phases tested.



Unique, Functionalized Phases - Different Selectivities

The functional group containing solutes - Aniline, Phenol, N,N-Dimethylaniline (N,N DMA) and Ethylbenzoate - clearly illustrates the very different selectivities of the functionalized reversed-phases vs. C18. Observe the colors representing solutes containing polar groups dramatically change positions from phase to phase. Also observe the changing hydropbobic selectivity by looking at the Ethylbenzene bar.

Both polar and hydrophobic selectivities are different on the different phases.



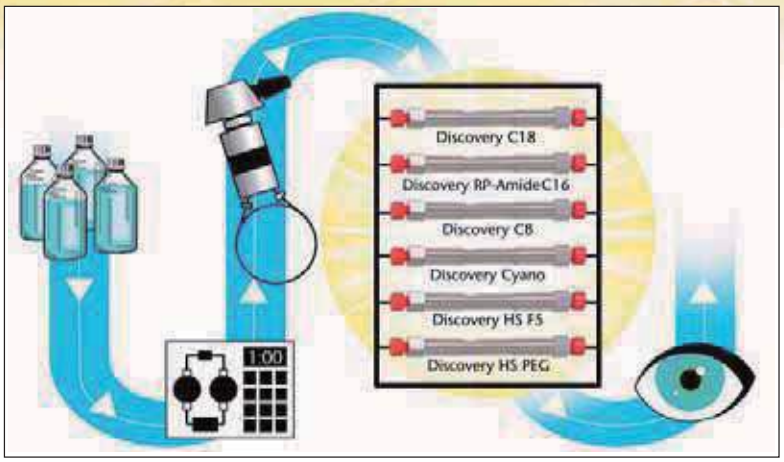
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Tips for Getting Started: Good Method Development Practices

Tip One: Column Selector Valve

Automated HPLC + Column Selector Valve

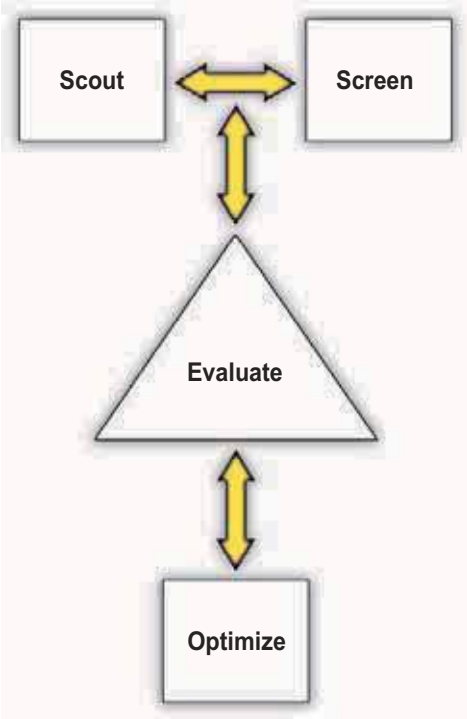
- While screening of functionalized reversed-phases can be done with a simple, manual HPLC system, an automated, multi-solvent system with programmable, temperature controlled column selector valve is highly recommended.



Tip Two: Simple Column Screening

Guidelines for Rapid Screening of Functionalized Reversed-Phases

- Step 1: Scout for "best" mobile phase on C18
- Step 2: Initial screening runs
  - Chromatograph sample on Discovery RP-AmideC16 and F5 using "best" C18 mobile phase
  - Chromatograph sample on PEG using 20% lower organic than "best" C18 mobile phase
- Step 3: Evaluate screening runs
  - Retention OK? If no, adjust % organic and rerun (Note: F5 sometimes requires stronger mobile phase than C18)
- Step 4: Optimize separation on most promising 1 or 2 columns using standard reversed-phase mobile phase adjustment techniques



Tip Three: Always screen several functionalized reversed-phases and a C18.

Tip Four: Optimize your separation on the 1 or 2 most promising phases!

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HPLC: Small Molecules

Alkyl Reversed-Phases

Discovery C18, C8, HS C18....

C18 and C8

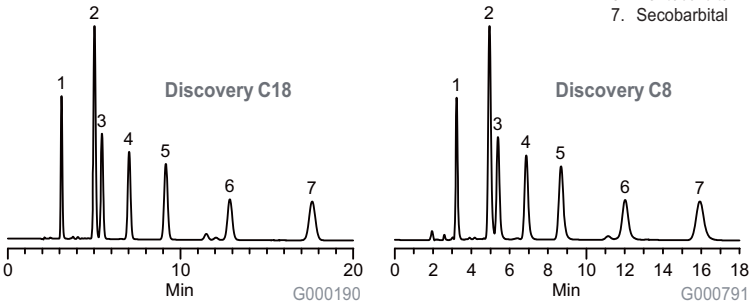
- Excellent performance
- Similar selectivities
- C18 generally more retentive than C8

	Surface Area: (m^2/g)	Pore Size: (Å)	Coverage: ($\mu moles/m^2$)	Endcapped	%C
C8	200	180	3.4	Yes	7.5%
C18	200	180	3.0	Yes	12%
HS C18	300	120	3.8	Yes	20%

Barbiturates

Column: 15cm x 4.6mm columns, 5µm particles
Mobile Phase: 55:45 Water:MeOH
Flow Rate: 1.0mL/min
Det.: UV at 214nm
Temp.: ambient
Inj.: 5µL (Discovery C8) or 10µL (Discovery C18)

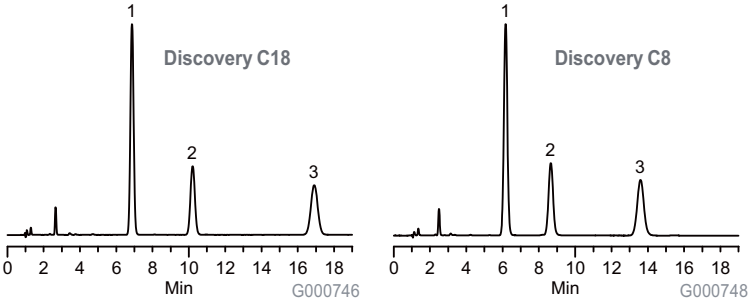
Sample: 1µg/mL of each
1. Barbital
2. Aprobarbital
3. Phenobarbital
4. Butabarbital
5. Mephobarbital
6. Pentobarbital
7. Secobarbital



Anticonvulsants

Column: 15cm x 4.6mm columns, 5µm particles
Mobile Phase: 70:30 Water:CH_3CN
Flow Rate: 2.0mL/min
Det.: UV at 254nm
Temp.: 20°C
Inj.: 10µL

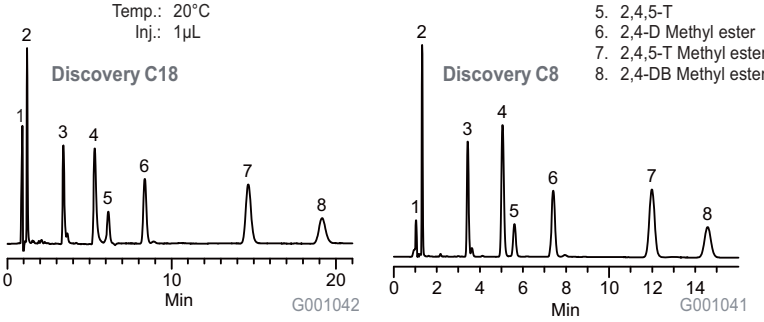
Sample:
1. Clonazepam
2. Clorazepate
3. Diazepam



Alhanoic / Aryloxyalhanoic Acid Using Isocratic Elution

Column: 15cm x 4.6mm columns, 5µm particles
Mobile Phase: 60:40 25mM Potassium Phosphate (pH 2.3):CH_3CN
Flow Rate: 2.0mL/min
Det.: UV at 214nm
Temp.: 20°C
Inj.: 1µL

Sample:
1. Solvent
2. Dalapon
3. 2,4-D
4. 2,4-DB
5. 2,4,5-T
6. 2,4-D Methyl ester
7. 2,4,5-T Methyl ester
8. 2,4-DB Methyl ester



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...Excellent Chromatography for a Wide Range of Compounds

HS C18 and C18

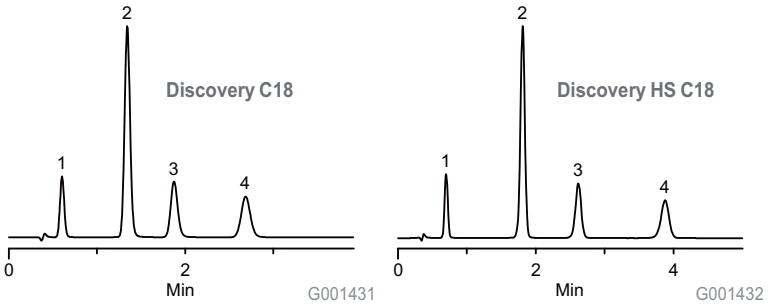
- C18 most general, 1st choice
- Similar selectivities
- HS C18 generally more retentive than C18
- HS C18 is more acidic

Mobile phase additive can improve chromatography of bases

Organic Acids

Column: 5cm x 4.6mm columns
Mobile Phase: 60:40 0.1%TFA in Water:MeOH
Flow Rate: 2.0mL/min
Temp.: 20°C
Det.: UV at 254nm
Inj.: 10µL

Sample:
1. Homovanillic acid (0.0625µg/mL)
2. Sorbic acid (0.00625µg/mL)
3. Salicylic acid (0.0625µg/mL)
4. p-Toluic acid (0.00625µg/mL)



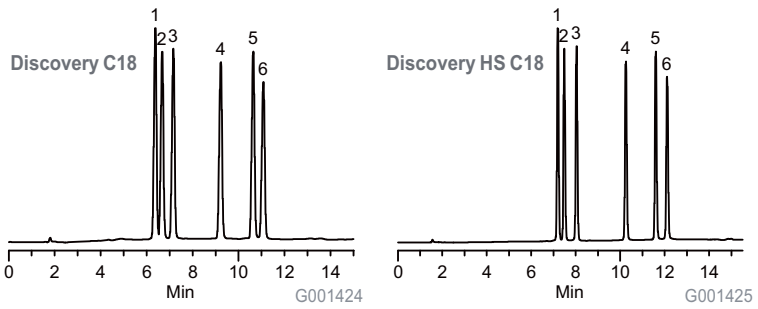
Antibiotics (Fluoroquinolones from Tablets)

Column: 15cm x 4.6mm columns
Mobile Phase: (A) 25 mM Potassium Phosphate (pH 3.0)
(B) CH_3CN
Flow Rate: 1.0mL/min
Temp.: 35°C
Det.: UV at 220nm
Inj.: 10µL

Gradient:

Min	%A	%B
0	90	10
15	65	35

Sample:
1. Levofloxacin
2. Ciprofloxacin
3. Lomefloxacin
4. Sparfloxacin
5. Grepafloxacin
6. Trovafloxacin



Conditions for Discovery C18 - no additive

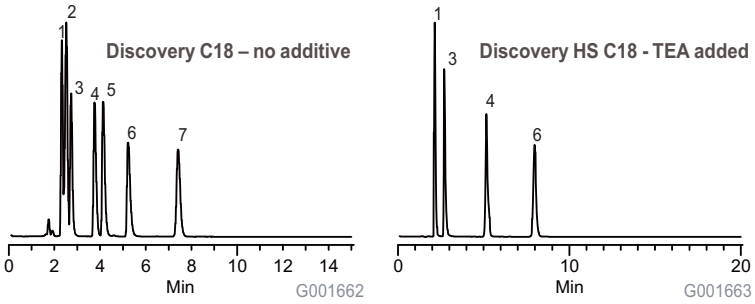
Column: 15cm x 4.6mm columns
5µm particles
Mobile Phase: 45:55 25mM Ammonium Phosphate (pH7.0):CH_3CN
Flow Rate: 1.0mL/min
Temp.: 30°C
Det.: UV at 254nm
Inj.: 10µL
Sample: 100µg/mL of each

Conditions for Discovery HS C18 - TEA added

Column: 15cm x 4.6mm columns
5µm particles
Mobile Phase: 45:55 25mM TEA phosphate (pH7):CH_3CN
Flow Rate: 1.0mL/min
Temp.: 30°C
Det.: UV at 254nm
Inj.: 10µL
Sample: 100µg/mL of each

...HS C18 is More Acidic...

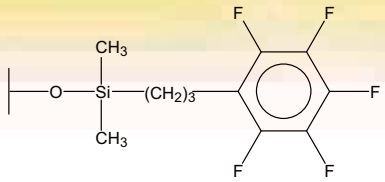
Sample:
1. Nordoxepin
2. Protriptyline/Desipramine
3. Nortriptyline
4. Doxepin
5. Imipramine
6. Amitriptyline
7. Trimipramine



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HPLC: Small Molecules
Discovery HS F5

Unique Retention and Selectivity Enables Better Separations



- Excellent performance
- Unique selectivity
- Similar retention to C18 (sometimes requires stronger mobile phase strength than C18)

	Surface Area: (m^2/g)	Pore Size: (Å)	Coverage: ($\mu moles/m^2$)	Endcapped	%C
HS F5	300	120	4.0	Yes	12

Excellent Retention of Multifunctional Compounds

The Discovery HS F5 shows greater retention, versus C18, of the multifunctional compounds shown in these chromatograms Compounds that elute too closely to the void volume (peak 1) on C18 columns are sufficiently retained by Discovery HS F5.

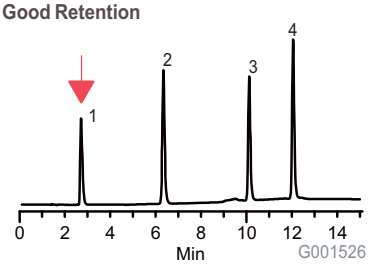
Column: Discovery HS F5 and Conventional C18, 15cm x 4.6mm, 5µm particles
Mobile Phase: (A) 10mM ammonium acetate, 0.1% formic acid; (B) MeOH
Flow Rate: 1.5mL/min
Temp.: 35°C
Det.: UV at 254nm
Inj.: 10µL

Gradient:

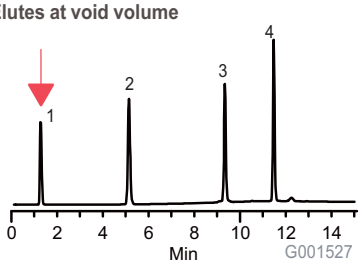
Min	%A	%B
0	90	10
3	90	10
10	50	50
15	50	50

Sample:
1. p-Aminophenol (100µg/mL)
2. Acetaminophen (10µg/mL)
3. Acetanilide (10µg/mL)
4. Phenacetin (10µg/mL)

Discovery HS F5: Good Retention



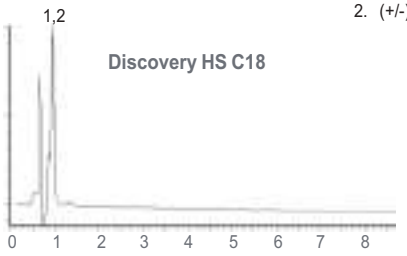
Conventional C18 Phase: Elutes at void volume



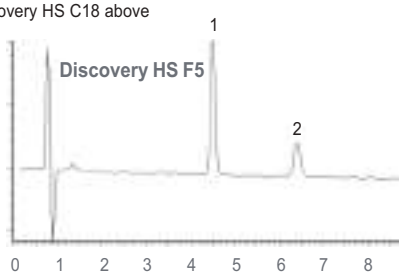
F5 Provides Excellent Separation - Solutes Are Not Retained on C18

Column: Discovery HS C18, 15cm x 4.6mm, 5µm particles
Mobile Phase: 30:70 10mM Ammonium Acetate (pH=6.98): CH_3CN
Flow Rate: 2.0mL/min
Temp.: 35°C
Det.: Photodiode Array
Inj.: 5µL

Sample:
1. Methcathinone (100µg/mL)
2. (+/-) Ephedrine (200µg/mL)



Column: Discovery HS F5, 15cm x 4.6mm
Conditions same as Discovery HS C18 above



Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

F5, a unique, functionalized reversed-phase uncovers a trace impurity missed by C18. "Pure" Quinidine was assayed on C18 under a variety of mobile phase conditions. Conditions C and D produced a single peak suggesting the Quinidine was pure. The peak resulting from condition B might be showing a partially resolved front shoulder. A quick screen of % organic was unable to resolve the possible impurity.

On F5 (chromatogram A) the impurity is clearly resolved. During method development a quick screen using unique, functionalized reversed-phases such as F5 greatly increases the chances of finding trace impurities early, before they can cause big problems.

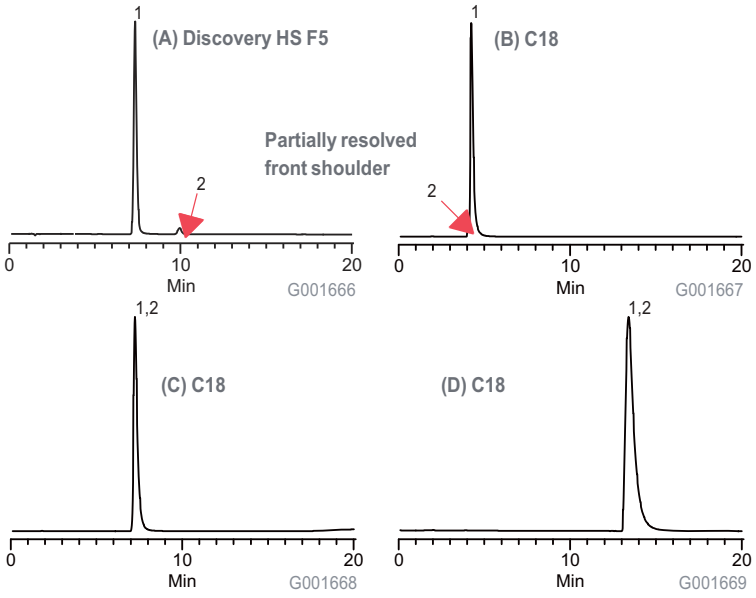
Helpful Hint

Routinely screen separations on several, complimentary functionalized reversed-phases (e.g. F5, PEG, RP-AmideC16) early in method development.

F5 Resolves Trace Impurity in Quinidine – C18 Does Not!

Column: Discovery HS F5 and Conventional C18, 15cm x 4.6mm, 5µm particles
Mobile Phase: 25 mM Ammonium Phosphate (pH 7.0):CH_3CN.
Varying Ratios: (A) 35:65, (B) 70:30, (C) 76:24, (D) 80:20
Flow Rate: 1.0mL/min
Temp.: 30°C
Det.: UV at 235nm
Inj.: 10µL

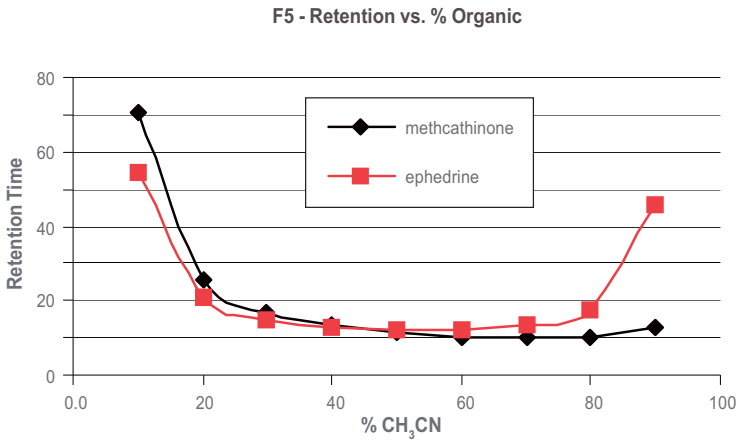
Sample:
1. Quinidine (50µg/mL)
2. Impurity



At lower organic, Discovery HS F5 exhibits reversed-phase behavior. At higher organic it exhibits normal phase behavior. At high % organic retention actually increases as % organic increases for some analytes. Benefits include:

- Improve LC/MS detection by using higher % organic mobile phase.
- Use mobile phase selectivity to develop valuable, different separations at high % organic

F5 Exhibits "U" Shaped Retention Creating Interesting Possibilities



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HPLC: Small Molecules
Discovery RP-Amide C16

Unique Retention and Selectivity Enables Better Separations

- Excellent performance
- Unique selectivity
- Similar retention to C18 (typically requires similar mobile phase strength as C18)

	Surface Area: (m^2/g)	Pore Size: (Å)	Coverage: ($\mu moles/m^2$)	Endcapped	%C
RP-AmideC16	200	180	2.6	Yes	11%

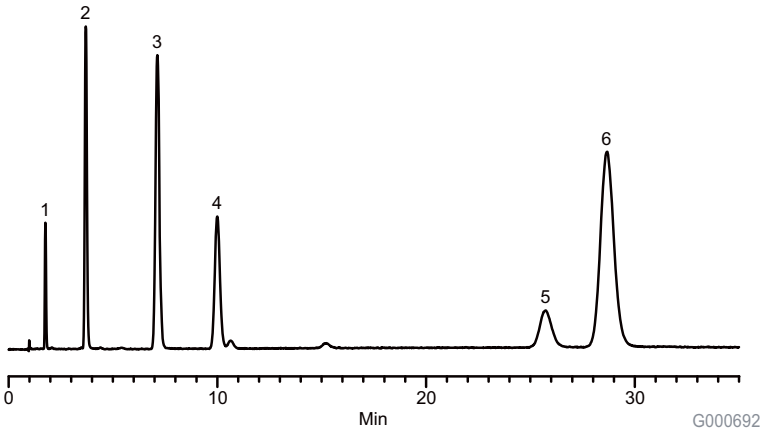
Discovery RP-AmideC16 Gives Better Resolution and Faster Analysis

- faster analysis from lower hydrophobicity
- better peak spacing (RP-AmideC16)
- better resolution of small impurities (RP-AmideC16)

Column: 15cm x 4.6mm, 5µm particles
Mobile Phase: 80:20 25mM Potassium Phosphate (pH 3.0):MeOH
Flow Rate: 2.0mL/min
Temp.: 35°C
Det.: UV at 254nm
Inj.: 10µL

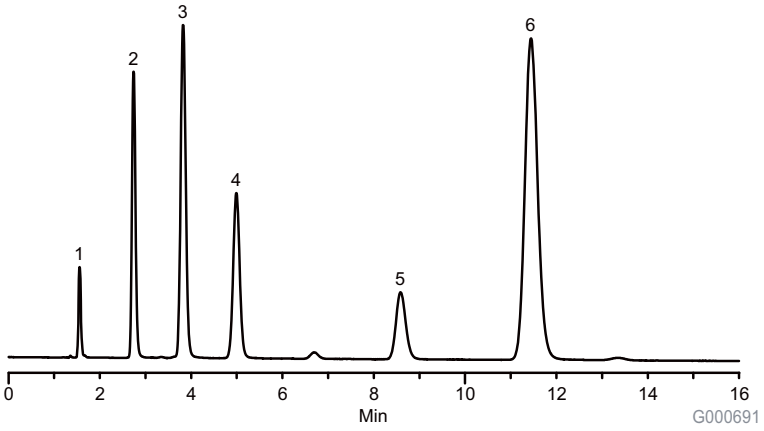
Sample:
1. Codeine
2. Strychnine
3. Quinidine
4. Quinine
5. Noscapine
6. Papaverine

Discovery C18



G000692

Discovery RP-AmideC16



G000691

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Faster analysis and different selectivity.

Antitussive/Antihistamine/Antipyretic Mix

Dramatic differences in peak order and run time are demonstrated by different Discovery reversed-phase stationary phases.

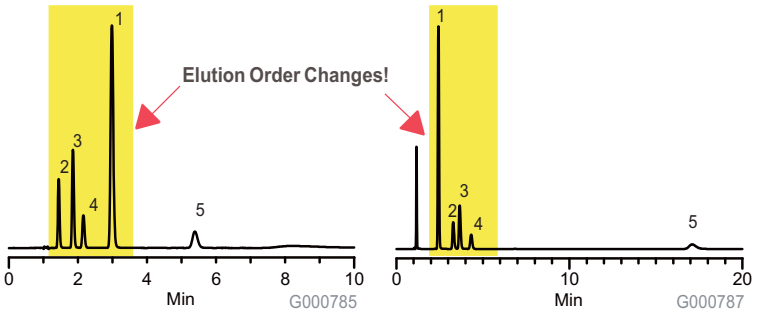
Column: 15cm x 4.6mm, 5µm particles
Mobile Phase: (A) 25 mM Potassium Phosphate (pH 2.3)
(B) CH_3CN
Flow Rate: 2.0mL/min
Temp.: ambient
Det.: UV at 214nM
Inj.: 10µL

Gradient:

Min	%A	%B
0	90	10
2	90	10
4	70	30
8	70	30
10	50	50

Sample: (1µg/mL of each)
1. Acetaminophen
2. Doxylamine
3. Pseudoephedrine
4. Codeine
5. Chlorpheniramine

Discovery RP-AmideC16 Discovery C18



But... different selectivity is not always better!

Here C18 provides a better separation.

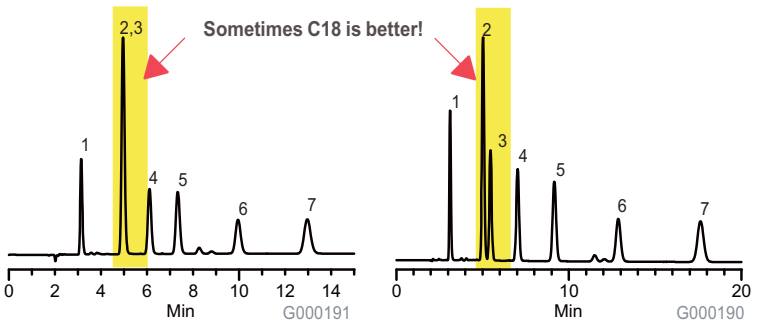
Barbiturates

Different Discovery column chemistries show different separations of barbiturates under identical conditions.

Column: 15cm x 4.6mm columns, 5µm particles
Mobile Phase: 55:45 Water:MeOH
Flow Rate: 1.0mL/min
Temp.: ambient
Det.: UV at 214nM
Inj.: 10µL

Sample: (1µg/mL of each)
1. Barbital
2. Aprobarbital
3. Phenobarbital
4. Butabarbital
5. Mephobarbital
6. Pentobarbital
7. Secobarbital

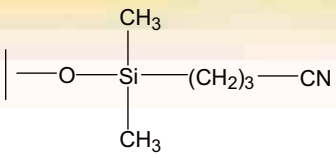
Discovery RP-AmideC16 Discovery C18



Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

HPLC: Small Molecules
Discovery Cyano

Unique Retention and Selectivity Enables Better Separations



- Excellent performance
- Unique selectivity
- Significantly less retentive than C18 (therefore typically requires greater % H $_2$O mobile phase)

	Surface Area: (m^2/g)	Pore Size: (Å)	Coverage: (µmoles/m^2)	Endcapped	%C
Cyano	200	180	3.5	Yes	4.5

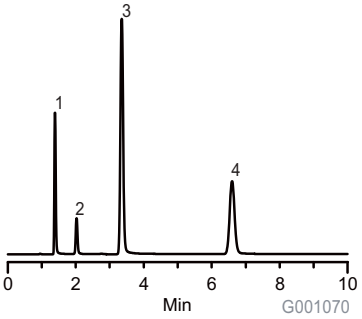
Faster Analysis - Eliminate Wasted Time

Urea Pesticides Using Isocratic Elution

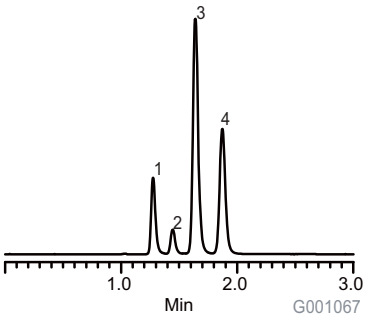
Column: 15cm x 4.6mm columns, 5µm particles
Mobile Phase: 60:40 Water:CH_3CN
Flow Rate: 2.0mL/min
Temp.: 20°C,
Det.: UV at 214nm
Inj.: 1µL

Sample:
1. Fenuron
2. Monuron
3. Diuron
4. Linuron

Discovery C18



Discovery Cyano



Faster Analysis - Different Selectivity

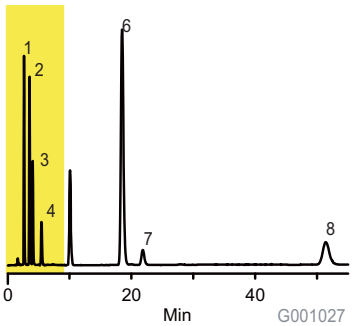
Organophosphorous Pesticides Using Isocratic Elution

Column: Discovery C18, 15cm x 4.6mm, 5µm particles
Mobile Phase: 30:70 Water:MeOH
Flow Rate: 1.0mL/min
Temp.: 20°C
Det.: UV at 214nm
Inj.: 1µL

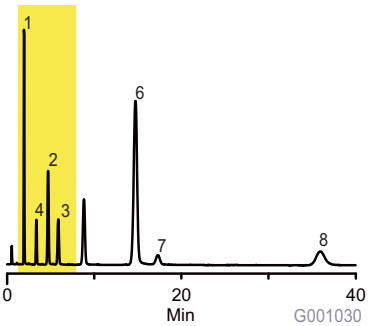
Column: Discovery Cyano, 15cm x 4.6mm, 5µm particles
Mobile Phase: 75:25 Water:CH_3CN
Flow Rate: 2.0mL/min
Temp.: 20°C
Det.: UV at 214nm
Inj.: 1µL

Sample:
1. Dichlorvos
2. Guthion
3. Methyl parathion
4. Ethoprophos
5. Disulfoton
6. Fenchlorvos
7. Chlorpyrifos
8. Prothiophos

Discovery C18

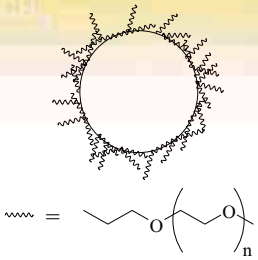


Discovery Cyano



Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Unique Retention and Selectivity Enables Better Separations



- Excellent performance
- Unique selectivity
- Significantly less retentive than C18 (therefore typically requires greater % H_2O mobile phase)

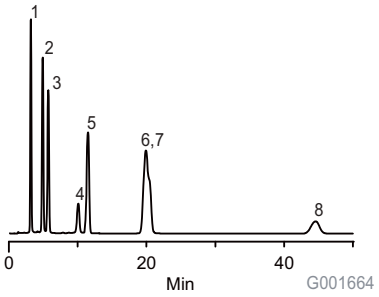
	Surface Area: (m^2/g)	Pore Size: (Å)	Coverage: ($\mu moles/m^2$)	Endcapped	%C
HS PEG	300	120	3.8	No	12

Flavones Demonstrate Dramatic Selectivity Differences Between HS PEG and C18

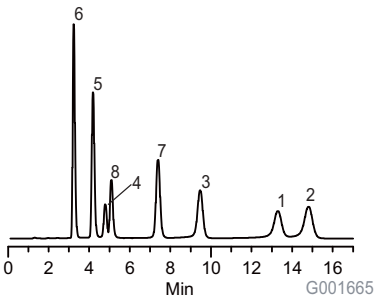
Column: 15cm x 4.6mm columns, 5µm particles
Mobile Phase: 45:55 0.1% Formic Acid in Water : 0.1% Formic Acid in MeOH
Flow Rate: 1.0mL/min
Temp.: 30°C,
Det.: UV at 254nm
Inj.: 10µL

Sample: 50µg/mL of each
1. Myricetin
2. Quercetin
3. Luteolin
4. Baicalein
5. 7-Hydroxyflavone
6. Flavone
7. Chrysin
8. 5-Hydroxyflavone

Discovery HS C18



Discovery HS PEG

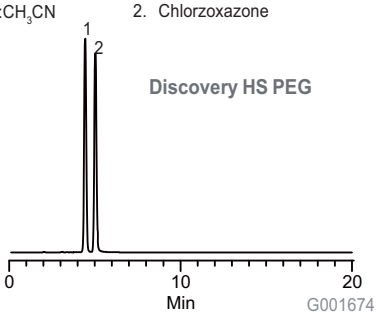


Chlorzoxazone - Excellent Separation on PEG; Excessive Retention and Resolution on HS C18

Column: 15cm x 4.6mm columns, 5µm particles
Mobile Phase: 70:30 20mM Acetic Acid in Water (pH 4.5 with Ammonium Hydroxide):CH_3CN
Flow Rate: 1.0mL/min
Temp.: 30°C,
Det.: UV at 285 nm
Inj.: 10µL

Sample: 100µg/mL of each
1. 6-Hydroxychlorzoxazone
2. Chlorzoxazone

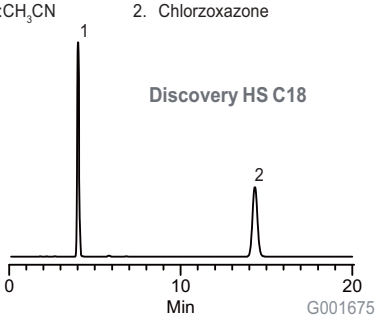
Discovery HS PEG



Column: 15cm x 4.6mm columns, 5µm particles
Mobile Phase: 75:25 20mM Acetic Acid in Water (pH 4.5 with Ammonium Hydroxide):CH_3CN
Flow Rate: 1.0mL/min
Temp.: 30°C,
Det.: UV at 285 nm
Inj.: 10µL

Sample: 100µg/mL of each
1. 6-Hydroxychlorzoxazone
2. Chlorzoxazone

Discovery HS C18



Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

HPLC: Small Molecules

Discovery C18 and Discovery HS C18 Columns

Discovery C18

PARTICLE SIZE	LENGTH X ID (cm x mm)	CAT. NO.	PRICE
DISCOVERY C18 (180Å, 12% CARBON)			
5µm	5 x 2.1	50494721	
5µm	10 x 2.1	569220-U	
5µm	12.5 x 2.1	569229-U	
5µm	15 x 2.1	50495521	
5µm	5 x 3.0	504947-30	
5µm	10 x 3.0	569221-U	
5µm	12.5 x 3.0	569230-U	
5µm	15 x 3.0	504955-30	
5µm	25 x 3.0	504971-30	
5µm	5 x 4.0	504947-40	
5µm	10 x 4.0	569222-U	
5µm	12.5 x 4.0	569231-U	
5µm	15 x 4.0	504955-40	
5µm	25 x 4.0	504971-40	
5µm	5 x 4.6	504947	
5µm	10 x 4.6	569223-U	
5µm	12.5 x 4.6	569232-U	
5µm	15 x 4.6	504955	
5µm	25 x 4.6	504971	
5µm	25 x 10.0	569224-U	
5µm	25 x 21.2	569226-U	
DISCOVERY C18 VALIDATION PACKS*			
5µm	5 x 2.1	55700-U21	
5µm	10 x 2.1	569800-U	
5µm	15 x 2.1	55702-U21	
5µm	5 x 4.6	55700-U	
5µm	10 x 4.6	569801-U	
5µm	15 x 4.6	55702-U	
5µm	25 x 4.6	55704-U	
DISCOVERY C18 SUPELGUARD CARTRIDGES			
5µm	2 x 2.1 (2/pk)	505188	
5µm	2 x 2.1 kit **	505161	
5µm	2 x 3.0 (2/pk)	59576-U	
5µm	2 x 3.0 kit **	59575-U	
5µm	2 x 4.0 (2/pk)	505137	
5µm	2 x 4.0 kit **	505129	

* Packs include 3 columns, each from a different lot of bonded phase.

** Kits include one cartridge, a stand-alone holder, a piece of tubing, 2 nuts and ferrules.

DISCOVERY C18 PROPERTIES:

Bonded Phase:	Octadecylsilane, endcapped
Silica:	Spherical, high purity (Fe <20; NA <7; Ca <7; Ti <1; Al <1; Mg <1ppm)
Particle Size:	5µm
Pore Size:	180Å
Surface Area:	200m²/g
%C:	~12%
Coverage:	~3µmoles/m²

Discovery HS C18 

PARTICLE SIZE	LENGTH X ID (cm x mm)	CAT. NO.	PRICE
DISCOVERY HS C18 (120Å, 20% CARBON)			
3µm	5 x 2.1	569253-U	
3µm	7.5 x 2.1	569254-U	
3µm	15 x 2.1	569255-U	
3µm	5 x 4.6	569250-U	
3µm	7.5 x 4.6	569251-U	
3µm	15 x 4.6	569252-U	
5µm	5 x 2.1	568500-U	
5µm	10 x 2.1	568501-U	
5µm	15 x 2.1	568502-U	
5µm	25 x 2.1	568503-U	
5µm	5 x 4.0	568510-U	
5µm	10 x 4.0	568511-U	
5µm	15 x 4.0	568512-U	
5µm	25 x 4.0	568513-U	
5µm	5 x 4.6	568520-U	
5µm	10 x 4.6	568521-U	
5µm	15 x 4.6	568522-U	
5µm	25 x 4.6	568523-U	
5µm	5 x 10.0	568530-U	
5µm	10 x 10.0	568531-U	
5µm	15 x 10.0	568532-U	
5µm	25 x 10.0	568533-U	
5µm	5 x 21.2	568540-U	
5µm	10 x 21.2	568541-U	
5µm	15 x 21.2	568542-U	
5µm	25 x 21.2	568543-U	
10µm	5 x 10.0	568630-U	
10µm	10 x 10.0	568631-U	
10µm	15 x 10.0	568632-U	
10µm	25 x 10.0	568633-U	
10µm	5 x 21.2	568640-U	
10µm	10 x 21.2	568641-U	
10µm	15 x 21.2	568642-U	
10µm	25 x 21.2	568643-U	
DISCOVERY HS C18 SUPELGUARD CARTRIDGES			
3µm	2 x 2.1 (2/pk)	569276-U	
3µm	2 x 2.1 kit **	569277-U	
3µm	2 x 4.0 (2/pk)	569274-U	
3µm	2 x 4.0 kit **	569275-U	
5µm	2 x 2.1 (2/pk)	568570-U	
5µm	2 x 2.1 kit **	568571-U	
5µm	2 x 4.0 (2/pk)	568572-U	
5µm	2 x 4.0 kit **	568573-U	
5µm	1 x 10.0	568574-U	
10µm	1 x 10.0	568674-U	

** Kits include one cartridge, a stand-alone holder, a piece of tubing, and 2 nuts and ferrules.

DISCOVERY HS C18 PROPERTIES:

Bonded Phase:	Octadecylsilane, endcapped
Silica:	Spherical, high purity (<10 ppm metals)
Particle Size:	3, 5, 10µm
Pore Size:	120Å
Surface Area:	300m²/g
%C:	~20%
Coverage:	~3.8µmoles/m²

Discovery RP-AmideC16

PARTICLE SIZE	LENGTH X ID (cm x mm)	CAT. NO.	PRICE
DISCOVERY RP-AMIDEC16 (180Å, 11% CARBON)			
5µm	5 x 2.1	50500521	
5µm	10 x 2.1	569320-U	
5µm	12.5 x 2.1	569329-U	
5µm	15 x 2.1	50501321	
5µm	5 x 3.0	505005-30	
5µm	10 x 3.0	569321-U	
5µm	12.5 x 3.0	569330-U	
5µm	15 x 3.0	505013-30	
5µm	25 x 3.0	505064-30	
5µm	5 x 4.0	505005-40	
5µm	10 x 4.0	569322-U	
5µm	12.5 x 4.0	569331-U	
5µm	15 x 4.0	505013-40	
5µm	25 x 4.0	505064-40	
5µm	5 x 4.6	505005	
5µm	10 x 4.6	569323-U	
5µm	12.5 x 4.6	569332-U	
5µm	15 x 4.6	505013	
5µm	25 x 4.6	505064	
5µm	25 x 10.0	569324-U	
5µm	25 x 21.2	569326-U	
DISCOVERY RP-AMIDEC16 VALIDATION PACKS *			
5µm	5 x 2.1	55705-U21	
5µm	10 x 2.1	569802-U	
5µm	15 x 2.1	55707-U21	
5µm	5 x 4.6	55705-U	
5µm	10 x 4.6	569803-U	
5µm	15 x 4.6	55707-U	
5µm	25 x 4.6	55709-U	
DISCOVERY RP-AMIDEC16 SUPELGUARD CARTRIDGES			
5µm	2 x 2.1 (2/pk)	505110	
5µm	2 x 2.1 kit **	505102	
5µm	2 x 3.0 (2/pk)	59578-U	
5µm	2 x 3.0 kit **	59577-U	
5µm	2 x 4.0 (2/pk)	505099	
5µm	2 x 4.0 kit **	505080	

* Packs include 3 columns, each from a different lot of bonded phase.

** Kits include one cartridge, a stand-alone holder, a piece of tubing, 2 nuts and ferrules.

DISCOVERY RP-AMIDEC16 PROPERTIES:

Bonded Phase:	Palmitamidopropylsilane, endcapped
Silica:	Spherical, high purity (Fe <20; NA <7; Ca <7; Ti <1; Al <1; Mg <1ppm)
Particle Size:	5µm
Pore Size:	180Å
Surface Area:	200m²/g
%C:	~11%
Coverage:	~2.6µmoles/m²

Discovery HS F5 New

PARTICLE SIZE	LENGTH X ID (cm x mm)	CAT. NO.	PRICE
DISCOVERY HS F5 (120Å, 12% CARBON)			
3µm	5 x 2.1	567500-U	
3µm	10 x 2.1	567502-U	
3µm	15 x 2.1	567503-U	
3µm	5 x 4.0	567530-U	
3µm	10 x 4.0	567531-U	
3µm	15 x 4.0	567532-U	
3µm	5 x 4.6	567504-U	
3µm	10 x 4.6	567506-U	
3µm	15 x 4.6	567507-U	
5µm	5 x 2.1	567508-U	
5µm	10 x 2.1	567510-U	
5µm	15 x 2.1	567511-U	
5µm	25 x 2.1	567512-U	
5µm	5 x 4.0	567533-U	
5µm	10 x 4.0	567534-U	
5µm	15 x 4.0	567535-U	
5µm	25 x 4.0	567536-U	
5µm	5 x 4.6	567513-U	
5µm	10 x 4.6	567515-U	
5µm	15 x 4.6	567516-U	
5µm	25 x 4.6	567517-U	
5µm	5 x 10.0	567518-U	
5µm	10 x 10.0	567537-U	
5µm	15 x 10.0	567519-U	
5µm	25 x 10.0	567520-U	
5µm	5 x 21.2	567521-U	
5µm	10 x 21.2	567539-U	
5µm	15 x 21.2	567522-U	
5µm	25 x 21.2	567523-U	
10µm	5 x 10.0	567524-U	
10µm	10 x 10.0	567538-U	
10µm	15 x 10.0	567525-U	
10µm	25 x 10.0	567526-U	
10µm	5 x 21.2	567527-U	
10µm	10 x 21.2	567540-U	
10µm	15 x 21.2	567528-U	
10µm	25 x 21.2	567529-U	
DISCOVERY HS F5 SUPELGUARD CARTRIDGES			
3µm	2 x 2.1 (2/pk)	567570-U	
3µm	2 x 2.1 kit **	567571-U	
3µm	2 x 4.0 (2/pk)	567572-U	
3µm	2 x 4.0 kit **	567573-U	
5µm	2 x 2.1 (2/pk)	567574-U	
5µm	2 x 2.1 kit **	567575-U	
5µm	2 x 4.0 (2/pk)	567576-U	
5µm	2 x 4.0 kit **	567577-U	
5µm	1 x 10.0	567578-U	
10µm	1 x 10.0	567580-U	

** Kits include one cartridge, a stand-alone holder, a piece of tubing, and 2 nuts and ferrules.

DISCOVERY HS F5 PROPERTIES:

Bonded Phase:	Pentafluorophenylpropylsilane, endcapped
Silica:	Spherical, high purity (<10 ppm metals)
Particle Size:	3, 5, 10µm
Pore Size:	120Å
Surface Area:	300m²/g
%C:	~12%
Coverage:	~4µmoles/m²

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Discovery HS PEG and Discovery C8 Columns

Discovery HS PEG

PARTICLE SIZE	LENGTH X ID (cm x mm)	CAT. NO.	PRICE
DISCOVERY HS PEG (120Å, 12% CARBON)			
3µm	5 x 2.1	567400-U	
3µm	10 x 2.1	567402-U	
3µm	15 x 2.1	567403-U	
3µm	5 x 4.0	567430-U	
3µm	10 x 4.0	567431-U	
3µm	15 x 4.0	567432-U	
3µm	5 x 4.6	567404-U	
3µm	10 x 4.6	567406-U	
3µm	15 x 4.6	567407-U	
5µm	5 x 2.1	567408-U	
5µm	10 x 2.1	567410-U	
5µm	15 x 2.1	567411-U	
5µm	25 x 2.1	567412-U	
5µm	5 x 4.0	567433-U	
5µm	10 x 4.0	567434-U	
5µm	15 x 4.0	567435-U	
5µm	25 x 4.0	567436-U	
5µm	5 x 4.6	567413-U	
5µm	10 x 4.6	567415-U	
5µm	15 x 4.6	567416-U	
5µm	25 x 4.6	567417-U	
5µm	5 x 10.0	567418-U	
5µm	10 x 10.0	567437-U	
5µm	15 x 10.0	567419-U	
5µm	25 x 10.0	567420-U	
5µm	5 x 21.2	567421-U	
5µm	10 x 21.2	567439-U	
5µm	15 x 21.2	567422-U	
5µm	25 x 21.2	567423-U	
10µm	5 x 10.0	567424-U	
10µm	10 x 10.0	567438-U	
10µm	15 x 10.0	567425-U	
10µm	25 x 10.0	567426-U	
10µm	5 x 21.2	567427-U	
10µm	10 x 21.2	567440-U	
10µm	15 x 21.2	567428-U	
10µm	25 x 21.2	567429-U	
DISCOVERY HS PEG SUPELGUARD CARTRIDGES			
3µm	2 x 2.1 (2/pk)	567470-U	
3µm	2 x 2.1 kit **	567471-U	
3µm	2 x 4.0 (2/pk)	567472-U	
3µm	2 x 4.0 kit **	567473-U	
5µm	2 x 2.1 (2/pk)	567474-U	
5µm	2 x 2.1 kit **	567475-U	
5µm	2 x 4.0 (2/pk)	567476-U	
5µm	2 x 4.0 kit **	567477-U	
5µm	1 x 10.0	567478-U	
10µm	1 x 10.0	567480-U	

** Kits include one cartridge, a stand-alone holder, a piece of tubing, and 2 nuts and ferrules.

DISCOVERY HS PEG PROPERTIES:

Bonded Phase:	Polyethyleneglycol, endcapped
Silica:	Spherical, high purity (<10 ppm metals)
Particle Size:	3, 5, 10µm
Pore Size:	120Å
Surface Area:	300m²/g
%C:	~12%
Coverage:	~3.8µmoles/m²

Discovery C8

PARTICLE SIZE	LENGTH X ID (cm x mm)	CAT. NO.	PRICE
DISCOVERY C8 (180Å, 7.5% CARBON)			
5µm	5 x 2.1	59352-U21	
5µm	10 x 2.1	569420-U	
5µm	12.5 x 2.1	569424-U	
5µm	15 x 2.1	59353-U21	
5µm	5 x 3.0	59352-U30	
5µm	10 x 3.0	569421-U	
5µm	12.5 x 3.0	569425-U	
5µm	15 x 3.0	59353-U30	
5µm	25 x 3.0	59354-U30	
5µm	5 x 4.0	59352-U40	
5µm	10 x 4.0	569422-U	
5µm	12.5 x 4.0	569426-U	
5µm	15 x 4.0	59353-U40	
5µm	25 x 4.0	59354-U40	
5µm	5 x 4.6	59352-U	
5µm	10 x 4.6	569423-U	
5µm	12.5 x 4.6	569427-U	
5µm	15 x 4.6	59353-U	
5µm	25 x 4.6	59354-U	
DISCOVERY C8 VALIDATION PACKS *			
5µm	5 x 2.1	55710-U21	
5µm	10 x 2.1	569804-U	
5µm	15 x 2.1	55712-U21	
5µm	5 x 4.6	55710-U	
5µm	10 x 4.6	569805-U	
5µm	15 x 4.6	55712-U	
5µm	25 x 4.6	55714-U	
DISCOVERY C8 SUPELGUARD CARTRIDGES			
5µm	2 x 2.1 (2/pk)	59588-U	
5µm	2 x 2.1 kit**	59587-U	
5µm	2 x 3.0 (2/pk)	59580-U	
5µm	2 x 3.0 kit**	59579-U	
5µm	2 x 4.0 (2/pk)	59590-U	
5µm	2 x 4.0 kit**	59589-U	

* Packs include 3 columns, each from a different lot of bonded phase.

** Kits include one cartridge, a stand-alone holder, a piece of tubing, 2 nuts and ferrules.

DISCOVERY C8 PROPERTIES:

Bonded Phase:	Octylsilane, endcapped
Silica:	Spherical, high purity (Fe <20; NA <7; Ca <7; Ti <1; Al <1; Mg <1ppm)
Particle Size:	5µm
Pore Size:	180Å
Surface Area:	200m²/g
%C:	~7.5%
Coverage:	~3.4µmoles/m²

Discovery Cyano Columns, Discovery Selectivity Packs

Discovery Cyano

PARTICLE SIZE	LENGTH X ID (cm x mm)	CAT. NO.	PRICE
DISCOVERY CYANO (180Å, 4.5% CARBON)			
5µm	5 x 2.1	59355-U21	
5µm	10 x 2.1	569521-U	
5µm	12.5 x 2.1	569524-U	
5µm	15 x 2.1	59356-U21	
5µm	5 x 3.0	59355-U30	
5µm	10 x 3.0	569522-U	
5µm	12.5 x 3.0	569525-U	
5µm	15 x 3.0	59356-U30	
5µm	25 x 3.0	59357-U30	
5µm	5 x 4.0	59355-U40	
5µm	10 x 4.0	569523-U	
5µm	12.5 x 4.0	569526-U	
5µm	15 x 4.0	59356-U40	
5µm	25 x 4.0	59357-U40	
5µm	5 x 4.6	59355-U	
5µm	10 x 4.6	569520-U	
5µm	12.5 x 4.6	569527-U	
5µm	15 x 4.6	59356-U	
5µm	25 x 4.6	59357-U	
DISCOVERY CYANO VALIDATION PACKS*			
5µm	5 x 2.1	55715-U21	
5µm	10 x 2.1	569806-U	
5µm	15 x 2.1	55717-U21	
5µm	5 x 4.6	55715-U	
5µm	10 x 4.6	569807-U	
5µm	15 x 4.6	55717-U	
5µm	25 x 4.6	55719-U	
DISCOVERY CYANO SUPELGUARD CARTRIDGES			
5µm	2 x 2.1 (2/pk)	59584-U	
5µm	2 x 2.1 kit**	59583-U	
5µm	2 x 3.0 (2/pk)	569571-U	
5µm	2 x 3.0 kit**	569570-U	
5µm	2 x 4.0 (2/pk)	59586-U	
5µm	2 x 4.0 kit**	59585-U	

* Packs include 3 columns, each from a different lot of bonded phase.

** Kits include one cartridge, a stand-alone holder, a piece of tubing, 2 nuts and ferrules.

DISCOVERY CYANO PROPERTIES:

Bonded Phase:	Cyanopropylsilane, endcapped
Silica:	Spherical, high purity (Fe <20; NA <7; Ca <7; Ti <1; Al <1; Mg <1ppm)
Particle Size:	5µm
Pore Size:	180Å
Surface Area:	200m²/g
%C:	~4.5%
Coverage:	~3.5µmoles/m²

Discovery Selectivity Packs

You can conveniently order the four Discovery column chemistries – RP-AmideC16, C18 , C8, and Cyano – in your choice of column dimensions, in a single kit. Quickly evaluate mobile phases on all four columns to find the optimum combination of chemistries for your separation. The Discovery HPLC Column Selectivity Pack gives you a powerful tool for rapid, efficient, simple pharmaceutical method development.

PARTICLE SIZE	LENGTH X ID (cm x mm)	CAT. NO.	PRICE
5µm	5 x 2.1	55720-U21	
5µm	10 x 2.1	569853-U	
5µm	15 x 2.1	55722-U21	
5µm	5 x 3.0	55720-U30	
5µm	10 x 3.0	569852-U	
5µm	15 x 3.0	55722-U30	
5µm	25 x 3.0	55724-U30	
5µm	5 x 4.0	55720-U40	
5µm	10 x 4.0	569851-U	
5µm	15 x 4.0	55722-U40	
5µm	25 x 4.0	55724-U40	
5µm	5 x 4.6	55720-U	
5µm	10 x 4.6	569850-U	
5µm	15 x 4.6	55722-U	
5µm	25 x 4.6	55724-U	

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Special Purpose SUPELCOSIL Columns

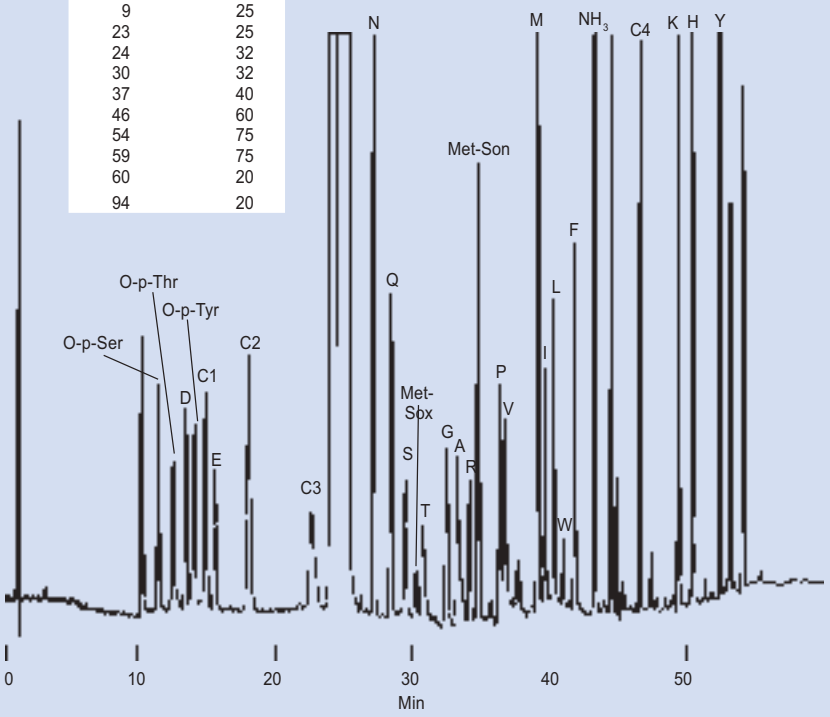
Special Purpose Columns: Amino Acids

SUPELCOSIL LC-DABS columns feature a specially treated and tested octadecylsilane bonded phase, for reversed-phase separations of precolumn derivatized dabsyl amino acids. More than 30 amino acids and ammonia can be separated in less than one hour.

PROPERTIES	
Particles:	spherical silica, 3µm
Pore Size:	120Å
Bonded Phase:	octadecylsilane
Surface Area:	170m²/g
Pore Volume:	0.6mL/g
pH Range:	2 - 7.5

Amino Acid	
O-p-Ser	o-Phosphoserine
O-p-Thr	o-Phosphothreonine
D	Aspartic acid
O-p-Tyr	o-Phosphotyrosine
C1	Cysteic acid
E	Glutamic acid
C2	S-Carboxymethylcysteine
C3	S-Sulfocysteine
N	Asparagine
Q	Glutamine
S	Serine
Met-Sox	Methionine sulfoxide
T	Threonine
G	Glycine
A	Alanine
R	Arginine
Met-Son	Methionine sulfone
P	Proline
V	Valine
M	Methionine
I	Isoleucine
L	Leucine
W	Tryptophan
F	Phenylalanine
NH_3	Ammonia
C4	Cystine
K	Lysine
H	Histidine
Y	Tyrosine

Gradient Program	
Temp. (min)	% B
0	20
9	25
23	25
24	32
30	32
37	40
46	60
54	75
59	75
60	20
94	20



Dabsyl Amino Acids

Column: SUPELCOSIL LC-DABS
15cm x 4.6mm ID, 3µm particles
Cat. No.: 59137
Mobile Phase: A = 25mM KH_2PO_4, pH7.0
B = acetonitrile:methanol (70:30)
Flow Rate: 1.5mL/min
Det.: VIS, 436nm
Inj.: 5µL, approx. 50pM each derivative

RELATED INFORMATION

Literature References

Stocchi, V., et al., Anal. Biochem.178: 107-117 (1989).

Stocchi, V., et al., Amino Acids3: 303-309 (1992).

References not available from Supelco.

PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
SUPELCOSIL LC-DABS (120Å, 12.3% CARBON)			
3µm	15 x 4.6	59137	
SUPELCOSIL LC-18-T Supelguard Cartridges (use for LC-DABS)			
5µm	2 x 4.0 (2/pk)	59621	
5µm	2 x 4.0 kit **	59620	

** Kits include one cartridge, a stand-alone holder, a piece of tubing, and 2 nuts and ferrules.

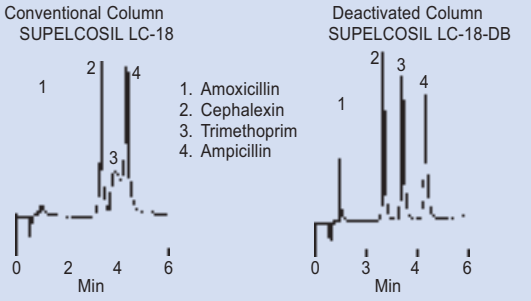
Special Purpose Columns: Basic Columns

SUPELCOSIL LC-18-DB and SUPELCOSIL LC-8-DB phases are deactivated (DB) for basic compounds. These columns provide shorter retention, better peak shape, and higher efficiency for organic bases than can be obtained on conventional reversed-phase columns. DB columns have become standards in the industry for analyses of "difficult" basic compounds, particularly in the pharmaceutical industry. An example of the performance of the LC-18-DB column versus that of a conventional C18 column is shown. The deactivated column allows the use of a simpler mobile phase to elute trimethoprim with good peak shape. To obtain similar results from the LC-18 column would require the addition of competing base to the mobile phase

PROPERTIES

Silica:	Spherical
Particle size:	3µm and 5µm
Pore size:	120Å
Pore Volume:	0.6mL/g
Surface Area:	170m²/g
pH Range:	2-7

Improved Peak Symmetry for Antibacterials



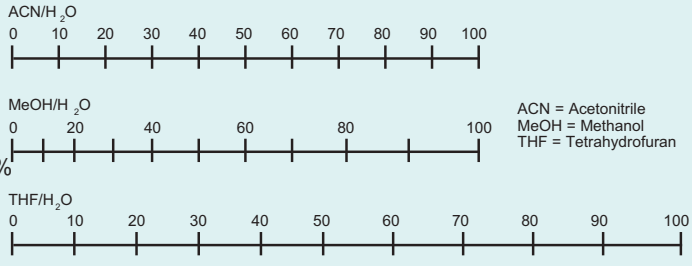
Column: 3.3cm x 4.6mm, 3µm
Cat. No.: 58977 (LC-18), 58978 (LC-18-DB)
Mobile Phase: methanlo:50mM KH_2PO_4, pH 3.0 (23:77)
Flow Rate: 1mL/min
Det.: UV, 254nm
Inj.: 10µL, 15, 5, 5 and 106µg/mL

PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
SUPELCOSIL LC-18-DB (120A, 11.0% CARBON)			
3µm	25 x 2.1	57943	
3µm	3.3 x 3.0	58978C30	
3µm	7.5 x 3.0	58992C30	
3µm	15 x 3.0	58993C30	
3µm	15 x 4.0	58993C40	
3µm	3.3 x 4.6	58978	
3µm	7.5 x 4.6	58992	
3µm	15 x 4.6	58993	
5µm	30 x 1.0	57984	
5µm	25 x 2.1	57940	
5µm	5 x 3.0	58345C30	
5µm	10 x 3.0	59208C30	
5µm	15 x 3.0	58348C30	
5µm	25 x 3.0	58355C30	
5µm	15 x 4.0	58348C40	
5µm	25 x 4.0	58355C40	
5µm	30 x 4.0	59164	
5µm	5 x 4.6	58345	
5µm	10 x 4.6	59208	
5µm	15 x 4.6	58348	
5µm	25 x 4.6	58355-U	
5µm	25 x 10.0	58358	
SUPELCOSIL LC-18-DB Supelguard Cartridges			
5µm	2 x 2.1 (2/pk)	59617	
5µm	2 x 2.1 kit **	59616	
5µm	2 x 3.0 (2/pk)	59565C30	
5µm	2 x 4.0 (2/pk)	59565	
5µm	2 x 4.0 kit **	59555	
SUPELCOSIL LC-8-DB (120Å, 6.0% CARBON)			
3µm	7.5 x 3.0	58990C30	
3µm	15 x 3.0	58991C30	
3µm	15 x 4.0	58991C40	
3µm	3.3 x 4.6	58976	
3µm	7.5 x 4.6	58990-U	
3µm	15 x 4.6	58991	
5µm	25 x 2.1	57933	
5µm	15 x 3.0	58347C30	
5µm	15 x 4.0	58347C40	
5µm	25 x 4.0	58354C40	
5µm	5 x 4.6	58344	
5µm	15 x 4.6	58347	
5µm	25 x 4.6	58354	
5µm	25 x 10.0	58357	
SUPELCOSIL LC-8-DB Supelguard Cartridges			
5µm	2 x 2.1 (2/pk)	59619	
5µm	2 x 2.1 kit **	59618	
5µm	2 x 4.0 (2/pk)	59563	
5µm	2 x 4.0 kit **	59553	

HELPFUL HINTS

Relative Strengths for Different Solvents

The graph provides for the interconversion of reversed-phase mobile phases having the same strength. Vertical lines in this figure intersect mobile phases having the same strength. For example, 40% Acetonitrile has the same strength as 50% Methanol or 30% THF.



** Kits include one cartridge, a stand-alone holder, a piece of tubing, and 2 nuts and ferrules.

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Special Purpose SUPELCOSIL Columns

Special Purpose Columns: Carbohydrates

Within the different classes of sugars, chemical and physical properties vary only slightly. HPLC separations of carbohydrates depend on differences in conformation, configuration, and column type. Because of this complexity, no single HPLC column or method is capable of separating every carbohydrate. To choose the best column for your carbohydrate analysis, consult Table 1 (below), the Retention Time Index (next page), and the Applications section of this catalog. For more information, request Bulletin 887 (HPLC Carbohydrate Column Selection Guide).

SUPELCOGEL K columns separate raffinose, sucrose, glucose, fructose, and betaine, a trimethylammonium zwitterionic compound found in beet and cane sugars and widely distributed in other plants.

The lead-form resin in SUPELCOGEL Pb columns provides the highest resolution and best selectivity for monosaccharides. SUPELCOGEL Pb columns provide excellent separation of xylose, galactose, and mannose, which are not completely resolved on calcium-form resin columns.

SUPELCOGEL Ca columns separate monosaccharides and sugar alcohols. Di-, tri-, and oligosaccharides are separated by class. A frequent application for this column is the separation of sugars in high fructose corn syrup (HFCS).

SUPELCOGEL C-610H and H columns are ideal for separating carbohydrates, alcohols, and organic acids present in the same sample: wines and other fermentation products, fruit juices, biological samples, etc.

SUPELCOGEL C-611 columns contain a unique ion exchange resin containing two divalent cations, rather than one. This provides different selectivities for separating monosaccharides and sugar alcohols. As with resins containing a single cation, di-,tri-, and oligosaccharides are separated by class. Galactose and mannose are well separated.

SUPELCOGEL Ag columns provide rapid separations of oligosaccharides. Glycerol and ethanol are well resolved.

Silica-based SUPELCOSIL LC-NH_2 columns separate monosaccharides, disaccharides, and some trisaccharides, with elution generally in order of increasing molecular weight. Retention decreases as the proportion of water:acetonitrile in the mobile phase is increased. For more information, request T397126 (Sugars on SUPELCOSIL LC-NH_2 Columns).

SUPELCOGEL CARBOHYDRATE COLUMN CHARACTERISTICS	
Particles:	sulfonated polystyrene/divinylbenzene, spherical, 9µm
Counter Ion:	varies (see Table 1)
pH Range:	1-13
Organic Compatibility:	<10% in mobile phase
Maximum Temperature:	varies (see Table 1)
Maximum Flow Rate:	7.8mm ID columns: 1.5mL/min 4.6mm ID columns: 0.4mL/min
Maximum Pressure:	1000psi (70 bar)

SUPELCOSIL LC-NH_2 COLUMN CHARACTERISTICS	
Particles:	spherical silica, 5µm
Bonded Phase:	aminopropylsilyl
pH Range:	2-7.5
Organic Compatibility:	no limits (avoid aldehydes and ketones)
Maximum Flow Rate:	2mL/min (4.6mm ID columns)
Maximum Pressure:	6000psi (420 bar)

Table 1. Carbohydrate Column Applications and Mobile Phases

COLUMN	APPLICATION[1]	FORM	TYPICAL MOBILE PHASE	MAX. TEMP. (°C)
SUPELCOGEL K	beet sugar, cane sugar, molasses, corn syrup	potassium	10mM K_2HPO_4	90
SUPELCOGEL Pb	monosaccharides, xylose/galactose/mannose	lead	deionized water	90
SUPELCOGEL Ca	high fructose corn syrup, monosaccharides, sugar alcohols, oligosaccharides	calcium	deionized water	90
SUPELCOGEL C-610H	organic acids	hydrogen	0.1% H_2SO_4 or H_3PO_4	60
SUPELCOGEL H	organic acids	hydrogen	0.1% H_2SO_4 or H_3PO_4	90
SUPELCOGEL C-611	mono-, di-, and trisaccharides, galactose/mannose	2 divalent cations	10 N NaOH	85
SUPELCOGEL Ag1	beer, dark corn syrup	silver	deionized water	90
SUPELCOGEL Ag2	oligosaccharides, glycerol/ethanol, corn syrup, hydrolyzed starch	silver	deionized water	90
SUPELCOSIL LC-NH_2	mono-, di-, some trisaccharides	aminopropyl silica	75% CH_3CN in water	70

[1] See Applications pages.

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Table 2. Retention Time Index for Carbohydrate Columns

	SUPELCOGEL COLUMNS								SUPELCOSIL
Cat. No.:	Ca 59305-U	C-610H 59320-U	H 59304-U	H 59346	Pb 59343	C-611 59310-U	K 59342	Ag2 59315	LC-NH_2 58338
Dimensions (mm):	300 x 7.8	300 x 7.8	300 x 7.8	250 x 4.6	300 x 7.8	300 x 7.8	300 x 7.8	300 x 7.8	250 x 4.6
Temp.:	80°C	30°C	30°C	30°C	85°C	60°C	85°C	85°C	ambient
Mobile Phase :	DH_2O	0.1% H_3PO_4	0.1% H_3PO_4	0.1% H_3PO_4	DH_2O	10^{-4}N NaOH	15mM K_2HPO_4	DH_2O	ACN:DH_2O (3:1)
Flow Rate (mL/min):	0.5	0.5	0.5	0.17	0.5	0.5	0.5	0.5	1.0
Det.:	refractive index								
Compound	Retention Times (min)								
Arabinose	15.3	13.9	14.3	13.8	19.2	19.6	16.8	17.1	7.5
Arabitol	19.8	14.1	14.9	14.3	32.3	22.8	13.5	16.0	7.2
Betaine	ND	ND	ND	ND	NR	ND	13.0	ND	ND
Dulcitol	22.3	13.4	14.2	13.7	43.4	25.7	12.9	15.9	9.0
Erythritol	17.7	15.0	15.6	14.8	24.5	20.2	14.0	16.1	5.9
Ethanol	19.4	25.6	ND	ND	ND	21.0	ND	18.4	NR
Fructose	14.9	13.1	13.3	12.9	20.8	20.7	15.2	16.0	8.3
Galactose	13.4	12.9	13.0	12.6	17.6	17.6	15.1	15.8	10.3
Glucose	12.0	12.1	11.9	11.7	14.9	15.8	14.0	14.6	9.8
Glycerol	18.7	16.8	17.6	16.6	23.8	20.9	15.2	17.1	NR
Inositol	14.9	12.6	12.7	12.4	24.5	20.1	15.7	17.4	ND
Isomaltose	9.6	10.3	ND	ND	ND	13.8	ND	11.6	19.4
Isomaltotriose	8.5	9.5	ND	ND	ND	12.6	ND	9.8	NR
Lactitol	ND	ND	11.1	11.0	26.5	ND	10.6	ND	ND
Lactose	10.2	10.8	10.2	10.2	13.5	14.3	10.9	11.8	19.5
Maltitol	13.6	11.0	10.7	10.7	23.8	17.7	10.2	15.0	15.5
Maltoheptaose	7.5	8.8	7.6	7.9	9.2	11.6	7.2	7.3	NR
Maltohexaose	7.7	8.9	7.7	8.1	9.7	12.0	7.4	7.6	NR
Maltopentaose	7.9	9.1	7.9	8 .2	10.5	12.6	7.8	8.1	NR
Maltose	9.8	10.5	9.9	9.9	13.0	14.2	10.7	11.5	17.4
Maltotetraose	8.3	9.3	8.2	8 .5	11.2	13.2	8.4	8.8	NR
Maltotriose	8.8	9.7	8.8	9.0	12.0	13.6	9.2	9.8	31.0
Mannitol	19.2	13.2	13.7	13.2	32.5	22.1	12.6	15.2	9.2
Mannose	13.7	12.8	12.9	12.5	19.8	18.9	15.6	15.9	9.1
Melezitose	8.7	9.7	8.8	9.0	10.8	12.4	8.6	9.3	24.5
Psicose	22.5	13.4	14.5	13.9	36.5	32.9	15.5	17.2	6.6
Raffinose	8.7	9.7	8.7	8.9	11.2	12.6	8.7	9.6	29.7
Ribitol	16.7	13.7	14.2	13.6	25.1	19.5	13.1	15.3	ND
Ribose	24.3	14.2	15.8	15.0	40.7	34.6	17.7	19.1	6.0
Sorbitol	23.4	13.4	14.4	13.9	46.9	28.3	13.3	16.3	9.0
Stachyose	8.1	9.3	8.1	8.4	10.4	11.9	7.9	8.5	67.3
Sucrose	9.8	10.6	9.9	9.9	12.2	13.6	10.1	11.2	14.0
Xylitol	23.3	14.4	15.7	15.0	42.1	28.0	14.2	17.1	7.3
Xylose	13.2	12.8	12.8	12.6	16.1	17.2	15.3	15.6	6.8

NR - not recommended

ND - no data available

For optimal separations, allow at least 1 minute between compounds.

For resins used in processing sugars and foods, refer to the low pressure LC media section.

SUPELCOGEL and SUPELCOSIL Carbohydrate Columns and Guard Columns

COLUMN	LENGTH (cm)	ID (mm)	CAT. NO.	PRICE	SUPELGUARD GUARD COLUMN	CAT. NO.	PRICE
SUPELCOGEL K	30	7.8	59342		K*	59344	
SUPELCOGEL Pb	30	7.8	59343		Pb*	59345	
SUPELCOGEL Ca	30	7.8	59305-U		Ca*	59306-U	
SUPELCOGEL C-610H	30	7.8	59320-U		H*	59319	
SUPELCOGEL H	30	7.8	59304-U		H*	59319	
SUPELCOGEL H	25	4.6	59346		H*	59319	
SUPELCOGEL C-611	30	7.8	59310-U		Ca*	59306-U	
SUPELCOGEL Ag1	30	7.8	59318-U		Ag1*	59317-U	
SUPELCOGEL Ag2	30	7.8	59315		Ag2*	59316	
SUPELCOSIL LC-NH_2	25	4.6	58338		LC-NH_2 (kit)**	59558	
					LC-NH_2 (2 cartridges)	59568	

* 5cm x 4.6mm guard column, does not include tubing, nuts or ferrules.

** Kits include one cartridge, a stand-alone holder, a piece of tubing, and 2 nuts and ferrules.

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HPLC: Small Molecules
Special Purpose SUPELCOSIL Columns

COLUMN CHARACTERISTICS	
Particles:	5µm spherical silica
Bonded Phase:	aminopropylsilyl
Pore Size:	120Å
Surface Area:	170m²/g
Pore Volume:	0.6mL/g
pH Range:	2 - 7.5

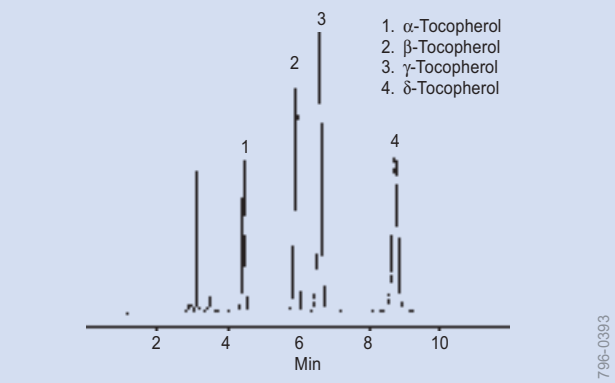


Figure A. Tocopherols

Column: SUPELCOSIL LC-NH$_2$-NP, 25cm x 4.6mm ID, 5µm particles
Cat. No.: 59132
Mobile Phase: hexane:ethyl acetate, 70:30
Flow Rate: 1.0mL/min
Temp.: 30°C
Det.: UV, 295nm
Inj.: 10µL hexane, 1.0mg/mL each analyte

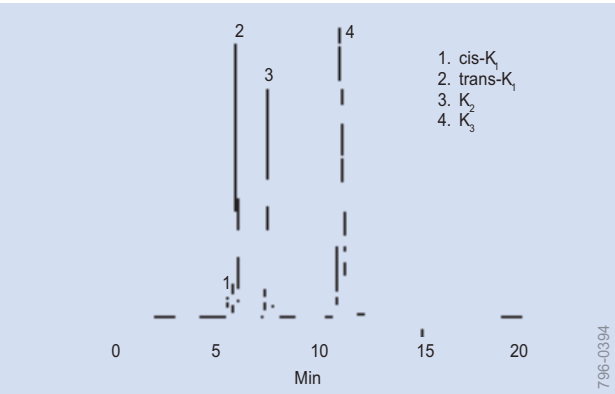


Figure B. Vitamin K Isomers

Column: SUPELCOSIL LC-NH$_2$-NP, 25cm x 4.6mm ID, 5µm particles
Cat. No.: 59132
Mobile Phase: hexane:ethyl acetate, 99:1
Flow Rate: 1.5mL/min
Temp.: 30°C
Det.: UV, 254nm
Inj.: 10µL hexane, 0.3mg/mL each analyte

Special Purpose Columns: Dedicated Normal Phase

SUPELCOSIL LC-NH$_2$-NP is an amino phase dedicated to normal phase chromatography. By employing special bonding technology, and avoiding water in manufacturing and testing the column, we have dramatically reduced the retention variation that is characteristic of normal phase chromatography.

SUPELCOSIL LC-NH$_2$-NP columns:

- show stable retention in normal phase separations
- are less sensitive to small or varying amounts of water in the mobile phase, relative to unmodified silica
- provide excellent separations of fat-soluble vitamins

Normal phase chromatography is especially useful when the analytes are not water soluble – for example, the fat-soluble vitamins A, D, E, and K. Figure A shows a separation of tocopherols (vitamin E) on a SUPELCOSIL LC-NH$_2$-NP column. The various isomers of vitamin K are separated in Figure B.

These columns should be used with non-aqueous mobile phases only.

PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
SUPELCOSIL LC-NH$_2$-NP (120Å, 3.0% CARBON)			
5µm	25 x 4.6	59132	
SUPELCOSIL LC-NH$_2$-NP Supelguard Cartridges			
5µm	2 x 4.0 (2/pk)	59516	
5µm	2 x 4.0 kit **	59515	

HELPFUL HINTS

Reversed-phase versus Normal Phase: Reversed-phase is characterized by strong interactions between analytes and the polar mobile phase. Interactions between analytes and the nonpolar stationary phase are weak. Mobile phases typically consist of water / organic solvent combinations. Reversed-phase columns include: Amide-C16, C18, C8, Phenyl, C5, Pentafluorinated Phenyl (F5), Cyano, C1, ODP-50, and TPR-100.

Normal phase is characterized by strong interactions between analytes and the polar stationary phase. Interactions between analytes and the nonpolar mobile phase are weak. Mobile phases consist of organic solvents. Normal phase columns include: Cyano, NH$_2$, and Silica.

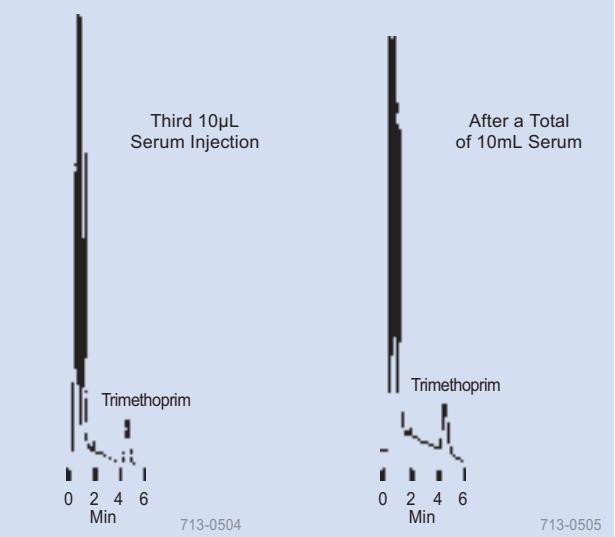
** Kits include one cartridge, a stand-alone holder, a piece of tubing, and 2 nuts and ferrules.

Special Purpose Columns: Direct Serum Injection

The Hisep column uses a shielded hydrophobic phase (SHP) for its mechanism of separation. The silica-based material is covere with a thin polymer consisting of hydrophobic regions in a hydrophilic network. Small analytes, such as drugs, penetrate th hydrophilic network and are retained by the hydrophobic moieties. The hydrophilic network shields protein molecules fror contact with the surface and the hydrophobic groups, and thus these molecules are not retained. Direct injection of biological samples eliminates time-consuming cleanup steps and increase analytical accuracy.

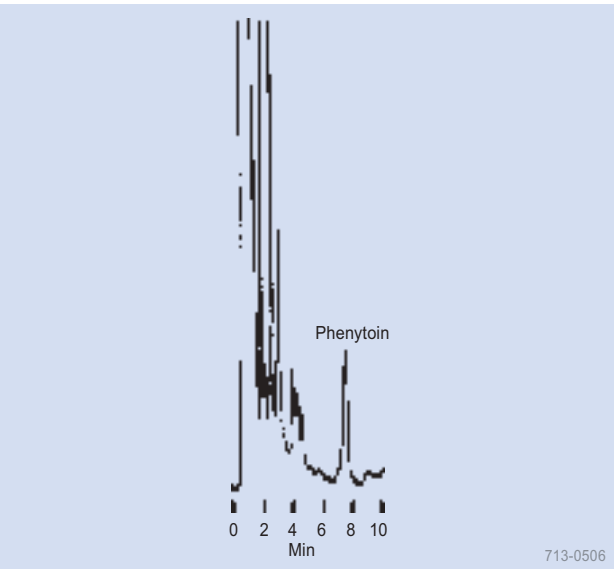
Excellent column stability and an ability to exclude proteins over a wide pH range set Hisep columns apart from other direct seru injection columns and techniques. Stability is demonstrated in Figure A – no significant change is seen in the chromatography trimethoprim after injecting 10mL of serum, in 10µL increments, onto a Hisep column. A low pH application is shown in Figure B The profile of the excluded serum peak will change with pH due to differing protonation states of the serum proteins.

Figure A. Hisep Columns Perform Consistently for Many Injections



Column: Hisep, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 58935
Mobile Phase: acetonitrile:180mM ammonium acetate (15:85), pH 7
Flow Rate: 2mL/min
Det.: UV, 254nm
Inj.: 10µL spiked serum (25µg/mL trimethoprim)

Figure B. Hisep Columns Are Compatible with Low pH Mobile Phases



Column: Hisep, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 58935
Mobile Phase: acetonitrile:180mM ammonium acetate (pH 4.6)
Flow Rate: 2mL/min
Det.: UV, 254nm
Inj.: 25µL phenytoin-spiked serum

PROPERTIES

Particles:	spherical silica, 5µm
Pore Size:	120Å
Surface Area:	170m²/g
Pore Volume:	0.6mL/g
pH range:	2-7.5

SUPELCOSIL Hisep

PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
SUPELCOSIL HISEP (120Å)			
5µm	25 x 2.1	57932	
5µm	5 x 4.6	59143	
5µm	15 x 4.6	58935	
5µm	25 x 4.6	58919	
SUPELCOSIL Hisep Supelguard Cartridges			
5µm	2 x 4.0 (2/pk)	59640-U	
5µm	2 x 4.0 kit **	59639	

RELATED INFORMATION

Request free literature by phone or fax, or see our website.

No.	Subject
T397145	Hisep columns for drugs

Literature References

Feibush, B., C. Santasania, J. Chromatogr. 54: 441-449 (1991).
Gisch, D.J., B.T. Hunter, B. Feibush, J. Chromatogr. 433: 264-268(1988).
Wong, S.H.Y., L.A. Bretts, A.C. Larson, J. Liq. Chromatogr. 11: 2039-2049 (1988).

References not available from Supelco.

** Kits include one cartridge, a stand-alone holder, a piece of tubing, and 2 nuts and ferrules.

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HPLC: Small Molecules

Special Purpose SUPELCOSIL Columns

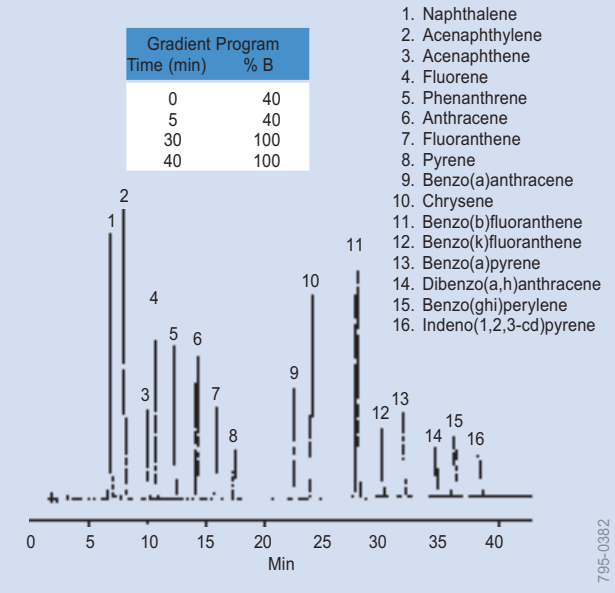


Figure A. Optimum PAH Resolution: 5µm Particles

Column: SUPELCOSIL LC-PAH, 25cm x 4.6mm ID, 5µm particles
Cat. No.: 58229
Mobile Phase: A = water, B = acetonitrile
Flow Rate: 1.5mL/min
Det.: UV, 254nm
Inj.: 3µL LC-PAH Test Mix (Cat. No. 48743), diluted 1:10 with acetonitrile

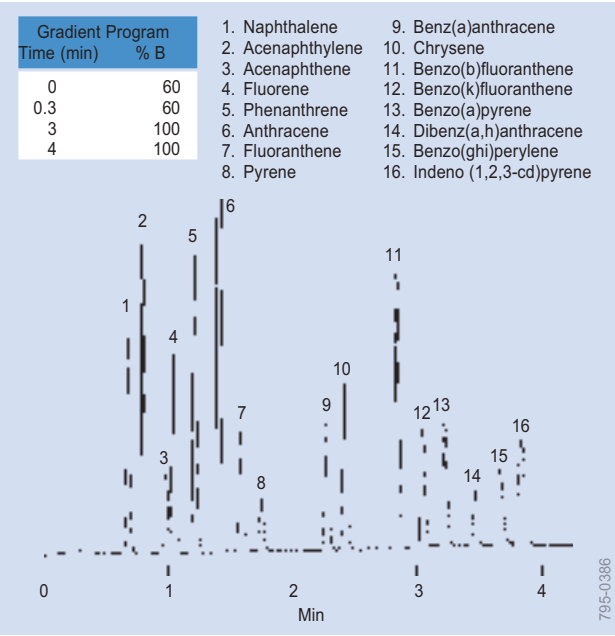


Figure B. Rapid Analyses: 3µm Particles

Column: SUPELCOSIL LC-PAH, 5cm x 4.6mm ID, 3µm particles
Cat. No.: 59133
Mobile Phase: A = water, B = acetonitrile
Flow Rate: 3.0mL/min
Det.: UV, 254nm

Special Purpose Columns: Polyaromatic Hydrocarbons

SUPELCOSIL LC-PAH columns were designed specifically for analyses of the priority pollutant PAHs listed in US EPA Method 610 (Figure A). 2.1mm and 3.0mm columns save solvent and improve sensitivity when sample mass is limited. 3µm columns provide extremely rapid, highly efficient analyses (Figure B), while retaining the durability of porous silicas. They are excellent and economical substitutes for 1.5µm nonporous silicas.

COLUMN CHARACTERISTICS

Particles:	spherical silica, 3µm, 5µm
Pore Size:	120Å
Bonded Phase:	octadecylsilane
Surface Area:	170m²/g
Pore Volume:	0.6mL/g
pH Range:	2 - 7.5

PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
SUPELCOSIL LC-PAH (120Å)			
3µm	5 x 3.0	59133C30	
3µm	10 x 3.0	59134C30	
3µm	5 x 4.6	59133	
3µm	10 x 4.6	59134	
5µm	25 x 2.1	57945	
5µm	15 x 3.0	58318C30	
5µm	15 x 4.6	58318	
5µm	25 x 4.6	58229	
SUPELCOSIL LC-18 Supelguard Cartridges (use for LC-PAH)			
5µm	2 x 2.1 (2/pk)	59613	
5µm	2 x 2.1 kit **	59612	
5µm	2 x 3.0 (2/pk)	59564C30	
5µm	2 x 4.0 (2/pk)	59564	
5µm	2 x 4.0 kit **	59554	

HELPFUL HINTS

Reversed-phase versus Normal Phase Reversed-phase is characterized by strong interactions between analytes and the polar mobile phase. Interactions between analytes and the nonpolar stationary phase are weak. Mobile phases typically consist of water / organic solvent combinations. Reversed-phase columns include: Amide-C16, C18, C8, Phenyl, C5, Pentafluorinated Phenyl (F5), Cyano, C1, ODP-50, and TPR-100.

Normal phase is characterized by strong interactions between analytes and the polar stationary phase. Interactions between analytes and the nonpolar mobile phase are weak. Mobile phases consist of organic solvents. Normal phase columns include: Cyano, NH_2, and Silica.

** Kits include one cartridge, a stand-alone holder, a piece of tubing, and 2 nuts and ferrules.

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Special Purpose Columns: Nucleosides

SUPELCOSIL LC-18-S columnsare designed for reliable separations of deoxyribonucleosides and ribonucleosides. Each column is tested to ensure performance.

PROPERTIES	
Silica:	Spherical
Particle Size:	5µm
Pore Size:	120Å
Bonded Phase:	octadecylsilane
Surface Area:	170m²/g
Pore Volume:	0.6mL/g
pH Range:	2-7.5

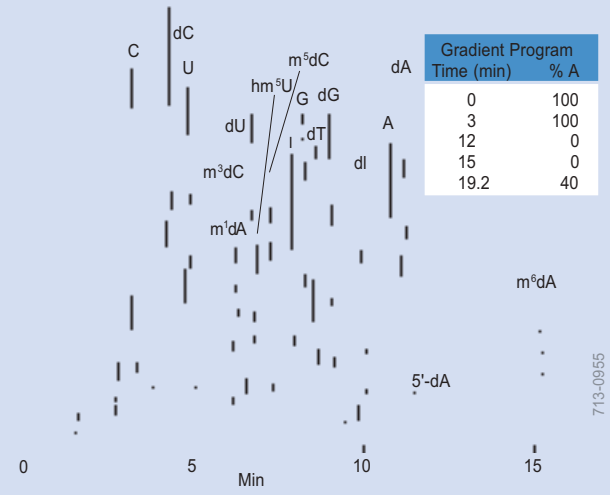


Figure provided by Dr. C. W. Gehrke and K.C. Kuo, University of Missouri-Columbia, Experimental Station Chemical Laboratories, Columbia, MO USA

Deoxyribonucleosides and Ribonucleosides on a SUPELCOSIL LC-18-S Column

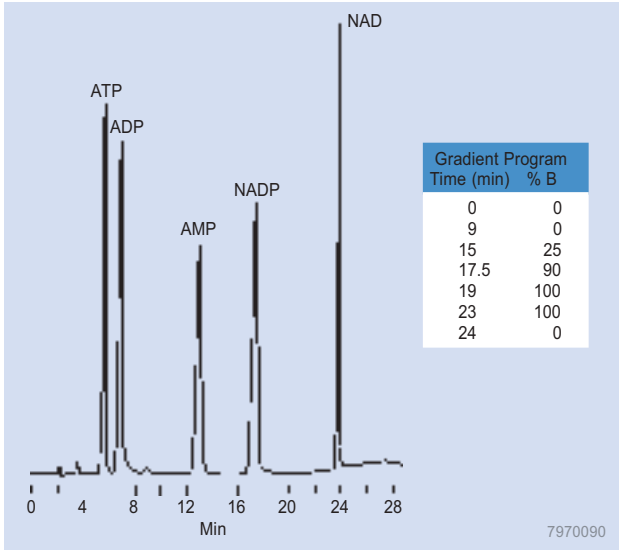
Column: SUPELCOSIL LC-18-S, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 58931
Mobile Phase: 50mM K_2HPO_4/KH_2PO_4 (pH 4.0): methanol
A = 97.5:2.5, B = 80:20
Flow Rate: 1.0mL/min
Temp.: 30°C
Det.: UV, 254nm
Inj.: nucleoside standards in water

PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
SUPELCOSIL LC-18-S (120A, 11.0% CARBON)			
5µm	30 x 1.0	57920	
5µm	25 x 2.1	57939	
5µm	15 x 3.0	58931C30	
5µm	15 x 4.6	58931	
5µm	25 x 4.6	58928-U	
SUPELCOSIL LC-18-S Supelguard Cartridges			
5µm	2 x 4.0 (2/pk)	59630	
5µm	2 x 4.0 kit **	59629	

Special Purpose Columns: Nucleotides

SUPELCOSIL LC-18-T columns feature an octadecylsilane bonded phase and a special surface treatment, for efficient separations of nucleotides. Each batch of packing material is tested to ensure good peak shape for a representative nucleotide, adenosine diphosphate (ADP). Chromatography of other compounds that exhibit metal chelating properties also can be improved by using this phase.

PROPERTIES	
Silica:	Spherical
Particle Size:	3µm, 5µm
Pore Size:	120Å
Bonded Phase:	octadecylsilane
Surface Area:	170m²/g
Pore Volume:	0.6mL/g
pH Range:	2-7.5



Nucleotides on a SUPELCOSIL LC-18-T Column

Column: SUPELCOSIL LC-18-T, 25cm x 4.6mm ID (5µm particles)
Cat. No. 58971
Mobile Phase: A = 0.1M KH_2PO_4, pH 6
B = A:methanol, 90:10
gradient program shown on figure
Flow Rate: 1.3mL/min
Det: UV, 254nm

PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
SUPELCOSIL LC-18-T (120Å, 12.3% CARBON)			
3µm	15 x 3.0	58970C30	
3µm	15 x 4.6	58970-U	
5µm	25 x 3.0	58971C30	
5µm	25 x 4.6	58971	
SUPELCOSIL LC-18-T Supelguard Cartridges			
5µm	2 x 3.0 (2/pk)	59621C30	
5µm	2 x 4.0 (2/pk)	59621	
5µm	2 x 4.0 kit **	59620	

** Kits include one cartridge, a stand-alone holder, a piece of tubing, and 2 nuts and ferrules.

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SUPELCO

HPLC: Small Molecules

Special Purpose SUPELCOGEL Columns

Special Purpose Columns: Organic Acids

SUPELCOGEL C-610H columns are prepared specifically for analyses of organic acids. Acetic, propionic, butyric, formic, malic, citric, succinic, lactic, and other acids are easily separated on these columns, using a simple isocratic mobile phase and minimal sample preparation. Retention times for many acids are shown in the table.

Separation is based on ion exclusion – the analytes selectively partition between the resin phase and the external aqueous pha Analyses are best performed at low pH (0.1% H_3PO_4 often is used as the mobile phase); the same mobile phase conditions can be applied to a wide variety of sample matrices.

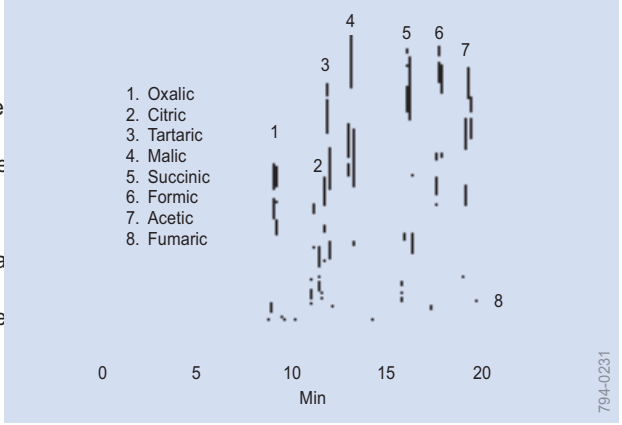
COLUMN CHARACTERISTICS	
Particles:	sulfonated polystyrene/divinylbenzene, spherical, 9µm
Counter Ion:	H^+
pH Range:	1-13
Organic Compatibility:	<20% in mobile phase
Maximum Flow Rate:	1.5mL/min
Maximum Pressure:	1000psi (70 bar)

SUPELCOGEL H columns have the same particle composition, retention mechanism, performance, sensitivity, and applications as SUPELCOGEL C-610H columns. However, particle improvements have made it possible to pack the SUPELCOGEL H packing material efficiently into conventional 4.6mm ID columns, to improve detection and reduce solvent consumption relative to 7.8mm ID columns.

COLUMN CHARACTERISTICS	
Particles:	sulfonated polystyrene/divinylbenzene, spherical, 9µm
Counter Ion:	H^+
pH Range:	1-13
Organic Compatibility:	<10% in mobile phase
Maximum Flow Rate:	1.5mL/min (7.8mm), 0.4mL/min (4.6mm)
Maximum Pressure:	1000psi (70 bar)

PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
SUPELCOGEL C-610H			
9µm	30 x 7.8	59320-U	
SUPELCOGEL H Guard Column (use to protect C-610H)			
9µm	5 x 4.6 *	59319	
SUPELCOGEL H			
9µm	25 x 4.6	59346	
9µm	30 x 7.8	59304-U	
SUPELCOGEL H Guard Column			
9µm	5 x 4.6 *	59319	

* 5cm x 4.6mm guard column does not include tubing, nuts or ferrules.



Organic Acids

Column: SUPELCOGEL C-610H, 30cm x 7.8mm ID
Cat. No.: 59320
Mobile Phase: 0.1% H_3PO_4
Flow Rate: 0.5mL/min
Temp.: 30°C
Det.: UV, 210nm
Inj.: 10µL

Typical Retention Times for Organic Acids on SUPELCOGEL C-610H and H Columns

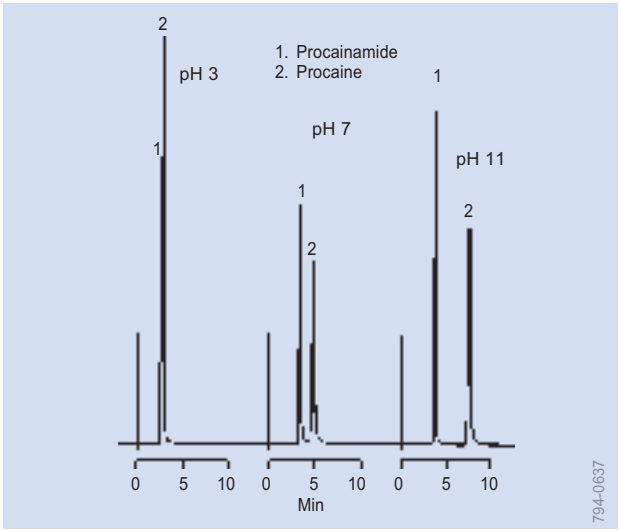
COLUMN:	C-610H	H	H
LENGTH:	30cm	30cm	25cm
ID:	7.8mm	7.8mm	4.6mm
CAT. NO.:	59320	59304	59346
Acid	Typical Retention Time (min)		
Acetic	19.0	19.6	17.6
Adipic	22.5	24.0	21.3
Ascorbic	13.1	13.3	12.1
Benzoic[1]	42.4	44.3	37.9
Butyric	28.0	28.3	24.9
Citric	11.0	10.9	10.1
Formic	17.5	18.1	16.3
Fumaric	19.8	20.9	18.2
Gluconic	12.0	12.0	11.1
Isobutyric	25.6	25.9	22.9
Isocitric	11.2	11.0	10.2
Lactic	16.0	16.9	15.2
Maleic	10.4	10.1	9.0
Malic	12.9	13.2	12.0
Malonic	13.4	13.7	12.5
Oxalic	9.0	7.9	7.3
Phytic	8.3	7.0	6.8
Propionic	22.5	23.1	20.5
Quinic	13.3	14.0	12.8
Shikimic	15.5	16.5	14.9
Succinic	15.7	16.4	14.9
Tartaric	11.7	11.7	10.7

Mobile Phase: 0.1% H_3PO_4, 0.5mL/min (0.17mL/min for 25cm x 4.6mm column), Temperature: 30°C, Detection: UV, 210nm

[1] As sodium benzoate.

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COLUMN CHARACTERISTICS	
Packing	
Composition :	polyvinylalcohol polymer, spherical
Functional Groups:	C18
Particle Size:	5µm
Pore Size:	250Å
Surface Area:	150m²/g
pH:	2-13



Separation of Basic Drugs Is Improved at High pH

Column: SUPELCOGEL ODP-50, 15cm x 4.0mm ID, 5µm particles
Cat. No.: 59307
Mobile Phase: acetonitrile:25mM phosphate, 40:60
Flow Rate: 0.45mL/min (850psi/5.8MPa)
Temp.: 30°C
Det.: UV, 254nm

Special Purpose Columns: Resin Based

SUPELCOGEL ODP-50: the selectivity of a C18 column, with a wider pH range

Because silica-based bonded phase packings are not stable above pH 7, many basic compounds are analyzed on these columns as positively charged compounds. The charged compounds often interact with residual silanol groups on the packing surface, giving low efficiency and tailing peaks. Resin-based reversed-phase columns are stable over almost the entire pH range, but traditionally have shown low efficiency for most analytes, compared to silica-based columns.

Resin-based SUPELCOGEL ODP-50 columns behave like silica C18 reversed phase columns, but enable you to operate at basic pH (recommended pH range: 2-13). Octadecyl functional groups are covalently attached to the hydroxyl groups of spherical 5µm polyvinylalcohol polymer particles, giving a high density C18 coverage (17% carbon). Separation characteristics are similar to conventional C18 reversed-phase columns – even at high pH. The improved processes used to manufacture SUPELCOGEL ODP-50 particles ensure column efficiencies and mechanical stability that rival those of silica-based packings.

The figure shows the benefits of high pH separations in analyses of basic drugs – at higher pH, the compounds lose their charge and interact more strongly with the packing, prolonging their retention times. Selectivity for most compound pairs is significantly improved, and some pairs reverse their elution order.

PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
SUPELCOGEL ODP-50 (250Å, 17.0% CARBON)			
5µm	15 x 4.0	59307-U	
SUPELCOGEL ODP-50 Supelguard Cartridges			
5µm	2 x 4.0 (2/pk)	59313C40	
5µm	2 x 4.0 kit**	59312-U	

** Kits include one cartridge, a stand-alone holder, a piece of tubing, and 2 nuts and ferrules.

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Liquid Chromatography
SUPELCO

HPLC: Small Molecules

Special Purpose SUPELCOGEL Columns

Special Purpose Columns: Resin Based

SUPELCOGEL TPR-100: a high efficiency resin-based column.

- Unique combination of hydrophilic and hydrophobic (aromatic and aliphatic) monomers
- Crosslinked for mechanical stability
- Narrow pore size and particle size distributions for high efficiency and good peak symmetry
- No micropores
- No bleed from residual porogens
- Use with 100% aqueous or 100% organic mobile phases without swelling or shrinking

Relative to silica, supports composed of organic polymers or res offer superior pH stability and chemical inertness. Choose a res based column when resolution is improved by using a pH above pH 7 or below pH 2, or when silanol or metal ion interactions cause peak tailing or irreproducible retention on a silica-based column.

SUPELCOGEL TPR-100 poly(divinylbenzene/methacrylate) resin has unique selectivity – less hydrophobic than a pure divinylbenzene resin, but less hydrophilic than a methacrylate resin. The resin also offers excellent efficiency, peak symmetry, and mechanical stability. Repeated gradients do not change the bed structure, and the columns can be used with 100% aqueous 100% organic mobile phases without shrinking or swelling. We recommend using these columns at pressures below 3000 psi.

The figure demonstrates the inertness of SUPELCOGEL TPR-100 resin. Although N,N-dimethylaniline tails severely on the silica-based C18 column, its peak shape on the SUPELCOGEL column is very good, without a competing base modifier in the mobile phase.

PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
SUPELCOGEL TPR-100 (100Å)			
5µm	15 x 3.0	59154C30	
5µm	15 x 4.0	59154C40	
5µm	15 x 4.6	59154	
SUPELCOGEL TPR-100 Supelguard Cartridges			
5µm	2 x 3.0 (2/pk)	59571C30	
5µm	2 x 4.0 (2/pk)	59571	
5µm	2 x 4.0 kit **	59570-U	

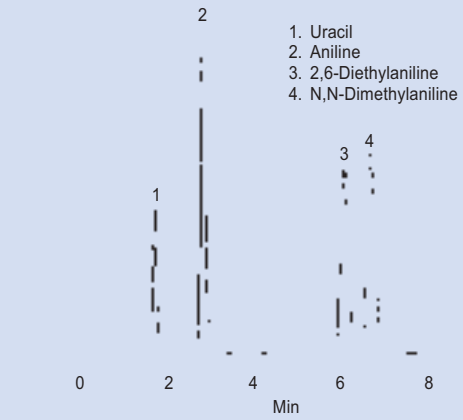
HELPFUL HINTS

Do not use SUPELCOGEL TPR-100 columns with methanol or methanol-containing mixtures.

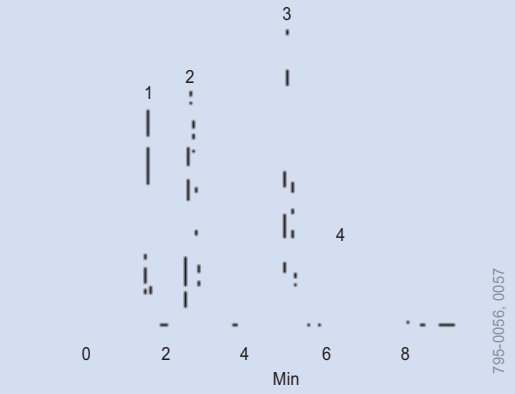
COLUMN CHARACTERISTICS

Particles: poly(divinylbenzene/methacrylate), spherical, 5µm
Pore Size: 100Å
Surface Area: 340m^2/g
pH: 2-13

SUPELCOGEL TPR-100 Column



Conventionally Deactivated C18 Column



Better Chromatography of Anilines than on a Deactivated Silica-Based Column

Columns: 15cm x 4.6mm ID, 5µm particles
Cat. No.: 59154 (SUPELCOGEL TPR-100 Column)
Mobile Phase: acetonitrile:water, 60:40
Flow Rate: 1mL/min
Temp.: ambient
Det.: UV, 254nm
Inj.: 10µL

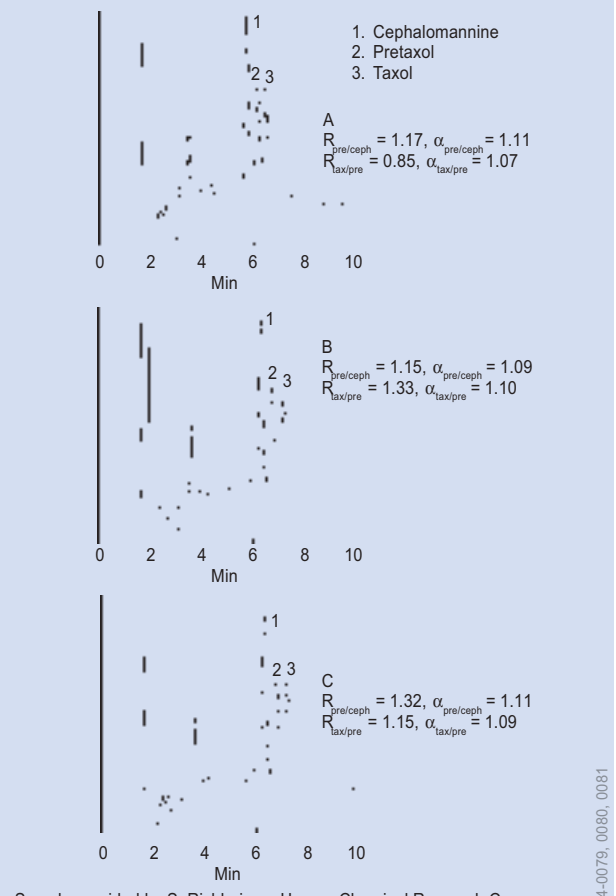
** Kits include one cartridge, a stand-alone holder, a piece of tubing, and 2 nuts and ferrules.

Special Purpose Columns: Taxols/Taxanes

SUPELCOSIL LC-F columns contain a pentafluorophenyl functional group/endcapped packing material. These columns offer selectivities different from traditional reversed phase columns for:

- Halogenated compounds, esters, ketones, and
- Taxanes, including taxol

Taxol, a chemically and pharmacologically unique taxane diterpene amide found in the bark and needles of the Pacific ye tree, has been approved by the US Food and Drug Administrati for treatment of ovarian cancer. In isocratic analyses of taxol, th crude and complex sample matrix shortens the lifetimes of traditional reversed phase columns. Analysis of a crude taxol mixture on a SUPELCOSIL LC-F is shown. Excellent resolution of the compounds of interest is obtained by using a mobile phas of acetonitrile, tetrahydrofuran, and water. Small adjustments in the percentage of tetrahydrofuran compensate for normal variation among samples.



Sample provided by S. Richheimer, Hauser Chemical Research Company.

794-0079, 0080, 0081

Tetrahydrofuran Concentration Affects Taxol Analysis

Column: SUPELCOSIL LC-F, 25cm x 4.6mm ID, 5µm particles
Cat. No.: 59158
Mobile Phase: acetonitrile:tetrahydrofuran:water,
A: 15:30:55, B: 20:25:55, C: 17:28:55
Flow Rate: 1.5mL/min
Det.: UV, 227nm
Inj.: 10µL crude taxol mix

COLUMN CHARACTERISTICS	
Particles:	spherical silica, 5µm
Pore Size:	120Å
Bonded Phase:	pentafluorophenyl
Surface Area:	170m²/g
Pore Volume:	0.6mL/g
pH Range:	2 - 7.5

PARTICLE SIZE	LENGTH (cm X mm)	CAT. NO.	PRICE
SUPELCOSIL LC-F (120Å, 5.0% CARBON)			
5µm	25 x 4.0	59158C40	
5µm	25 x 4.6	59158	
SUPELCOSIL LC-F Supelguard Cartridges			
5µm	2 x 4.0 (2/pk)	59521	
5µm	2 x 4.0 kit **	59520	

HELPFUL HINT: PROPERTIES OF ORGANIC SOLVENTS COMMONLY USED IN HPLC

SOLVENT	POLARITY	MISCIBLE WITH WATER?	UV CUTOFF	REFRACTIVE INDEX AT 20°C	SOLVENT STRENGTH, $\hat{I}_o$ (SILICA)	VISCOSITY AT 20°C, CP
Hexane	nonpolar	no	200	1.3750	0.00	0.33
Isooctane		no	200	1.3910	0.01	0.50
Carbon tetrachloride		no	263	1.4595	0.14	0.97
Chloroform		no	245	1.4460	0.31	0.57
Methylene chloride		no	235	1.4240	0.32	0.44
Tetrahydrofuran		yes	215	1.4070	0.35	0.55
Diethyl ether		no	215	1.3530	0.29	0.23
Acetone		yes	330	1.3590	0.43	0.32
Ethyl acetate		poorly	260	1.3720	0.45	0.45
Dioxane		yes	215	1.4220	0.49	1.54
Acetonitrile		yes	190	1.3440	0.50	0.37
2-Propanol		yes	210	1.3770	0.63	2.30
Methanol		yes	205	1.3290	0.73	0.60
Water	polar	yes	–	1.3328	>0.73	1.00

[1] Typical values.

** Kits include one cartridge, a stand-alone holder, a piece of tubing, and 2 nuts and ferrules.

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Liquid Chromatography
SUPELCO

HPLC: Small Molecules
SUPELCOSIL Columns

SUPELCOSIL HPLC Columns

Our SUPELCOSIL silica-based HPLC column line includes nearly 30 bonded phase chemistries in a range of particle sizes and colu configurations from microbore to preparative scale. When developing a new method, see Supelco's new Discovery suite of reversed phase HPLC columns in this catalog.

PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
SUPELCOSIL ABZ+PLUS (120Å, 12.0% CARBON)			
3µm	3.3 x 2.1	5919121	
3µm	5 x 2.1	5919221	
3µm	10 x 2.1	57917	
3µm	3.3 x 3.0	59191C30	
3µm	7.5 x 3.0	59193C30	
3µm	15 x 3.0	59194C30	
3µm	5 x 4.0	59192C40	
3µm	3.3 x 4.6	59191	
3µm	5 x 4.6	59192-U	
3µm	7.5 x 4.6	59193	
3µm	15 x 4.6	59194	
5µm	30 x 1.0	57978	
5µm	5 x 2.1	5919521	
5µm	10 x 2.1	57925	
5µm	15 x 2.1	57926	
5µm	25 x 2.1	57927	
5µm	5 x 3.0	59195C30	
5µm	15 x 3.0	59196C30	
5µm	25 x 3.0	59197C30	
5µm	5 x 4.0	59195C40	
5µm	15 x 4.0	59196C40	
5µm	25 x 4.0	59197C40	
5µm	5 x 4.6	59195-U	
5µm	15 x 4.6	59196	
5µm	25 x 4.6	59197	
5µm	25 x 10.0	59179	
5µm	10 x 21.2	59148	
5µm	25 x 21.2	54855	
12µm	25 x 4.6	59156	
12µm	25 x 21.2	59174	
SUPELCOSIL ABZ+Plus Supelguard Cartridges			
5µm	2 x 2.1 (2/pk)	59605	
5µm	2 x 2.1 kit **	59604	
5µm	2 x 3.0 (2/pk)	59535C30	
5µm	2 x 4.0 (2/pk)	59535-U	
5µm	2 x 4.0 kit **	59534-U	
SUPELCOSIL LC-ABZ (120Å, 12.0% CARBON)			
5µm	30 x 1.0	57990-U	
5µm	25 x 2.1	57936	
5µm	5 x 3.0	59141C30	
5µm	15 x 3.0	59140C30	
5µm	25 x 3.0	59142C30	
5µm	25 x 4.0	59142C40	
5µm	5 x 4.6	59141	
5µm	15 x 4.6	59140-U	
5µm	25 x 4.6	59142	
5µm	25 x 10.0	59170	
SUPELCOSIL LC-ABZ Supelguard Cartridges			
5µm	2 x 2.1 (2/pk)	59611	
5µm	2 x 2.1 kit **	59610	
5µm	2 x 3.0 (2/pk)	59545C30	
5µm	2 x 4.0 (2/pk)	59545-U	
5µm	2 x 4.0 kit **	59544-U	

PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
SUPELCOSIL SUPLEX pKB-100 (120Å, 12.5% CARBON)			
5µm	25 x 2.1	57937	
5µm	25 x 3.0	58934C30	
5µm	25 x 4.0	58934C40	
5µm	5 x 4.6	58921-U	
5µm	15 x 4.6	58932	
5µm	25 x 4.6	58934	
5µm	25 x 10.0	59172	
SUPELCOSIL Suplex pKb-100 Supelguard Cartridges			
5µm	2 x 2.1 (2/pk)	59609	
5µm	2 x 2.1 kit **	59608	
5µm	2 x 4.0 (2/pk)	59541-U	
5µm	2 x 4.0 kit **	59531-U	
SUPELCOSIL LC-18 (120Å, 11.0% CARBON)			
3µm	25 x 2.1	57942	
3µm	3.3 x 3.0	58977C30	
3µm	5 x 3.0	58973C30	
3µm	15 x 3.0	58985C30	
3µm	7.5 x 4.0	58984C40	
3µm	15 x 4.0	58985C40	
3µm	3.3 x 4.6	58977	
3µm	5 x 4.6	58973	
3µm	7.5 x 4.6	58984	
3µm	15 x 4.6	58985	
5µm	30 x 1.0	57982	
5µm	15 x 2.1	57934	
5µm	25 x 2.1	57935	
5µm	10 x 3.0	59209C30	
5µm	15 x 3.0	58230C30	
5µm	25 x 3.0	58298C30	
5µm	5 x 4.0	58239C40	
5µm	10 x 4.0	59209C40	
5µm	15 x 4.0	58230C40	
5µm	25 x 4.0	58298C40	
5µm	30 x 4.0	59165	
5µm	5 x 4.6	58239	
5µm	10 x 4.6	59209	
5µm	15 x 4.6	58230-U	
5µm	25 x 4.6	58298	
5µm	25 x 10.0	58368	
5µm	25 x 21.2	54849	
12µm	25 x 4.6	59182	
12µm	25 x 21.2	59185	
SUPELCOSIL LC-18 Supelguard Cartridges			
5µm	2 x 2.1 (2/pk)	59613	
5µm	2 x 2.1 kit **	59612	
5µm	2 x 3.0 (2/pk)	59564C30	
5µm	2 x 4.0 (2/pk)	59564	
5µm	2 x 4.0 kit **	59554	

** Kits include one cartridge, a stand-alone holder, a piece of tubing, and 2 nuts and ferrules.

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PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
SUPELCOSIL LC-18-DB (120Å, 11.0% CARBON)			
3µm	25 x 2.1	57943	
3µm	3.3 x 3.0	58978C30	
3µm	7.5 x 3.0	58992C30	
3µm	15 x 3.0	58993C30	
3µm	15 x 4.0	58993C40	
3µm	3.3 x 4.6	58978	
3µm	7.5 x 4.6	58992	
3µm	15 x 4.6	58993	
5µm	30 x 1.0	57984	
5µm	25 x 2.1	57940	
5µm	5 x 3.0	58345C30	
5µm	10 x 3.0	59208C30	
5µm	15 x 3.0	58348C30	
5µm	25 x 3.0	58355C30	
5µm	15 x 4.0	58348C40	
5µm	25 x 4.0	58355C40	
5µm	30 x 4.0	59164	
5µm	5 x 4.6	58345	
5µm	10 x 4.6	59208	
5µm	15 x 4.6	58348	
5µm	25 x 4.6	58355-U	
5µm	25 x 10.0	58358	
SUPELCOSIL LC-18-DB Supelguard Cartridges			
5µm	2 x 2.1 (2/pk)	59617	
5µm	2 x 2.1 kit **	59616	
5µm	2 x 3.0 (2/pk)	59565C30	
5µm	2 x 4.0 (2/pk)	59565	
5µm	2 x 4.0 kit **	59555	
SUPELCOSIL LC-18-S (120Å, 11.0% CARBON)			
5µm	30 x 1.0	57920	
5µm	25 x 2.1	57939	
5µm	15 x 3.0	58931C30	
5µm	15 x 4.6	58931	
5µm	25 x 4.6	58928-U	
SUPELCOSIL LC-18-S Supelguard Cartridges			
5µm	2 x 4.0 (2/pk)	59630	
5µm	2 x 4.0 kit **	59629	
SUPELCOSIL LC-18-T (120Å, 12.3% CARBON)			
3µm	15 x 3.0	58970C30	
3µm	15 x 4.6	58970-U	
5µm	25 x 3.0	58971C30	
5µm	25 x 4.6	58971	
SUPELCOSIL LC-18-T Supelguard Cartridges			
5µm	2 x 3.0 (2/pk)	59621C30	
5µm	2 x 4.0 (2/pk)	59621	
5µm	2 x 4.0 kit **	59620	
SUPELCOSIL LC-DABS (120Å, 12.3% CARBON)			
3µm	15 x 4.6	59137	
SUPELCOSIL LC-18-T Supelguard Cartridges (use for LC-DABS)			
5µm	2 x 4.0 (2/pk)	59621	
5µm	2 x 4.0 kit **	59620	

PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
SUPELCOSIL LC-PAH (120Å)			
3µm	5 x 3.0	59133C30	
3µm	10 x 3.0	59134C30	
3µm	5 x 4.6	59133	
3µm	10 x 4.6	59134	
5µm	25 x 2.1	57945	
5µm	15 x 3.0	58318C30	
5µm	15 x 4.6	58318	
5µm	25 x 4.6	58229	
SUPELCOSIL LC-18 Supelguard Cartridges (use for LC-PAH)			
5µm	2 x 2.1 (2/pk)	59613	
5µm	2 x 2.1 kit **	59612	
5µm	2 x 3.0 (2/pk)	59564C30	
5µm	2 x 4.0 (2/pk)	59564	
5µm	2 x 4.0 kit **	59554	
SUPELCOSIL LC-318 (300Å, 6.0% CARBON)			
5µm	5 x 4.6	58852	
5µm	25 x 4.6	58858	
SUPELCOSIL LC-318 Supelguard Cartridges			
5µm	2 x 4.0 (2/pk)	59512	
5µm	2 x 4.0 kit **	59502	
SUPELCOSIL LC-8 (120Å, 6.0% CARBON)			
3µm	3.3 x 3.0	58975C30	
3µm	7.5 x 3.0	58982C30	
3µm	15 x 3.0	58983C30	
3µm	15 x 4.0	58983C40	
3µm	3.3 x 4.6	58975	
3µm	7.5 x 4.6	58982	
3µm	15 x 4.6	58983	
5µm	30 x 1.0	57986	
5µm	25 x 2.1	57929	
5µm	15 x 3.0	58220C30	
5µm	25 x 3.0	58297C30	
5µm	15 x 4.0	58220C40	
5µm	25 x 4.0	58297C40	
5µm	5 x 4.6	58238	
5µm	15 x 4.6	58220-U	
5µm	25 x 4.6	58297	
5µm	25 x 10.0	58367	
5µm	25 x 21.2	54845	
12µm	25 x 4.6	59181	
12µm	25 x 21.2	59184	
SUPELCOSIL LC-8 Supelguard Cartridges			
5µm	2 x 2.1 (2/pk)	59615	
5µm	2 x 2.1 kit **	59614	
5µm	2 x 3.0 (2/pk)	59562C30	
5µm	2 x 4.0 (2/pk)	59562	
5µm	2 x 4.0 kit **	59552	

** Kits include one cartridge, a stand-alone holder, a piece of tubing, and 2 nuts and ferrules.

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HPLC: Small Molecules
SUPELCOSIL Columns

SUPELCOSIL HPLC Columns(cont'd)

PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
SUPELCOSIL LC-8-DB (120Å, 6.0% CARBON)			
3µm	7.5 x 3.0	58990C30	
3µm	15 x 3.0	58991C30	
3µm	15 x 4.0	58991C40	
3µm	3.3 x 4.6	58976	
3µm	7.5 x 4.6	58990-U	
3µm	15 x 4.6	58991	
5µm	25 x 2.1	57933	
5µm	15 x 3.0	58347C30	
5µm	15 x 4.0	58347C40	
5µm	25 x 4.0	58354C40	
5µm	5 x 4.6	58344	
5µm	15 x 4.6	58347	
5µm	25 x 4.6	58354	
5µm	25 x 10.0	58357	
SUPELCOSIL LC-8-DB Supelguard Cartridges			
5µm	2 x 2.1 (2/pk)	59619	
5µm	2 x 2.1 kit **	59618	
5µm	2 x 4.0 (2/pk)	59563	
5µm	2 x 4.0 kit **	59553	
SUPELCOSIL LC-308 (300Å, 3.5% CARBON)			
5µm	5 x 4.6	58851	
5µm	25 x 4.6	58857	
SUPELCOSIL LC-308 Supelguard Cartridges			
5µm	2 x 4.0 (2/pk)	59511-U	
5µm	2 x 4.0 kit **	59501	
SUPELCOSIL LC-DP (120Å, 6.0% CARBON)			
5µm	15 x 3.0	59150C30	
5µm	25 x 3.0	58842C30	
5µm	30 x 4.0	59167	
5µm	5 x 4.6	58841	
5µm	10 x 4.6	59211	
5µm	15 x 4.6	59150-U	
5µm	25 x 4.6	58842	
SUPELCOSIL LC-DP Supelguard Cartridges			
5µm	2 x 3.0 (2/pk)	59566C30	
5µm	2 x 4.0 (2/pk)	59566	
5µm	2 x 4.0 kit **	59556	
SUPELCOSIL LC-3DP (300Å, 4.0% CARBON)			
5µm	25 x 4.6	58859	
SUPELCOSIL LC-3DP Supelguard Cartridges			
5µm	2 x 4.0 (2/pk)	59513	
SUPELCOSIL LC-F (120Å, 5.0% CARBON)			
5µm	25 x 4.0	59158C40	
5µm	25 x 4.6	59158	
SUPELCOSIL LC-F Supelguard Cartridges			
5µm	2 x 4.0 (2/pk)	59521	
5µm	2 x 4.0 kit **	59520	
SUPELCOSIL LC-304 (300Å, 2.7% CARBON)			
5µm	5 x 4.6	58823	
5µm	25 x 4.6	58824	
SUPELCOSIL LC-304 Supelguard Cartridges			
5µm	2 x 4.0 (2/pk)	59592	
5µm	2 x 4.0 kit **	59591	

PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
SUPELCOSIL LC-CN (120Å, 4.0% CARBON)			
3µm	3.3 x 3.0	58979C30	
3µm	7.5 x 3.0	58986C30	
3µm	3.3 x 4.6	58979	
3µm	7.5 x 4.6	58986	
5µm	5 x 3.0	58211C30	
5µm	25 x 3.0	58231C30	
5µm	15 x 4.0	58221C40	
5µm	25 x 4.0	58231C40	
5µm	5 x 4.6	58211	
5µm	15 x 4.6	58221-U	
5µm	25 x 4.6	58231	
5µm	25 x 10.0	58369	
SUPELCOSIL LC-CN Supelguard Cartridges			
5µm	2 x 3.0 (2/pk)	59567C30	
5µm	2 x 4.0 (2/pk)	59567	
5µm	2 x 4.0 kit **	59557	
SUPELCOSIL LC-PCN (120Å, 4.0% CARBON)			
5µm	15 x 3.0	58377C30	
5µm	25 x 3.0	58378C30	
5µm	15 x 4.0	58377C40	
5µm	15 x 4.6	58377	
5µm	20 x 4.6	59189	
5µm	25 x 4.6	58378	
SUPELCOSIL LC-PCN Supelguard Cartridges			
5µm	2 x 4.0 (2/pk)	59514	
5µm	2 x 4.0 kit **	59504	
SUPELCOSIL LC-1 (120Å, 2.0% CARBON)			
5µm	15 x 3.0	58210C30	
5µm	15 x 4.0	58210C40	
5µm	5 x 4.6	58237	
5µm	15 x 4.6	58210-U	
5µm	25 x 4.6	58296	
SUPELCOSIL LC-1 Supelguard Cartridges			
5µm	2 x 3.0 (2/pk)	59561C30	
5µm	2 x 4.0 (2/pk)	59561	
SUPELCOSIL LC-NH_2 (120Å, 3.0% CARBON)			
3µm	7.5 x 3.0	58988C30	
3µm	15 x 3.0	58989C30	
3µm	7.5 x 4.6	58988	
3µm	15 x 4.6	58989	
5µm	25 x 3.0	58338C30	
5µm	25 x 4.0	58338C40	
5µm	25 x 4.6	58338	
SUPELCOSIL LC-NH_2 Supelguard Cartridges			
5µm	2 x 3.0 (2/pk)	59568C30	
5µm	2 x 4.0 (2/pk)	59568	
5µm	2 x 4.0 kit **	59558	
SUPELCOSIL LC-NH_2-NP (120Å, 3.0% CARBON)			
5µm	25 x 4.6	59132	
SUPELCOSIL LC-NH_2-NP Supelguard Cartridges			
5µm	2 x 4.0 (2/pk)	59516	
5µm	2 x 4.0 kit **	59515	

** Kits include one cartridge, a stand-alone holder, a piece of tubing, and 2 nuts and ferrules.

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HPLC: Small Molecules
SUPELCOSIL & SUPELCOGEL Columns

PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
SUPELCOSIL HISEP (120Å)			
5µm	25 x 2.1	57932	
5µm	5 x 4.6	59143	
5µm	15 x 4.6	58935	
5µm	25 x 4.6	58919	
SUPELCOSIL Hisep Supelguard Cartridges			
5µm	2 x 4.0 (2/pk)	59640-U	
5µm	2 x 4.0 kit **	59639	
SUPELCOSIL LC-Si (120Å)			
3µm	7.5 x 3.0	58980C30	
3µm	15 x 3.0	58981C30	
3µm	15 x 4.0	58981C40	
3µm	3.3 x 4.6	58974	
3µm	7.5 x 4.6	58980-U	
3µm	15 x 4.6	58981	
5µm	30 x 1.0	57980-U	
5µm	25 x 2.1	57930-U	
5µm	10 x 3.0	59210C30	
5µm	15 x 3.0	58200C30	
5µm	15 x 4.0	58200C40	
5µm	25 x 4.0	58295C40	
5µm	30 x 4.0	59166	
5µm	5 x 4.6	58236	
5µm	10 x 4.6	59210-U	
5µm	15 x 4.6	58200-U	
5µm	25 x 4.6	58295	
5µm	25 x 10.0	58365	
5µm	25 x 21.2	54843	
12µm	25 x 4.6	59180-U	
12µm	25 x 21.2	59183	
SUPELCOSIL LC-Si Supelguard Cartridges			
5µm	2 x 3.0 (2/pk)	59560C30	
5µm	2 x 4.0 (2/pk)	59560	
5µm	2 x 4.0 kit **	59550	
SUPELCOSIL LC-3Si (300Å)			
5µm	25 x 6.2	58965	
SUPELCOSIL LC-Si Supelguard Cartridges (use for LC-3Si)			
5µm	2 x 4.0 (2/pk)	59560	
5µm	2 x 4.0 kit **	59550	
SUPELCOSIL LC-DIOL (120Å, 3.5% CARBON)			
5µm	25 x 3.0	58201C30	
5µm	25 x 4.0	58201C40	
5µm	25 x 4.6	58201	
SUPELCOSIL LC-Diol Supelguard Cartridges			
5µm	2 x 4.0 (2/pk)	59569	
5µm	2 x 4.0 kit **	59559	
SUPELCOSIL SAX1 (120Å)			
5µm	25 x 3.0	59138C30	
5µm	25 x 4.0	59138C40	
5µm	25 x 4.6	59138	
SUPELCOSIL SAX1 Supelguard Cartridges			
5µm	2 x 4.0 (2/pk)	59537-U	
5µm	2 x 4.0 kit **	59536-U	
SUPELCOSIL LC-SCX (120Å)			
5µm	25 x 3.0	58997C30	
5µm	25 x 4.6	58997	
SUPELCOSIL LC-SCX Supelguard Cartridges			
5µm	2 x 4.0 (2/pk)	59519	
5µm	2 x 4.0 kit **	59509	

SUPELCOGEL resin-based HPLC Columns

For reversed-phase separations at high pH or low pH, we offer SUPELCOGEL TPR-100 and SUPELCOGEL ODP-50 resin-based HPLC columns. SUPELCOGEL resin-based ion exclusion HPLC columns contain sulfonated divinylbenzene resins in six cationic forms, each offering a unique selectivity for analyses of saccharides or organic acids.

PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
SUPELCOGEL TPR-100 (100Å)			
5µm	15 x 3.0	59154C30	
5µm	15 x 4.0	59154C40	
5µm	15 x 4.6	59154	
SUPELCOGEL TPR-100 Supelguard Cartridges			
5µm	2 x 3.0 (2/pk)	59571C30	
5µm	2 x 4.0 (2/pk)	59571	
5µm	2 x 4.0 kit **	59570-U	
SUPELCOGEL ODP-50 (250Å, 17.0% CARBON)			
5µm	15 x 4.0	59307-U	
SUPELCOGEL ODP-50 Supelguard Cartridges			
5µm	2 x 4.0 (2/pk)	59313C40	
5µm	2 x 4.0 kit **	59312-U	
SUPELCOGEL AG1			
9µm	30 x 7.8	59318-U	
SUPELCOGEL AG1 Guard Column			
9µm	5 x 4.6 ****	59317-U	
SUPELCOGEL AG2			
9µm	30 x 7.8	59315	
SUPELCOGEL AG2 Guard Column			
9µm	5 x 4.6 ****	59316	
SUPELCOGEL C-610H			
9µm	30 x 7.8	59320-U	
SUPELCOGEL H Guard Column (use to protect C-610H)			
9µm	5 x 4.6 ****	59319	
SUPELCOGEL C-611			
9µm	30 x 7.8	59310-U	
SUPELCOGEL Ca Guard Column (use to protect C-611)			
9µm	5 x 4.6 ****	59306-U	
SUPELCOGEL CA			
9µm	30 x 7.8	59305-U	
SUPELCOGEL Ca Guard Column			
9µm	5 x 4.6 ****	59306-U	
SUPELCOGEL H			
9µm	25 x 4.6	59346	
9µm	30 x 7.8	59304-U	
SUPELCOGEL H Guard Column			
9µm	5 x 4.6 ****	59319	
SUPELCOGEL K			
9µm	30 x 7.8	59342	
SUPELCOGEL K Guard Column			
9µm	5 x 4.6 ****	59344	
SUPELCOGEL Pb			
9µm	30 x 7.8	59343	
SUPELCOGEL Pb Guard Column			
9µm	5 x 4.6 ****	59345	

** Kits include one cartridge, stand-alone holder, a piece of tubing, and 2 nuts and ferrules.

**** Does not include tubing, nuts or ferrules.

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HPLC: Small Molecules
Other Columns

Other HPLC Columns - Small Molecules

In addition to our own product lines, we offer name brand silica-based columns: alphaBond, Hypersil, Kromasil, LiChrosorb, LiChrospher, Nucleosil, TSK-GEL, and Waters Spherisorb.

alphaBond

PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
ALPHABOND (125Å)			
C18			
10µm	15 x 3.9	57488	
10µm	30 x 3.9	57489	
alphaBond Guard Cartridges			
C18			
10µm	1 x 4.6 (4/pk)	57490-U	

Hypersil

PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
HYPERSIL (120Å)			
ODS (C18)			
3µm	10 x 3.2	54931	
3µm	10 x 4.6	Z226327	
5µm	15 x 3.2	54932	
5µm	25 x 3.2	54933	
5µm	15 x 4.6	Z226335	
5µm	25 x 4.6	Z226343	
BDS-C18*			
5µm	15 x 3.2	54915-U	
5µm	25 x 3.2	54916	
5µm	15 x 4.6	57485	
5µm	25 x 4.6	57486	
MOS (C8)			
3µm	10 x 3.2	54934	
3µm	10 x 4.6	Z226351	
5µm	15 x 4.6	Z226378	
5µm	25 x 4.6	Z226386	
BDS-C8*			
5µm	15 x 4.6	506109	
5µm	25 x 4.6	506095	
Phenyl			
3µm	10 x 3.2	54943	
3µm	10 x 4.6	Z226459	
5µm	25 x 3.2	54945	
5µm	15 x 4.6	Z226467	
5µm	25 x 4.6	Z226475	
CPS (Cyano)			
3µm	10 x 3.2	54940	
3µm	10 x 4.6	Z226424	
5µm	25 x 3.2	54942	
5µm	15 x 4.6	Z226432	
5µm	25 x 4.6	Z226440	
SAS (C1)			
3µm	10 x 4.6	Z226483	
5µm	15 x 3.2	54947-U	
5µm	15 x 4.6	Z226491	
5µm	25 x 4.6	Z226505	

PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
HYPERSIL (120Å) CONT'D			
Silica			
3µm	10 x 4.6	Z226297	
5µm	15 x 4.6	Z226300	
5µm	25 x 4.6	Z226319	
APS (NH_2)			
3µm	10 x 3.2	54937	
3µm	10 x 4.6	Z226394	
5µm	15 x 3.2	54938	
5µm	25 x 3.2	54939	
5µm	15 x 4.6	Z226408	
5µm	25 x 4.6	Z226416	
Hypersil Guard Cartridges			
ODS (C18)			
5µm	1 x 4.6 (4/pk)	Z227064	
BDS-C18*			
5µm	1 x 4.6 (4/pk)	57487	
MOS (C8)			
5µm	1 x 4.6 (4/pk)	Z227072	
BDS-C8*			
5µm	1 x 4.6 (4/pk)	506117	
Phenyl			
5µm	1 x 4.6 (4/pk)	Z227102	
CPS (Cyano)			
5µm	1 x 4.6 (4/pk)	Z227099	
SAS (C1)			
5µm	1 x 4.6 (4/pk)	Z227110	
Silica			
5µm	1 x 4.6 (4/pk)	Z227056	
APS (NH_2)			
5µm	1 x 4.6 (4/pk)	Z227080	

Inertsil

PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
INERTSIL (150Å)			
ODS-2**			
5µm	15 x 4.6	506079	
5µm	25 x 4.6	506060	
Inertsil Guard Cartridges			
ODS-2**			
5µm	1 x 4.6 (4/pk)	506087	

* BDS = Base Deactivated Silica.

** Deactivated C18.

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Kromasil

PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
KROMASIL (100Å)			
C18			
5µm	15 x 4.6	55148	
5µm	25 x 4.6	55147	
10µm	25 x 4.6	55149	
C8			
5µm	15 x 4.6	55151	
5µm	25 x 4.6	55150-U	
10µm	25 x 4.6	55152	
C4			
5µm	15 x 4.6	55154-U	
5µm	25 x 4.6	55153	
60-A (Silica, 60Å)			
5µm	15 x 4.6	55163	
5µm	25 x 4.6	55162	
10µm	25 x 4.6	55164	
100-A (Silica)			
5µm	25 x 4.6	55159	
10µm	25 x 4.6	55161	
NH_2			
5µm	25 x 4.6	55156-U	
10µm	25 x 4.6	55158-U	
Kromasil Guard Cartridges			
C18			
5µm	1 x 4.6 (4/pk)	55165-U	
C8			
5µm	1 x 4.6 (4/pk)	55166	
C4			
5µm	1 x 4.6 (4/pk)	55167	
60-A (Silica, 60Å)			
5µm	1 x 4.6 (4/pk)	55170-U	

Lichrosorb

PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
LICHROSORB (100Å)			
RP-18 (C18)			
5µm	15 x 3.2	54952	
5µm	25 x 3.2	54950-U	
5µm	15 x 4.6	54951	
5µm	25 x 4.6	54949	
RP-8 (C8)			
5µm	15 x 4.6	54955-U	
5µm	25 x 4.6	54953-U	
Si-60 (Silica, 60Å)			
5µm	25 x 3.2	54962	
5µm	15 x 4.6	54963-U	
5µm	25 x 4.6	54961	
NH_2			
5µm	25 x 3.2	54958-U	
5µm	15 x 4.6	54959	
5µm	25 x 4.6	54957-U	

PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
LiChrosorb Guard Cartridges			
RP-18 (C18)			
5µm	1 x 4.6 (4/pk)	54965-U	
RP-8 (C8)			
5µm	1 x 4.6 (4/pk)	54966	
Si-60 (Silica, 60Å)			
5µm	1 x 4.6 (4/pk)	54968	
NH_2			
5µm	1 x 4.6 (4/pk)	54967	

Lichrospher

PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
LICHROSPHER (100Å)			
RP-18 (C18)			
5µm	15 x 3.2	54775	
5µm	25 x 3.2	54777	
5µm	15 x 4.6	54774	
5µm	25 x 4.6	54776	
RP-8 (C8)			
5µm	15 x 3.2	54779	
5µm	15 x 4.6	54778	
5µm	25 x 4.6	54780	
CN (Cyano)			
5µm	15 x 4.6	54786	
5µm	25 x 4.6	54788	
Si-60 (Silica, 60Å)			
5µm	15 x 3.2	54791-U	
5µm	15 x 4.6	54790-U	
5µm	25 x 4.6	54792	
NH_2			
5µm	15 x 3.2	54783	
5µm	25 x 3.2	54785	
5µm	15 x 4.6	54782	
5µm	25 x 4.6	54784	
LiChrospher Guard Cartridges			
RP-18 (C18)			
5µm	1 x 4.6 (4/pk)	54794	
CN (Cyano)			
5µm	1 x 4.6 (4/pk)	54798	
Si-60 (Silica, 60Å)			
5µm	1 x 4.6 (4/pk)	54797-U	
NH_2			
5µm	1 x 4.6 (4/pk)	54796-U	

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HPLC: Small Molecules
Other Columns

Nucleosil

PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
NUCLEOSIL (100Å)			
C18			
3µm	10 x 3.2	54917	
3µm	10 x 4.6	Z226165	
5µm	15 x 3.2	54918	
5µm	25 x 3.2	54919	
5µm	15 x 4.6	Z226173	
5µm	25 x 4.6	Z226181	
C8			
3µm	10 x 3.2	54920-U	
3µm	10 x 4.6	Z226203	
5µm	15 x 3.2	54921	
5µm	25 x 3.2	54922	
5µm	15 x 4.6	Z226211	
5µm	25 x 4.6	Z226238	
Phenyl			
7µm	25 x 4.6	Z226246	
CN (Cyano)			
5µm	15 x 3.2	54924	
5µm	25 x 3.2	54925-U	
5µm	15 x 4.6	Z226254	
5µm	25 x 4.6	Z226262	
Silica			
5µm	25 x 3.2	54914	
5µm	15 x 4.6	Z226149	
5µm	25 x 4.6	Z226157	
NH_2			
5µm	15 x 3.2	54926	
5µm	25 x 3.2	54927	
5µm	25 x 4.6	Z226289	
Nucleosil Guard Cartridges			
C18			
5µm	1 x 4.6 (4/pk)	Z227137	
C8			
5µm	1 x 4.6 (4/pk)	Z227145	
Phenyl			
7µm	1 x 4.6 (4/pk)	Z227153	
CN (Cyano)			
5µm	1 x 4.6 (4/pk)	Z227161	
Silica			
5µm	1 x 4.6 (4/pk)	Z227129	
NH_2			
5µm	1 x 4.6 (4/pk)	Z227188	

TSK-GEL C18

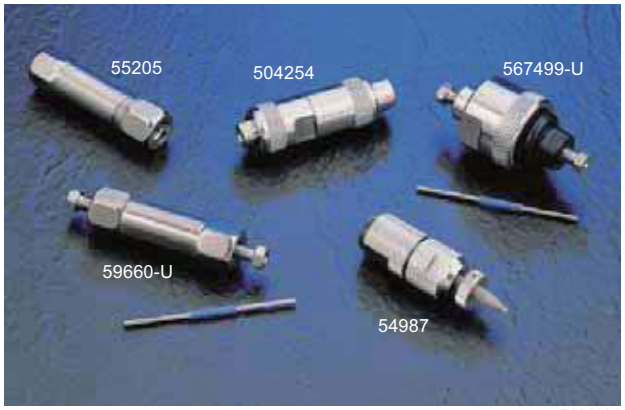
PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
TSK-GEL C18 COLUMNS			
ODS-80Tm (80Å)			
5µm	7.5 x 4.6	816651	
5µm	15 x 4.6	808148	
5µm	25 x 4.6	808149	
ODS-80Ts (80Å)			
5µm	7.5 x 4.6	817200	
5µm	15 x 4.6	817201	
5µm	25 x 4.6	817202	
ODS-120A (120Å)			
5µm	15 x 4.6	807636	
5µm	25 x 4.6	807124	
ODS-120T (120Å)			
5µm	15 x 4.6	807637	
5µm	25 x 4.6	807125	

PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
TSK-GEL C18 COLUMNS, CONT'D			
Super-ODS (110Å)			
2µm	5 x 4.6	818154	
2µm	10 x 4.6	818197	
TSK-GEL Guard Cartridges and Filters			
ODS-80Ts (80Å)			
5µm	1.5 x 3.2 (3/pk)	817242	
ODS-120T (120Å)			
5µm	1.5 x 3.2 (3/pk)	814125	
Filter			
	(3/pk)	818207	

Waters Spherisorb

PARTICLE SIZE	LENGTH X ID (cm X mm)	CAT. NO.	PRICE
WATERS SPHERISORB (80Å)			
ODS-2 (C18)			
3µm	10 x 3.2	54903	
3µm	10 x 4.6	Z226033	
5µm	15 x 3.2	54904	
5µm	25 x 3.2	54905	
5µm	15 x 4.6	Z226041	
5µm	25 x 4.6	Z226068	
Octyl (C8)			
3µm	10 x 4.6	Z226076	
5µm	25 x 3.2	54908	
5µm	15 x 4.6	Z226084	
5µm	25 x 4.6	Z226092	
Phenyl			
5µm	25 x 4.6	Z226106	
Cyano			
5µm	25 x 3.2	54910	
5µm	25 x 4.6	Z226114	
Silica			
3µm	10 x 4.6	Z226009	
5µm	15 x 3.2	54901	
5µm	25 x 3.2	54902	
5µm	15 x 4.6	Z226017	
5µm	25 x 4.6	Z226025	
Amino (NH_2)			
5µm	25 x 3.2	54911-U	
5µm	25 x 4.6	Z226122	
SAX			
5µm	25 x 4.6	Z226130	
Waters Spherisorb Guard Cartridges			
ODS-2 (C18)			
5µm	1 x 4.6 (4/pk)	Z226971	
Octyl (C8)			
5µm	1 x 4.6 (4/pk)	Z226998	
Phenyl			
5µm	1 x 4.6 (4/pk)	Z227005	
Cyano			
5µm	1 x 4.6 (4/pk)	Z227013	
Silica			
5µm	1 x 4.6 (4/pk)	Z226963	
Amino (NH_2)			
5µm	1 x 4.6 (4/pk)	Z227021	
SAX			
5µm	1 x 4.6 (4/pk)	Z227048	

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Guard Column Holders

Use these guard column holders with the guard cartridges listed on the previous pages. The Direct-Connect holders allow a guard cartridge to attach to a Supelco modular column with no dead volume. The Direct-Connect holders can only be used with Supelco modular columns. The Swivel-type holders allow the tubing to move independently of the holder, reducing the risk of leaks caused by crimped tubing. The Stand-Alone holders include the necessary tubing, nuts and ferrules for connecting to any analytical columns.

DESCRIPTION	CAT. NO.	PRICE
FOR SUPELCO SUPELGUARD CARTRIDGES		
Direct-Connect (Swivel-type) Holder*	504262	
Direct-Connect (Swivel-type) Holder**	504254	
Direct-Connect Holder**	55205	
Stand-Alone Holder***	59660-U	
New Stand-Alone Holder****	567499-U	
FOR SUPELCO PELLIGUARD CARTIDGES		
Stand-Alone Holder	500054	
FOR OTHER CARTRIDGES		
Stand-Alone Holder (includes PEEK Column Coupler)	54987	
Replacement PEEK Column Coupler	54986	
FOR TSK-GEL CARTRIDGES AND FILTERS		
Stand-Alone Holder for TSK-GEL Cartridges	814100	
Stand-Alone Holder for TSK-GEL Filters	818206	

* For 2.1mm ID Supelco columns
** For 3.0, 4.0 and 4.6mm ID Supelco columns
*** For 2.1, 3.0, 4.0 and 4.6mm ID Supelco columns
**** For 10.0mm ID Supelco columns

HELPFUL HINTS

Before flushing a reversed-phase HPLC column that contains a buffer (salt), flush with warm (60°C) DI H_2O thoroughly to remove salts. Not following this general rule may result in salt precipitation when returned to 100% organic for long-term storage. For more information, refer to literature T401012, Buffer Solubility section.

Pelliguard Guard Cartridges



For 5µm, 10µm, or 12µm SUPELCOSIL and other silica-based HPLC columns, where samples are especially dirty, and a small loss of efficiency is acceptable. Each kit contains one cartridge (2cm x 4.6mm ID) filled with 40µm Pelliguard packing, a reusable stand-alone column holder, and hardware for connecting the holder to 1/16" tubing. Replacement cartridges come in packages of four.

COLUMN TO BE PROTECTED	RECOMMENDED PELLIGUARD COLUMN	CAT. NO.	PRIC
Silica	LC-Si Kit	59641	
	Cartridges (pk. of 4)	59651	
Cyano	LC-CN Kit	59645-U	
	Cartridges (pk. of 4)	59655	
Amino	LC-NH_2 Kit	59646	
	Cartridges (pk. of 4)	59656	
C8	LC-8 Kit	59643	
	Cartridges (pk. of 4)	59653	
C18	LC-18 Kit	59644	
	Cartridges (pk. of 4)	59654	



Bulk Pellicular Packing Kits

Reusable 5cm x 4.6mm ID guard column hardware and 40µm pellicular packing, for protecting 10µm columns. Each column kit contains an empty 5cm x 4.6mm ID column, 10g of Pelliguard packing, 10 frits, and hardware for connecting the column to 1/16" tubing. About 1.3 grams of packing is needed to pack one 5cm x 4.6mm column.

COLUMN TO BE PROTECTED	RECOMMENDED PELLIGUARD COLUMN	CAT. NO.	PRIC
Silica	LC-Si Kit	58202	
	LC-Si Packing, 10g	58291	
Cyano	LC-CN Kit	58234	
	LC-CN Packing, 10g	58235	
C8	LC-8 Kit	58222-U	
	LC-8 Packing, 10g	58293	
C18	LC-18 Kit	58232	
	LC-18 Packing, 10g	58294	



Guard Column Hardware Kit, Funnel and Tubing

Kit includes 5cm x 4.6mm ID column, endfittings, 2 frits (2.0µm pores), and 2"/5cm of 0.01" ID x 1/16" OD SS tubing. Funnel connects to column with tygon tubing (included) for easier column filling.

DESCRIPTION	CAT. NO.	PRICE
Guard Column Hardware Kit	58319	
Replacement Frits (pk. of 10)	58264	
Funnel and Tubing	20390-U	

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HPLC: Small Molecules
HPLC Column Test Mixes

HPLC Column Test Mixes

Performance evaluation mixes for HPLC columns.

Well defined test mixes enable you to troubleshoot chromatographic problems, optimize system efficiency, and evaluate columns under conditions where their performance is understood. We ship these test mixes in amber ampuls to prevent photodegradation, and we include instructions for proper use and interpretation of results.

Choose from column-specific or application-specific mixes. All mixes except the amino phase test mix (Cat. No. 58424-U) call for UV detection; the amino phase test mix (sugars) calls for refractive index detection. We recommend our HPLC Troubleshooting Guide (Bulletin 826) for additional information about using test mixes.

1mL unless otherwise specified.

TEST MIX	USE TO TEST	SOLVENT	COMPONENTS (CONC./mL)	CAT. NO.	PRICE
Amino Phase	LC-NH_2 columns	acetonitrile:water, 25:75	D-fructose (25mg) α-D-glucose (25mg) sucrose (25mg) maltose (25mg) lactose (25mg)	58424	
Cyano Phase	LC-CN, LC-PCN, ABZ+Plus columns, any weakly hydrophobic phase	acetonitrile:water, 25:75	uracil (7µg) acetophenone (7µg) benzene (750µg) toluene (775µg)	58299	
Normal Phase Mix 1	LC-Si (silica) columns	methylene chloride	benzene (600µg) benzanilide (20µg) acetanilide (20µg)	58281	
Normal Phase Mix 2	LC-Si, LC-CN, LC-NH_2 columns	ethanol:hexane, 5:95	toluene (1mg) diethyl phthalate (1mg) dimethyl phthalate (1mg)	47640-U	
Nucleosides	LC-18-S columns	water, sodium formate (10mg/mL)	12 nucleosides (10-100µg) (see page 146)	47310-U	
LC-PAH	LC-PAH columns	methanol: methylene chloride, 50:50	16 PAHs (100-2000µg) (see page 410)	48743	
Peptide Standard	reversed phase columns used for peptide separations (e.g., 300Å phases)	none (dried film)	Gly-Tyr (~0.125mg) Val-Tyr-Val (~0.5mg) Met enkephalin (~0.5mg) Leu enkephalin (~0.5mg) angiotensin II (~0.5mg)	H2016-1VL	
Reversed Phase Mix 1	hydrophobic RP columns (e.g., LC-8, LC-18)	methanol:water, 60:40	uracil (7µg) acetophenone (7µg) benzene (750µg) toluene (775µg)	58278	
Reversed Phase Mix 2	hydrophobic RP columns (e.g., LC-8, LC-18)	acetonitrile:water, 58:42	uracil (5µg) phenol (700µg) N,N-diethyl-m-toluamide (600µg) toluene (4mg)	47641-U	
Chiral 1	chiral phases	hexane:ethyl acetate, 80:20	toluene (70µg) (+) TFAE[1] (25µg) (–) TFAE[1] (25µg)	48250-U	
Chiral 2	chiral phases	chloroform	benzene (500µg) (+) N-PDBA[2] (50µg) (–) N-PDBA[2] (50µg))	48251	

[1] 2,2,2-trifluoro-1-(9-anthryl)ethanol
[2] N-(1-phenylethyl)-3,5-dinitrobenzamide

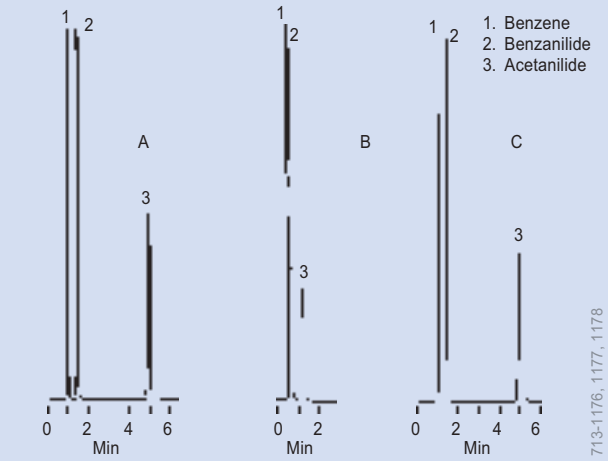
Custom Test Mixes

For information on made-to-order standards and test mixes, call our Technical Service chemists, or request our Custom Chemical Reference brochure (Publication No. 196905).

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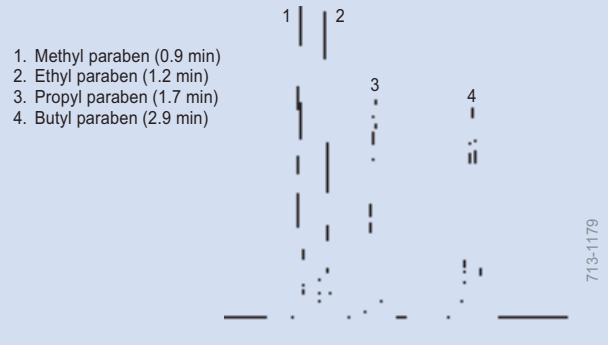
Restore Column Performance

Properly performing column (A) is exposed to water and alcohol (B), then treated with Silica Column Regeneration Solution (C).



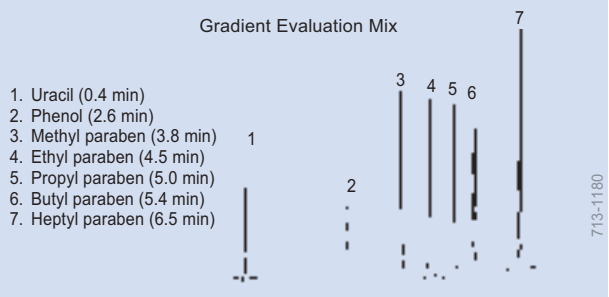
Column: SUPELCOSIL LC-Si, 15cm x 4.6mm, 3µm particles
Cat. No.: 58981
Mobile Phase: A = methylene chloride:methanol:water (99.4:0.5:0.1)
B = 2-propanol:water (50:50)
C = Silica Column Regeneration Solution, 4mL/min for 10 min, then methylene chloride:methanol:water (99.4:0.5:0.1), 2mL/min for 10 min
Det.: UV, 254nm
Inj.: 10µL

Isocratic Evaluation Mix



Flow Rate: 2mL/min
Det.: UV, 254nm
Inj.: 10µL

Gradient Evaluation Mix



Flow Rate: 2mL/min methanol:water, 10:90 to 90:10 in 5 min
Det.: UV, 254nm
Inj.: 10µL

HPLC Column Test Mixes

System diagnostics: test kits and column regeneration solutions.

Silica Column Regeneration Solution -This solution effectively regenerates a silica column that has come into contact with very strongly polar solvents, such as water or alcohols. Simply flush the column with regeneration solution for 10 minutes, then reequilibrate with mobile phase for 10 minutes. Column performance usually is restored to that obtained before exposure to the polar solvent.

System Diagnostic Kit -Take a systematic approach to diagnosing problems in an HPLC system. This kit consists of:

- 5cm x 4.6mm SUPELCOSIL LC-18SD column
- 6 x 1mL Isocratic Evaluation Mix
- 6 x 1mL Gradient Evaluation Mix
- four 1.8mL screwcap vials with hole caps and septa

When you need to determine the cause of a problem, install the 5cm column, prepare a simple methanol:water mobile phase, and inject 10µL of Isocratic Evaluation Mix onto the column. Compare your chromatogram with that from a properly performing system and use the information sheet included with the kit to help isolate the source of the problem. If necessary, make injections with the gradient mix.

We recommend our HPLC Troubleshooting Guide (Bulletin 826 available free on request) to help you interpret the results you obtain.

Evaluation Test Mixes -Six 1mL ampuls of test compounds in methanol:water, 60:40.

These formulations are designed for evaluating how reliably a chromatographic system is providing such fundamentally important parameters as flow rate, proportioning, and mixing.

DESCRIPTION	QTY.	CAT. NO.	PRICE
Silica Column Regeneration Solution	200mL	33175	
LC-18SD System Diagnostic Kit		58543	
Isocratic Evaluation Mix	6 x 1mL	48270-U	
Gradient Evaluation Mix	6 x 1mL	48271	

RELATED INFORMATION

Request free literature by phone or fax, or see our website.

No.	Subject
T100826	HPLC troubleshooting guide
T196905	custom chemicals brochure

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HPLC: Biopolymers

Column Selection: Nucleic Acid Separations

SAMPLE TYPE	SEPARATION MODE	MCI GEL HPLC (SEE PAGE)	AMERSHAM BIOSCIENCES FPLC (SEE PAGE)	TSK-GEL HPLC (SEE PAGE)	SUPELCO HPLC (SEE PAGE)
DNA/RNA	Gel Filtration		Superdex 200 (62)	G-DNA-PW (63)	
	Ion Exchange	ProtEx-DEAE (60)	Mono Q (60)	DEAE-NPR (61)	
PCR Fragments	Ion Exchange	ProtEx-DEAE (60)	Mono Q (60)	DEAE-NPR (61)	
Oligonucleotides	Ion Exchange	ProtEx-DEAE (60)	Mono Q (60)	DEAE-5PW (61) DEAE-NPR (61)	
	Reversed Phase			Oligo-DNA RP (64)	SUPELCOSIL LC-318 (64) Discovery C18 (28)
Nucleotides	Reversed-Phase				SUPELCOSIL LC-18-T (39) Discovery C18 (28) Discovery RP-AmideC16 (29)
	Ion Exchange			DEAE-2SW (61)	SUPELCOSIL SAX1 (47)
Nucleosides	Reversed-Phase				SUPELCOSIL LC-18-S (39) Discovery C18 (28) Discovery RP-AmideC16 (29)
Nucleic Acid Bases	Reversed-Phase				SUPELCOSIL LC-18 (44) SUPELCOSIL LC-18-DB (33) Discovery C18 (28) Discovery RP-AmideC16 (29)
	Ion Exchange				SUPELCOSIL LC-SCX (47)

RELATED INFORMATION

Request free literature by phone or fax, or see our website.

No.	Subject
T402038	Discovery BIO Wide Pore HPLC Columns and Capillaries: Solutions to Protein and Peptide Separation Challenges

McClung, G., W.T. Frankenburger, Jr. Comparison of Reversed Phase High Performance Liquid Chromatographic Methods for Precolumn Derivatized Amino Acids. J. Liq. Chromatogr. 11: 613-646 (1988). Reference not available from Supelco.

HPLC: Biopolymers

Column Selection: Peptide and Protein Separations

SEPARATION MODE	MCI GEL HPLC (SEE PAGE)	AMERSHAM BIOSCIENCES FPLC (SEE PAGE)	TSK-GEL HPLC (SEE PAGE)	SUPELCO HPLC (SEE PAGE)
Gel Filtration		Superdex Peptide Superdex 75 Superdex 200 (62) Fast Desalting HR 10/10 (62)	G2000SW, G2000SW$_{XL}$ G3000SW, G3000SW$_{XL}$ G4000SW, G4000SW$_{XL}$ Super 3000 SW (62)	
Strong Anion Exchange	ProtEx-DEAE (60)	Mono Q (60)		
Weak Anion Exchange		Mono P (60)	DEAE-5PW, DEAE-NPR (61)	
Chromatofocusing		Mono P (60)		
Strong Cation Exchange	ProtEx-SP (60)	Mono S (60)	SP-5PW, SP-NPR (61)	
Weak Cation Exchange			CM-5PW (61)	
Hydrophobic Interaction			Ether-5PW Phenyl-5PW Butyl-NPR (64)	
Reversed Phase			Phenyl-5PW RP Octadecyl-4PW Octadecyl-NPR Super-ODS (64)	Discovery BIO Wide Pore C18 (57) Discovery BIO Wide Pore C8 (58) Discovery BIO Wide Pore C5 (59) Discovery RP-AmideC16 (29) Discovery C18 (28) Discovery C8 (30)
Affinity			ABA-5PW Boronate-5PW Chelate-5PW Heparin-5PW Tresyl-5PW (64)	

Note: Products in italics are used under low pressure conditions.

Columns for Amino Acid Separations

DERIVATIZED AMINO ACID	SUPELCOSIL HPLC	DIMENSIONS (cm x mm ID)	CAT. NO.	PRICE	SUPELGUARD GUARD COLUMN	CAT. NO.	PRICE
Dabsyl-AA	LC-DABS (3µm)	15 x 2.1	59137		LC-18-T	59621	
DABTH-AA	LC-18 (3µm)	15 x 4.6	58985		LC-18	59564	
OPA-AA	LC-18 (5µm)	15 x 4.6	58230-U		LC-18	59564	
PTC-AA	LC-18-DB (5µm)	25 x 4.6	58355-U		LC-18-DB	59565	
PTH-AA	LC-18-DB (3µm)	25 x 2.1	57943		LC-18-DB	59565	
	LC-18-DB (5µm)[1]	25 x 4.6	58355-U		LC-18-DB	59565	

[1] Alternative to 3µm LC-18-DB.

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HPLC: Biopolymers

Discovery BIO Wide Pore Columns

Discovery BIO

Solutions to Protein and Peptide Separation Challenges

Discovery BIO HPLC columns and capillaries provide sensitive, stable, efficient, reproducible separations of proteins and peptides. The different phase chemistries provide unique selectivity increasing your resolution options. Separations are completely scalable from analytical to prep. The low-bleed feature and microbore and capillary dimensions make them ideal for proteomics and LC/MS applications.

Discovery BIO Wide Pore C18

Ideal for high resolution peptide mapping and synthetic and native peptide separations.

Discovery BIO Wide Pore C8

Also ideal for high resolution peptide mapping and synthetic and native peptide separations. The intermediate hydrophobicity of the C8 phase makes it very useful for method development.

Discovery BIO Wide Pore C5

The short-chain C5 phase is used for protein and hydrophobic peptide separations. Discovery BIO Wide Pore C5 is more stable than the commonly-used C4 phases.

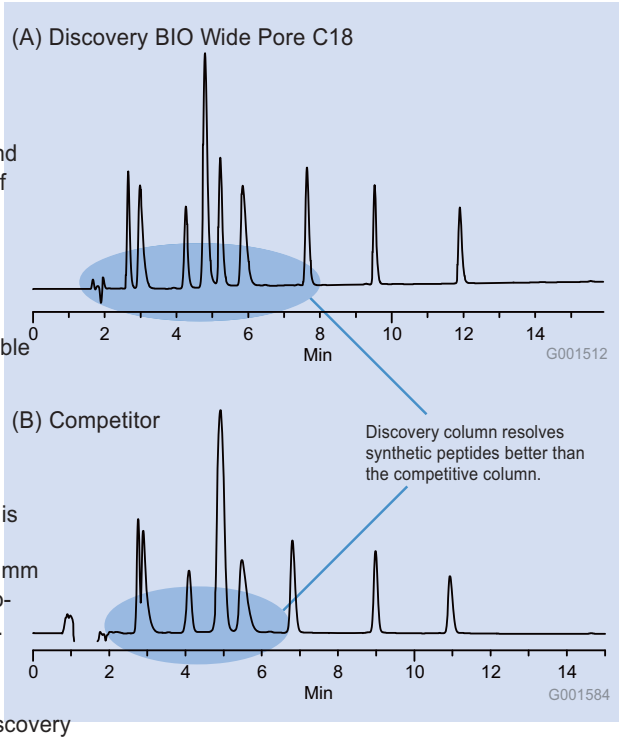
Capillary and Microbore Dimensions

With the rapid growth of proteomics, the demand for detailed characterization on smaller sample volumes is increasing. So is the utility of smaller ID HPLC columns. Traditional column IDs of 4.6mm and even 2.1mm are being replaced by microbore (1mm ID) and capillary (< 1mm ID) dimensions. The benefits are two-fold: increased sensitivity and decreased sample consumption. Discovery BIO C18 and C5 is available in capillary and microbore dimensions to meet these criteria.

Go to www.sigma-aldrich.com/supelco-bio to see the entire Discovery BIO line, including new additions, and download the most recent literature and applications.

Mixture of Synthetic Peptides on Discovery BIO Wide Pore C18 and a Leading Competitive Column

Columns:	(A) Discovery BIO Wide Pore C18, 15cm x 4.6mm, 5µm (Cat. No. 568222-U) (B) Competitive protein and peptide C18, 15cm x 4.6mm, 300Å, 5µm
Mobile Phase:	(A) 80:20, (0.1% TFA in water): (0.1% TFA in CH_3CN); (B) 66:34, (0.1% TFA in water): (0.1% TFA in CH_3CN)
Flow Rate:	1.0mL/min
Temp:	30°C
Detection:	220nm
Injection:	10µL, ~0.25µg each peptide (Sigma Peptide Mix, Cat. No. P 2693 containing Arg^8-vasopressin, bradykinin (fragment 1-5), oxytocin, luteinizing hormone releasing hormone, Met-enkephalin, bradykinin, Leu-enkephalin, bombesin, Substance P) in 0.1%TFA. See sequence in Figure 14.
Gradient:	0-100%B in 14 min after 1 minute delay



Suggestions for Choosing a Discovery BIO Wide Pore Column:

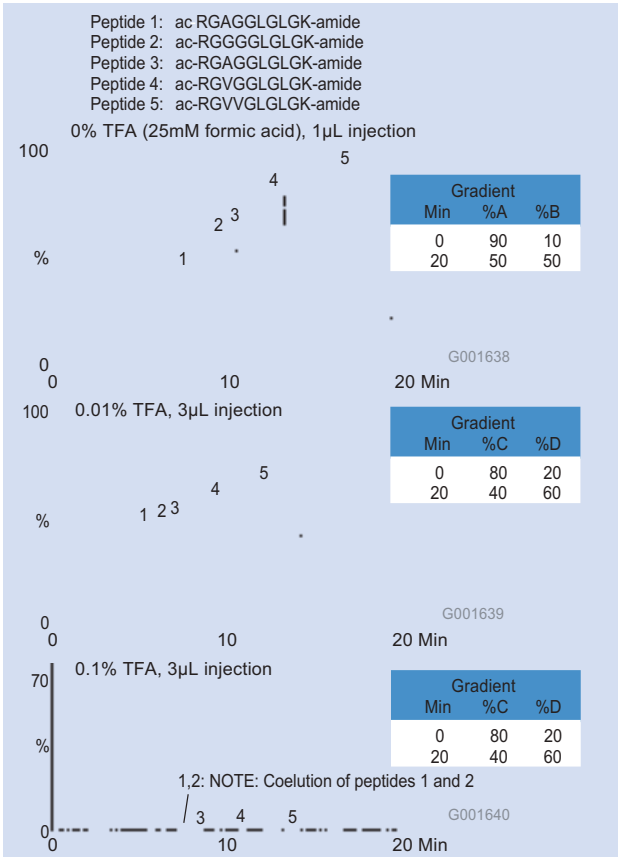
APPLICATIONS	BONDED PHASES
Proteins	BIO Wide Pore C5
Hydrophobic peptides or proteins (e.g. membrane proteins)	BIO Wide Pore C5
Peptide mapping	BIO Wide Pore C18
Proteomics	BIO Wide Pore C18
Scouting	BIO Wide Pore C8 (because of its intermediate hydrophobicity between a C18 and C5)

APPLICATION	SILICA PARTICLE SIZES
LC/MS	3 micron or 5 micron
Fast analysis, or highthroughput applications	3 micron
Peptide mapping	3 micron or 5 micron
Analytical HPLC	3 micron or 5 micron
Preparative	10 micron

APPLICATION	COLUMN ID
LC/MS	2.1mm or smaller
Peptide mapping	4.6mm, 4.0mm, 2.1mm
Analytical HPLC	4.0mm, 4.6mm
Preparative	10mm, 21.2mm
Low level detection or limited sample volume	0.32mm, 0.5mm, 1.0mm

Discovery BIO Wide Pore C18

Peptide maps generated by RP-HPLC provide valuable information about protein structure, stability, and purity. To be effective, the RP-HPLC column must be able to resolve a high percentage of the peptides in the sample. The more peptides, the better the information. Discovery BIO Wide Pore C18 gives unsurpassed RP-HPLC resolution of peptide maps from tryptic digests. The improvements in silica and bonded phase chemistry we've incorporated into the Discovery BIO Wide Pore line improve resolution by increasing efficiency and reducing the peak tailing. An added benefit to this is the ability to analyze peptides without TFA in the mobile phase thereby increasing the LC/MS signal.



Effect of Chromatographic Conditions on MS Signals of Peptides

Column:	Discovery BIO Wide Pore C18, 15cm x 2.1mm, 3µm
Cat. No.:	567202-U
Mobile Phase A:	25mM formic acid in water
Mobile Phase B:	50:50 (25mM formic acid in water) : (20mM formic acid in MeCN) [1]
Mobile Phase C:	0.01 or 0.1% TFA in water
Mobile Phase D:	50:50 (0.01 or 0.1% TFA in water) : (0.01 or 0.1% TFA in MeCN)
Flow Rate:	0.208mL/min [2]
Det.:	+ES
Temp.:	ambient
Inj.:	1µL or 3µL
Sample:	RP Peptide Performance Standard, p/n RPS-P0010 (Alberta Peptide Institute)

1. molarity of formic acid adjusted to provide minimum baseline drift.
2. linear velocity equal to 1mL/min on 4.6mm ID columns.

PARTICLE SIZE	LENGTH x ID (cm x mm)	CAT. NO.	PRICE
DISCOVERY BIO WIDE PORE C18 (300Å, 9.2% CARBON)			
3µm	5 x 0.32	65526-U	
3µm	10 x 0.32	65527-U	
3µm	5 x 0.5	65517-U	
3µm	10 x 0.5	65518-U	
3µm	5 x 1.0	65504-U	
3µm	10 x 1.0	65506-U	
3µm	5 x 2.1	567200-U	
3µm	10 x 2.1	567201-U	
3µm	15 x 2.1	567202-U	
3µm	5 x 4.6	567203-U	
3µm	10 x 4.6	567204-U	
3µm	15 x 4.6	567205-U	
5µm	15 x 0.32	65529-U	
5µm	15 x 0.5	65519-U	
5µm	15 x 1.0	65508-U	
5µm	25 x 1.0	65509-U	
5µm	5 x 2.1	568200-U	
5µm	10 x 2.1	568201-U	
5µm	15 x 2.1	568202-U	
5µm	25 x 2.1	568203-U	
5µm	5 x 4.0	568210-U	
5µm	10 x 4.0	568211-U	
5µm	15 x 4.0	568212-U	
5µm	25 x 4.0	568213-U	
5µm	5 x 4.6	568220-U	
5µm	10 x 4.6	568221-U	
5µm	15 x 4.6	568222-U	
5µm	25 x 4.6	568223-U	
5µm	25 x 10.0	568230-U	
10µm	25 x 4.6	567206-U	
10µm	5 x 10.0	567207-U	
10µm	15 x 10.0	567208-U	
10µm	25 x 10.0	567209-U	
10µm	5 x 21.2	567210-U	
10µm	15 x 21.2	567211-U	
10µm	25 x 21.2	567212-U	
Supelguard Cartridges			
3µm	2 x 2.1 (2/pk)	567270-U	
3µm	2 x 2.1 kit **	567271-U	
3µm	2 x 4.0 (2/pk)	567272-U	
3µm	2 x 4.0 kit **	567273-U	
5µm	2 x 2.1 (2/pk)	568270-U	
5µm	2 x 2.1 kit **	568271-U	
5µm	2 x 4.0 (2/pk)	568272-U	
5µm	2 x 4.0 kit **	568273-U	
10µm	1 x 10.0	567282-U	

** Kits include one cartridge, a stand-alone holder, a piece of tubing, and 2 nuts and ferrules.

PROPERTIES:	
Bonded Phase:	Covalently-bonded octadecylsilane, endcapped
Silica:	Spherical, high purity (<10ppm metals)
Particle Size:	3, 5, and 10mm
Pore Size:	300Å
Surface Area:	100m²/g
%C:	~9%
Coverage:	~4 µmoles/m²

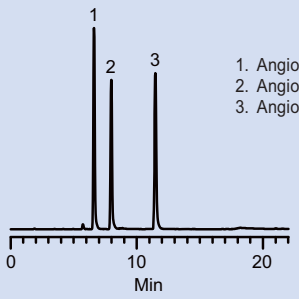
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HPLC: Biopolymers

Discovery BIO Wide Pore C8 Columns

PARTICLE SIZE	LENGTH X ID (cm x mm)	CAT. NO.	PRICE
DISCOVERY BIO WIDE PORE C8 (300Å, 5.0% CARBON)			
3µm	5 x 2.1	567213-U	
3µm	10 x 2.1	567214-U	
3µm	15 x 2.1	567215-U	
3µm	5 x 4.6	567216-U	
3µm	10 x 4.6	567217-U	
3µm	15 x 4.6	567218-U	
5µm	5 x 2.1	568300-U	
5µm	10 x 2.1	568301-U	
5µm	15 x 2.1	568302-U	
5µm	25 x 2.1	568303-U	
5µm	5 x 4.0	568310-U	
5µm	10 x 4.0	568311-U	
5µm	15 x 4.0	568312-U	
5µm	25 x 4.0	568313-U	
5µm	5 x 4.6	568320-U	
5µm	10 x 4.6	568321-U	
5µm	15 x 4.6	568322-U	
5µm	25 x 4.6	568323-U	
5µm	25 x 10.0	568330-U	
10µm	25 x 4.6	567219-U	
10µm	5 x 10.0	567220-U	
10µm	15 x 10.0	567221-U	
10µm	25 x 10.0	567222-U	
10µm	5 x 21.2	567223-U	
10µm	15 x 21.2	567224-U	
10µm	25 x 21.2	567225-U	
Supelguard Cartridges			
3µm	2 x 2.1 (2/pk)	567274-U	
3µm	2 x 2.1 kit **	567275-U	
3µm	2 x 4.0 (2/pk)	567276-U	
3µm	2 x 4.0 kit **	567277-U	
5µm	2 x 2.1 (2/pk)	568370-U	
5µm	2 x 2.1 kit **	568371-U	
5µm	2 x 4.0 (2/pk)	568372-U	
5µm	2 x 4.0 kit **	568373-U	
10µm	1 x 10.0	567284-U	

** Kits include one cartridge, a stand-alone holder, a piece of tubing, and 2 nuts and ferrules.



1. Angiotensin II (1.67g/L) (DRVYIHPF)
2. Angiotensin III (1.67g/L) D(RVYIHPF)
3. Angiotensin I (1.67g/L) (DRVYIHPFHL)

Resolution of Angiotensins at Neutral pH

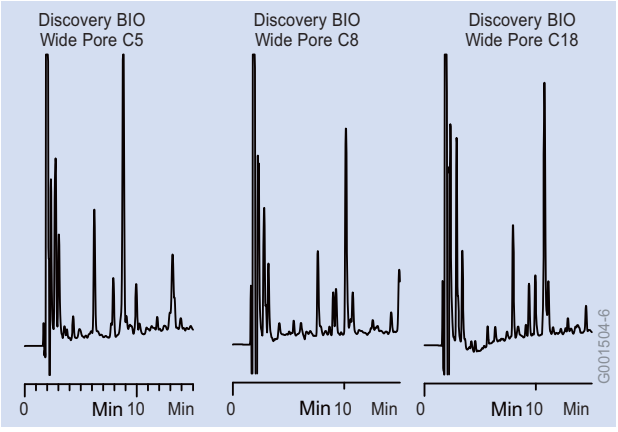
Column: Discovery BIO Wide Pore C8, 15cm x 4.6mm, 5µm
Cat. No.: 568322-U
Mobile Phase: (A) 10mM $NH_4H_2PO_4$/ NH_4OH, pH 7;
(B) 50:50, (20mM $NH_4H_2PO_4$/ NH_4OH, pH 7):MeCN
Flow Rate: 1mL/min
Temp: 30°C
Det.: 215nm
Inj.: 6µL in water
Gradient: 30-60% B in 15 min

Discovery BIO Wide Pore C8

Discovery BIO Wide Pore C8 is an RP-HPLC phase for proteins and peptides that has hydrophobicity intermediate between the Discovery BIO Wide Pore C5 and the Discovery BIO Wide Pore C18. The difference in hydrophobicity gives it unique selectivity relative to these other phases. It is ideal for peptide mapping because it provides complementary information compared to a C18 separation. Because of its intermediate hydrophobicity we also recommend it for method development or scouting work. As with all Discovery BIO Wide Pore phases, the C8 phase gives efficient, symmetrical peaks, exceptional stability, long column lifetime, and LC/MS compatibility.

PROPERTIES:

Bonded Phase: Covalently-bonded octylsilane, endcapped
Silica: Spherical, high purity (<10ppm metals)
Particle Size: 3, 5, and 10mm
Pore Size: 300Å
Surface Area: 100m²/g
%C: ~5
Coverage: ~4 µmoles/m²



Each Discovery BIO Wide Pore Phase Gives Unique Elution Profiles of Carboxymethylated Apohemoglobin Peptide Fragments

Columns: (A) Discovery BIO Wide Pore C5 (Cat. No. 568422-U),
(B) Discovery BIO Wide Pore C8 (Cat. No. 568322-U),
or (C) Discovery BIO Wide Pore C18 (568222-U),
each 15cm x 4.6mm, 5µm
Mobile Phase: (A) 95:5, (0.1% TFA in water):(0.1% TFA in CH_3CN);
(B) 50:50, (0.1% TFA in water):(0.1% TFA in CH_3CN)
Flow Rate: 1.0mL/min
Temp: 30°C
Detection: 215nm
Injection: 50µL carboxymethylated apohemoglobin tryptic digest in 50mM NH_4HCO_3
Gradient: 0-100%B in 65 min

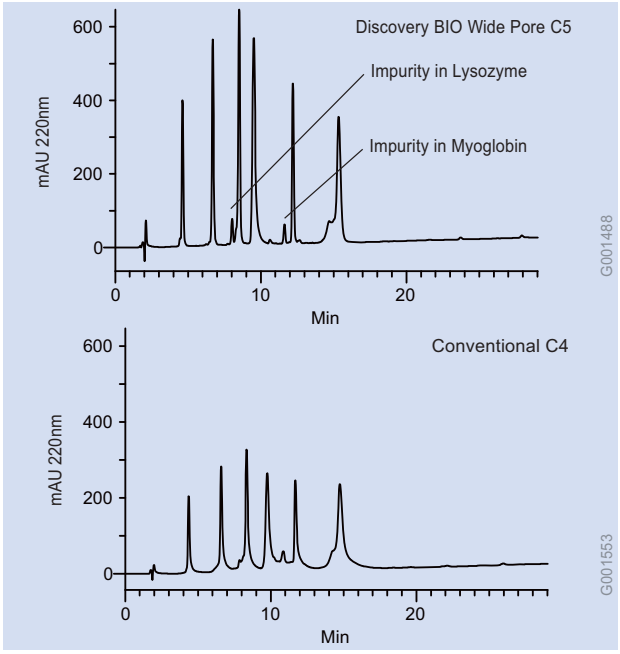
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Discovery BIO Wide Pore C5

Discovery BIO Wide Pore C5 was designed for the efficient and reliable separation of proteins and peptides, especially hydrophobic peptides, by RP- HPLC. Long-chain phases, like C8 or C18, are often too hydrophobic for proteins and can cause excessively long retention time or even irreversible binding to the column. For this reason short-chain phases, typically C3 or C4, are often used for RP-HPLC of proteins. However, these short-chain phases are susceptible to hydrolysis resulting in short column lifetime, especially at low pH. The Discovery BIO Wide Pore C5 gives elution order similar to a conventional C4, yet has enhanced pH stability for longer column lifetime. Generally, higher efficiency separations are achievable on the Discovery BIO Wide Pore C5 because of the improvements we have made to the silica and bonded phase chemistry.

PROPERTIES:

Bonded Phase:	Covalently-bonded pentylsilane, endcapped
Silica:	Spherical, high purity (<10ppm metals)
Particle Size:	3, 5, and 10mm
Pore Size:	300Å
Surface Area:	100m²/g
%C:	~3%
Coverage:	~4 µmoles/m²



Excellent Performance for Proteins

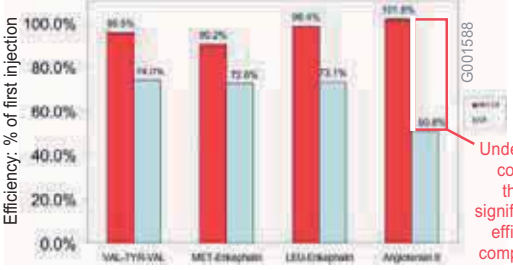
Column:	Discovery BIO Wide Pore C5, 15cm x 4.6mm, 5µm
Cat. No.:	568422-U
Mobile Phase:	(A) 0.1% (v/v) TFA in H_2O : MeCN (75:25), (B) 0.1% (v/v) TFA in H_2O : MeCN (25:75)
Flow Rate:	1mL/min
Temp:	30°C
Det.:	220nm
Inj.:	10µL
Sample:	Protein Test Mix in 0.1% TFA
Gradient:	0-100% B in 25 min.

PARTICLE SIZE	LENGTH X ID (cm x mm)	CAT. NO.	PRICE
DISCOVERY BIO WIDE PORE C5 (300Å, 3.5% CARBON)			
3µm	5 x 0.32	65531-U	
3µm	10 x 0.32	65532-U	
3µm	5 x 0.5	65520-U	
3µm	10 x 0.5	65521-U	
3µm	5 x 1.0	65511-U	
3µm	10 x 1.0	65512-U	
3µm	5 x 2.1	567226-U	
3µm	10 x 2.1	567227-U	
3µm	15 x 2.1	567228-U	
3µm	5 x 4.6	567229-U	
3µm	10 x 4.6	567230-U	
3µm	15 x 4.6	567231-U	
5µm	15 x 0.32	65533-U	
5µm	15 x 0.5	65522-U	
5µm	15 x 1.0	65513-U	
5µm	5 x 2.1	568400-U	
5µm	10 x 2.1	568401-U	
5µm	15 x 2.1	568402-U	
5µm	25 x 2.1	568403-U	
5µm	5 x 4.0	568410-U	
5µm	10 x 4.0	568411-U	
5µm	15 x 4.0	568412-U	
5µm	25 x 4.0	568413-U	
5µm	5 x 4.6	568420-U	
5µm	10 x 4.6	568421-U	
5µm	15 x 4.6	568422-U	
5µm	25 x 4.6	568423-U	
5µm	25 x 10.0	568430-U	
10µm	25 x 4.6	567232-U	
10µm	5 x 10.0	567233-U	
10µm	15 x 10.0	567234-U	
10µm	25 x 10.0	567235-U	
10µm	5 x 21.2	567236-U	
10µm	15 x 21.2	567237-U	
10µm	25 x 21.2	567238-U	
Supelguard Cartridges			
3µm	2 x 2.1 (2/pk)	567278-U	
3µm	2 x 2.1 kit **	567279-U	
3µm	2 x 4.0 (2/pk)	567280-U	
3µm	2 x 4.0 kit **	567281-U	
5µm	2 x 2.1 (2/pk)	568470-U	
5µm	2 x 2.1 kit **	568471-U	
5µm	2 x 4.0 (2/pk)	568472-U	
5µm	2 x 4.0 kit **	568473-U	
10µm	1 x 10.0	567286-U	

** Kits include one cartridge, a stand-alone holder, a piece of tubing, and 2 nuts and ferrules.

Increased Stability of Discovery BIO Wide Pore C5 over Conventional C4

Efficiency on Discovery BIO Wide Pore C5 is stable even after 25,000 column volumes (222 gradient cycles).



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HPLC: Biopolymers
Ion Exchange Chromatography

MCI GEL Ion Exchange Columns

In ion exchange purifications and analyses of biopolymers, ProtEx-DEAE columns (diethylaminoethyl functionality) and ProtEx-SP columns (sulfopropyl functionality) offer significant benefits:

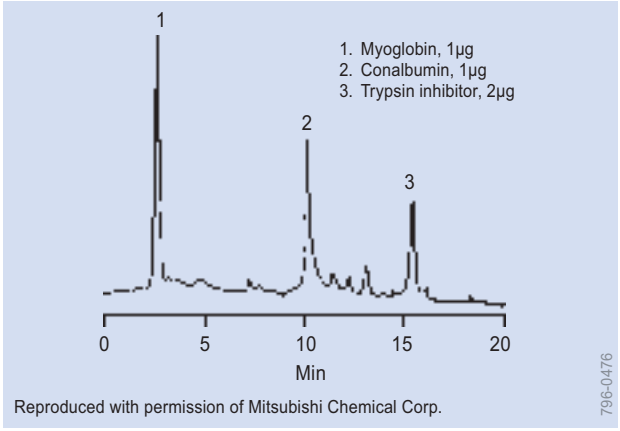
- Excellent separations of protein isoforms
- High resolution at low sample load
- Quantitative recovery – a hydrophilic surface eliminates protein adsorption
- High efficiency (plate number)

ProtEx columns are 5.0cm x 4.6mm ID polyetheretherketone (PEEK) hardware packed with high performance, monodisperse, 5µm, 1000Å macroporous polymethacrylate beads with a chemically bonded, crosslinked hydrophilic surface. Physical characteristics of these columns are summarized below.

We especially recommend ProtEx columns for applications that require high resolution, such as separating protein isoforms, isozymes, or DNA.

COLUMN CHARACTERISTICS	
Dimensions:	5.0cm x 4.6mm ID
Bed Volume:	0.83mL
Flow Rate:	0.5-1.5mL/min
Maximum Backpressure:	735psi (4.9MPa)
Temperature:	4°C - 50°C
pH:	2 - 11
Maximum Loading Capacity:	10mg/injection

Proteins at Low Loading Concentrations



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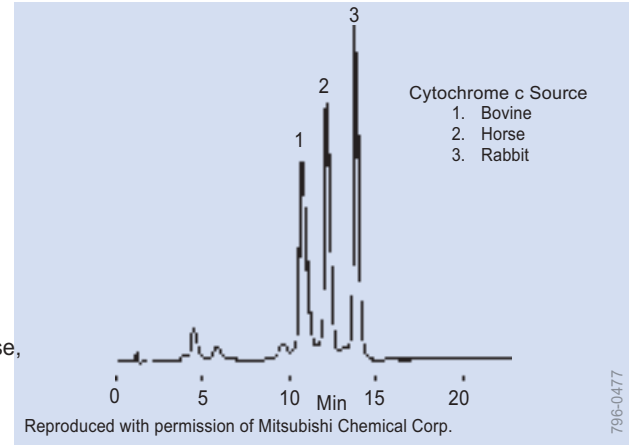
Column: ProtEx-DEAE, 5.0cm x 4.6mm ID, 5µm particles
Cat. No.: 54742
Mobile Phase: A = 20mM Tris HCl, pH 8.2
B = A + 0.5M NaCl
0% B – 100% B in 20 min
Flow Rate: 0.5mL/min
Det.: UV, 280nm

RELATED INFORMATION

Request free literature by phone or fax, or see our website.

No.	Subject
T496177	ProtEx ion exchange HPLC columns
T194882	Mobile phases for ion exchange and chromatofocusing
T495047	Mono Q and Mono S columns

Cytochrome c Species Variants by Ion Exchange HPLC



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Column: ProtEx-SP, 5.0cm x 4.6mm ID, 5µm particles
Cat. No.: 54740-U
Mobile Phase: A = 20mM Bis-Tris HCl, pH 7.0; B = A + 0.5M NaCl
24% B – 69% B in 20 min
Flow Rate: 0.5mL/min
Det.: UV, 280nm
Inj.: 10µg each isoform



DESCRIPTION	PART. SIZE	LENGTH x ID (cm x mm)	CAT. NO.	PRICE
ProtEx-SP	5µm	5 x 4.6	54740-U	
ProtEx-DEAE	5µm	5 x 4.6	54742	

Amersham Biosciences Ion Exchange Columns

Mono columns are highly efficient, pH-stable columns designed for high performance ion exchange separations of proteins, peptides, and polynucleotides, in applications including peptide mapping and monoclonal antibody purification. The unique properties of these columns are based on MonoBeads support – a beaded hydrophilic material with the narrowest particle size distribution of any chromatographic support. This monodispersity permits high flow rates at relatively low backpressures.

DESCRIPTION	QTY.	CAT. NO.	PRICE
AMERSHAM BIOSCIENCES ION EXCHANGE COLUMNS			
Mono Q HR5/5	1	54807	
Mono S HR5/5	1	54808	
Mono P HR5/5	1	54809	
CHROMATOFOCUSING REAGENTS			
Pharmalyte 8-10.5	25mL	P2147-25ML	
Polybuffer 74	100mL	P9652-100ML	
Polybuffer 74	250mL	P9652-250ML	
Polybuffer 96	25mL	P9777-25ML	
Polybuffer 96	100mL	P9777-100ML	
Polybuffer 96	250mL	P9777-250ML	

TSK-GEL Ion Exchange Columns

TSK-GEL ion exchange columns are highly efficient and combine sample purification with excellent recovery rates. Anion- and cation-exchangers are available on porous polymer-based and silica-based matrices, and in nonporous resin (NPR) columns. The various column types are described in the table below.

TSK-GEL 5PW and NPR ion exchange columns are stable between pH 2-12. TSK-GEL SW columns can be used from pH 2-7.5. TSK-GEL 2SW ion exchange columns (125Å pores) are best suited for small molecular weight solutes, such as nucleotides. Larger biomolecules, including peptides and small proteins, can be analyzed on TSK-GEL 3SW ion exchange columns (250Å pores). The wide-pore (1000Å), polymer-based 5PW columns are suitable for analyses and purifications of large proteins and nucleic acids. Sample capacity for a 7.5cm x 7.5mm 5PW ion exchange column is approximately 1mg.

Proteins and nucleic acids can be analyzed 3-5 times faster on a nonporous TSK-GEL NPR column. The sample capacity of these columns for proteins is, however, 50-100 times smaller. TSK-GEL DEAE-NPR columns are commonly used to separate DNA fragments, particularly those obtained from the polymerase chain reaction (PCR). We strongly recommend using a DEAE-NPR guard column to protect the analytical column when analyzing PCR fragments. SP-NPR columns can provide fast results in hemoglobin A1c screening. Due to their small particle size (2.5µm), packings in TSK-GEL NPR columns must be protected by using a precolumn filter containing a 0.5µm frit (Rheodyne in-line filter or Sigma-Aldrich precolumn filter).

CHARACTERISTIC	DEAE-5PW	DEAE-3SW	DEAE-2SW	DEAE-NPR
ANION EXCHANGE COLUMNS				
Matrix	hydrophilic resin	silica	silica	hydrophilic resin
Particle Size (µm)	10	10	5	2.5
Pore Size (Å)	1000	250	125	nonporous
Functional Group	$-CH_2CH_2N^+(C_2H_5)_2$	$-CH_2CH_2N^+(C_2H_5)_2$	$-CH_2CH_2N^+(C_2H_5)_2$	$-CH_2CH_2N^+(C_2H_5)_2$
Counter Ion	Cl^-	Cl^-	Cl^-	Cl^-
pH Range	2 - 12	2 - 7.5	2 - 7.5	2 - 12
Exclusion Limit (PEG, Dalton)	1,000,000	30,000	10,000	500
Capacity (mg BSA/mL)	30	120	not available	5
Small Ion Capacity	>0.1meq/mL	>0.3meq/g	>0.3meq/mL	>0.15meq/mL
pKa	11.2	11.2	11.2	11.2

CHARACTERISTIC	SP-5PW	SP-NPR	CM-5PW	CM-2SW	CM-3SW
CATION EXCHANGE COLUMNS					
Matrix	hydrophilic resin	hydrophilic resin	hydrophilic resin	silica	silica
Particle Size (µm)	10	2.5	10	5	10
Pore Size (Å)	1000	nonporous	1000	125	250
Functional Group	$-CH_2CH_2CH_2SO_3^-$	$-CH_2CH_2CH_2SO_3^-$	$-CH_2COO^-$	$-CH_2COO^-$	$-CH_2COO^-$
Counter Ion	Na^+	Na^+	Na^+	Na^+	Na^+
pH Range	2 - 12	2 - 12	2 - 12	2 - 7.5	2 - 7.5
Exclusion Limit (PEG, Dalton)	1,000,000	500	1,000,000	10,000	30,000
Capacity (mg Hb/mL)	40	5	45	—	110
Small Ion Capacity	>0.1meq/mL	>0.1meq/g	>0.1meq/mL	>0.3meq/mL	>0.3meq/mL
pKa	2.3	2.3	4.2	4.2	4.2

TSK-GEL Ion Exchange (Anion) Columns

DESCRIPTION	PART. SIZE	LENGTH x ID (cm x mm)	CAT. NO.	PRICE
TSK-GEL ION EXCHANGE (ANION) COLUMNS				
DEAE-NPR	2.5µm	3.5 x 4.6	813075	
DEAE-5PW	10µm	7.5 x 7.5	807164	
DEAE-2SW	5µm	25 x 4.6	807168	
Guard Columns and Kits				
DEAE-NPR	5µm	0.5 x 4.6	817088	
DEAE-5PW	20µm	1 x 6.0 kit	807210	
DEAE-SW	10µm	1 x 6.0 kit	807648	

TSK-GEL Ion Exchange (Cation) Columns

DESCRIPTION	PART. SIZE	LENGTH x ID (cm x mm)	CAT. NO.	PRICE
TSK-GEL ION EXCHANGE (CATION) COLUMNS				
CM-5PW	10µm	7.5 x 7.5	813068	
SP-NPR	2.5µm	3.5 x 4.6	813076	
SP-5PW	10µm	7.5 x 7.5	807161	
CM-2SW	5µm	25 x 4.6	807167	
CM-3SW	10µm	7.5 x 7.5	807162	
Guard Column Kits				
CM-5PW[1]	20µm	1 x 6.0 kit	813069	
SP-5PW[1]	20µm	1 x 6.0 kit	807211	
CM-SW[1]	10µm	1 x 6.0 kit	807650	

[1] Kits include one cartridge, a stand-alone holder, 5mL packing, 5cm of 1/16" tubing, and 2 nuts and ferrules.

RELATED INFORMATION

Request free literature by phone or fax, or see our website.

No.	Subject
T494077	TSK-GEL Ion Exchange Columns
T109862	TSK-GEL NPR Columns

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Liquid Chromatography
SUPELCO

HPLC: Biopolymers
Gel Filtration Chromatography

Amersham Biosciences Gel Filtration Columns

For use in an HPLC system, use unions described under Accessories for HR and HiLoad Columns

Fast Desalting Column - Ready for use in an FPLC system.

Superdex HR Column - Filter Kit HR 10, a filter tool, wrench, and instructions are included with Superdex HR columns.

Hi-Load Superdex Column - A dismantling tool, support screen, 10mm net ring, O-ring, and domed nut (in an accessory bag) are included.

DESCRIPTION	EXCLUSION LIMIT	SEPARATION RANGE (PROTEINS)
Fast Desalting Column	>5,000 Da	1,000-4,000
Superdex Peptide	>20,000 Da	100-7,000
Superdex 75	>100,000 Da	3,000-70,000
Superdex 200	>300,000 Da	10,000-600,000

DESCRIPTION	QTY.	CAT. NO.	PRICE
FAST DESALTING COLUMNS			
Fast Desalting HR10/10		54804-U	
PD-10 Columns[1]	30	54805	
Empty PD-10[1]	50	54806	
GEL FILTRATION COLUMNS			
Superdex Peptide HR10/30		504165	
Superdex 75 HR10/30		54800-U	
Superdex 200 HR10/30		54801-U	
HiLoad 16/60 Superdex 75 PG		54802-U	
ACCESSORIES FOR HR AND HILOAD COLUMNS[2]			
Filters, HR 5	10	54860-U	
Filter Tool	1	54863	
Unions, 1/16", female to M6 female Waters	2	54866	
Valco Adapter, male 10-32/female M6	2	54868	
Column End Plugs (Domed Nut) for M6 male	4	54865	
Capillary Tubing, PTFE 2m x 1.8mm OD x 0.5mm ID		54870	

[1] Syringe barrel sample preparation columns; cannot be connected to any system.

[2] Amersham Biosciences columns are supplied ready for installation into an FPLC system. To connect these columns to an HPLC system, use one of the three listed unions.

RELATED INFORMATION

Request free literature by phone or fax, or see our website.

No.	Subject
T494076	TSK-GEL SW and SW_{XL} Columns

TSK-GEL Gel Filtration Columns (Silica-Based)

TSK-GEL SW and TSK-GEL SW_{XL} columns contain silica-based, hydrophilic bonded phase packings that minimize interaction with proteins. Properties of these popular columns are summarized in the table below. A 30cm TSK-GEL SW_{XL} column and a 60cm TSK-GEL SW column provide similar resolution, but the SW_{XL} column requires half the time. Sample capacity increases in proportion with column length.

Because TSK-GEL SW_{XL} and TSK-GEL SW columns are silica-based, they must be operated within the recommended pH range of 2.5-7.5. Detailed operating conditions are described in the information accompanying the columns. We recommend protecting these columns with the appropriate SW_{XL} or SW guard column.

TSK-GEL QC-PAK columns provide fast, high resolution analyses, especially in quality control applications. The 15cm glass or stainless steel columns are packed with 5µm SW_{XL} materials.

TSK-GEL COLUMN	PARTICLE SIZE (µm)	PORE SIZE (Å)	SAMPLE MW (GLOBULAR PROTEINS)
Super SW2000	4	125	5-150 x 10^3
G2000SW_{XL}	5	125	5-150 x 10^3
G2000SW	10	125	5-100 x 10^3
Super SW3000	4	250	10-500 x 10^3
G3000SW_{XL}	5	250	10-500 x 10^3
G3000SW	10	250	10-500 x 10^3
G4000SW_{XL}	8	450	20-10,000 x 10^3
G4000SW	13	450	20-10,000 x 10^3

Mobile Phase: 0.03M NaCl in 0.1M phosphate buffer, pH 7.0

DESCRIPTION	PART. SIZE	LENGTH x ID (cm x mm)	CAT. NO.	PRICE
TSK-GEL GEL FILTRATION COLUMNS				
G2000SW_{XL}	5µm	30 x 7.8	808540	
G3000SW_{XL}	5µm	30 x 7.8	808541	
G4000SW_{XL}	8µm	30 x 7.8	808542	
Super SW2000	4µm	30 x 4.6	818674	
Super SW3000	4µm	30 x 4.6	818675	
G2000SW	10µm	30 x 7.5	805788	
G2000SW	10µm	60 x 7.5	805102	
G3000SW	10µm	30 x 7.5	805789	
G3000SW	10µm	60 x 7.5	805103	
G4000SW	13µm	30 x 7.5	805790	
G4000SW	13µm	60 x 7.5	805104	
TSK-GEL QC-PAK GEL FILTRATION COLUMNS				
GFC 200	5µm	15 x 7.8	816215	
GFC 300	5µm	15 x 7.8	816049	
GFC 300GL[3]	5µm	15 x 8.0	816216	
GUARD COLUMNS				
SW_{XL}	7µm	4 x 6.0	808543	
SW	10µm	7.5 x 7.5	805371	

[3] Glass.

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TSK-GEL Gel Filtration Columns (Polymer-Based)

TSK-GEL PW and TSK-GEL PW_{XL} columns are used in high performance gel filtration separations of water-soluble polymers and oligosaccharides. The hydrophilic polymer matrix has excellent chemical and mechanical stability. Although commonly used with aqueous solvents, the polymer is compatible with up to 50% organic solvent.

TSK-GEL GMPW and TSK-GEL $GMPW_{XL}$ columns are mixed bed columns with calibration curves that are linear over a wide range of molecular weights. Because the pore volume of a mixed bed column is the same as that for a narrow pore size column, the slope of the calibration curve is much steeper, which limits resolution. Mixed bed columns are ideal for preliminary investigations, when the molecular weight composition of a sample is unknown. Then, unless the molecular weight distribution of the sample is very broad, one selects a second column (or series of columns) with a pore size (or range of pore sizes) that can provide optimum resolution.

TSK-GEL G-Oligo-PW columnsare specially prepared for separating noncharged or cationic oligomers. A small residual positive charge makes G-Oligo-PW and G2000PW columns unsuitable for analyses of anionic oligomers.

DESCRIPTION	PART. SIZE	LENGTH x ID (cm x mm)	CAT. NO.	PRICE
TSK-GEL GEL FILTRATION COLUMNS				
G-Oligo-PW	6µm	30 x 7.8	808031	
$G2500PW_{XL}$	6µm	30 x 7.8	808020	
$G3000PW_{XL}$	6µm	30 x 7.8	808021	
$G4000PW_{XL}$	10µm	30 x 7.8	808022	
$G5000PW_{XL}$	10µm	30 x 7.8	808023	
$G6000PW_{XL}$	13µm	30 x 7.8	808024	
$GMPW_{XL}$	13µm	30 x 7.8	808025	
G-DNA-PW	10µm	30 x 7.8	808032	
G2000PW	10µm	30 x 7.5	805761	
G2500PW	10µm	30 x 7.5	808028	
G3000PW	10µm	30 x 7.5	805762	
G4000PW	17µm	30 x 7.5	805763	
G5000PW	17µm	30 x 7.5	805764	
G6000PW	17µm	30 x 7.5	805765	
GMPW	17µm	30 x 7.5	808026	
GUARD COLUMNS				
G-Oligo-PW	12µm	4 x 6.0	808034	
PW_{XL}	12µm	4 x 6.0	808033	
PW	12µm	7.5 x 7.5	806762	

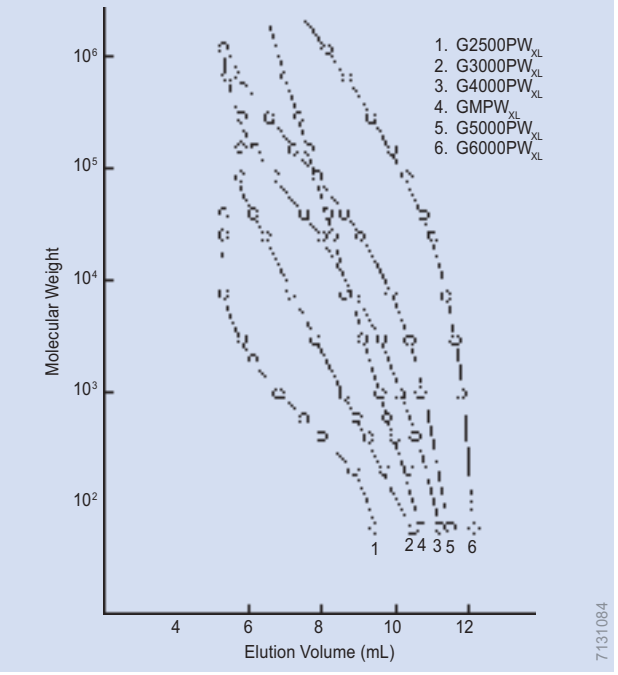
RELATED INFORMATION

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No.	Subject
T494075	TSK-GEL PW and PW_{XL} Columns

COLUMN	PARTICLE SIZE (µm)	PORE SIZE (Å)	SAMPLE MW PEGs/PEOs	SAMPLE MW DEXTRANS
G-Oligo-PW	6	125	<2000	–
G2000PW	10	125	<2000	–
$G2500PW_{XL}$	6	<200	<3000	–
G2500PW	10	<200	<3000	–
$G3000PW_{XL}$	6	200	<50,000	<60,000
G3000PW	10	200	<50,000	<60,000
$G4000PW_{XL}$	10	500	2000-300,000	1000-700,000
G4000PW	17	500	2000-300,000	1000-700,000
$G5000PW_{XL}$	10	1000	4000-1,000,000	50,000-7,000,000
G5000PW	17	1000	4000-1,000,000	50,000-7,000,000
$G6000PW_{XL}$	13	>1000	40,000-8,000,000	500,000-50,000,000
G6000PW	17	>1000	40,000-8,000,000	500,000-50,000,000
G-DNA-PW	10	4000	40,000-8,000,000	–
$GMPW_{XL}$	13	<100-1000	500-8,000,000	<50,000,000
GMPW	17	<100-1000	500-8,000,000	<50,000,000

Mobile Phase: Polyethylene glycols/polyethylene oxides - distilled water
Mobile Phase: Dextrans - 0.2M phosphate buffer, pH 6.8



PEG/PEO Calibration Curves on TSK-GEL PW_{XL} Columns

Column 1: $G2500PW_{XL}$, 30cm x 7.8mm, 6µm particles
Cat. No.: 808020
Column 2: $G3000PW_{XL}$, 30cm x 7.8mm, 6µm particles
Cat. No.: 808021
Column 3: $G4000PW_{XL}$, 30cm x 7.8mm, 10µm particles
Cat. No.: 808022
Column 4: $GMPW_{XL}$, 30cm x 7.8mm, 13µm particles
Cat. No.: 808025
Column 5: $G5000PW_{XL}$, 30cm x 7.8mm, 10µm particles
Cat. No.: 808023
Column 6: $G6000PW_{XL}$, 30cm x 7.8mm, 13µm particles
Cat. No.: 808024
Mobile Phase: DI water
Flow Rate: 1mL/min
Det.: refractive index
Inj.: polyethylene glycols and polyethylene oxides

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Liquid Chromatography
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HPLC: Biopolymers

Reversed-Phase, Affinity, Hydrophobic Interaction Chromatography

SUPELCOSIL Wide Pore (300Å) Reversed-Phase Columns

SUPELCOSIL Wide Pore reversed-phase columns continue to b
available. Discovery BIO Wide Pore reversed-phase columns
provide enhanced performance and are recommended as the fi
choice. The Discovery BIO Wide Pore columns can be found on
the preceding pages.

PARTICLE SIZE	LENGTH x ID (cm x mm)	CAT. NO.	PRICE
SUPELCOSIL LC-318 (300Å, 6.0% CARBON)			
5µm	5 x 4.6	58852	
5µm	25 x 4.6	58858	
SUPELCOSIL LC-318 Supelguard Cartridges			
5µm	2 x 4.0 (2/pk)	59512	
5µm	2 x 4.0 kit [1]	59502	
SUPELCOSIL LC-308 (300Å, 3.5% CARBON)			
5µm	5 x 4.6	58851	
5µm	25 x 4.6	58857	
SUPELCOSIL LC-308 Supelguard Cartridges			
5µm	2 x 4.0 (2/pk)	59511-U	
5µm	2 x 4.0 kit [1]	59501	
SUPELCOSIL LC-3DP (300Å, 4.0% CARBON)			
5µm	25 x 4.6	58859	
SUPELCOSIL LC-3DP Supelguard Cartridges			
5µm	2 x 4.0 (2/pk)	59513	
SUPELCOSIL LC-304 (300Å, 2.7% CARBON)			
5µm	5 x 4.6	58823	
5µm	25 x 4.6	58824	
SUPELCOSIL LC-304 Supelguard Cartridges			
5µm	2 x 4.0 (2/pk)	59592	
5µm	2 x 4.0 kit [1]	59591	
SUPELCOSIL LC-3Si (300Å)			
5µm	25 x 6.2	58965	
SUPELCOSIL LC-Si Supelguard Cartridges (use for LC-3Si)			
5µm	2 x 4.0 (2/pk)	59560	
5µm	2 x 4.0 kit [1]	59550	

RELATED INFORMATION

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No.	Subject
T100795	Separating Proteins and Peptides using SUPELCOSIL columns.
T494079	TSK-GEL Reversed-Phase Columns
T494080	TSK-GEL Affinity Columns
T494078	TSK-GEL Hydrophobic Interaction Columns

TSK-GEL Reversed-Phase Columns

DESCRIPTION	PART. SIZE	LENGTH X ID (cm x mm)	CAT. NO.	PRICE
SILICA-BASED COLUMNS				
Oligo-DNA RP	5µm	15 x 4.6	813352	
Super ODS	2µm	5 x 4.6	818154	
Super ODS	2µm	10 x 4.6	818197	
Guard Filters				
Filter		(3/pk)	818207	
Stand-Alone Holder for Filters			818206	
RESIN-BASED COLUMNS				
C18-NPR	2.5µm	3.5 x 4.6	814005	
C18-4PW	7µm	15 x 4.6	813351	
Phenyl-5PW RP	10µm	7.5 x 4.6	808043	
Guard Filters				
Filter		(3/pk)	818207	
Stand-Alone Holder for Filters			818206	

TSK-GEL Affinity Columns

DESCRIPTION	PART. SIZE	LENGTH X ID (cm x mm)	CAT. NO.	PRICE
ABA-5PW	10µm	7.5 x 7.5	813067	
Boronate-5PW	10µm	7.5 x 7.5	813066	
Chelate-5PW	10µm	7.5 x 7.5	808645	
Guard Column Kits [2]				
Chelate-5PW	20µm	1 x 6.0 kit	808647	
Heparin-5PW	20µm	1 x 6.0 kit	813121	

TSK-GEL Hydrophobic Interaction (HIC) Columns

DESCRIPTION	PART. SIZE	LENGTH X ID (cm x mm)	CAT. NO.	PRICE
Butyl-NPR	2.5µm	3.5 x 4.6	814947	
Ether-5PW	10µm	7.5 x 7.5	808641	
Phenyl-5PW	10µm	7.5 x 7.5	807573	
Guard Column Kits [2]				
Phenyl-5PW	20µm	1 x 6.0 kit	807652	

[1] Kits include one cartridge, a stand-alone holder, a piece of tubing, and 2 nuts and ferrules.

[2] Kits include one cartridge, a stand-alone holder, 5mL packing, 5cm of 1/16" tubing, and 2 nuts and ferrules.

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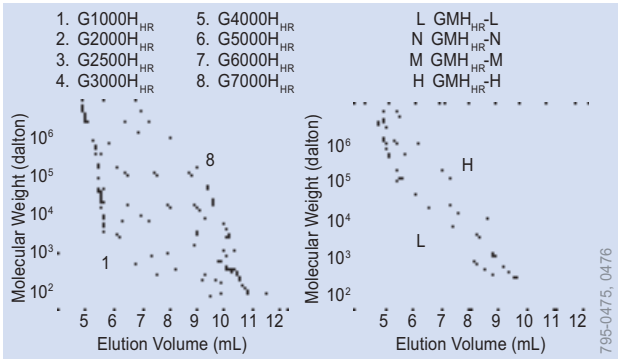
TSK-GEL Gel Permeation Columns

TSK-GEL H_{HR} gel permeation columns are stable in solvents having a wide range of polarities. The particles do not swell or shrink as the solvent is changed from toluene through methanol. However, these columns cannot be used with polar solvents, such as water or water:methanol mixtures. Spherical 5µm polystyrene/divinylbenzene particles provide a minimum of 16,000 plates per 30cm x 7.8mm ID column. Eight pore sizes are available (Figure A), ranging from an exclusion limit of about 2000 Dalton for $G1000H_{HR}$ columns to more than 10,000,000 Dalton for $G7000H_{HR}$ columns. The four mixed bed columns (H, L, M, N) feature extended linear molecular weight operating ranges for sample screening or more formal analyses.

Using Calibration Curves

GPC is widely used for fingerprinting molecular weights of industrial polymers. For compounds of similar molecular shape, a sigmoidal calibration curve is obtained by plotting the logarithm of molecular weight (MW) versus the elution volume (V_e) for molecules of known weight. The optimal separation range is defined by the linear portion of this curve. Once a calibration curve is prepared, the elution volume for a polymer of similar shape, but unknown weight, can be used to determine the MW. Results are most accurate when the investigator prepares the calibration curve and determines the molecular weight of the unknown molecule on the same day, with the same mobile phases, etc.

COLUMN	ANALYTE MOLECULAR WEIGHT RANGE (DALTON)
G1000H	<1500
G2000H	<4000
G2500H	<1.2 x 10^4
G3000H	<3.0 x 10^4
G4000H	<5.5 x 10^5
G5000H	<1.5 x 10^6
G6000H	<~1 x 10^7
G7000H	<~5 x 10^7
GMH-H	<~1 x 10^7
GMH-L	<1.0 x 10^4
GMH-M	<1.0 x 10^6



Sample Elution by Molecular Weight

Columns: TSK-GEL H_{HR}, 30cm x 7.8mm ID, 5µm particles
Mobile Phase: tetrahydrofuran
Temp.: ambient
Flow Rate: 1mL/min
Det.: UV, 254nm
Inj.: polystyrene standards

DESCRIPTION	PART. SIZE	LENGTH X ID (cm x mm)	CAT. NO.	PRICE
TSK-GEL H_{HR} GEL PERMEATION COLUMNS				
$G1000H_{HR}$	5µm	30 x 7.8	817352	
$G2000H_{HR}$	5µm	30 x 7.8	817353	
$G2500H_{HR}$	5µm	30 x 7.8	817354	
$G3000H_{HR}$	5µm	30 x 7.8	817355	
$G4000H_{HR}$	5µm	30 x 7.8	817356	
$G5000H_{HR}$	5µm	30 x 7.8	817357	
$G7000H_{HR}$	5µm	30 x 7.8	817359	
GMH_{HR}-L	5µm	30 x 7.8	817362	
GMH_{HR}-M	5µm	30 x 7.8	817392	
GMH_{HR}-H	5µm	30 x 7.8	817360	
Guard Columns				
H_{HR}-L[1]	7µm	4 x 6.0	817368	
TSK-GEL H_{XL} GEL PERMEATION COLUMNS				
$G1000H_{XL}$	5µm	30 x 7.8	816131	
$G2000H_{XL}$	5µm	30 x 7.8	816134	
$G2500H_{XL}$	5µm	30 x 7.8	816135	
$G3000H_{XL}$	6µm	30 x 7.8	816136	
$G4000H_{XL}$	6µm	30 x 7.8	816137	
$G5000H_{XL}$	9µm	30 x 7.8	816138	
$G6000H_{XL}$	9µm	30 x 7.8	816139	
GMH_{XL}	9µm	30 x 7.8	816141	
GMH_{XL}-HT	13µm	30 x 7.8	807112	
Guard Columns				
H_{XL}-L[2]	6µm	4 x 6.0	807113	
H_{XL}-H[3]	13µm	4 x 6.0	813727	

[1] Use to protect $G1000H_{HR}$ – $G4000H_{HR}$ and GMH_{HR}-L columns.
[2] Use to protect $G1000H_{XL}$ – $G4000H_{XL}$ columns.
[3] Use to protect $G5000H_{XL}$ – $G6000H_{XL}$ columns.

RELATED INFORMATION

Request free literature by phone or fax, or see our website.

No.	Subject
T496085	TSK-GEL H_{HR} Columns

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Liquid Chromatography
SUPELCO

HPLC
Custom, Endfittings, Connectors

Custom Prepared HPLC Columns

If the column of your choice is not listed as a stock product in our catalog, we may be able to prepare it for you as a custom. below is our current listing of available packings. For the most current listing of hardware, and a price quotation, plea Technical Service.

Delivery:
We typically ship custom prepared analytical HPLC columns within 5 to 7 business days to anywhere in the world. Larger sizes (preparative and special requests) may take longer.

Performance Testing:
Supelco's custom prepared columns are fully tested for efficiency and symmetry. Please let us know if you have special test cr

PHASE	PARTICLE SIZE (µm)
DISCOVERY BIO WIDE PORE PHASES	
RP-AmideC16	5
C18	5
C8	5
Cyano	5
DISCOVERY HS PHASES	
C18	3
C18	5
C18	10
F5	3
F5	5
F5	10
PEG	3
PEG	5
PEG	10
DISCOVERY BIO WIDE PORE PHASES	
C18	3
C18	5
C18	10
C8	3
C8	5
C8	10
C5	3
C5	5
C5	10
SUPELCOSIL PHASES	
ABZ*Plus	3
ABZ*Plus	5
ABZ*Plus	12
LC-ABZ	5
Suplex pKb-100	5
LC-18-DB	3
LC-18-DB	5
LC-18	3
LC-18	5
LC-18	12

PHASE	PARTICLE SIZE (µm)
SUPELCOSIL PHASES, CONT'D	
LC-318	5
LC-DABS	3
LC-PAH	3
LC-PAH	5
LC-18-S	5
LC-18-T	3
LC-18-T	5
LC-8-DB	3
LC-8-DB	5
LC-8	3
LC-8	5
LC-8	12
LC-308	5
LC-DP	5
LC-3DP	5
LC-F	5
LC-304	5
LC-CN	3
LC-CN	5
LC-PCN	5
LC-1	5
LC-Si	3
LC-Si	5
LC-Si	12
LC-NH_2	3
LC-NH_2	5
LC-NH_2-NP	5
LC-Diol	5
LC-3Diol	5
SAX1	5
LC-SCX	5
Hisep	5
SUPELCOGEL PHASES	
TPR-100	5
ODP-50	5
Ion Exclusion	9

Replacement Discovery/SUPELCOSIL Column Endfittings



55200-U

Use when fittings become damaged or with replacement cartridges. (pk. of 2)

DESCRIPTION	CAT. NO.	PRICE
For 2.1mm columns	55201-U	
For 3.0mm, 4.0mm, 4.6mm columns	55200-U	

Column Connector



55213

Connects two Discovery or SUPELCOSIL analytical columns. Zero dead volume design.

DESCRIPTION	CAT. NO.	PRICE
Column Connector	55213	

Fluka HPLC Buffers

Fluka puriss. p.a. HPLC buffers are analytically assayed to satisfy the rigorous analytical requirements HPLC analysis. These buffers have a 99.5% purity or greater unless otherwise stated. Fluka HPLC Buffers include a certificate of analysis.

CAS #	PRODUCT DESCRIPTION	QTY.	CAT. NO.	PRICE
64-19-7	Acetic acid 50%	100mL 500mL	45754-100ML 45754-500ML	
	Acetic acid:Triethylamine 2M:1M concentrate, in water	100mL 500mL	09749-100ML 09749-500ML	
5204-74-0	Acetic acid:Triethylamine 2M:2M concentrate, in water	100mL 500mL	09748-100ML 09748-500ML	
631-61-8	Ammonium acetate, ≥99.0%[2]	50g 250g	17836-50G 17836-250G	
7722-76-1	Ammonium dihydrogen phosphate, ≥99.0%[1]	50g 250g	17842-50G 17842-250G	
540-69-2	Ammonium formiate, dried material, ≥99.0%[2]	50g 250g	17843-50G 17843-250G	
1336-21-6	Ammonium hydroxide Solution, ~10%, in water	100mL 1L	17837-100ML 17837-1L	
3336-58-1	Ammonium trifluoracetate, ≥99.0%[2]	10g 50g	17839-10G 17839-50G	
6381-92-6	Ethylenediaminetetraacetic acid disodium salt, dihydrate, ≥99.0%[3]	10g 50g	03682-10G 03682-50G	
	Formic acid 50%	100mL 500mL	09676-100ML 09676-500ML	
	Formic acid:Triethylamine 2M:1M concentrate	100mL 500mL	09751-100ML 09751-500ML	
585-29-5	Formic acid:Triethylamine 2M:2M concentrate	100mL 500mL	09752-100ML 09752-500ML	
7664-38-2	ortho-Phosphoric acid 50%	100mL 500mL	79607-100ML 79607-500ML	
7778-77-0	Potassium dihydrogen phosphate, ≥99.5%[1]	50g 250g	60221-50G 60221-250G	
7646-93-7	Potassium hydrogen sulfate, ≥99.0%[1]	50g 250g	60351-50G 60351-250G	
7758-11-4	di-Potassium hydrogen phosphate, anhydrous, ≥99.0%[1]	50g 250g	17835-50G 17835-250G	
10138-93-9	Phosphoric acid:Triethylamine 2M:1M concentrate, in water	100mL 500mL	03387-100ML 03387-500ML	
35365-94-7	Phosphoric acid:Triethylamine 2M:2M concentrate, in water	100mL 500mL	03388-100ML 03388-500ML	
1310-58-3	Potassium hydroxide Solution ~45%	100mL 500mL	03564-100ML 03564-500ML	
127-09-3	Sodium acetate, anhydrous, ≥99.0%[2]	50g 250g	71185-50G 71185-250G	
7558-80-7	Sodium dihydrogen phosphate, anhydrous, ≥99.0%[1]	50g 250g	17844-50G 17844-250G	
141-53-7	Sodium formate, ≥99.0%[1]	50g 250g	17841-50G 17841-250G	
10028-24-7	di-Sodium hydrogen phosphate, dihydrate~99% [1]	50g 250g	71633-50G 71633-250G	
1310-73-2	Sodium hydroxide Solution 50%	1L 2.5L	71686-1L 71686-2.5L	
7757-82-6	Sodium sulfate, anhydrous, ≥99.0%[1]	50g 250g	71958-50G 71958-250G	
7664-93-9	Sulfuric acid 50%	100mL 500mL	84733-100ML 84733-500ML	
27039-85-6	Sulfuric acid:Triethylamine 2M:2M concentrate., in water	25mL 100mL	09744-25ML 09744-100ML	

[1] Assayed by common titration.
[2] Assayed by non-aqueous titration.
[3] Assayed by coulometric titration.

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HPLC
Fluka Buffers

Fluka HPLC Buffers (cont'd)

CAS #	PRODUCT DESCRIPTION	QTY.	CAT. NO.	PRICE
54272-29-6	Sulfuric acid:Triethylamine 2M:1M concentrate, in water	100mL 500mL	09745-100ML 09745-500ML	
121-44-8	Triethylamine, ≥99.5%[2]	1EA	17924-1EA	
	Trifluoroacetic acid:Triethylamine 2M:1M concentrate	100mL 500mL	09746-100ML 09746-500ML	
454-49-9	Trifluoroacetic acid:Triethylamine 2M:2M concentrate	100mL 500mL	09747-100ML 09747-500ML	
76-05-1	Trifluoroacetic acid, ≥99.0%[2]	1EA	91707-1EA	
2923-18-4	Trifluoroacetic acid, sodium salt, ≥99.0%[1]	10g 50g	17840-10G 17840-50G	
	Water for gradient elution, prepared under cleanroom conditions	1L 5L 10L	95270-1L 95270-5L 95270-10L	

Fluka Capillary Electrophoresis Buffers

Fluka BioChemika grade Capillary Electrophoresis buffers are specially produced for use in biochemical applications. For CE, Fluka Capillary Electrophoresis buffers are ideally suited for separation of inorganic and low molecular weight organic ions, peptides, nucleic acids, and DNA restriction fragments.

PRODUCT DESCRIPTION	QTY.	CAT. NO.	PRICE
CAPS buffer solution, 20mM, pH 10.0	50mL 100mL 500mL	82606-50ML 82606-100ML 82606-500ML	
CAPS buffer solution, 20mM, pH 10.5	50mL 100mL 500mL	82607-50ML 82607-100ML 82607-500ML	
CAPS buffer solution, 20mM, pH 11.0	50mL 100mL 500mL	82608-50ML 82608-100ML 82608-500ML	
Citric Acid/Sodium Hydroxide buffer solution, 20mM, pH 2.5	50mL 100mL 500mL	82581-50ML 82581-100ML 82581-500ML	
Citric Acid/Sodium Hydroxide buffer solution, 20mM, pH 3.0	50mL 100mL 500mL	82582-50ML 82582-100ML 82582-500ML	
Glycine/Sodium hydroxide buffer solution, 20mM, pH 11.0	50mL 100mL	82617-50ML 82617-100ML	
Hydrochloric acid solution, 0.1M	100mL 500mL	84428-100ML 84428-500ML	
Phosphoric acid solution, 20 mM	100mL 500mL	79618-100ML 79618-500ML	
Phosphoric acid solution, 10 mM	100mL 500mL	79616-100ML 79616-500ML	
Potasium phosphate buffer solution, 150mM, pH 3.0	100mL 500mL	82622-100ML 82622-500ML	
Sodium citrate buffer solution, 20mM, pH 3.5	50mL 100mL 500mL	82583-50ML 82583-100ML 82583-500ML	
Sodium citrate buffer solution, 20mM, pH 4.0	50mL 100mL 500mL	82584-50ML 82584-100ML 82584-500ML	
Sodium citrate buffer solution, 20mM, pH 4.5	50mL 100mL 500mL	82585-50ML 82585-100ML 82585-500ML	
Sodium citrate buffer solution, 20mM, pH 5.0	50mL 100mL 500mL	82586-50ML 82586-100ML 82586-500ML	

[1] Assayed by common titration.
[2] Assayed by GC.

Fluka Capillary Electrophoresis Buffers (cont'd)

PRODUCT DESCRIPTION	QTY.	CAT. NO.	PRICE
Sodium citrate buffer solution, 20mM, pH 5.5	50mL 100mL 500mL	82587-50ML 82587-100ML 82587-500ML	
Sodium citrate buffer solution, 20mM, pH 6.0	50mL 100mL 500mL	82588-50ML 82588-100ML 82588-500ML	
Sodium hydroxide solution, 1.0 M	100mL	72082-100ML	
Sodium hydroxide solution, 0.1M	100mL 500mL	72079-100ML 72079-500ML	
Sodium hydroxide solution, 20mM	100mL 500mL	72089-100ML 72089-500ML	
Sodium phosphate buffer solution, 50mM, pH 2.5	50mL 100mL	82635-50ML 82635-100ML	
Sodium phosphate buffer solution, 100mM, pH 2.5	50mL 100mL 500mL	82578-50ML 82578-100ML 82578-500ML	
Sodium phosphate buffer solution, 100mM, pH 3.0	50mL 100mL 500mL	82599-50ML 82599-100ML 82599-500ML	
Sodium phosphate buffer solution, 20mM, pH 6,5	50mL 100mL 500mL	82589-50ML 82589-100ML 82589-500ML	
Sodium phosphate buffer solution, 20mM, pH 7.0	50mL 100mL 500mL	82591-50ML 82591-100ML 82591-500ML	
Sodium phosphate buffer solution, 50mM, pH 7.0	50mL 100mL	82636-50ML 82636-100ML	
Sodium phosphate buffer solution, 100mM, pH 7.0	50mL 100mL	82637-50ML 82637-100ML	
Sodium phosphate buffer solution, 20mM, pH 7.5	50mL 100mL 500mL	82592-50ML 82592-100ML 82592-500ML	
Sodium phosphate buffer solution, 20mM, pH 8.0	50mL 100mL 500mL	82593-50ML 82593-100ML 82593-500ML	
Sodium phosphate buffer solution, 50mM, pH 8.0	50mL 100mL	82633-50ML 82633-100ML	
Sodium phosphate buffer solution, 100mM, pH 8.0	100mL 500mL	82634-100ML 82634-500ML	
Sodium phosphate buffer solution, 20mM, pH 8.5	50mL 100mL 500mL	82601-50ML 82601-100ML 82601-500ML	
Sodium phosphate buffer solution, 20mM, pH 9.0	50mL 100mL 500mL	82603-50ML 82603-100ML 82603-500ML	
Sodium phosphate buffer solution, 20mM, pH 9.5	50mL 100mL 500mL	82605-50ML 82605-100ML 82605-500ML	
Sodium tetraborate buffer solution, 20mM, pH 8.0	50mL 100mL 500mL	82594-50ML 82594-100ML 82594-500ML	
Sodium tetraborate buffer solution, 20mM, pH 8.5	50mL 100mL 500mL	82602-50ML 82602-100ML 82602-500ML	
Sodium tetraborate buffer solution, 20mM, pH 9.0	50mL 100mL 500mL	82604-50ML 82604-100ML 82604-500ML	

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Thin Layer Chromatography
TLC Plates

Sigma-Aldrich TLC Plates

All silica plates coated with 60Å pore size silica. Silica-based adsorbent layers incorporate a polymeric binder; highly purified silica gel plates incorporate a gypsum/polymer binder.

Glass is the most widely used support material in TLC, but PET polyester plates offer an economical alternative to glass plates. PET plates are flexible, can be cut with scissors, and can be heated to 160°C to char spots. Aluminum foil-backed plates offer the advantages of polyester while tolerating even higher temperatures. Concentrated mineral acids and ammonia should not be used with aluminum backed plates.

Catalog Nos. Z292893 and Z292907 (highly purified silica gel on glass) were designed for analyses of aflatoxins. The special gypsum/polymer binder (mostly gypsum) used in these plates gives a softer layer than our other plates. This is ideal in applications requiring removing individual spots by scraping. The gypsum binder also gives these plates slightly different selectivities from silica gel plates.

ADSORBENT LAYER	PLATE DIMENSIONS (cm x cm)	LAYER THICKNESS (µm)	PARTICLE SIZE (µm)	FLUORESCENT INDICATOR [1]	QTY.	CAT. NO.	PRICE
BASIC ALUMINA ON PET POLYESTER							
Aluminum oxide	20 x 20	200	<60	yes	25	Z234214-1PAK	
Aluminum oxide	20 x 20	200	<60	no	25	Z234206-1PAK	
SILICA ON ALUMINUM FOIL							
Silica gel	5 x 10	200	2-25	yes	50	Z193275-1PAK	
Silica gel	10 x 20	200	2-25	yes	20	Z193283-1PAK	
Silica gel	20 x 20	200	2-25	yes	25	Z193291-1PAK	
SILICA ON GLASS							
Silica gel	5 x 20	250	5-17	no	100	Z122688-100EA	
Silica gel	5 x 20	250	5-17	yes	100	Z122696-100EA	
Silica gel	10 x 20	250	5-17	no	50	Z185310-50EA	
Silica gel	10 x 20	250	5-17	yes	50	Z185329-50EA	
Silica gel	20 x 20	250	5-17	no	25	Z122718-25EA	
Silica gel	20 x 20	250	5-17	yes	25	Z122726-25EA	
SILICA ON PET POLYESTER							
Silica gel	20 x 20	250	5-17	no	25	Z122777-25EA	
Silica gel	20 x 20	250	5-17	yes	25	Z122785-25EA	
HIGHLY PURIFIED SILICA GEL, ACID WASHED, ON GLASS							
Silica gel, highly purified [2]	20 x 20	250	5-17	no	25	Z292893-1PAK	
Silica gel, highly purified [2]	20 x 20	250	5-17	yes	25	Z292907-1PAK	

[1] Manganese-activated zinc silicate.

[2] Recommended for applications that require removing individual spots by scraping.

Merck TLC Plates

Glass plates coated with 60Å pore silica. These plates incorporate a charrable organic binder.

ADSORBENT LAYER	PLATE DIMENSIONS (cm x cm)	LAYER THICKNESS (µm)	PARTICLE SIZE (µm)	FLUORESCENT INDICATOR [1]	QTY.	CAT. NO.	PRICE
SILICA OR SILICA/C18 ON GLASS							
Silica gel 60	10 x 20	250	5-20	no	50	Z292966-1PAK	
Silica gel 60	20 x 20	250	5-20	no	25	Z292974-1PAK	
Silica gel 60	2.5 x 7.5	250	5-20	yes	100	Z292982-1PAK	
Silica gel 60	5 x 10	250	5-20	yes	200	Z292990-1PAK	
Silica gel 60	5 x 20	250	5-20	yes	100	Z293008-1PAK	
Silica gel 60	10 x 20	250	5-20	yes	50	Z293016-1PAK	
Silica gel 60	20 x 20	250	5-20	yes	25	Z293024-1PAK	
Silica gel 60/C18	20 x 20	250	5-20	yes	25	Z293032-1PAK	

[1] Manganese-activated zinc silicate.

Sequential Spraying Makes Drug and Lipid Detection Simpler



Drugs: Amphetamines, phenothiazines, and methaqualone can be sequentially detected on one plate, at the sensitivities shown in the table (narcotics, alkaloids). Remove the plate from the tank, dry it (5 min, 110°C), cool it, and spray it with fluorescamine (Cat. No. 34653). After 5-10 minutes, amphetamines will exhibit bright green fluorescence under long-wave UV.

Next, warm the plate to 110°C for 1-2 min. Phenothiazines will develop color and tranquilizers will exhibit fluorescence under long-wave UV. Finally, spray the plate with neutral iodoplatinate (Cat. No. 34651) to detect methaqualone and hydrolyzed methaqualone.

Similarly, amphetamines and alkaloids can be sequentially detected on one plate. Remove the plate from the tank, dry it (5 min, 110°C), cool it, and examine it under long-wave UV for quinine, quinine metabolites, and demerol.

Next, spray the plate with ninhydrin (Cat. No. 34660), heat it at 90°C for 10 min, then spray it heavily with diphenyl-carbazone, for an intense response from amphetamines and methamphetamines. Spray the plate with acidic iodoplatinate (Cat. No. I0256). Alkaloids will appear as spots of various colors. To aid in identifying specific compounds, change or intensify certain colors by overspraying the plate with Dragendorff's reagent (Cat. No. 34652). Finally, spray the plate with ammoniacal silver nitrate and heat it (10 min, 110°C), to detect morphine.

Lipids: Ninhydrin and Phospray can be used to visualize separated lipids. Dry the plate, spray it with ninhydrin, and gently heat it. Amino-containing compounds (phosphatidyl ethanolamine, etc.) will appear as pink spots. Mark these spots to avoid confusion in the next step.

Cool the plate to room temperature and spray it with Phospray to reveal phosphorus-containing compounds (phosphatidyl choline, phosphatidyl ethanolamine etc.).

Sigma Spray Reagents (Unless otherwise noted store at 0-5°C.)

DESCRIPTION/QUANTITY	USE	CAT. NO.	PRICE
Aniline-Diphenylamine, 100mL - 1.8% w/v aniline and 1.8% w/v diphenylamine in acidified acetone.	reducing sugars	A8142-100ML	
Antimony Trichloride, 100mL - 22% w/v antimony trichloride in chloroform.	vitamin A, steroid glycosides, related compounds	A6528-100ML	
Dragendorff's Reagent, 100mL - 0.11M potassium iodide & 0.6mM bismuth subnitrate in 3.5M acetic acid. (Room temp.)	alkaloids, quaternary nitrogen compounds	D7518-100ML	
Fluorescamine, 100mL - 0.05% w/v fluorescamine in acetone. (Room temp.)	primary amino acids and amines, peptides, proteins	F6756-100ML	
Iodoplatinate, 100mL - 0.15% w/v potassium chloroplatinate & 3% potassium iodide in dilute hydrochloric acid.	alkaloids, amines, organic nitrogen compounds	I0256-100ML	
Molybdenum Blue, 100mL - 1.3% w/v molybdenum oxide in 4.2M sulfuric acid. (Room temp.)	phospholipids, related compounds	M3389-100ML	
Ninhydrin [485-47-2], 100mL - 0.2% w/v ninhydrin in ethanol.	amino acids, amines, amino sugars	N0507-100ML	
Ninhydrin Fixer, 100mL - Acidified ethanol containing 1% (v/v) saturated cupric nitrate.	fixative for ninhydrin chromatograms	N0757-100ML	
Orcinol Ferric Chloride (Bial's reagent), 100mL - 0.9% w/v ferric chloride and 0.55% w/v orcinol in acidified ethanol.	sugars, glycosides, sulfolipids	O7875-100ML	
Phosphomolybdic Acid [51429-74-4], 100mL - 10% w/v phosphomolybdic acid in ethanol.	lipids, steroids, lactones, keto and hydroxy acids, unsaturated fatty acids, phenolic compounds	P1518-100ML	

Supelco TLC Spray Reagents

DESCRIPTION/QUANTITY	USE TO DETECT	SENSITIVITY (µg/SPOT)	CAT. NO.	PRICE
Bromothymol blue, 200mL	L/S ratio lipids	2	34656	
Fluorescamine, 100mL	amino acids, amines	2	34653	
Iodoplatinate (neutral) (Narcvis), 200mL (kit)	narcotics, alkaloids	10	34651	
Phospray[1], 200mL	phospholipids	2	33047-U	

[1] Poisonous

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Thin Layer Chromatography
Accessories

Reagent Sprayers



Compressed-air sprayers for spraying TLC plates. Apparatus includes a glass sprayer head and the designated tube, bottle or flask.

Bottle-Type Sprayer -Provides uniformly fine spray required for TLC. Vented for instant spray control.

Sprayer Conversion Kit -Converts 250mL sprayer (Cat. No58005) to 50mL capacity. Includes 50mL glass tube and hexagonal stand.

Tube-Type Sprayer -50mL tube with hexagonal stand & sprayer head.

Flask-Type Sprayer -75mL or 250mL Erlenmeyer flask with sprayer head (#15 Ace-Thred).

DESCRIPTION	CAT. NO.	PRICE
Bottle-Type Sprayer, 250mL	58005	
Sprayer Conversion Kit	Z126314-1SET	
Tube-Type Sprayer	Z126292-1SET	
Flask-Type Sprayer, 75mL	Z190373-1EA	
Flask-Type Sprayer, 250mL	Z129178-1EA	
Replacement Flask, 75mL	Z190381-1EA	
Replacement Flask, 250mL	Z129186-1EA	
Sprayer Head (fits both flasks)	Z190403-1EA	

S1509-5EA



S2009-4EA



Z169064-1EA



P000447-448, 450-452

TLC Accessories

Disposable TLC Spray Box -14 x 14 x 14" (35 x 35 x 35cm). Contains knock-out vents. Compatible with most spray reagents. (pk. of 5)

TLC Spotting Guide and R_f Reader -Markings at the bottom of the template are useful guides for applying samples at uniform distances across the plate. Printed on 5mm clear polyacetate, measures 7 x 8 1/2" (180 x 215mm).(pk. of 4)

Diamond Glass Cutter -Scores/breaks single or double-strength glass. Nickel-plated brass cutter with wooden handle.

Scoring Tool - Good for cutting glass plates. Tungsten carbide tip.

DESCRIPTION	CAT. NO.	PRICE
Disposable TLC Spray Boxes	S1509-5EA	
TLC Spotting Guide/R_f Reader	S2009-4EA	
Diamond Glass Cutter	Z169064-1EA	
Scoring Tool	23746	

Calibrated Microcapillary Pipettes

High quality micropipettes, imprinted with volume and color-code bar for easy identification. Deliver to within ±0.5%. Includes 15"/38cm aspirator tube assembly. (pk. of 250)

VOLUME (µL)	COLOR CODE	CAT. NO.	PRICE
1-5	white	P0549-1PAK	
10	orange	P0674-1PAK	
20	black	P0799-1PAK	
50	green	P1049-1PAK	
100	blue	P1174-1PAK	

Rectangular Glass Developing Tank with Lid

INSIDE DIMENSIONS L x H x W (cm)	CAT. NO.	PRICE
TANK & LID		
27.5 x 27.5 x 7.5	Z126195-1EA	
17.5 x 16.0 x 8.2	Z204153-1EA	
17.5 x 11.0 x 6.2	Z204188-1EA	
12.1 x 10.8 x 8.3	Z146226-1EA	
7.5 x 15.5 x 8.0	Z204226-1EA	
Lid Only for 27.5 x 27.5 x 7.5 tank	Z146218-1EA	

Cylindrical Glass Developing Tank with Lid

H x DIAMETER (cm)	QTY.	CAT. NO.	PRICE
10.5 x 6.5	1	Z243906-1EA	
10.5 x 6.5	6	Z243906-6EA	
21 x 6.5	1	Z243914-1EA	

Spectroline CM UV Viewing Cabinets



P000454

Portable, lightweight aluminum minicabinets with 4 watt or 6 watt removable lamps that also can be used for hand-held applications. Lamps provide long- and short-wave irradiation for viewing TLC plates, UV fluorescence or absorption demonstrations. Flexible, contoured viewer for built-in UV absorbing window, easy access felt curtains, and removable bottoms for placement over transilluminators for greater intensity and contrast. UL listed, meet OSHA requirements. 9" W x 12" L x 6 1/2" H (23 x 30 x 16cm).

Cabinet CM-10 - Without light source. Can be used with 4 watt or 6 watt Spectroline UV lamps listed below.

Cabinet CM-24 - Includes 4 watt E-series UV lamp described below.

Cabinet CM-26 - Includes 6 watt E-series UV lamp described below.

DESCRIPTION	CAT. NO.	PRICE
Cabinet CM-10	Z169374-1EA	
Cabinet CM-24, 110V/60Hz	Z169382-1EA	
Cabinet CM-24, 220V/50Hz [1]	Z169390-1EA	
Cabinet CM-26, 110V/60Hz	Z169439-1EA	

[1] CE approved.

Spectroline E-Series UV Lamps

Can be hand-held or used in viewing cabinets above. Lamps have 1 long-wave (365nm) and 1 short-wave (254nm) tube.

WATTS	µW/cm²	V	CAT. NO.	PRICE
4	300/310	110	Z169595-1EA	
		220 [1]	Z169609-1EA	
6	350/420	110	Z169617-1EA	

[1] CE approved.

CAMAG Instrumentation

TLC Scanner 3 with winCATS s/w - This scanner has been designed for densitometric evaluation of both TLC/HPTLC and electrophoresis objects up to 200mm x 200mm.

- Scanning can be performed in reflectance or in transmittance mode, by absorbance or by fluorescence.
- The spectral range is 190-800 nm.
- The spatial resolution is selective between 25 and 200µm.
- Spectral recording is fast, e.g. 100nm/s at over sampling rate of 40/nm
- Scanning speed is selectable up to 100mm/sec.

WinCATS Software offers complete control of the scanner via RS32 with transfer of digital data to a PC for processing and result computation and reporting. WinCATS, the comprehensive "Planar Chromatography Manager", also hosts and organizes all scanner related options including Dual WL, Multi-WL, Qualification, Spectrum Library, etc. It manages data from other winCATS controlled instruments as well. One analysis file can handle all the data, from sample application to scan results, including an image of the chromatogram.

ReproStar 3 with Digital Camera -This image/photo documentation system makes image acquisition, storage, and retrieval simple and easy, all in comformity with cGMP. The system has an ImageScan software for evaluating the images of thin-layer chromatograms, producing video densitometry type data.

Horizontal Developing Chamber and CAMAG's Twin Trough Chamber- Both of these chambers have unique design features and advantages. The HDC provides development from both sides of the plate, using minimum amounts of solvent.

Nanomat 4 - Sample application as spots from fixed volume capillaries. Correct positioning and spacing are controlled by the instrument.

Linomat 5 - The Linomat sprays samples onto the TLC layer in the form of narrow bands, ensuring better resolution and precision. Ideal for quantitative and preparative work.

Automatic TLC Sampler 4 - Band or spot sample application, fully automatic with winCATS control. A very versatile instrument with many control options to apply small or large volumes in a variety of configurations.

All winCATS instruments can be IQ/OQ qualified for use in a GMP/GLP environment — 21CFR Rule 11 compliance ready

TLC Scanner 3 with winCATS



Digital Camera System



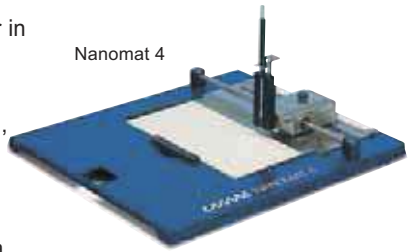
Horizontal Developing Chamber



Twin Trough Chambers



Nanomat 4



Linomat 5



Automatic TLC Sampler 4



For complete information about CAMAG products:

www.camag.com

CAMAG Switzerland: 41-61-4673434
41-61-4610702 FAX

CAMAG USA 800-334-3909
910-343-1834 FAX

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

HPLC Accessories

In-Line Filters

A precolumn filter is essential for protecting HPLC columns against particulate matter which can accumulate on the column frit, leading to split peaks and high back pressure. Sources of particles include mobile phases (especially when buffers are mixed with organic solvents), leaking pump and injector seals, and samples. Use a 2.0µm frit to protect columns containing 5µm or larger particles, a 0.5µm frit for columns with particles smaller than 5µm.



Supelco Filter

Direct-connect; protects analytical and guard columns. Our precolumn filter can be connected directly, hand-tight, into any HPLC column or guard column that has Valco-compatible endfittings. PEEK cap and body, 2µm stainless steel frit. For a metal-free system, order PEEK/Teflon replacement frits (Cat. No. 57430-U).

DESCRIPTION	QTY.	CAT. NO.	PRICE
Supelco Precolumn Filter	1	Z227323	
Replacement Frits			
0.5µm pores	5	Z290874	
2µm pore	5	Z227331	
PEEK/Teflon, 2µm[1]	5	57430-U	

[1] Biocompatible, metal-free.



Isolation Technologies Precolumn Filter

In-line installation. High capacity inlet filter minimizes dead volume and band broadening, to prevent loss of column efficiency while protecting your column. Frit porosity: 0.5µm. Complete as shown.

DESCRIPTION	QTY.	CAT. NO.	PRICE
Isolation Technologies Precolumn Filter			
3mm frit (4.6mm columns)	1	57675-U	
1.5mm frit (2.1mm columns)	1	57676-U	
Replacement Frits			
3mm	5	57677	
1.5mm	5	57678	



SSI High Pressure Preinjector Filter

Place between the pump and injector to provide final filtration for the mobile phase. Easily replaced 316 stainless steel filter element (0.5µm pores). Maximum operating pressure: 15,000psi (105MPa). For 1/16" OD tubing, 10-32 threads.

DESCRIPTION	CAT. NO.	PRICE
SSI High Pressure Preinjector Filter	59262-U	
Replacement Filter Elements (pk. of 2)		
0.5µm pores	59264	
2µm pores	59265	



SSI High Pressure Precolumn Filter

In-line installation. The 316 stainless steel filter disc (0.5µm pores) is easily replaced without removing the column end fitting. Maximum operating pressure: 15,000psi (1054kg/cm²). For 1/16" tubing.

DESCRIPTION	QTY.	CAT. NO.	PRICE
SSI High Pressure Precolumn Filter			
10-32 Threads[2]	1	59269	
Waters Threads	1	59271	
Replacement Filter Elements			
0.5µm pores	10	59273	
2µm pores	10	59272	

[2] Most HPLC fittings, except SSI and some Waters fittings, have 10-32 threads.



Upchurch Precolumn Filter

In-line installation. Stainless steel body with inert polyetherether-ketone (PEEK) endfittings and a 0.5µm or 2µm PEEK frit in one endfitting.

DESCRIPTION	QTY.	CAT. NO.	PRICE
Upchurch Precolumn Filter			
0.5µm frit	1	55079	
2µm frit	1	55078	
Replacement Frits			
0.5µm	10	55080-U	
2µm	10	55081	



Upchurch Mini MicroFilter Assembly

Ultra-low swept volume – 0.85µL. Use with Microtight tubing sleeves. Available with 1µm or 2µm frit capsules (stainless steel frit in color-coded PEEK capsule). Includes 2 MicroFingertight II fittings, 3 filter capsules.

DESCRIPTION	CAT. NO.	PRICE
Mini MicroFilter Assembly		
with 1µm Frit	54722-U	
with 2µm Frit	54721-U	
Replacement Mini MicroFilter Capsules		
with 1µm Frit (black PEEK)	54724-U	
with 2µm Frit (natural PEEK)	54723-U	



Upchurch In-Line MicroFilter

Install between 2 pieces of capillary tubing, using Microtight tubing sleeves. Special PEEK fitting encases 0.5µm PEEK frit. 0.006" thru hole, 0.24µL swept volume. Includes 2 MicroFingertight nuts, 5 frits (1 installed).

DESCRIPTION	CAT. NO.	PRICE
In-Line MicroFilter	502707	
Replacement Frits (pk. of 10)	502715	



Upchurch Precolumn MicroFilter

In-line filter connects capillary tubing (using Microtight tubing sleeves) or 1/16" OD tubing to female 10-32 fitting. 0.5µm frit, 0.3µL swept volume. Includes 5 frits (1 installed).

DESCRIPTION	CAT. NO.	PRICE
MicroFilter for 0.025" OD Tubing		
with PEEK Frits	502677	
with Stainless Steel Frits	502669	
MicroFilter for 1/16" OD Tubing		
with PEEK Frits	502693	
with Stainless Steel Frits	502685	
Replacement Frits, pk. of 10		
PEEK, 0.5µm	502790	
Stainless Steel, 0.5µm	502731	
Stainless Steel, 2.0µm	502723	



Valco Precolumn Frit and Screen Filters [3]

In-line installation. Efficient, low dead volume filters protect your columns from particles without reducing column performance. The replaceable 1/8" frit has 0.5µm pores to protect 3µm or 5µm column packings, the replaceable screen has 2µm pores. Choose the frit filter for higher filtration capacity (most applications) or the screen filter for less dead volume (e.g., with microbore columns). Use with 1/16" OD tubing; 1/16" fittings included.

DESCRIPTION	QTY.	CAT. NO.	PRICE
Valco Precolumn Filters			
Frit Filter	1	58420-U	
Screen Filter	1	58279-U	
Replacement Frits			
0.5µm pores	10	59037	
2.0µm pores	10	59129	
Replacement Screens	10	58284	

[3] Frits and screens should not be interchanged in these filters.



Supelco Silica and C18 Saturator Columns

To protect your column from alkaline mobile phases which can dissolve silica (pH>7.0), saturate the mobile phase with silica by passing it through a silica saturator column. Similarly, to protect your column from acidic mobile phases which can strip bonded phase (pH<2.0), use a C18 saturator column.

Each kit consists of 10g of packing (12µm spherical particles, 180m²/g surface area), a 7.5cm x 4.6mm column, two frits, and fittings to connect the column to 1/16" tubing. The optional plastic funnel is helpful for filling these columns.

DESCRIPTION	CAT. NO.	PRICE
Supelco Silica Saturator Column Kit	58410	
Supelco C18 Saturator Column Kit	58418	
Replacement Components and Accessories		
Spherical Silica, 10g	58411	
C18 packing, 10g	58419	
Funnel and Tubing	20390-U	

SSI Back-Pressure Regulator

Prevents bubbles and improves baseline stability. This 1/16" flange-type unit (4 x 1.3cm) has a unique mechanism that ensures constant back-pressure over a wide range of mobile phase flows and viscosities. It is immune to clogging and other problems common to restrictor-type devices. Easily adjusts from 1-4 atm (15-60psi/1-4kg/cm²).

DESCRIPTION	CAT. NO.	PRICE
SSI Back-Pressure Regulator	58788	



SSI Flow-Through Back-Pressure Regulator

Designed to apply constant pressure to an HPLC detector outlet, over a wide range of mobile phase flows and viscosities. Can be used with flowmeters.

Minimizes bubble formation in the detector cell, improves baseline stability. Flow-through design minimizes band spreading. Immune to clogging. Adjustable from 0.3 to 5 atmospheres (factory set at 4 atmospheres), for compatibility with any detector. Small, inert to common HPLC solvents, biocompatible flow path.

DESCRIPTION	CAT. NO.	PRICE
SSI Flow-Through Back-Pressure Regulator	59284	



Upchurch In-Line Check Valve

Place in the flow system where you wish to restrict fluid flow to one direction. Complete with wrench.

DESCRIPTION	CAT. NO.	PRICE
Upchurch In-Line Check Valve	55085-U	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

HPLC Accessories
Syringe-Tip Filters

Minisart Syringe-Tip Filter Units


16534K

Minisart-PLUS Filters - An integral glass fiber prefilter greatly reduces the clogging associated with typical disposable syringe filtration units. Cellulose acetate filters with 0.2µm or 0.45µm pores. Sterile; individually packaged.

Minisart filters have a Luer Lock inlet and outlet, for positive attachment to the syringe. Suitable for clear aqueous solutions not requiring preliminary filtration.

DESCRIPTION	CAT. NO.	PRICE
MINISART-PLUS FILTERS (BOX OF 50)		
0.2µm Pores	17823K	
0.45µm Pores	17829K	
MINISART FILTERS (BOX OF 50)		
0.2µm Pores	16534K	
0.45µm Pores	16555K	
0.8µm Pores	16592K	
1.2µm Pores	17593K	
5µm Pores	17594K	


54120-U

Iso-Disc Syringe-Tip Filter Units

Sample filtration can prolong column life and minimize down-time. Use Iso-Disc syringe filters to protect your HPLC column and instrument. Filters are available in Nylon, PTFE, PVDF.

RECOMMENDATIONS

Nylon Membrane:	General filtration, especially for aqueous or other hydrophilic samples. Not recommended for use with acids.
PTFE Membrane:	General filtration for hydrophobic samples. High solvent resistance.
PVDF Membrane:	Similar to PTFE, but recommended where low protein binding is important.
0.45µm Pores:	Most HPLC applications.
0.2µm Pores:	Use when using 3µm HPLC columns or when suspended particles must be minimized.

SPECIFICATIONS

Housing:
Polypropylene
Connectors:
Female luer lock inlet; Male luer outlet
Pressure Rating:

	PTFE	Nylon	PVDF
25mm	100psi	90psi	50psi
13mm	100psi	100psi	50psi
4mm	75psi	75psi	n/a

Typical Sample Volume (depends on condition of sample):
25mm: <100mL
13mm: <10mL
4mm: <2mL
Typical Holdup Volume (with air purge):
25mm: <100µL
13mm: <10µL
4mm: <10µL

B-D disposable syringes are available from Aldrich

Iso-Disc Syringe-Tip Filter Units

ISO-DISC UNIT	MEMBRANE	DIAMETER (mm)	PORE SIZE (µm)	COLOR OF LETTERING	QUANTITY	CAT. NO.	PRICE
PTFE-25-2	PTFE	25	0.2	Green	50	54120-U	
PTFE-25-4	PTFE	25	0.45	Green	50	54121-U	
PTFE-25-10	PTFE	25	1	Green	50	54128-U	
PTFE-13-2	PTFE	13	0.2	Green	50	54131-U	
PTFE-13-4	PTFE	13	0.45	Green	50	54132-U	
PTFE-4-2	PTFE	4	0.2	Natural Body*	100	54143-U	
PTFE-4-4	PTFE	4	0.45	White/Red Body*	100	54144-U	
N-25-2	Nylon	25	0.2	Orange	50	54122-U	
N-25-4	Nylon	25	0.45	Orange	50	54123-U	
N-13-2	Nylon	13	0.2	Orange	50	54133-U	
N-13-4	Nylon	13	0.45	Orange	50	54134-U	
N-4-2	Nylon	4	0.2	Natural Body*	100	54145-U	
N-4-4	Nylon	4	0.45	Natural Body*	100	54146-U	
PVDF-25-2	PVDF	25	0.2	Red	50	54124-U	
PVDF-25-4	PVDF	25	0.45	Red	50	54125-U	
PVDF-13-2	PVDF	13	0.2	Red	50	54135-U	
PVDF-13-4	PVDF	13	0.45	Red	50	54136-U	

* No lettering.

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

PEEK HPLC Fittings

PEEK (polyetheretherketone) fingertight fittings are convenient, inert, and bio-compatible. Use these fittings with 1/16" OD PEEK, stainless steel, titanium, Tefzel, or Teflon tubing. PEEK fittings are compatible with all HPLC solvents (avoid concentrated sulfuric and nitric acids), and can be used at temperatures to 150°C.

Unlike stainless steel ferrules, PEEK ferrules do not permanently lock into place on the tubing. This allows you to move the nut and ferrule from one manufacturer's fitting to another (e.g., from Upchurch to Waters), and still form a zero dead volume, leak-free connection.

All fittings on this page can be used in any internal fittings, including Altex, Parker, Supelco, Swagelok, Upchurch, Valco, Waters, and Whatman fittings.





Supelco PEEK Fittings – Biocompatible PEEK fittings for all 1/16" tubing connections.

One-Piece Fingertight Fittings – Hold to 6000psi (420kg/cm²).

Two-Piece Fingertight Fittings – Nut has wings to make finger-tightening easier. Holds to 6000psi/420kg/cm². Ferrules included.

Two-Piece Fingertight/Wrenchtight Fittings – Hold to 6000psi/420kg/cm² when finger-tightened or 10,000psi/700kg/cm² when wrench-tightened. Double-tapered ferrules included.

Two-Piece Wrenchtight Fittings – Have a special double-tapered ferrule which is leak-free to 10,000psi/700kg/cm². Hexagonal head. Double-tapered ferrules included.

DESCRIPTION	QTY.	CAT. NO.	PRICE
SUPELCO PEEK FITTINGS			
One-Piece Fingertight Fittings			
Fittings	5	Z227250	
Two-Piece Fingertight Fittings			
Fittings	5	Z227269	
Ferrules	5	Z227277	
Two-Piece Fingertight/Wrenchtight Fittings			
Fittings	5	Z227285	
Ferrules	5	Z226858	
Two-Piece Wrenchtight Fittings			
Short Fittings	5	Z226874	
Long Fittings	5	Z226866	





Upchurch PEEK Fingertight Fittings

One-piece fittings are convenient (there is no ferrule to drop onto the floor); two-piece fittings have lower replacement cost (the nut generally has a longer life than the ferrule). Except where noted, Upchurch PEEK Fingertight fittings can be used to 6000psi/420kg/cm².

DESCRIPTION	QTY.	CAT. NO.	PRICE
One-Piece Fittings			
10-32	10	55067-U	
Two-Piece Fittings			
Nuts & ferrules, 10-32	10	57654	
Ferrules for 10-32	10	57655-U	
Nuts & ferrules, 1/4-28	10	57656	
Ferrules for 1/4-28	6	57657	



Upchurch Two-Piece Stainless Steel /PEEK Fingertight Fittings

Hold to 6000psi/420kg/cm² when finger-tightened or 10,000psi/700kg/cm² when wrench-tightened.

DESCRIPTION	QTY.	CAT. NO.	PRICE
Two-Piece Fitting	1	58478-U	
Ferrules	5	58479	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

HPLC Accessories
PEEK Fittings





Upchurch PEEK LiteTouch Fittings

Unique design prevents twisting of PEEK tubing. The fitting consists of a special PEEK ferrule, a stainless steel ring, and a PEEK or stainless steel nut for 1/16" tubing. The fitting will not leak at pressures to 5000psi/340 bar with the PEEK nut, 2500psi/175 bar with the stainless steel nut finger-tightened or 7000psi/480 bar with wrench tightening. After wrench-tightening the stainless steel nut, subsequent finger-tightening will hold to 5000psi. Compatible with all manufacturers' stainless steel nuts. Order nuts and ferrules separately.

DESCRIPTION	QTY.	CAT. NO.	PRICE
Nuts, PEEK	10	57651	
Nuts, Stainless Steel	10	22990-U	
Ferrules[1]	10	57650-U	

[1] Includes stainless steel ring.



RheFlex PEEK Fittings

For Rheodyne valves. Hold to 5000psi/350kg/cm².

DESCRIPTION	CAT. NO.	PRICE
1/16" RHEFLEX FITTING SETS		
Long Fitting Sets (5 nuts, 5 ferrules)	57690-U	
Short Fitting Sets (5 nuts, 5 ferrules)	57691	
1/16" Ferrules (pk. of 5)	57692	
1/8" RHEFLEX FITTING SETS		
Fitting Set (1 nut, 1 ferrule)	57477	



Upchurch Fingertight Fittings Kit

High pressure fittings. Includes Delrin Fingertight fittings, 4000psi/280kg/cm² (5); Stainless steel Fingertight fittings, 6000psi/420kg/cm²; 10,000psi/700kg/cm² when wrench-tightened (5); PEEK gripping ferrules (10).

DESCRIPTION	CAT. NO.	PRICE
Fingertight Fittings Kit	58632	



Upchurch PEEK Fingertight Unions

Operate the carbon-filled PEEK zero dead volume unions to 5000psi/352kg/cm², the PEEK tees and crosses to 4000psi/281kg/cm². All items include Fingertight III nuts and ferrules.

DESCRIPTION	CAT. NO.	PRICE
10-32 THREADS		
Union, 0.010" ID	57658	
Union, 0.020" ID	57659	
Tee, 0.020" ID	57661	
Cross, 0.020" ID	57663	
1/4-28 THREADS		
Union, 0.020" ID	57660-U	
Tee, 0.020" ID	57662-U	



Dynaseal Fittings

Dynaseal hand-tight fittings will seal against pressures to over 7000psi/490kg/cm². Each fitting consists of a reusable nut, collet, and ferrule. The ferrule will not deform stainless steel seats and can be reused. Except for the fitting for Rheodyne valves, these fittings are compatible with all 1/16" female compression-type fittings now used on HPLC columns. Spacers are helpful for leak-free sealing with some column end fittings where thread-depth varies.

DESCRIPTION	CAT. NO.	PRICE
Dynaseal Fittings (pk. of 2)	58462	
Collets (pk. of 2)	58464	
Ferrules (pk. of 5)	58463	
Ferrules, KEL-F Polymer (pk. of 10)	58468	
Spacers (pk. of 2)	58679	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Upchurch PEEK Microtight Fittings

These fittings are designed for connecting fused silica or other capillary tubing, using Upchurch PEEK Microtight tubing sleeves.


P000598

MicroFingertight I Fitting:6-32 fitting connects capillary tubing to Microtight union, adapter, or filter. Pack of 10.


P000597

MicroFingertight II Fitting:Connects capillary tubing to MicroTee or MicroCross assembly. Order nut and MicroFerrule separately.


P000599

Microtight Union: Connects 2 pieces of capillary tubing. True zero-dead volume design – tubing pieces butt together. Use gauge plug (included) to properly seat tubing. Includes 2 MicroFingertight fittings.


P000600

Microtight Adapter: Connects capillary tubing to 1/16" OD tubing. True zero-dead volume design. Use gauge plug (included) to properly seat tubing. Includes 1 MicroFingertight fitting, 1 standard Fingertight fitting.


P000601

MicroTee:Connects 3 capillary tubes, using MicroFingertight II fittings. Includes 3 MicroFerrules for 0.025" OD tubing, 3 female nuts.


P000602

MicroCross:Connects 4 capillary tubes, using MicroFingertight II fittings. Includes 4 MicroFerrules for 0.025" OD tubing, 4 female nuts.

DESCRIPTION	CAT. NO.	PRICE
MicroFingertight I Fitting	502405	
MicroFingertight II Fitting Nut	502464	
Microtight Union	502413	
Microtight Adapter	502421	
MicroTee	502472	
MicroCross	502480	


P000626

Upchurch Microtight Tubing Sleeves/Kit

Microtight Tubing Sleeves -Use these PEEK sleeves with all Microtight fittings, to connect capillary tubing. All are 0.025" OD; normally, choose an ID that is 0.002-0.003" larger than the OD of the capillary tubing. Package of 10 sleeves.

Microtight Sleeve Kit - Contains 6 each of the PEEK Microtight tubing sleeves described.

DESCRIPTION	COLOR	CAT. NO.	PRICE
Microtight Tubing Sleeves			
0.005"/125µm	red	502510	
0.007"/178µm	yellow	502561	
0.013"/330µm	orange	502618	
0.015"/380µm	green	502626	
0.018"/460µm	black	502634	
Microtight Sleeve Kit		502650	


P000835

Upchurch Microtight Fittings Kit

10 Microtight tubing sleeves, 2 Microtight unions, 2 Microtight adapters.

DESCRIPTION	CAT. NO.	PRICE
Microtight Fittings Kit	502804	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

HPLC Accessories
Stainless Steel Fittings

Stainless Steel HPLC Fittings

Each connection requires one ferrule and one male nut. The long Rheodyne nut has a longer hex portion for easier wrench access.



Rheodyne Fittings

DESCRIPTION	CAT. NO.	PRICE
Nuts, 1/16" (pk. of 10)	58256	
Long Nuts, 1/16" (pk. of 10)	58257	
Extra Long Nuts, 1/16" (pk. of 5)	58687	
Ferrules, 1/16" (pk. of 10)	58258	
Fitting Set, 1/8" (1 nut, 1 ferrule)	57479	
Ferrules, 1/8" (pk. of 5)	57480-U	



Valco Fittings

DESCRIPTION	CAT. NO.	PRICE
Nuts, 1/16" (pk. of 10)	22990-U	
Nuts, 1/8"(pk. of 10)	22991	
Ferrules, 1/16" (pk. of 10)	22988	
Ferrules 1/8" (pk. of 10)	22989	
Ferrules, 1/4" (pk. of 10)	58245-U	



Waters Fittings

DESCRIPTION	CAT. NO.	PRICE
Nuts and Ferrules, 1/16" (5 each)	58458	



SSI Fittings

DESCRIPTION	CAT. NO.	PRICE
Nuts, 1/16" (pk. of 10)	58760-U	
Ferrules, 1/16" (pk. of 10)	58762	
Plug, 1/16" (nut required)	58764	
Cap, 1/16" (nut and ferrule required)	58766	



SSI Fittings Kit

Save time when looking for the fitting you need. This kit contains everything you need to connect most columns to a 1/16" tubing system, regardless of the column manufacturer. It is designed for easy storage and easy parts identification – everything is clearly labeled to help you quickly locate what you need.

The kit contains:

- SSI ferrules (5)
- SSI gland nuts (5)
- CPI ferrules (5)
- CPI gland nuts (5)
- E-Z Grip ferrules (3)
- E-Z Grip gland nuts (3)
- CPI fittings, KEL-F (2)
- SSI coupling, 0.10" ID (1)
- SSI to CPI couplings (2)

DESCRIPTION	CAT. NO.	PRICE
SSI Column Fittings Kit	59280-U	



Ferrule Saver Tool

- Quickly and simply dislodges swaged ferrule from 1/16" OD (0.010-0.030" ID) tubing
- Saves time, money, and needless aggravation

Removes high pressure CPI-type stainless steel ferrules without the need for disassembling your HPLC system plumbing or cutting the tubing. Eliminates the need for opening, filing, and passivating tubing before installing a new ferrule. Opens and permits reuse of the removed ferrule.

Not recommended for self-locking SSI and Rheodyne ferrules (could damage ferrule or tool).

DESCRIPTION	CAT. NO.	PRICE
Ferrule Saver Tool	58647	

Upchurch Fittings Kits

If you've ever been caught without the fitting you need to install a column, new plumbing line, etc., you'll appreciate these kits. They contain all the fittings and tubing you normally need to operate your HPLC system, conveniently stored in a plastic case.


P000587

each

COMPONENT	HPLC SYSTEM/CAT. NO. OF KIT AGILENT/ HP 58635-U	BECKMAN/ RHEODYNE 58634	PERKIN-ELMER 58636	SPECTRA-PHYSICS/ RHEODYNE 58637	VARIAN/ RHEODYNE 58638	WATERS 58639	BIORAD/ RHEODYNE 58640-U
S.S. ZDV Union, 0.020"	2	2	2	2	2	2	2
S.S. ZDV Union, 0.050"	—	—	—	—	—	—	2
S.S. Waters ZDV Union, 0.020"	—	—	—	—	—	2	—
Perkin-Elmer Male Nut (SSI)	—	—	5	—	—	—	—
Perkin-Elmer Ferrule (SSI)	—	—	5	—	—	—	—
Rheodyne Short Male Nut	—	4	4	4	4	—	4
Rheodyne Long Male Nut	—	2	2	2	2	—	2
Rheodyne Extra-Long Male Nut	—	2	2	2	2	—	2
Rheodyne Ferrule	—	10	10	10	10	—	10
Waters Male Nut	—	—	—	—	—	10	—
Waters Ferrule	—	—	—	—	—	10	—
S.S. Male Nut	10	5	5	5	5	5	5
S.S. Female Nut	10	5	5	5	5	5	5
S.S. Ferrule	20	10	10	10	10	—	10
Tefzel Cap	2	2	2	2	2	2	2
Delrin Plug	2	2	2	2	2	2	2
Fingertight II Male Nut (Delrin)	2	2	2	2	2	2	—
Fingertight I Male Nut (one piece)	—	—	—	—	—	—	2
PEEK Replacement Ferrule	4	4	4	4	4	4	—
1/16" Flangeless Male Nut, Black, Delrin	6	6	6	6	6	6	—
1/16" Flangeless Ferrule, Tefzel	6	6	6	6	6	6	—
STAINLESS STEEL TUBING							
5cm x 0.01" ID	4	4	4	4	4	4	4
10cm x 0.01" ID	4	4	4	4	4	4	4
20cm x 0.01" ID	4	4	4	4	4	4	4
5cm x 0.02" ID	4	4	4	4	4	4	4
10cm x 0.02" ID	4	4	4	4	4	4	4
20cm x 0.02" ID	4	4	4	4	4	4	4

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

HPLC Accessories

Stainless Steel Unions, Tubing

Amersham Biosciences Tube Unions

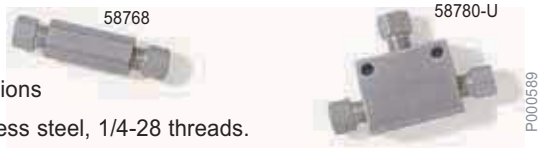
M6 to 1/16".



DESCRIPTION	CAT. NO.	PRICE
M6 to Waters, Stainless Steel	54866	
Valco Adapter, Male 10-32 to Female M6, TFE	54868	

SSI Unions

Stainless steel, 1/4-28 threads.



DESCRIPTION	TUBING OD	BORE	CAT. NO.	PRICE
Coupling (nuts and ferrules included)				
	1/16"	0.043"	58768	
	1/16"	0.015"	58769	
	1/16"	0.010"	58770	
Adapter Coupling SSI to Waters				
	1/16"	0.015"	58774-U	
Tee (nuts and ferrules included)				
	1/16"	0.043"	58780-U	
	1/16"	0.015"	58781	

Valco Column Endfittings (Unions)

Stainless steel. Nuts and ferrules included.



DESCRIPTION	TUBING OD	BORE	CAT. NO.	PRICE
Internal Reducing Union (zero dead volume)				
	1/16" to 1/32"	0.25mm	59026	
	1/8" to 1/16"	0.75mm	22999	
	1/4" to 1/16"	0.75mm	58249	
External Reducing Union				
	1/4" to 1/16"	0.25mm	59110-U	

Valco Unions



Stainless steel, unless noted otherwise. All items include nuts and ferrules.

DESCRIPTION	TUBING OD	BORE	CAT. NO.	PRICE
Internal Union	1/16"	0.75mm	22997-U	
	1/16"	0.25mm	58627	
Internal Reducer	1/16" to 1/32"	0.25mm	59025-U	
	1/8" to 1/16"	0.25mm	22949	
Tee	1/16"	0.75mm	58283	
	1/16"	0.25mm	58626	
Cross	1/16"	0.25mm	58625-U	
Union, PEEK	1/16"	0.25mm	Z227242	
Union	1/16"	0.25mm	Z226807	

Waters Union

Stainless steel. 1/16".



DESCRIPTION	CAT. NO.	PRICE
Waters Union	58289	

Stainless Steel Capillary Tubing

316 stainless steel, 1/16" OD.One piece each. 5 cm, 10 cm and 20 cm lengths are straight, all others dimensions are coiled.

TUBING ID/LENGTH	CAT. NO.	PRICE
0.005" ID [1]		
5cm	56707	
10cm	56708	
20cm	56709	
30cm	56710-U	
0.5m	56711	
1.0m	56712-U	
0.007" ID [1]		
5cm	56713	
10cm	56714	
20cm	56715-U	
30cm	56716	
0.5m	56717	
1.0m	56718-U	
0.010" ID [1]		
5cm	56719	
10cm	56720-U	
30cm	56722	
0.5m	56723	
1.0m	56724	
0.020" ID [1]		
20cm	56727	
30cm	56728	
0.5m	56729	
1.0m	56730-U	
0.030" ID [1]		
5cm	56731	
10cm	56732	
20cm	56733-U	
30cm	56734-U	
1.0m	56736	
0.040" ID [1]		
5cm	56737	
10cm	56738	
20cm	56739	
30cm	56740-U	
0.5m	56741-U	
1.0m	56742-U	

[1] ±0.001".

Stainless Steel Tubing Kits

Ready-to-use lengths.Each kit contains ten 5cm and ten 10cm pieces of 1/16" tubing.

1/32" Stainless Steel Tubing Kit -316 stainless steel, 1/32" OD x 0.005" ID, for narrowbore HPLC. Two 6"/15cm and two 12"/30cm pieces.

DESCRIPTION	CAT. NO.	PRICE
1/16" OD x 0.005" ID	502839	
1/16" OD x 0.007" ID	502820	
1/16" OD x 0.010" ID	502812	
1/16" OD x 0.020" ID	502847	
1/32"OD x 0.005" ID	58404	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



P000617

PEEK Tubing

Polyetheretherketone (PEEK) tubing has become a popular replacement for stainless steel tubing in various places in the HPLC system. It is especially useful when contact between the sample and metal components must be avoided, such as when working with metal complexing agents or certain biochemical compounds. PEEK tubing also offers other advantages: it is flexible, easy to cut, has excellent mechanical stability and chemical compatibility, and can be used to 100°C.

Tetrahydrofuran (THF), dimethyl sulfoxide (DMSO), methylene chloride, and concentrated nitric and sulfuric acids should not be used with PEEK tubing. Our PEEK tubing is color coded for easy identification of the internal diameter.

10-foot/3m length.

ID (IN.)	MAX. PRESSURE (PSI)	COLOR	CAT. NO.	PRICE
1/16" OD				
0.005	8000	Red	Z227307	
0.007	8000	Yellow	Z226688	
0.01	6000	Blue	Z226661	
0.02	6000	Orange	Z227293	
0.03	5000	Green	Z226955	
0.055	1000	Black	54994	
1/8" OD				
0.062	5000	Natural	54995	

TFE Teflon Tubing

Economical, flexible TFE Teflon tubing is ideal for use at pressures up to 500psi/35kg/cm². Use in automatic analyzer, postcolumn reaction, preparative scale systems, in-stream sampling devices, and when monitoring physiologically important compounds.

The maximum recommended operating temperature for TFE Teflon is 200°C, but short term exposure to higher temperatures seldom causes damage.

DIAMETER OD	ID	CAT. NO.	PRICE
10'/3m LENGTH			
1/16"/1.58mm	0.8mm/0.031"	58700-U	
1/16"/1.58mm	0.5mm/0.023"	58701	
1/16"/1.58mm	0.3mm/0.012"	58702	
1/8"/3.2mm	1.5mm/0.063"	58703	
50'/15m LENGTH			
1/16"/1.58mm	0.8mm/0.031"	58696-U	
1/16"/1.58mm	0.5mm/0.023"	58697-U	
1/16"/1.58mm	0.3mm/0.012"	58698-U	
1/8"/3.2mm	1.5mm/0.063"	58699	

FEP Teflon Tubing

For connecting pump to reservoirs. Use 1/8" OD x 0.0625" ID tubing with most pumps, 0.15" OD x 0.118" ID tubing with Waters pumps. 10'/3m length.

DESCRIPTION	CAT. NO.	PRICE
1/8" OD x 0.0625" ID	58694-U	
0.15" OD x 0.118" ID	58695-U	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

HPLC Accessories
Tubing Cutters



SSI TC-20 Tubing Cutter

A zero dead volume connection is important for maximum chromatographic performance. Unswept volume, caused by a poor fit between tubing and the mating seat, can cause sample dispersion and unsatisfactory chromatographic results.

The SSI Model TC-20 tube cutter assures a zero dead volume connection. Because the tubing is held securely in a clamp vise on the vertical swing arm, a square cut is produced when the swing arm is lowered against the abrasive cutting wheel, which produces a finished end. No lubricant or cutting fluid is required. The unit, which is CE marked, will cut most common tubing used in chromatography. 1/16", 1/8", and ¼" outside diameter tubing with inside diameters as small as 0.008" can be smooth-cut and dressed without distortion.

The precision ground dressing tool for the 1/16" OD tubing is included and is attached directly to the swing arm: it cannot be misplaced or lost. Dressing tools for all three diameters can be ordered separately.

DESCRIPTION	CAT. NO.	PRICE
SSI ELECTRIC STAINLESS STEEL TUBING CUTTER		
Voltage Selectable: 110/220 Volts 50-60 Hz, CE Approved	58539-U	
REPLACEMENT PARTS		
Cutting Wheels, TC-20 (pk. of 3)	58540-U	
DressingTool for 1/16" Tubing	58804	
Needle Insert for 1/16" Deburring Tool	58805	
ADDITIONAL PARTS		
Dressing Tool for 1/8" Tubing	58806	
Needle Insert for 1/8" Dressing Tool	58807	
Cutting Wheels, TC-10 (pk. of 3)[1]	58803	

[1] Replacement cutting wheels for SSI Model TC-10 tubing cutter. Will not fit Model TC-20.



Manual Cutting Tool

Easily cut 1/16" stainless steel tubing, then deburr the cut end to ensure a uniform flow of gas or liquid. Deburring kit includes deburring tool, tubing holder, file. Order tubing cutter and deburring kit separately.

DESCRIPTION	CAT. NO.	PRICE
Manual Cutting Tool	58692-U	
Cutting Wheels (pk. of 2)	22411	
Deburring Kit	58691-U	
Deburring Tool	58804	



Straightening Pliers

Jaws grooved specifically for 1/16" stainless steel tubing. Grips are spring-loaded for easier operation.

DESCRIPTION	CAT. NO.	PRICE
Straightening Pliers	58646	



Upchurch Polymer Tubing Cutter

Upchurch designed this reliable and durable device specifically for cutting PEEK, Teflon, and Tefzel tubing. Includes 4 replacement blades.

DESCRIPTION	CAT. NO.	PRICE
Polymer Tubing Cutter	57665-U	
Replacement Blades (pk. of 5)	57666-U	



PEEK Tubing Cutter

Makes burr-free, perpendicular cuts through polymer tubing with outside diameters from 1/16" to 1/8". Designed for cutting PEEK tubing, but also easily slices through Teflon and Tefzel capillary tubing. Compact design includes a safety locking mechanism. One spare blade included.

DESCRIPTION	CAT. NO.	PRICE
PEEK Tubing Cutter	Z290882-1EA	
Replacement Blade	Z290947-1EA	



Column Blanks

Each column blank kit includes a precision-bore polished 316 stainless steel column blank, two zero dead volume external reducing unions (internal unions with 10mm ID blanks) with nuts and ferrules for 1/16" OD tubing, and two 2µm frits.

ID (mm) x OD (in.) x LENGTH (cm)	CAT. NO.	PRICE
2.1 x 1/4 x 25	59127	
4.6 x 1/4 x 15	59101	
4.6 x 1/4 x 25	59102-U	
10 x 1/2 x 25	58217	



Column Frits

Choose frits with 0.5µm pores to retain packings prepared from 3µm particles, frits with 2µm pores to retain larger particles.

FRIT DIAM. (in.)	PORE DIAM (µm)	CAT. NO.	PRICE
FRITS FOR CONVENTIONAL COLUMN HARDWARE (PK. OF 10)			
1/8	0.5	59037	
1/8	2	59129	
1/4	0.5	59038	
1/4	2	58264	
1/2	2	58255	



Frit Assemblies for Supelco Column Hardware

FRIT DIAM. (mm)	PORE DIAM (µm)	CAT. NO.	PRICE
PEEK WITH STAINLESS STEEL FRIT, PK. OF 2			
2.1	0.5	55203	
2.1	2	55204	
3.0	0.5	55207	
3.0	2	55208	
4.0-4.6	0.5	55209	
4.0-4.6	2	55210	



Frit-Removing Tool for Supelco Modular Columns

Removes frits from 2.1mm ID to 4.6mm ID Supelco modular columns.

DESCRIPTION	CAT. NO.	PRICE
Frit-Removing Tool	55216	



Column End Plugs

Use column end plugs with all female 10-32 compression type endfittings, Amersham Biosciences domed nut with M6 male fittings. Inert Delrin construction, compatible with any common HPLC solvent.

DESCRIPTION	CAT. NO.	PRICE
Column End Plugs, 1/16" (pk. of 10)	59031	
Amersham Biosciences Domed Nut (each)	54865	

HELPFUL HINTS

Supelco modular columns contain the following markings:
- 4.6mm ID = 3/8” OD tubing with 2 lines
- 4.0mm ID = 3/8” OD tubing with no lines
- 3.0mm ID = 3/8” OD tubing with 1 line
- 2.1mm ID = 1/4” OD tubing with 2 lines

Supelco frit assemblies are color-coded as follows:
- Gray = 2.0µm pores
- Black = 0.5µm pores

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

HPLC Accessories

SupelPRO™ Valves

New!

SupelPRO™ Automated Fluidics Instruments

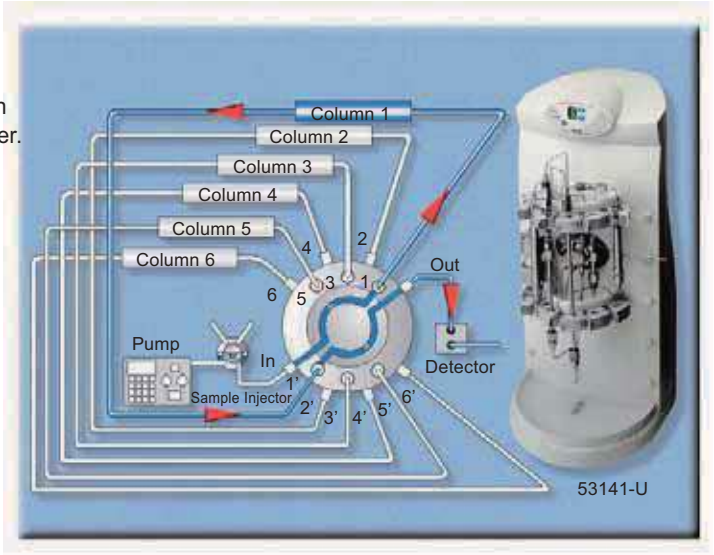
Supelco's SupelPRO series are precision, electronically-controlled, motorized valve instruments for repetitive fluid switching. Each SupelPRO instrument is self-contained and incorporates a 2-position or multi-position port valve. Standard multi-position models include a 4-line BCD port, and the 2-position models include the Level Logic. Power requirements: 100-240VAC, 50-60Hz (auto switching). All units shipped with standard US power cord. Other power cords are available on a custom basis.

All SupelPRO™ units are CE approved.

SupelPRO™ 3-Column or 6-Column Selector

Select from among up to 3 columns or up to 6 columns. Useful for column selectivity comparisons, other column selection applications. Includes mounting clips and cover.

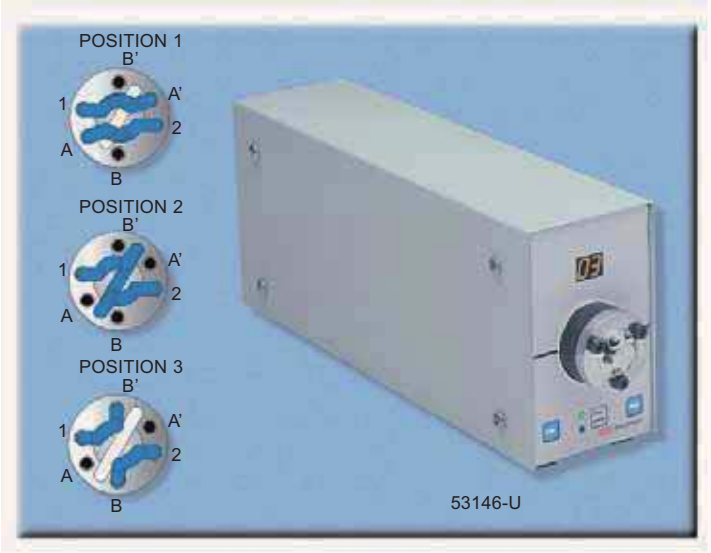
DESCRIPTION	CAT. NO.	PRICE
3-Column		
Stainless Steel	53140-U	
PEEK	53142-U	
6-Column		
Stainless Steel	53141-U	
PEEK	53143-U	



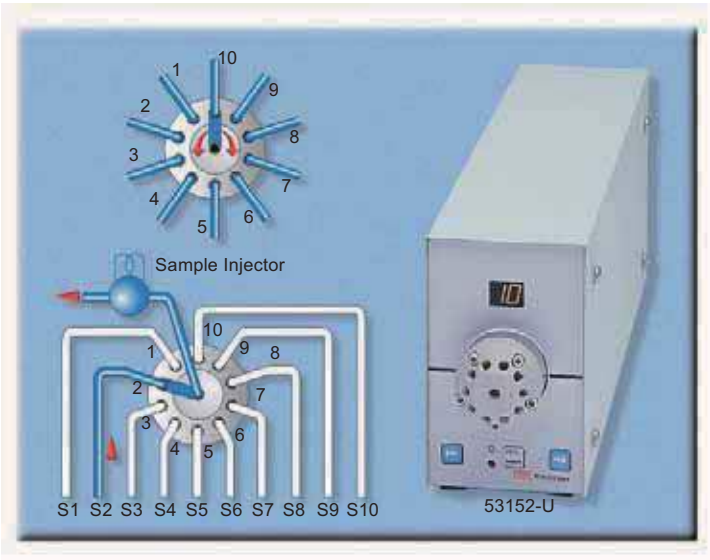
SupelPRO™ 2-Channel Selector with Bypass Valve

This 6-port, 3-position motorized valve is useful for selecting 1 of 2 connected columns, or flush.

DESCRIPTION	CAT. NO.	PRICE
Stainless Steel	53146-U	
PEEK	53147-U	



Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



SupelPRO™ 11-Port, 10-Position Valve

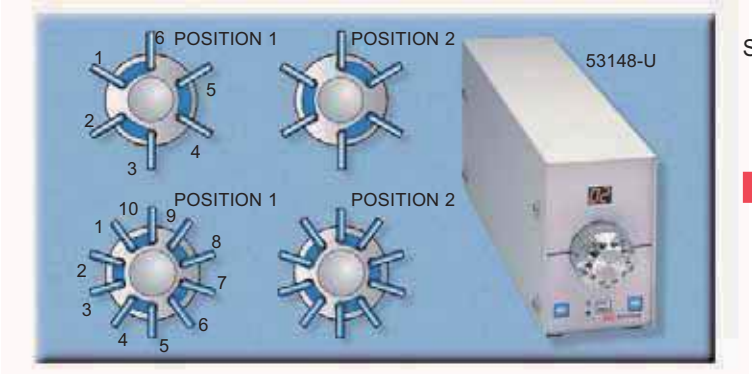
Use this 11-port, 10-position valve to select from up to 10 inputs to 1 output, or select 10 outputs from 1 input.

DESCRIPTION	CAT. NO.	PRICE
Stainless Steel	53152-U	
PEEK	53153-U	

SupelPRO™ 2-Position Valves

Available with 6 or 10 ports. Useful for a wide variety of applications, including sample clean-up and back-flushing.

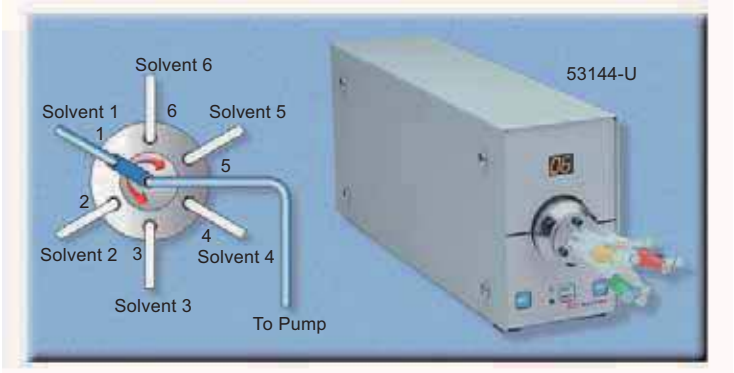
DESCRIPTION	CAT. NO.	PRICE
6-Port		
Stainless Steel	53148-U	
PEEK	53149-U	
10-Port		
Stainless Steel	53150-U	
PEEK	53151-U	



SupelPRO™ Solvent Selector Valve

Allows automation of mobile phase selection from 6 inlets. Comes with factory installed 1/16" or 1/8" OD tubing and 1/4-28 fittings. Rated to 300psi (20 bar).

DESCRIPTION	CAT. NO.	PRICE
1/16"	53144-U	
1/8"	53145-U	



Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

HPLC Accessories
Rheodyne Injectors



Rheodyne Model 3725i Preparative Sample Injectors

Model 3725i sample injectors for 1-10cm ID HPLC columns combine the ease of use and versatility of Rheodyne's analytical-scale injectors with the ability to handle large samples and high flow rates. Rugged and easily maintained, in a choice of stainless steel or PEEK flowpaths. Includes 10mL sample loop, 1/8" fitting for all ports, 5cm large-bore syringe needle (16 gauge/0.65" OD) for rapid injection of large samples, needle port cleaner, two vent tubes, wrenches, mounting screws, and instructions.

SPECIFICATIONS

Tubing and Fittings:	1/8"
Valve Flow Passages:	1mm/0.04"
Flow Rates:	10-800mL/min
Pressure Rating:	Model 3725i: 276 bar/4000psi*
	Model 3725i-038: 345 bar/5000psi

* Usable pressure depends on sample loop ID, organic solvent concentration, and organic solvent exposure time.

DESCRIPTION	CAT. NO.	PRICE
PREPARATIVE SAMPLE INJECTORS		
Model 3725i, PEEK	57461	
Model 3725i-038, SS	57463	
REPLACEMENT COMPONENTS		
Rotor Seal	57473	
Stator Face Assembly	57474	
Needle, PEEK for model 3725	57475	
Needle, 16-Gauge SS for model 3725	57476	
Fitting Set, 1/8" (1 nut & 1 ferrule)		
RheFlex	57477	
Stainless Steel	57479	
Ferrules, 1/8" (pk. of 5)		
Stainless Steel	57480-U	
RheBuild Kit for 3725/3725i/3725-038/3725i-038	55043	
SAMPLE LOOPS[2]		
PEEK		
2mL	57464-U	
5mL	57465	
10mL	57466-U	
20mL	57467	
Stainless Steel		
2mL	57468-U	
5mL	57469	
10mL	57470-U	
20mL	57471	



Rheodyne Model 7000 Stream Switching Valve

Designed specifically for column selection, sample clean-up and enrichment, column programming, backflushing, and other stream switching operations. Six peripheral ports (no center port) are interconnected through a two-position rotor. Low volume flow passages (0.6mm ID) minimize dead volume that can affect column switching analyses. The pressure limit is factory set at 5000psi (350kg/cm²), but can be adjusted to 7000psi (490kg/cm²). The flat-face seal is easy to adjust.

DESCRIPTION	CAT. NO.	PRICE
Model 7000 Valve	58920-U	
REPLACEMENT COMPONENTS		
VESPEL Rotor Seal	58831	
RheBuild Kit for 7000/7010	55044	



Rheodyne Model 7010 Injector

The original Rheodyne HPLC injector, Model 7010 introduces 5µL-5mL samples onto a column with excellent reproducibility (intended for complete loop filling only). Six clustered ports allow compact interconnections, minimizing tubing volume. The flat-face seal is easy to adjust and service. Operates at pressures to 7000psi (490kg/cm²). Supplied with a 20µL loop; order fill port separately.

DESCRIPTION	CAT. NO.	PRICE
Model 7010 Injector	58827	
REPLACEMENT COMPONENTS		
Loop Fill Port	58825-U	
VESPEL Rotor Seal	58831	
RheBuild Kit for 7000/7010	55044	
SAMPLE LOOPS WITH FITTINGS		
5µL	58840-U	
10µL	58832	
20µL	58833-U	
50µL	58834	
100µL	58835	
200µL	58836	
500µL	58837	
1mL	58838	
2mL	58839	
5mL	57637	

[1] Supplied with unswaged fittings for connection to Model 3721i injector.

[2] Two 1/8" x 1/16" reducing unions (Cat. No. 22999), two short pieces of 1/16" capillary tubing, and 1/16" nuts and ferrules are needed to connect a preparative sample loop to a valve with 1/16" ports .



Rheodyne Model 7060
Selection Valve

For column or mobile phase selection.

Instead of frequently connecting and disconnecting columns to your system, connect the injector outlet to the common center port of a Model 7060 valve, and connect up to 6 columns to the peripheral ports. (We recommend allowing one port for bypass/flushing operations.) The common port can be sequentially connected to each of the 6 peripheral ports by manually rotating the handle in either direction. Connect the column outlets to a second Model 7060 valve to direct the flow from the columns to the detector.

Low dispersion 0.41mm/0.016" ID passages and an internal volume of less than 2µL ensure minimal extra-column band broadening.

DESCRIPTION	CAT. NO.	PRICE
Model 7060 Selection Valve	58817	



Rheodyne Model 7520
Microsample (Syringe-Loading) Injector

Designed specifically for use with narrow bore HPLC columns. 0.13mm/0.005" ID passages and a built-in needle port (0.3µL hold-up volume) minimize dispersion of small samples. A 0.5µL sample rotor is included; order other rotors separately.

DESCRIPTION	CAT. NO.	PRICE
Model 7520 Microsample Injector	58819	
REPLACEMENT COMPONENTS		
RheBuild Kit for 7520/7526	55048	
SAMPLE ROTORS		
0.2µL	58820	
1.0µL	58822-U	



Rheodyne Model 7125 Injector

The Rheodyne Model 7125 syringe loading injector allows injection of the entire contents of the syringe into the sample loop – you won't have to flush the valve between injections, unless you are conducting trace analyses. It also injects samples from a partially filled loop (you save time by not having to change the sample loop).

The Model 7125 injector can be used at pressures to 7000psi (490kg/cm²) and is supplied with a VESPEL rotor seal for operation at pH 0-10. A 20µL sample loop is included; order additional loops separately.

DESCRIPTION	CAT. NO.	PRICE
Model 7125 Injector	58826	
REPLACEMENT COMPONENTS		
VESPEL Rotor Seal	58830-U	
Tefzel Rotor Seal	57633	
Needle Port Cleaner	57635	
Valve Angle Bracket (for all metal Rheodyne valves)	57636	
RheBuild Kit for 7125/7126	55045	
SAMPLE LOOPS WITH FITTINGS		
5µL	58840-U	
10µL	58832	
20µL	58833-U	
50µL	58834	
100µL	58835	
200µL	58836	
500µL	58837	
1mL	58838	
2mL	58839	
5mL	57637	

Note: Use VESPEL seals to pH 10, Tefzel seals to pH 14.

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

HPLC Accessories
Rheodyne Injectors

Rheodyne Model 7725 and 7725i Injectors

The Rheodyne Model 7725 injector allows you to inject 1µL-5mL samples with accuracy and precision. The rugged, easily maintained design offers many advanced features:

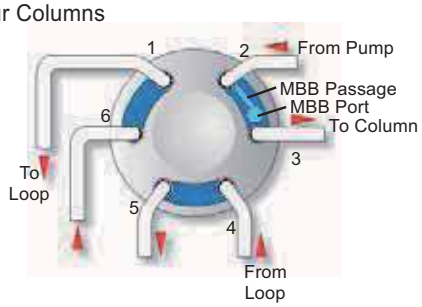
- Patented continuous flow design (Figure A) – flow is uninterrupted when you switch from LOAD to INJECT
- Easy seal adjustment using pressure screw on front of injector
- Easy access to fittings (Figure B)

Injector includes a 20µL sample loop and is supplied with a VESPEL rotor seal that can be replaced with a Tefzel rotor seal for operation at pH 0-14. Factory set at 5000psi (345 bar), adjustable to 7000psi (483 bar). Model 7725i has an internal position sensing switch.

DESCRIPTION	CAT. NO.	PRICE
Model 7725 Injector	57620-U	
Model 7725i Injector	57621	
REPLACEMENT COMPONENTS		
VESPEL Rotor Seal	58830-U	
Tefzel Rotor Seal	57633	
Stator Face Assembly	57634	
Needle Port Cleaner	57635	
Valve Angle Bracket (for all metal Rheodyne valves)	57636	
RheBuild Kit for 7725/7725i/7726	55049	
SAMPLE LOOPS(WIDE-ANGLE PORTS; FITTINGS INCLUDED)		
2µL	57622	
5µL	57623	
10µL	57624	
20µL	57625	
50µL	57626	
100µL	57627	
200µL	57628-U	
500µL	57629-U	
1mL	57630	
2mL	57631	
5mL	57632	

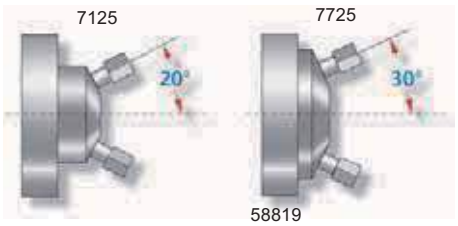
Note: Use VESPEL seals to pH 10, Tefzel seals to pH 14.

Figure A. A Model 7725 Injector Reduces Wear and Tear on Your Columns



A conventional HPLC valve momentarily interrupts flow during sample injection, subjecting your column to repetitive pressure shocks. Rheodyne's patented MBB (make-before-break) design makes the new connection before breaking the old one, providing uninterrupted flow.

Figure B. Model 7725 Injectors also Feature a Wide Port Angle (30°), for Easy Access to the Fittings



Rheodyne Model 8125 Low Dispersion Injector

Inject as little as 0.1µL of sample with high accuracy and zero waste.

Small diameter flow channels in a low-dispersion version of the popular Model 7125 injector. Excellent for use with narrow bore columns (1-3mm ID), but also well suited for larger diameter columns. Resolution is most improved with relatively unretained (I peaks – the peaks most affected by extra-column effects. Additional features include:

- Built-in zero-holdup needle port
- Built-in position switch to signal injection
- Long rotor seal lifetime – make up to 30,000 injections before replacing seal (VESPEL)
- User-adjustable to 7000psi (490kg/cm²)
- Easy-to-service flat-face rotor design

Supplied with a 5µL sample loop, fittings for all ports, 22-gauge luer hub needles, needle port cleaner, two vent tubes, wrench mounting screws and instructions. Order additional sample loops separately.

DESCRIPTION	CAT. NO.	PRICE
Model 8125 Injector	57950-U	
REPLACEMENT COMPONENTS		
VESPEL Rotor Seal	57955	
RheBuild Kit for 8125/8126	55050-U	
SAMPLE LOOPS		
5µL	57951	
10µL	57952	
20µL	57953	



Biocompatible Rheodyne Injectors

All flow passages in the 6-port injectors on this page are inert PEEK (polyetheretherketone) or alumina-ceramic materials. They are unaffected by buffers, acids, bases, or halide salts, including 1M sodium chloride, over the entire pH range. Both valves are rated for pressures up to 5000psi (350kg/cm²), but the usable operating pressure may be lower, depending on the loop and solvents used.



57695

Rheodyne Model 9010 Injector

This injector is similar in function to the Model 7010 stainless steel injector, but is constructed of inert PEEK and Tefzel materials for use in the pH range 0-14. It can be used for HPLC, soft gel chromatography, or ion chromatography.

A position-sensing switch closes in the INJECT position and stays closed until the handle is returned to the LOAD position. Supplied with a 20µL sample loop; order additional loops separately.

DESCRIPTION	CAT. NO.	PRICE
Model 9010 Injector	57695	
REPLACEMENT COMPONENTS		
Tefzel Rotor Seal	57696	
Loop Filler Port	57638	
Needle Port	57639	
RheBuild Kit for 9010/9040	55052	



54432

Rheodyne Model 9725 Injector

The Model 9725 injector is ideal for both HPLC and soft gel LC purification procedures for biomolecules. Performance of this 6-port rotary injector is similar to that of the Model 7725 injector, but no metal contacts the samples. Model 9725 incorporates the patented make-before-break design (see previous page, Figure A).

The 0.25mm ID flow channels provide low dispersion when used with narrow ID columns, but prevent excessive flow resistance at flow rates used with larger analytical columns and preparative columns. Use with Rheodyne HPT fittings and high pressure PEEK tubing. Model 9725i includes a position-sensing switch.

Supplied with a 20µL PEEK sample loop, Tefzel rotor seal, fittings for all ports, 22-gauge luer hub needle, needle port cleaner, two Tefzel vent tubes, wrenches, mounting screws and instructions. Order additional sample loops separately.

DESCRIPTION	CAT. NO.	PRICE
Model 9725 Injector	54432	
REPLACEMENT COMPONENTS		
Tefzel Rotor Seal	57971-U	
RheBuild Kit for 9725/9725i/9726	55053	

PEEK Sample Loops for 9010, 9125, and 9725 Injectors

VOLUME	CAT. NO.	PRICE
5µL	57640	
10µL	57641	
20µL	57642	
50µL	57643	
100µL	57644	
200µL	57645	
500µL	57646	
1mL	57647	
2mL	57648	
5mL	57649	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

HPLC Accessories

Rheodyne RheBuild Kits, Fittings, Tools



RheBuild Kits

These kits include all of the tools and parts you need to repair your Rheodyne injector. The parts included are those most likely to be damaged, worn, or lost. Kits for front-loading injectors include: rotor seal, stator face assembly, isolation seal, needle guide, needle port cleaner, 2 hex keys, operating instructions, and a mini-manual. Parts may vary, depending on valve model.

VALVE MODEL	CAT. NO.	PRICE
3725/3725i/3725-038/3725i-038	55043	
7010	55044	
7010 with stator	504602	
7125/7126	55045	
7125-081	55046	
7410	55047	
7520/7526	55048	
7650/9650 TPMV	504629	
7725/7725i/7726	55049	
7750 TPMV Series	7750999	
8125/8126	55050-U	
9010/9040	55052	
9125/9126	55051	
9725/9725i/9726	55053	
9750 TPMV Series	9750999	
KITS FOR SupelPRO/LabPRO UNITS		
Injector with Purge[1]	54398-U	
2-Channel Selector[1]	54394-U	
3 Column Selector[1]	54388-U	
11-Port/10-Position[1]	57443-U	
2-Position, 6-Port[1]	54395-U	
2-Position, 10-Port[1]	54396-U	
Solvent Selector, 1/16"	54392-U	
Solvent Selector, 1/8"	54393-U	
Low Pressure Switching, 1/16"	54390-U	

[1] Either stainless steel or PEEK unit.



Rheodyne Port Adapter, ValvTool

Use the Port Adapter for connecting 1/16" tubing to a 1/8" valve port. Use the ValvTool for changing sample loops or replacing fittings on Rheodyne valves. The 1/4" end is a uniquely designed slotted socket wrench that provides easy access to many hard-to-reach areas.

DESCRIPTION	CAT. NO.	PRICE
Rheodyne Port Adapter	57472	
ValvTool	55087-U	



Rhedyne Fittings

DESCRIPTION	CAT. NO.	PRICE
Nuts, 1/16" (pk. of 10)	58256	
Long Nuts, 1/16" (pk. of 10)	58257	
Extra Long Nuts, 1/16" (pk. of 5)	58687	
Ferrules, 1/16" (pk. of 10)	58258	
Fitting Set, 1/8" (1 nut, 1 ferrule)	57479	
Ferrules, 1/8" (pk. of 5)	57480-U	



RheFlex PEEK Fittings

For Rheodyne valves. Hold to 5000psi/350kg/cm².

DESCRIPTION	CAT. NO.	PRICE
1/16" RHEFLEX FITTING SETS		
Long Fitting Sets (5 nuts, 5 ferrules)	57690-U	
Short Fitting Sets (5 nuts, 5 ferrules)	57691	
1/16" Ferrules (pk. of 5)	57692	
1/8" RHEFLEX FITTING SETS		
Fitting Set (1 nut, 1 ferrule)	57477	

Rheodyne pH Upgrade Kits

Enables you to use your Rheodyne injector with samples at pH 0-14. Includes Tefzel rotor seal, 2 hex keys, instructions.

VALVE MODEL	CAT. NO.	PRICE
7000/7010/7040	55054	
7125/7126	55055	
7410	55056	
8125/8126	55057	

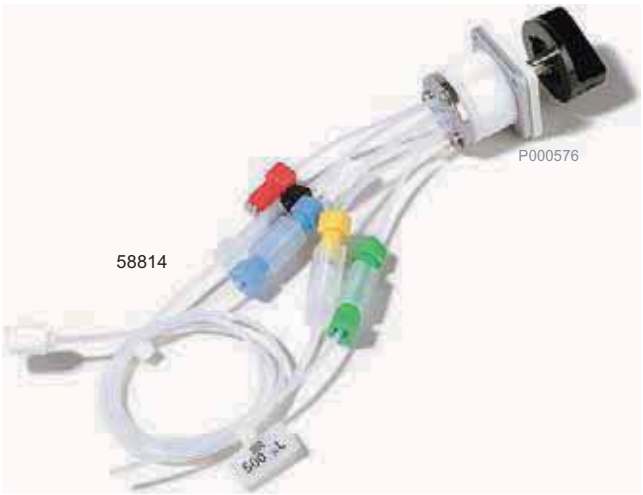
Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



Rheodyne Model 5011 Low Pressure Mobile Phase Selection Valve

Draw the mobile phase you need simply by rotating a switch. This zero dead volume, 7-port 6-position rotary valve operates to 300psi (21kg/cm²). Inert Teflon tubing (0.8mm ID) ensures contaminant-free mobile phases.

DESCRIPTION	CAT. NO.	PRICE
Model 5011 Valve	58829	
Mounting Bracket for 5011/5020	57460-U	



Rheodyne Model 5020 Low Pressure Sample Injection Valve

A Teflon, fixed volume loop injector with 0.8mm/0.03" ID flow passages. Operates to 300psi (21kg/cm²). Supplied with a 0.5mL sample loop and a female Luer adapter for a Luer tip syringe.

DESCRIPTION	CAT. NO.	PRICE
Model 5020 Injection Valve	58814	
SAMPLE LOOPS		
0.1mL	57680-U	
1mL	57683	
5mL	57684	
10mL	57685	



Upchurch Micro-Valves

- Inert PEEK construction
- Flow rates as low as 3.5µL/minute (water)
- 1/4-28 or 10-32 1/16" fittings

SPECIFICATIONS

Internal Volume
1/4-28 valves: 4.13µL fully opened; 2.1µL closed.
10-32 valves: 2.8µL fully opened; 1.2µL closed.
10-32/6-32 valves. 2.5µL fully opened; 1.2µL closed.
Thru-Hole
54720-U: 0.010”
all others: 0.020”
Pressure Rating
low pressure valves: 800psi (54 bar).
high pressure valves: 5000psi (338 bar).

DESCRIPTION	CAT. NO.	PRICE
MICRO-METERING VALVE (LOW PRESSURE)		
1/4-28 Flangeless Fittings	502367	
10-32 Fingertight Fittings	502375	
MICRO-SPLITTER VALVE (LOW PRESSURE)		
1/4-28 Flangeless Fittings	502383	
10-32 Fingertight Fittings	502391	
MICRO-SPLITTER VALVE (HIGH PRESSURE)		
10-32 Fingertight Fittings	54719-U	
2 x 10-32, 1 x 6-32* Fingertight Fittings	54720-U	
REPLACEMENT FITTINGS		
1/4-28 Flangeless Fittings		
Nuts & Ferrules (5 each)	58685	
Ferrules (pk. of 10)	56700-U	
Fingertight Fittings		
10-32 (pk. of 10)	55067-U	
6-32 (pk. of 10)	502405	

* For capillary tubing.

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

HPLC Accessories

Priming Valves, Gauge Kits, SSI Valves, Pulse Damper



OPTI-PRIME Priming Valve for Waters Pumps

Makes priming Waters pumps a convenient, one hand operation. Replaces Waters priming system.

DESCRIPTION	CAT. NO.	PRICE
OPTI-PRIME Priming Valve	59425-U	
Priming Valve with Safety Syringe	59426	
Safety Syringe	59451	



SSI Prime/Purge Valve

The drain port in this valve is incorporated into the valve stem, eliminating the need for extra tubing and fittings. A luer taper on the valve stem accepts a luer syringe for priming. Valve shutoff is provided by a soft-seal tip that withstands back pressures to 8000psi (560kg/cm²). Only Teflon, Tefzel, and 316 stainless steel come in contact with the mobile phase. Order 1/16" SSI nuts and ferrules separately.

DESCRIPTION	CAT. NO.	PRICE
SSI Prime and Purge Valve	58690-U	

Upchurch Prime/Purge Valve

Automatic valve operation with a simple twist of the Luer-Lock syringe. Easy installation, long seal life.

DESCRIPTION	CAT. NO.	PRICE
Upchurch Prime/Purge Valve for Waters Pumps	54716-U	
Upchurch Universal Prime/Purge Valve (1/4 - 28 fittings)	54718-U	

SSI Pressure Gauge Kits

Components already assembled, ready for easy installation. Backed by a three-year warranty, these highly accurate (±1.5%), glycerine-filled gauges have a 2 1/2"/6.4cm face and 1/4" NPT connection. To resist corrosion, the one-piece case and socket and the bourdon tube are made of 316 stainless steel. All fittings and SSI tee are included.

DESCRIPTION	CAT. NO.	PRICE
0-3000psi/210kg/cm²	58623-U	
0-6000psi/420kg/cm²	58624	



SSI Two-Way Shut-Off Valve

For 1/16" tubing; 1/4-28 (SSI style) fittings included. Rated to 15,000psi (1054kg/cm²)

DESCRIPTION	CAT. NO.	PRICE
Two-Way Shut-Off Valve	58789	

SSI Three-Way Stream-Splitting Valve

Each port in this valve can be connected to pressure, as in stream-splitting, or when connecting an in-line pressure gauge (open valve to read pressure, seal off to prevent contamination). The side vent model can replace the injector bypass valve on Altex, LDC, Perkin-Elmer, Spectra-Physics, or other chromatographs, and is recommended for all general applications. The bottom vent model replaces the bypass valve on a Varian 5000 chromatograph. For 1/16" tubing; 1/4-28 (SSI style) fittings included. Rated to 15,000psi (1054kg/cm²)

DESCRIPTION	CAT. NO.	PRICE
Three-Way Stream-Splitting Valve		
Side Vent	58794	
Bottom Vent	58793	

SSI LO-Pulse Damper

A pulse damper controls pump pulsations for a more stable baseline. The LO-Pulse damper is a patented unit compatible with single piston reciprocating HPLC pumps (Altex 110A, Eldex pumps, LDC Mini-Pump VS, SSI Models 200 and 300, etc.). At pressures from 500psi to 6000psi (35-420kg/cm²), it improves precision of quantitative analyses and detection limits for trace sample components. Fittings and instructions included.

DESCRIPTION	CAT. NO.	PRICE
Pulse Damper	58455	
Pulse Damper without Cabinet	58442	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



Supelco Mobile Phase Degassing System

Eliminates:

- Flow instabilities
- Detector noise
- Baseline drift
- Expensive helium tanks
- Sparging problems

Degasses up to four solvents at one time. The Supelco Mobile Phase Degassing System removes dissolved gases from the mobile phase. The mobile phase passes through a gas-permeable membrane inside a vacuum chamber, where dissolved gases are pulled out of the solution. Special tubing, which eliminates regassing from ambient sources, carries the mobile phase from the degasser to the pump. Includes 12'/3.6m of tubing and 8 fittings.

CE approved.

SPECIFICATIONS	
Number of Channels:	4
Degassing Efficiency (25°C):	8.1ppm oxygen reduced to 0.5ppm at 1mL/min or 1ppm at 4mL/min
Dead Volume/Channel:	15mL
Maximum Flow/Channel:	10mL/min
Power Requirements:	115VAC/240VAC ±10%, 50/60Hz

DESCRIPTION	CAT. NO.	PRICE
Supelco Mobile Phase Degassing System	55020	



Mobile Phase Reservoir System

This convenient system is made entirely of inert parts: glass, Tefzel, PEEK, and TFE Teflon. Includes 10'/3m of 1/8" OD Teflon tubing, a PEEK bottom-of-the-bottle filter/sparger, a plug, and a 1-liter or 2-liter safety-coated bottle.

DESCRIPTION	CAT. NO.	PRICE
MOBILE PHASE RESERVOIR SYSTEM		
with 1-liter Bottle	55060-U	
with 2-liter Bottle	55061	
ACCESSORIES AND REPLACEMENT PARTS		
Bottom-of-the-Bottle Filter/Sparger, GL-45	55058	
Luer Plug	54983	
Luer to 1/4-28 Adapter	58722	
Safety-Coated Bottle, 1-Liter, GL-45	59324	
Safety-Coated Bottle, 2-Liter, GL-45	59323	
Replacement Cap for 1- or 2-Liter Reservoir System[1], 3 holes, GL-45	55062	
Caps for 1- or 2-Liter Bottle[2] (pk. of 12), solid, GL-45	23170-U	
Cap for Narrow-Mouth Bottle (fits GL-38)[3], 3 holes	A622	
TFE Teflon Tubing, 10'/3m x 1/8" OD	58703	
Flangeless Fittings for 1/8" Tubing (pk. of 5)	58686	
Two-Way Shut-Off Valve, 1/4-28 threads	56704	
Bottom-of-the-Bottle Filter/Sparger, GL-38	A437	

[1] Cap has a Tefzel core with 3 holes (same as in 55060-U).
[2] Solid cap, no hole.
[3] Use with solvent bottles to eliminate transfer step.

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HPLC Accessories

Mobile Phase Degassing / Filtration



Supelco Mobile Phase Filtration Apparatus

Protect your instrument and columns by removing particles and gases from solvents and other mobile phase components. Nylon 66 membrane filters are compatible with all solvents commonly used in HPLC.

Filtration Apparatus 1 (connects to 1000mL sidearm flask) - Includes 250mL glass reservoir, funnel base and stopper, clamp, stainless steel holder and screen, 10 Teflon gaskets, 50 Nylon 6 filters (47mm, 0.45µm pores).

Filtration Apparatus 2 (connects to aspiration line) - Includes 250mL glass reservoirs (2) 34/45 tapered funnel bases (2) 34/45 tapered 1000mL flask and glass cap, clamp, stainless steel holder and screen, 10 Teflon gaskets, 50 Nylon 66 filters (47mm, 0.45µm pores).

DESCRIPTION	CAT. NO.	PRICE
SUPELCO MOBILE PHASE FILTRATION APPARATUS		
Filtration Apparatus 1	58061	
Filtration Apparatus 2	58062-U	
REPLACEMENT GLASS PARTS		
For Filtration Apparatus 1		
Reservoir, 250mL	58063	
Reservoir, 500mL	58074	
Funnel Base and Stopper	58064	
For Filtration Apparatus 2		
Tapered Funnel Base	58068	
Tapered Flask, 1000mL	58070-U	
Tapered Flask, 2000mL	58075	
Cap for Flask	58071	
REPLACEMENT FILTER PARTS FOR BOTH APPARATUS		
Filter Holder and Screen, SS	58065	
Gaskets, Teflon (pk. of 10)	58066	
Filter, Nylon 66, 47mm (pk. of 50)		
0.45µm pores	58067	
0.20µm pores	58060-U	
Clamp, Spring Action	58053	
Vacuum Flask, 1000mL, with Sidearm	Z290459-1EA	

Membrane Filter Disks, fits all 47mm Filtration Units

DESCRIPTION	PORE SIZE (µm)	QTY.	CAT. NO.	PRICE
Nylon 66	0.45	50	58067	
	0.20	50	58060-U	
Teflon	1.0	10	58097	
	1.5	10	58086	
Cellulose	0.22	100	58188	

Nylon 46 Membrane Filters

Hydrophilic, compatible with a wide range of chemicals.

DIAMETER (mm)	PORE SIZE (µm)	QTY.	CAT. NO.	PRICE
25	0.45	100	Z290815-100EA	
47	0.2	100	Z290807-100EA	
47	0.45	100	Z290793-100EA	
90	0.45	25	Z290785-25EA	

Solvents and Solutions Compatible with Nylon 66 and Nylon 46 Filters

RECOMMENDATIONS		
ACIDS		
Acetic acid, 1%		
BASES		
Potassium hydroxide, 6N		
ALCOHOLS		
Amyl alcohol	Ethanol	Isopropanol
Benzyl alcohol	Ethylene glycol	Methanol
Butyl alcohol	Glycerine (glycerol)	Methyl Cellosolve
Butyl Cellosolve	Isobutyl alcohol	Propanol
SOLVENTS		
Acetone	Dimethylformamide	Methyl ethyl ketone
Acetonitrile	Dimethylsulfoxide	Methyl isobutyl ketone
Amyl acetate	Dioxane	Nitrobenzene
Benzene[1]	Ethyl ether	Methylene chloride[1]
Bromoform	Ethylene dichloride	Pentane
Butyl acetate	Formaldehyde	Perchloroethylene
Carbon tetrachloride[1]	Freon 113	Tetrahydrofuran[1]
Cellosolve (2-ethoxyethanol)	Gasoline	Trichloroethylene
Chloroform[1]	Hexane	Toluene[1]
Cyclohexane	Isopropyl acetate	Trichlorethane
Cyclohexanone	Kerosene	Triethylamine
Diethylacetamide	Methyl acetate	Xylene[1]

Note: Controlled vacuum is recommended to prevent boiling of volatile solvents.

[1] Limited stability in neat solvent.

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco





Aura Mobile Phase Filter/Degasser Unit

Attaches to any vacuum line.

Easy-to-use Aura filter/degasser units simultaneously degas solvents and buffers and remove particles. You can eliminate spurious peaks caused by gas bubbles in your detector, and prevent particle damage to check valves and other system components. A clean mobile phase also prolongs column life.

Each unit includes a Teflon filtering/degassing assembly, ten 1.5µm Teflon filter membranes, 40"/1m x 1/4" OD Teflon tubing, and a heavy wall, graduated, borosilicate glass solvent reservoir. Choose either a 1-liter or a 2-liter reservoir.

The standard taper Teflon joint on the filtering assembly fits into Ehrlenmeyer flasks and other containers. The filtering assembly accepts any standard 47mm filter membrane and is compatible with all solvents used in HPLC. Use with appropriate glassware and any vacuum pump.

The Aura filter/degasser is particularly suitable for use with solid phase extraction disks (SPED). It ensures simple disc placement, large filtration area, small restriction to flow from the disk support element, and the convenience and advantages of the liquid inlet tube (allows sediments to be transferred last).

DESCRIPTION	CAT. NO.	PRICE
AURA FILTER/DEGASSER UNIT		
with 1-Liter Reservoir	58094	
with 2-Liter Reservoir	58093	
with No Reservoir	55023	

Inverted Solvent System

- No need to tilt bottle to use the last few milliliters
- Replaceable 2µm frit for in-line filtration
- Vented – maintains reservoir contents at atmospheric pressure
- Built-in sparging frit
- Only solvent-resistant materials (glass, Teflon, KEL-F, stainless steel) contact the mobile phase
- Teflon tubing and low pressure, finger-tight fittings included

DESCRIPTION	CAT. NO.	PRICE
INVERTED MOBILE PHASE RESERVOIR SYSTEM		
with 1-Liter Reservoir	59321	
with 2-Liter Reservoir	59322	
REPLACEMENT PARTS		
Reservoir, 1-Liter	59324	
Reservoir, 2-Liter	59323	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

HPLC Accessories

Mobile Phase Degassing / Filtration, Flow Measurement



ULTRA-WARE Mobile Phase Reservoir System

This five-valve mobile phase reservoir system offers completely integrated filtration, sparging, storage, and delivery of HPLC mobile phases. Valves controlling helium sparge, venting, vacuum (for filtration or degassing), mobile phase recirculation, and mobile phase delivery to the pump inlet are conveniently located on the front of the cap. Tubing connects to the back of the cap, minimizing clutter.

The solvent pickup adapter allows you to use standard 47mm filter membranes. If you use a solvent recycler, you can close off the reservoir to maintain the helium-sparged environment.

A sparge port check valve prevents mobile phase from backing up into the sparging gas lines, and a built-in pressure relief valve prevents accidental over-pressurization. The screw-cap design allows you to remove the cap without kinking the tubing.

DESCRIPTION	CAT. NO.	PRICE
ULTRA-WARE FIVE-VALVE MOBILE PHASE RESERVOIR SYSTEM		
1-Liter	55024	
2-Liter	55025	
5-Liter	55026	
REPLACEMENT PARTS/ACCESSORIES FOR FIVE-VALVE SYSTEM		
1-Liter Reservoir	55027	
2-Liter Reservoir	55028	
5-Liter Reservoir	55029	
Storage Cap with PTFE Liner	55030	
Lower Screw Cap, GL45	55040-U	
Lower Cap Retainer Ring	55039	
O-ring, TFE/Propylene, size 008 (pk. of 2)	55034	
O-ring, size 122 (pk. of 10)	55041	
Upper Screw Clamp	55032	
Valve Stem, Short, CTFE (sparge or pump)	55035	
Valve Stem, Long, CTFE (filter, vent, or recycle valve)	55036	
Drip Tip, PTFE	55037	
Check Valve with Retainer	55038	
Fittings Kit (included with complete system)	55059	

Membranes - Fit all 47mm filtration units

DESCRIPTION	CAT. NO.	PRICE
TEFLON MEMBRANES(PK. OF 10)		
47mm, 1.0µm pores	58097	
47mm, 1.5µm pores	58086	
NYLON 66 MEMBRANES (PK. OF 50)		
47mm, 0.45µm pores	58067	
47mm, 0.20µm pores	58060-U	
CELLULOSIC MEMBRANES (PK. OF 100)		
47mm, 0.22µm pores	58188	



Humonics Model 1000 Liquid Flowmeter

- Easy set-up and operation
- NIST traceable

MODEL	FLOW RANGE (mL/min)	RESOLUTION	CALIBRATION POINTS
1000	0.100 1.999	0.001	1.5, 3, 5 mL/min
	2.00 - 9.99	0.01	
	10.0 - 30.0	0.1	

Humonic's Digital Liquid Flowmeters are accurate, convenient, NIST-traceable flow measuring devices for validating HPLC pumping systems. Simply connect the detector outlet tubing to the flowmeter, route the waste lines to appropriate containers, and you are ready to measure flow rates.

This flowmeter uses digital electronics and infrared optics to make accurate, true volumetric measurements by measuring a rising volume of liquid within a precision-bore glass tube. Each unit is factory calibrated against an NIST-registered burette. The calibration parameters are stored on an internal circuit which cannot be modified by the user.

CE approved.

DESCRIPTION	CAT. NO.	PRICE
110VAC	55090-U	
220VAC	55093	

NOTE: Do not use ULTRA-WARE system with tetrahydrofuran, chlorinated hydrocarbons, ethers, or ketones. Please inquire about units resistant to these solvents.



10µm Slip-On Inlet Filter

Universal design.

We recommend this filter for solvent inlet applications. The 10µm filter protects the HPLC system from contamination while minimizing pump cavitation problems. Compatible with the 1.5mm ID tubing used with many HPLC pumps. Also fits the 2.2mm ID tubing used with Varian pumps and the 3.0mm ID tubing used with Waters pumps. 316 stainless steel tip and filter element connected by a KEL-F collar.

DESCRIPTION	CAT. NO.	PRICE
10µm Slip-On Inlet Filter	59277	

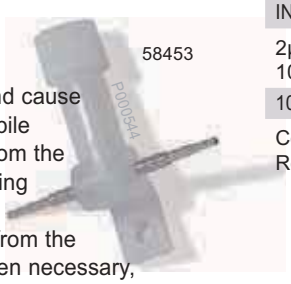


2µm Stainless Steel Inlet Filter

All stainless steel construction with a 2µm porous filter element, 11/16"/1.7cm diameter. 1/8" pipe.

DESCRIPTION	CAT. NO.	PRICE
2µm Stainless Steel Inlet Filter	58267	
1/8” x 1/16” union and fittings	22999	
1/8” x 1/8” union and fittings	22041	
Optional Teflon ferrules:		
1/8” front (10 pack)	22058	
1/8” back (10 pack)	22059	
1/16” front (5 pack)	22068	
1/16” back (5 pack)	22069	

Mobile Phase Debubbler



Universal design.Gas bubbles in the mobile phase reduce pump output and cause check valves to malfunction. The mobile phase debubbler removes bubbles from the pump inlet line. Bubbles in the incoming mobile phase rise in the debubbler, displacing an equal volume of liquid from the debubbler reservoir to the pump. When necessary, simply remove the cap and refill the reservoir – the gas-liquid interface is visible through the housing. Compatible with 1.5mm ID and 3.0mm ID Teflon tubing used with Waters and other popular HPLC pumps. KEL-F, Teflon, and 316 stainless steel construction.

DESCRIPTION	CAT. NO.	PRICE
Mobile Phase Debubbler	58453	



Biocompatible Inlet Filters

Bottom-of-the-Bottle 2µm Filters- These Upchurch filters have an integrated 2µm PEEK sparging frit. Connect to 1/8" tubing through push-on connectors.

Integrated 2µm/10µm Filter/Spargers-The unique design of these PEEK and Teflon filter/spargers allows you to use all but the last few milliliters of mobile phase. Two sparging filters in each unit ensure efficient helium sparging. The slip-on design accepts all common 1/8" OD tubing (1.5mm, 2.2mm, and 3.0mm ID).

10µm Inlet Filter - This metal-free Upchurch unit consists of a replaceable 10µm ultra-high molecular weight polyethylene filter that screws into a Tefzel holder. The unit connects to the inlet tubing through a flangeless Tefzel fitting (included).

DESCRIPTION	CAT. NO.	PRICE
BOTTOM-OF-THE-BOTTLE 2µm FILTERS		
28mm Filter Diameter, for GL-45	55058	
23mm Filter Diameter, for GL-38	A437	
INTEGRATED FILTER/SPARGER		
2µm	55021	
10µm	55022	
10µm INLET FILTER		
Complete Assembly	56705	
Replacement Filters (pk. of 5)	56706	

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HPLC Accessories
Vacuum Pumps

PIAB Lab Vac Vacuum Pumps

Safe, maintenance-free air-driven pumping systems for filtering and degassing mobile phases.

PIAB Lab Vac air-driven pumping systems can be used for filtration, degassing, rotary evaporation, and many other laboratory applications. Lab Vac units are designed for safe, quiet, efficient, virtually maintenance-free operation – there is no oil to change and no electric motor to spark or wear out.

The Lab Vac's multi-stage, ejector-style vacuum pump creates vacuum by passing compressed air through a series of three nozzles. As air passes from one nozzle to the next, a vacuum is created around the nozzle in each successive chamber, like in a water aspirator. Standard moving parts are made from ethylene-propylene diene monomer (EPDM), and are designed for long life. In Supelco laboratories, we have used PIAB vacuum systems for several years with NO maintenance required. Note that we recommend installing a solvent trap in the vacuum line, to avoid drawing solvent vapors into the Lab Vac unit. Add a 40µm particle filter if your air supply might contain particulate matter and/or a 0-100psi pressure regulator if there is no pressure regulation on your air supply.



SPECIFICATIONS						
	Attainable Absolute Pressure			Inches Hg Below	Air Consumption	Optimum Inlet Air
PIAB Unit	Inches Hg	kPa	Torr	Atmosphere	(scfm)	(psi)
LVX5	2.1	7.1	53	-28.1	0.76	72
LVX10	2.1	7.1	53	-28.1	1.5	72
LVX20	2.1	7.1	53	-28.1	3.1	72
LVX40	1.5	5.1	38	-28.7	5.3	87
LVH40	0.4	1.5	11	-29.5	5.5	87

100% vacuum = 0kPa, –29.9 inches mercury.

Each unit includes an inlet pressure gauge and a vacuum gauge, mounted on the unit. A selection of PIAB High Speed (quick-connect) fittings are included, to enable you to connect the unit to a variety of tubing sizes. Nipple-style adapters are included for use with vacuum tubing (not included). Also included are 6' (1.8 meters) of compressed air hose, 1' (0.3 meter) of vacuum tubing, and hose clamps for easy connection to your laboratory compressed air supply (with or without the optional in-line pressure regulator). Screws for wall mounting also are included.

Accessories

Vacustat Pressure Monitor/Controller - Any Lab Vac pump can be easily equipped with the Vacustat pressure monitor. The Vacustat monitor shuts off the vacuum pump when the system reaches a set vacuum level. When the vacuum level falls below the setpoint, the Vacustat reactivates the Lab Vac.

Particle Filter - This in-line filter removes particles which can clog a PIAB Lab Vac unit. Use it if your compressed air might contain particles (many house air lines do). Order the filter element repair kit for periodic maintenance.

Pressure Regulator - Install this 0-100psi regulator in-line, before the Lab Vac unit, to allow proper regulation of inlet pressure. Includes a 0-100 pressure gauge and PIAB quick-connect hose connections for inlet and outlet tubing.

HELPFUL HINTS

Use a Model PIAB LVX5 Lab Vac with any of the mobile phase filtration units on the previous pages.
Use a Model LVX40 or Model LVH40 with our Visiprep solid phase extraction manifolds.

DESCRIPTION	CAT. NO.	PRICE
PIAB LAB VAC PUMPS		
Model LVX5	506141	
Model LVX10	506168	
Model LVX20	506176	
Model LVX40	506184	
Model LVH40	506192	
ACCESSORIES		
Vacustat Pressure Controller	506206	
Particle Filter, 40µm porosity	24990-U	
Element Repair Kit for 24990-U	24991	
Pressure Regulator, 0-100psi	506214	

Supelco Solvent Recovery Systems

Recover and reuse clean mobile phase, dispose of only contaminated mobile phase.

- Reduce solvent purchase and disposal costs
- Save money, mobile phase preparation time, and the environment

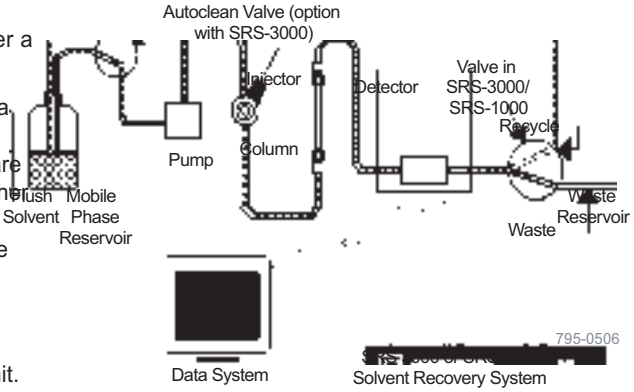




Supelco SRS-3000 and SRS-1000 Solvent Recovery Systems can save money and time in any isocratic analysis. A microprocessor-controlled solvent switching valve monitors detector output and directs the solvent to the waste reservoir only when a peak is detected (Figure A). When the baseline falls below the threshold you select, the uncontaminated solvent is directed back to the mobile phase reservoir. In a typical isocratic analysis, 80-90% of the mobile phase is uncontaminated and can be recycled (Figure B). Settings for threshold, detection range, and delay time enable you to precisely control the switching valve.

In addition to the basic features mentioned above, the SRS-3000 unit offers validation output (included), an Autoclean option (see below), and storage for up to 10 method files. The validation output provides a continuous, auditable data trail of the solvent recycling valve position, for GMP, GLP, or ISO-9000 protocols. The valve position is recorded by superimposing tick marks over a separate copy of the chromatographic signal.

Figure A. Installation Is Simple



1. Connect SRS-3000 or SRS-1000 unit to detector signal output (cable is included).
2. Connect SRS-3000 or SRS-1000 unit to mobile phase and waste reservoirs and detector (Teflon tubing is included).
3. Set the threshold value and begin saving time and money.

Autoclean Valve - The SRS-3000 system also is available with a valve that enables you to select a different solvent to flush the HPLC system. The Autoclean valve is especially useful if you are using a single pump with mobile phases containing buffer or other salts. The Autoclean valve installs between the mobile phase reservoir and the pump. It has two inlet lines, one for the mobile phase and one for the wash solvent. The valve can be factory installed, or you can order it separately and install it yourself.

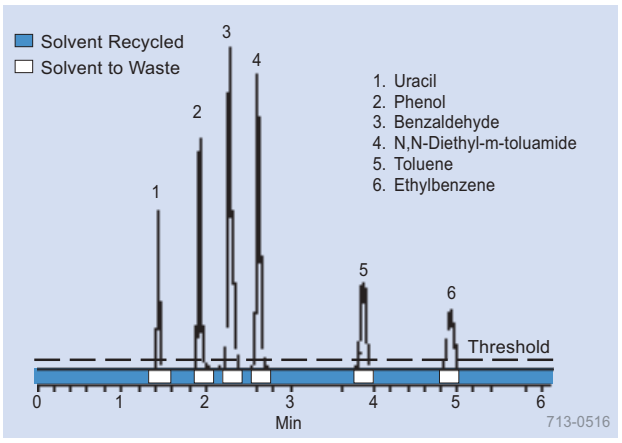
Economy-Priced Unit - The economically priced SRS-1000 includes the same solvent-saving features as the SRS-3000 unit. A simpler display and no advanced features (no validation output, Autoclean option, or method storage memory) allow us to keep the price substantially lower.

Both Systems are Ready to Use - Both systems include a control unit with switching valve, a power cord, a 2-lead signal cable (+/–), Teflon tubing and fittings, and an instruction manual.

In addition to these components, the SRS-3000 system with the Autoclean valve has the wash valve, additional tubing and fittings, a wash start cable, and a pump remote stop cable.

The SRS-3000 and SRS-1000 units meet all CE requirements. The SRS-1000 units also meet UL and CSA requirements.

Figure B. Recover 80% or More of the Mobile Phase Used In an Isocratic Analysis



DESCRIPTION	CAT. NO.	PRICE
SRS-3000 Solvent Recovery System[1]	57431	
SRS-3000 System with Autoclean[1]	57432	
Autoclean retrofit kit	57433	
Switching valve assembly for SRS-3000 unit	57435	
SRS-1000 Solvent Recovery System[1]		
110VAC	506125	
220VAC	506133	

[1]CE approved.

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HPLC Accessories
Temperature Control

Eppendorf HPLC Temperature Control Systems

Column temperature control leads to:

- More reproducible retention times
- More stable baselines
- Faster analyses
- Less system wear

Column temperature control is essential to reproducible retention times and detector baseline stability in reversed phase, normal phase, ion exchange, and size exclusion liquid chromatography. The temperature variation in most labs – a 3-4°C daily fluctuation – is sufficient to cause errors in quantification or peak identification, particularly in automated systems and systems incorporating temperature-sensitive detectors.

To enable you to design a temperature control system that best matches your needs, we offer these Eppendorf heaters and control Model CH-500 incorporates both heat and control functions; Models CH-30, CH-430, and CH-460 heaters (next page) MUST be connected to a separate controller.

SPECIFICATIONS				
FOR TEMPERATURE CONTROLLERS				
Model:	CH-500 [1]	TC-45	TC-50	TC-55 [2]
Temperature Range:	amb.-150°C	30-65°C	amb.-150°C	amb.-150°C
Readability:	0.1°C	5°C	0.1°C	0.01°C
Setability:	0.1°C	5°C	0.1°C	0.01°C
Set Control:	10 turn potentiometer	8 DIP switches	10 turn potentiometer	membrane switches or RS-232
Typical Stability:	±0.1°C	±0.1°C	±0.1°C	±0.01°C
Absolute Accuracy:	±1°C (50°C)	±1°C (50°C)	±1°C (50°C)	±1°C (50°C)
Display:	3 1/2 digit LED	DIP switches	4 digit LED	5 digit LED each
Power:	120/240VAC	120/240VAC	120/240VAC	120/240VAC

FOR COLUMN HEATERS			
Model:	CH-30, CH-500 [1]	CH-430	CH-460
Temperature Range:	amb.-150°C	amb.-150°C	amb.-150°C
Length: [3]	≤30cm	≤30cm	≤50cm
OD:	CH-30: ≤1/2" OD CH-500: two 1/2" OD plus two 1/8" OD	≤1/2" OD (four)	≤1/2" OD (four)
Injector Heating:	No	Yes (two)	Yes (two)
Power:	120/240VAC	120/240VAC	120/240VAC
Sensor:	1000 ohm RTD	1000 ohm RTD	1000 ohm RTD
Element:	125W	300W	500W

[1] Heater/controller (combined).

[2] Model TC-55 can control 2 heaters independently.

[3] Not including endfittings.

[4] Heating channels for 1/8" columns can be used to heat solvent before it enters the injector.



CH-500 HPLC Column Heater System

This heater/controller essentially combines the features of the CH-30 heater and the TC-50 controller in a single unit. It includes Eppendorf's innovative reversible heating blocks and remote heater on/off capability. Alternatively, the heating channels for 1/8" columns can be used to heat solvent before it enters the injector.

CE/CSA/UL approved.

CH-500 HEATING COLUMN COMBINATIONS
Two 1/4" x ≤30cm and two 1/8" x ≤30cm columns.
One 3/8" x <30cm column and 1/4" x <30cm column and one 1/8" x <30cm column.
One 1/2" x <30cm column and 1/4" x <30cm column and one 1/8" x <30cm column.
Two 3/8" x <30cm columns.
Two 1/2" x <30cm columns.
One 3/8" x <30cm column and one 1/2" x <30cm column.

DESCRIPTION	CAT. NO.	PRICE
CH-500 COLUMN HEATING SYSTEM		
120V	500844	
240V, with standard European cord	500852	
240V, with UK cord	500860	
REPLACEMENT HEATING BLOCKS FOR CH-500		
4" (pk. of 2)	500879	
1" (pk. of 2)	500895	

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Eppendorf TC-45 Temperature Controller

This low-cost controller will control a CH-30, CH-430, or CH-460 Eppendorf heater from 30-65°C. Temperature is set via DIP switches in 5°C increments.

DESCRIPTION	CAT. NO.	PRICE
120V	56760-U	
240V[1]	500763	



Eppendorf TC-50 Temperature Controller

Controls a CH-30, CH-430, or CH-460 Eppendorf heater from ambient temperature to 150°C. Temperature is set via a 10 turn potentiometer. The set point and actual temperature are displayed on an LED display. Includes remote heater on/off capability and solid state control.

DESCRIPTION	CAT. NO.	PRICE
120V	56762	
240V[1]	500771	



Eppendorf TC-55 Temperature Controller

This top-of-the-line controller will control up to two CH-30, CH-430, or CH-460 Eppendorf heaters, using microprocessor technology. Proportional heating is used to maintain very stabile temperatures. Temperature is set via up/down membrane switch (1 set for each of 2 ovens).
Set point and actual temperature are displayed on an LED display. Includes an RS-232 interface for external control of temperature programming, recording, etc.

DESCRIPTION	CAT. NO.	PRICE
120V	56764	
240V[1]	500798	



Eppendorf CH-30 Column Heater

Holds one column up to 1/2" OD or two columns up to 3/8" OD. Maximum column length is 30cm (not including endfittings).

DESCRIPTION	CAT. NO.	PRICE
120V	56766	
240V[1]	500801	



Eppendorf CH-430 Column Heater

The model CH-430 column heater is like the model CH-30, except that it is wider, to accommodate up to four 30cm long columns (not including endfittings). The CH-430 heater also has provisions for heating two 7000 series Rheodyne valves.

DESCRIPTION	CAT. NO.	PRICE
120V	56768	
240V[1]	500828	



Eppendorf CH-460 Column Heater

The model CH-460 is like the model CH-430, except that it is longer, to accommodate up to four 50cm long columns (not including endfittings). The CH-460 heater also has provisions for heating two 7000 series Rheodyne valves.

DESCRIPTION	CAT. NO.	PRICE
120V	56770-U	
240V[1]	500836	
COLUMN ENVELOPES FOR CH-30, CH-430, OR CH-460 COLUMN HEATERS		
1/4 OD (in.)	56772-U	
3/8 OD (in.)	56773	
1/2 OD (in.)	56774-U	

[1] Does not have a CE mark.

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HPLC Accessories
Pump Replacement Parts

Optimize Technologies
Pump Replacement Parts

A preventative maintenance program that includes routine replacement of pump parts that are subject to wear will help you avoid costly downtime. These Optimize Technologies check valves, seals, and pistons meet or exceed the pump manufacturer's specifications.

If you don't see the parts you need, or your instrument model isn't listed – just call us.



OPTI-MAX Cartridge Check Valves - An economical and very convenient way to maintain and repair check valves – after initially purchasing the stainless steel inlet or outlet housing (one cartridge is included), simply purchase replacement cartridges in packs of two.

We recommend a stainless steel cartridge with a ruby ball/sapphire seat for most applications, but a ceramic ball/sea offers longer life when you are using high concentrations of acetonitrile. Change every 6 months.

Traditional Check Valves - Direct replacements for the manufacturer's original valves, factory assembled in a clean-room environment. Rebuild kits are available. Change every 6 months.

OPTI-SEAL Pump Seals - Made from an inert, ultra-high molecular weight polyethylene material (UHMW-PE). Relative to conventional Teflon seals, these seals show less particle shedding. This reduces the potential for clogged frits, saving you downtime system downtime. We recommend these seals for typical reversed phase mobile phases (aqueous to moderate levels of organic). Not recommended for long-term use with highly organic mobile phases, such as typical normal phase solvents.

UHMW-PE seals are relatively hard, and will not seal well on worn plungers. We recommend that you install a new plunger when yo initially switch to using UHMW-PE seals. Change every 3 months.

ITB (Teflon) Seals - Made from PTFE, ITB pump seals are especially recommended for mobile phases with a high organic concentration, such as typical normal phase mobile phases. ITB seals are soft and will not last as long as UHMW-PE seals. Unlike UHMW-PE seals, ITB seals will conform to out-of-round plungers. Change every 3 months.

Plungers (Pistons) - Made to exacting standards, these high quality sapphire plungers reduce seal wear, which means less system dow time. Replace once a year, and when you initially switch to using UHMW-PE seals.

Pump Replacement Parts

MANUFACTURER/MODEL	DESCRIPTION	REPLACES MFR. NO.	CAT. NO.	PRIC
AGILENT/HP				
HP-1050,1100[2]	OPTI-MAX outlet check valve cartridge system, SS	01018-60008	59456	
	OPTI-SEAL pump seal	5062-8516	59409	
	Sapphire plunger	55062-2441	59408	
HP-1090	OPTI-SEAL pump seal	5062-2494	59397	
	OPTI-SEAL pump seal (pk. of 10)		59398	
BECKMAN[3]				
100A, 110A/B, 112, 112M, 114, 114M, 116, 118, 125, 126, 127, 128	OPTI-MAX inlet check valve cartridge system, SS	240720	59454	
	OPTI-MAX outlet check valve cartridge system, SS	240721	59455	
100A, 110A/110B	OPTI-SEAL pump seal	887138	59405	
110A/110B, 112/112M	Piston	243053	59402	
HITACHI[4]				
655, L6000, L6200, L6200A	OPTI-MAX inlet check valve cartridge system, SS	885-1330	59457	
	OPTI-MAX outlet check valve cartridge system, SS	885-1331	59458	
	OPTI-SEAL pump seal	655-1080	59407	
	Piston	810-1033	59406	

[1] Recommendation for general preventive maintenance. Depending on your applications, more frequent replacement could be necessary.
[2] Takes 1/8" replacement cartridge. See next page.
[3] Takes 3/16" replacement cartridge. See next page.
[4] Takes 1/16" replacement cartridge. See next page.

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Pump Replacement Parts (contd.)

MANUFACTURER/MODEL	DESCRIPTION	REPLACES MFR. NO.	CAT. NO.	PRIC
LDC/MILTON ROY[2]				
All Analytical Pumps	OPTI-MAX inlet check valve cartridge system, SS	900947001	59490-U	
	OPTI-MAX outlet check valve cartridge system, SS	900947002	59491	
	OPTI-SEAL pump seal	206234	59492	
	Plunger	801306	500593	
PERKIN-ELMER[2]				
250, Series 4, 200, 400, 410, 620, Integral 400 0	OPTI-MAX inlet check valve cartridge system, SS	0254-0177	59459	
	OPTI-MAX outlet check valve cartridge system, SS	0254-0197	59460	
	OPTI-SEAL pump seal	0990-7324	59461	
Series 1, 2, 3, 3B, 10	OPTI-SEAL pump seal	0990-7324	59461	
SHIMADZU[2]				
LC-6A, LC-10AS	OPTI-MAX inlet check valve cartridge system, SS	228-12353-91	59465-U	
	OPTI-MAX outlet check valve cartridge system, SS	228-09054-93	59466	
	OPTI-SEAL pump seal	228-11999-00/ 228-21975-00	59468	
LC-6A	Plunger	228-12904-93	59467	
LC-10AS	Plunger	228-17019-93	59473	
SPECTRA-PHYSICS[2]				
8700, 8800, 8810, IsoChrom, P-Series	OPTI-MAX inlet check valve cartridge system, SS	A3495-010	59475	
	OPTI-MAX outlet check valve cartridge system, SS	A3490-010	59476	
	OPTI-MAX transducer check valve cartridge system, SS	A3990-010	59493	
8800, 8810, Isochrom, P-Series	Improved ruby piston	A3102-010	59477	
	OPTI-SEAL pump seal	A2962-010	59478	
8700, 8700XR, 8750	OPTI-SEAL pump seal	A1703-020	59479	
VARIAN[2]				
2010	OPTI-MAX inlet check valve cartridge system, SS	00-997-261-09	59480-U	
	OPTI-MAX outlet check valve cartridge system, SS	00-997-261-10	59481	
	Sapphire piston	00-997-261-08	59482	
WATERS[2]				
M45, M45G, M501, 510, 515, 590,600, 600E, 610, 6K, 6KA	OPTI-MAX inlet check valve cartridge system, SS	33679	59484	
	OPTI-MAX outlet check valve cartridge system, SS	25216	59485-U	
	OEM inlet check valve (all except 515)	25214	59376	
	Inlet rebuild kit (repairs two OEM valves)	60495	59377	
	OEM outlet check valve (all except 515)	25216	59380-U	
	Outlet rebuild kit (repairs two OEM valves)	26014	59381	
	OEM actuator outlet check valve (510, 590, 610 only)	26016	59378	
	Actuator rebuild kit (repairs 2 OEM valves)	26014	59379-U	
	OPTI-SEAL pump seal	22934	59388	
	OPTI-SEAL pump seal (pk. of 10)	22934	59389	
	ITB black piston seal	26613	59422	
	ITB red piston seal (pk. of 10)	25638	59369	
M45, M45G, M501	Plunger	26524	59387	
510, 590, 600, 600E, 610, 6K, 6KA	Plunger	25656	59386	
OPTI-MAX REPLACEMENT CARTRIDGE – ALL MANUFACTURERS				
	PEEK cartridge, 1/8" ruby ball/sapphire seat (pk. of 2)		59370-U	
	PEEK cartridge, 1/8" ceramic ball and seat (pk. of 2)		59371	
	SS cartridge, 1/16" ruby ball/sapphire seat (pk. of 2)		59494	
	SS cartridge, 3/16" ruby ball/sapphire seat (pk. of 2)		59495	
	SS cartridge, 1/8" ruby ball/sapphire seat (pk. of 2)		59496	

[2] Takes 1/8" replacement cartridge.

Other pump replacement parts are available on request.

HELPFUL HINTS

During replacement, take care to avoid contaminating your check valves with dust or other particles.

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HPLC Accessories
Pump Replacement Parts

ASI Pump Replacement Parts

Analytical Scientific Instruments (ASI) cartridge check valve design offers self-priming convenience, rugged, crush proof construction, most rapid response time (ball seats more quickly, for less pulsation and a more stable flow), and replaceable outlet filters (to protect system from particles). If your pump model is not listed, please call us.

MANUFACTURER/MODEL	DESCRIPTION	REPLACES MFR. NO.	CAT. NO.	PRICE
AGILENT/HP				
1090	Inlet cartridge		504734	
BIO RAD				
1330, 1350	Inlet check valve (complete assembly)	125-0306	501190	
	Inlet cartridge		501204	
	Outlet check valve (complete assembly)	125-0307	501891	
	Outlet cartridge		501905	
	UHMW PE[1] pump seal (each)	125-0302	501921	
	Piston	125-0304	501948	
ELDEX				
A, B, E	Inlet check valve (complete assembly)		501956	
	Inlet cartridge		501964	
	Outlet check valve (complete assembly)		501972	
	Outlet cartridge		502006	
	Filters for outlet check valve (pk. of 5)		501913	
GILSON				
5S, 10S, 5SC, 10SC	Inlet check valve (complete assembly)		502855	
	Inlet cartridge		501964	
	Outlet check valve (complete assembly)		502871	
	Outlet cartridge		502006	
	Filters for outlet check valve (pk. of 5)		504068	
5S, 5SC	UHMW PE pumpseal (each)	5463088063	504653	
	Piston	350008	504661	
10S, 10SC	Piston	365009	504696	
SSI				
200, 220, 222, 300	Inlet check valve (complete assembly)		504793	
	Outlet check valve (complete assembly)		504866	
	Outlet cartridge		501905	
	Filters for outlet check valve (pk. of 5)		501913	
200, 220, 222	Piston	120101	505153	
	Piston for pumps with self flush option	120567	505242	
300			505250	
WATERS				
M-45, 501, 510, 590, 600E, 6000	Inlet check valve (complete assembly)		505277	
	Inlet cartridge		501204	
	Outlet check valve (complete assembly) (all EXCEPT M501, 600E)		505382	
	Outlet cartridge		501905	
	Filters for outlet check valve (pk. of 5)		501913	
	UHMW PE pump seal (each)	26613	505420	
	Piston (M-45, 501 ONLY)	26524	505439	
	Piston (M-510, 590, 600, 6000 ONLY)	25656	505447	
Extended Flow 510EF,	Inlet check valve (complete assembly)		505455	
	Outlet check valve (complete assembly)(all EXCEPT 600EF)		505498	
	Outlet check valve (complete assembly) (600EF ONLY)		505609	
	Outlet cartridge		501905	
	Filters for outlet check valve (pk. of 5)		501913	

[1] UHMW PE - ultra-high molecular weight polyethylene1

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Postcolumn Reactor

Increase detection sensitivity for amino acids, proteins, carbohydrates, pesticides, inorganic ions, other samples.

The heated reactor cartridge in the ASI Model 310 Postcolumn Reactor Module mixes reagent with column effluent efficiently and with minimum peak dispersion. Unlike conventional Teflon tube coil reactors, the rugged reactor cartridge can be used at pressures up to 3000psi, at 150°C, without rupturing. We recommend using a low volume static mixer, such as the binary input housing/mixer cartridges listed on this page, with the Model 310 module. Install the mixer in line, prior to the reactor cartridge, to combine the reagent with the column effluent. A pump is required for delivering reagent to the system.

SPECIFICATIONS	
Reactor Cartridge Volume:	0.15mL, 0.50mL, or 1.0mL
Sample-Contacting Materials:	Teflon, 316 stainless steel
Maximum Pressure:	3000psi at 150°C
Oven Temperature Range:	10°C above ambient to 150°C
TemperaturE Control:	solid state controller with LED display
Dimensions:	12" x 9" x 6"
Power:	120 VAC (50-60Hz), 220 VAC, or 100 VAC

DESCRIPTION	CAT. NO.	PRICE
HEATER MODULE WITH 0.15mL REACTOR		
120 VAC	54974	
HEATER MODULE WITH 0.50mL REACTOR		
120 VAC	54976	
HEATER MODULE WITH 1.0mL REACTOR		
120 VAC	54973	
220 VAC[1]	54981	
HEATER MODULE ONLY		
120 VAC	54970-U	
220 VAC[1]	54971	
REACTOR CARTRIDGE (FITS ALL HEATER MODULES)		
0.15mL	54978	
0.50mL	54979	
1.0mL	54980-U	

[1] Does not have a CE mark.



ASI Static Mixers for HPLC and Postcolumn Derivatization

- Reduces baseline noise.
- Increases sensitivity.
- Increases reaction efficiency in postcolumn derivatization.
- Improves accuracy in gradient mixing for microbore analyses.

A highly efficient cross-flow shearing mechanism in the ASI static mixer produces vortex mixing over a wide range of flow rates. Use the binary input housing to combine two flowpaths into one, such as in postcolumn or gradient mixing applications. Use the in-line housing when additional mixing is needed in a single flowpath. Within each product series (Micro, Low and High volume) the mixer cartridges are interchangeable. We recommend the 250µL cartridge for large peak volumes, and the 50µL or 150µL sizes for smaller volumes. Use the Micro-Mixer Cartridges only with Micro-Mixer Housings and the Low Volume Mixer Cartridges only with the Low Volume Mixer Housings.

Component Assemblies:
Choose a Housing and a Cartridge within each volume group. In-Line, Binary or Ternary refers to the number of lines going into the mixer Housing 1, 2 and 3 respectively.

DESCRIPTION	VOLUME	CAT. NO.	PRICE
MICRO-MIXER (2 – 25µL)			
Housing, In-Line, SS		56665-U	
Housing, Binary, SS		56666-U	
Housing, Ternary, SS		56667-U	
Cartridge, SS	2µL	56661-U	
Cartridge, SS	5µL	56662-U	
Cartridge, SS	10µL	56663-U	
Cartridge, SS	25µL	56664-U	
LOW VOLUME MIXER (50 – 250µL)			
Housing, In-Line, SS		57548	
Housing, Binary, SS		57549	
Housing, Ternary, SS		500488	
Housing, In-Line, PEEK		500496	
Housing, Binary, PEEK		500518	
Housing, Ternary, PEEK		500526	
Cartridge, SS	50µL	57545	
Cartridge, SS	150µL	57546	
Cartridge, SS	250µL	57547	
Cartridge, PEEK	50µL	500445	
Cartridge, PEEK	150µL	500453	
Cartridge, PEEK	250µL	500461	
HIGH-FLOW (HIGH VOLUME) MIXERS, COMPLETE ASSEMBLIES			
In-Line, SS	350µL	500534	
In-Line, SS	500µL	500550	
Binary, SS	500µL	500569	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

HPLC Accessories
Postcolumn Reaction

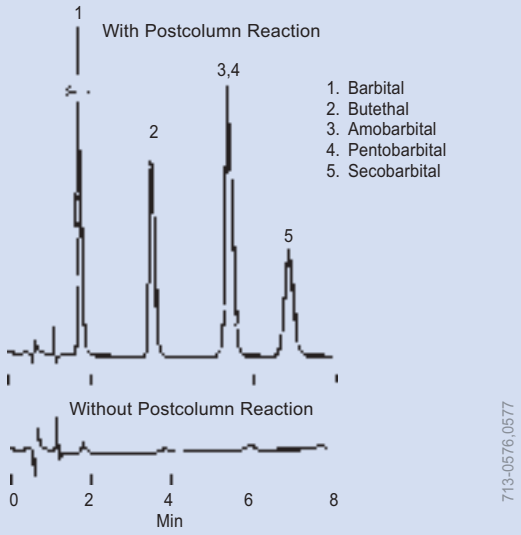
Assemble Your Own System and Save!

The equipment needed to perform postcolumn reactions can be relatively simple. These components enable you to easily and economically construct your own system. We recommend using a 5cm x 4.6mm column filled with 250µm beads when peak volumes are large. Our Mixing Column Hardware Kit (Cat. No58319), contains a 5cm x 4.6mm ID column blank, two fittings, two frits, and 2"/5cm of 1/16" tubing. For small peak volumes, use a column filled with 75µm beads, or a single bead string reactor (30cm of 0.5mm ID Teflon tubing filled with 250µm beads).

Use our ready-to-use single bead string reactors, or prepare your own from our TFE Teflon tubing, 1/16" internal union, and silanized glass wool (for terminating the reactor). The delay tubes (Cat. No. 59206 and 59207) are knitted Teflon tubing.

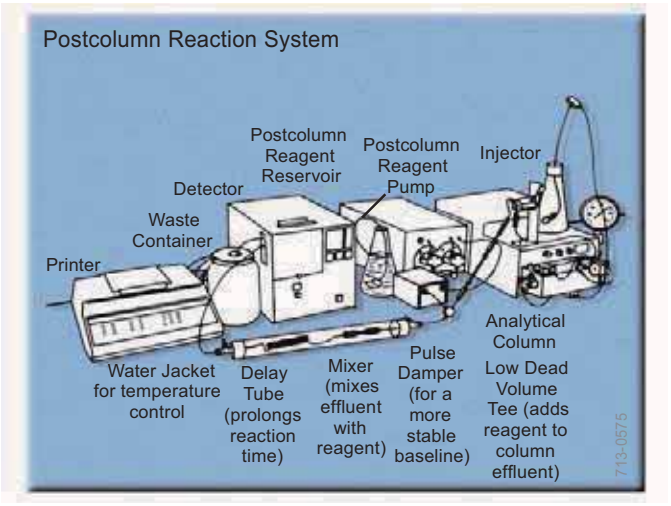
Improve sensitivity for amino acids, proteins, carbohydrates, inorganic ions, pesticides, and other samples. In postcolumn reactions, column effluent is mixed with a reagent before it enters the detector. The reaction can increase detection sensitivity or enable you to use more selective conditions (e.g., a different UV wavelength). The reaction can be as simple as changing the pH of the effluent, but the results often are significant. A postcolumn reaction system can be used to perform derivatizations or other reactions. It can be used with fluorescence, electrochemical, conductivity, and UV/visible detectors.

Postcolumn pH Change Greatly Improves Barbiturates Detection



Deprotonization of barbiturates, an instantaneous reaction, gives a twenty-fold increase in sensitivity. The reaction also improves selectivity by shifting the UV absorption maximum from 220nm to 240nm.

Column:	SUPELCOSIL LC-8, 15cm x 4.6mm, 5µm particles
Cat. No.:	58220
Mobile Phase:	methanol:water (50:50)
Flow Rate:	1.5mL/min
Postcolumn Reagent:	0.05M H_3BO_3, 0.05N NaOH (pH 10.4)
Reagent Flow Rate:	0.1mL/min
Mixer:	5cm x 4.6mm column of 75µm glass beads
Det.:	UV, 240nm, 0.04 AUFS
Inj.:	20µL mobile phase, 0.1µg each drug



Postcolumn Reaction System Components

DESCRIPTION	CAT. NO.	PRICE
GLASS BEADS, 25g		
Acid Washed, 75µm	59200-U	
Acid Washed, 250µm	59202	
Acid Washed/Silanized, 75µm	59201	
Acid Washed/Silanized, 250µm	59203	
DELAY TUBES (10'/3m)		
0.5mm ID	59206	
0.8mm ID	59207	
Pulse Damper, LO-Pulse	58455	
Tee, Low Dead Volume	58283	
SINGLE BEAD STRING REACTORS		
Acid Washed Beads	59204	
Acid Washed Silanized Beads	59205	
Mixing Column Hardware Kit	58319	
TFE TEFLON TUBING (1/16"/1.58mm OD, 10'/3m)		
0.3mm ID	58702	
0.5mm ID	58701	
0.8mm ID	58700-U	
ACCESSORIES		
Internal Union, 1/16"	22997-U	
Glass Wool, Silane Treated	20411	
Column Water Jacket	58450-U	

PHRED: Photochemical Reactor Enhanced Detection

Improve detection of barbiturates (1,5), amino acids, peptides, and proteins (2), and a wide variety of other compounds (3, 4, 6, 7), in the presence of interfering matrix components, or when present at low concentrations.

Some pharmaceutical and biological analytes exhibit UV absorption maxima at wavelengths at which impurities are also absorptive. This is especially true at short wavelengths (e.g., 220nm). Serum and urine samples, for example, often contain components that interfere with detection at shorter wavelengths. With post-column photochemical reaction, longer UV wavelengths can be used to detect barbitals (1). In addition, a photochemical reactor potentially can be used to increase detector sensitivity for certain analytes that exhibit limited solubility in a desired solvent, and so must be monitored at unsatisfactorily low concentrations.

Placed between the HPLC column and the detector, the PHRED unit performs continuous on-line photolytic derivatization. The unit consists of a 254nm low-pressure mercury lamp (15W) and lamp holder and a holder for the reactor coil (order the appropriate reactor coil separately).

DESCRIPTION	CAT. NO.	PRICE
PHRED Photochemical Reactor, 110V	57400-U	
Replacement Lamp Bulb	57401	
KNITTED REACTOR COILS		
5m x 0.25mm ID (0.25mL)	57402	
10m x 0.25mm ID (0.5mL)	57403	
15m x 0.25mm ID (0.75mL)	57404	
20m x 0.25mm ID (1.0mL)	57410-U	
5m x 0.50mm ID (1.0mL)	57405	
10m x 0.50mm ID (2.0mL)	57406	
15m x 0.50mm ID (3.0mL)	57407	
20m x 0.50mm ID (4.0mL)	57411	
Reflective Support Plate, Stainless Steel	57408	

References

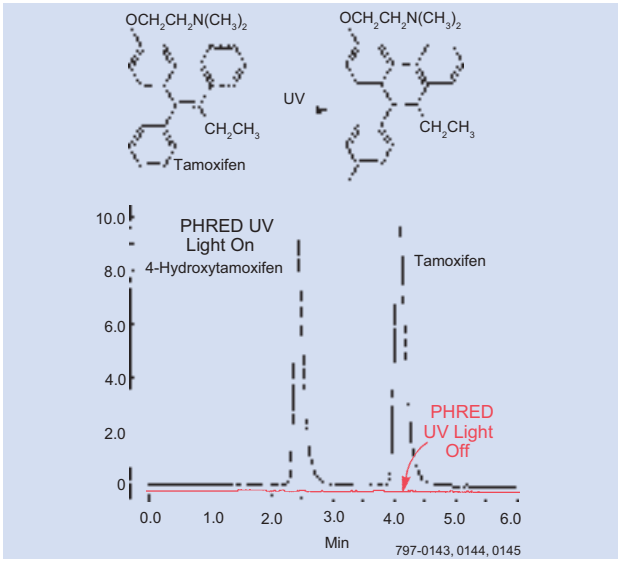
1. C. Wolf, R. W. Schmid, J. Liq. Chromatogr.13: 2207 (1990).
2. L. Dou, I. S. Krull, Anal. Chem.62: 2599 (1990).
3. W. J. Bachman, J. Stewart,LC/GC7: 38 (1989).
4. Krull, I.S., C.M. Selavka, M. Lookabaugh, W.R. Childress,LC/GC7: 758 (1989).
5. The Reporter XII, #4, pp. 6-7.
6. H. Joshua,American Laboratory,April 1995, p. 36J.
7. The Reporter , Vol.16, no. 3, p. 9.

References 1-4, 6 not available from Supelco.

HELPFUL HINTS

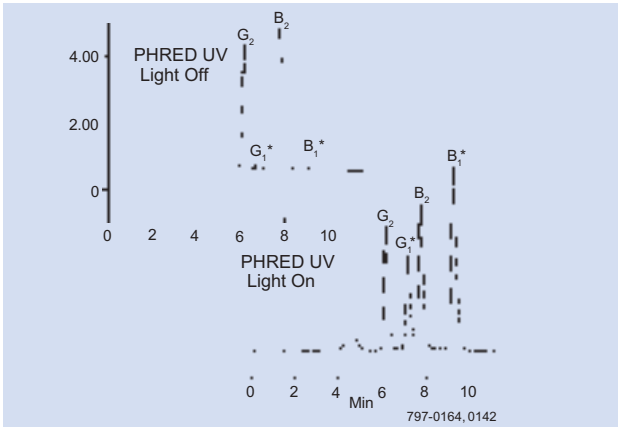
Please inquire about 220VAC, CE approved units.

Tamoxifen and Its Major Metabolite



Column: SUPELCOSIL ABZPlus, 15cm x 4.6mm, 5µm particles
Cat. No.: 59196
Mobile Phase: acetonitrile: 0.01M H_3PO_4, 40:60
Flow Rate: 1mL/min
Temp.: 40°C
Det.: fluorescence; 260nm excitation, >418nm emission
Reactor Coil: 5m x 0.25mm ID
Inj.: 20µL mobile phase containing 800ng/mL tamoxifen, 500ng/mL 4-hydroxytamoxifen

Aflatoxins



*Requires derivatization for fluorescence detection. By replacing chemical derivatization, photochemical derivatization simplifies this procedure.

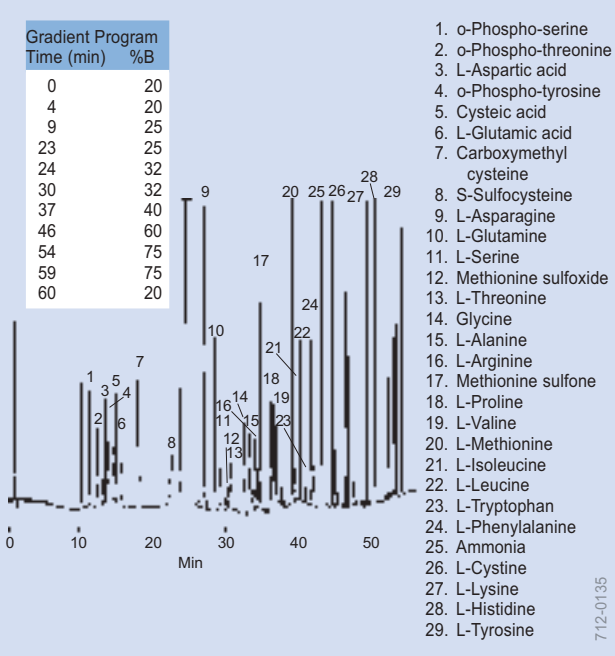
Column: SUPELCOSIL LC-18, 15cm x 4.6mm, 5µm particles
Cat. No.: 58230-U
Mobile Phase: acetonitrile:methanol:water, 20:20:60
Flow Rate: 1mL/min
Temp.: 30°C
Det.: fluorescence; 360nm excitation, >418nm emission
Reactor Coil: 25m x 0.25mm ID (50°C)
Inj.: 20µL (aflatoxin mix*:acetonitrile:water (1:3), 1:4)
*Cat. No. 46304 -U
1µg/mL B_1, G_1, 0.3µg/mL B_2, G_2

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Liquid Chromatography

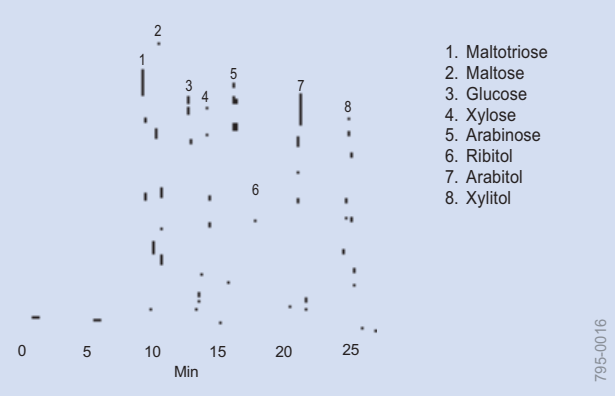
SUPELCO

HPLC Applications
Amino Acids, Carbohydrates



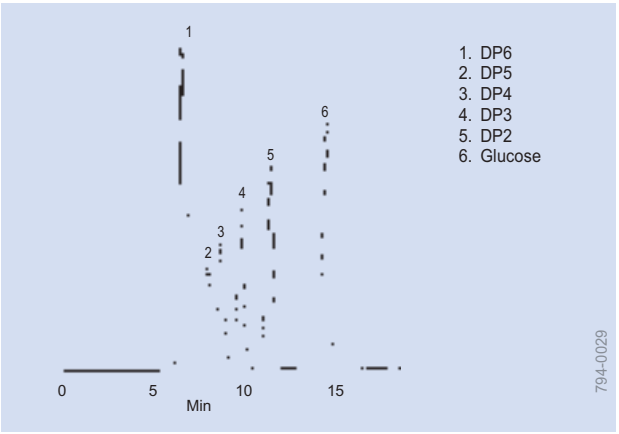
Amino Acids, Dabsyl (HPLC)

Column: SUPELCOSIL LC-DABS, 15cm x 4.6mm ID, 3µm particles
Cat. No.: 59137
Mobile Phase: A = 0.025M KH_2PO_4, pH 7.0 with potassium hydroxide
B = acetonitrile:methanol (70:30)
Flow Rate: 1.5mL/min
Det.: VIS, 436nm
Inj.: 5µL, 50pmole each amino acid on-column



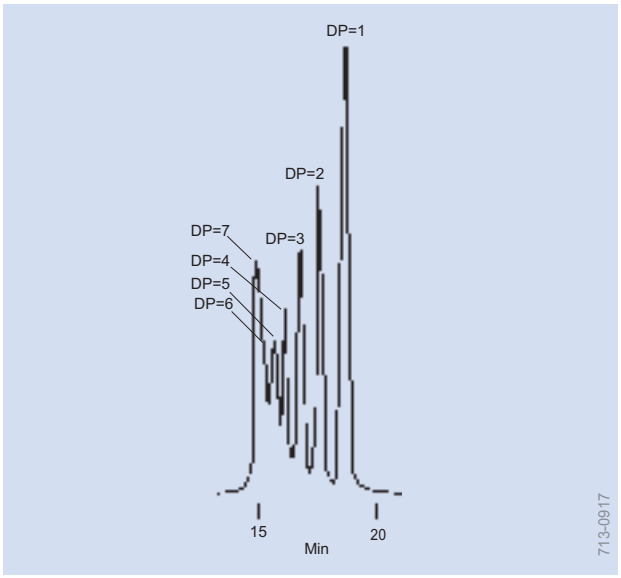
Carbohydrates (HPLC)

Column: SUPELCOGEL Ca, 30cm x 7.8mm ID
Cat. No.: 59305-U
Mobile Phase: water
Flow Rate: 1.5mL/min
Temp.: 80°C
Det.: RI
Inj.: 10µL, 2.5mg/mL each analyte in water



Dark Corn Syrup (HPLC)

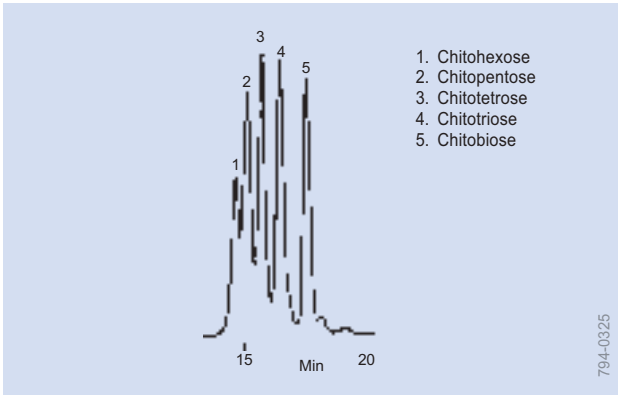
Column: SUPELCOGEL Ag, 30cm x 7.8mm ID
Cat. No.: 59315
Mobile Phase: water
Flow Rate: 0.5mL/min
Temp.: 85°C
Det.: RI
Inj.: 10µL of 1g syrup/10mL DI water, filtered (0.20µm filter)



β-Cyclodextrin, Hydrolyzed (HPLC)

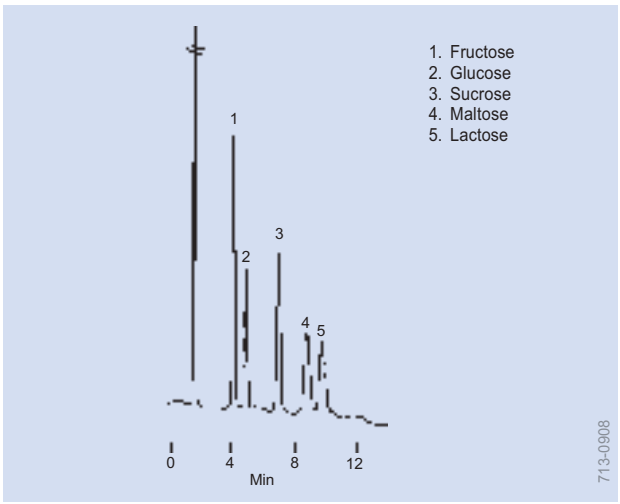
Column: Two TSKgel G-Oligo-PW, 30cm x 7.8mm ID, 6µm particles
Cat. No.: 808031
Mobile Phase: distilled water
Flow Rate: 1mL/min
Temp.: 60°C
Det.: refractive index

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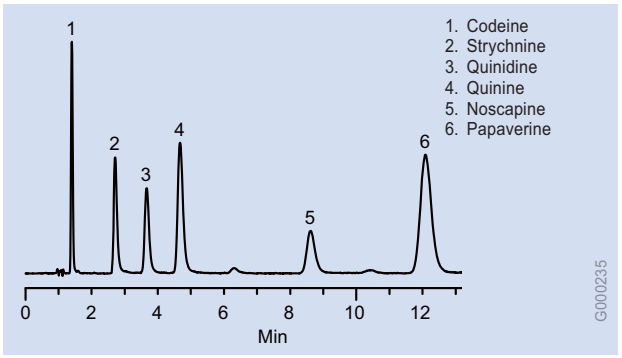
Chito Oligosaccharides (HPLC)

Column: TSKgel G-Oligo-PW, 30cm x 7.8mm ID, 6µm particles
Cat. No.: 808031
Eluent: distilled water
Flow Rate: 1.0mL/min
Temp.: 60°C
Det.: RI



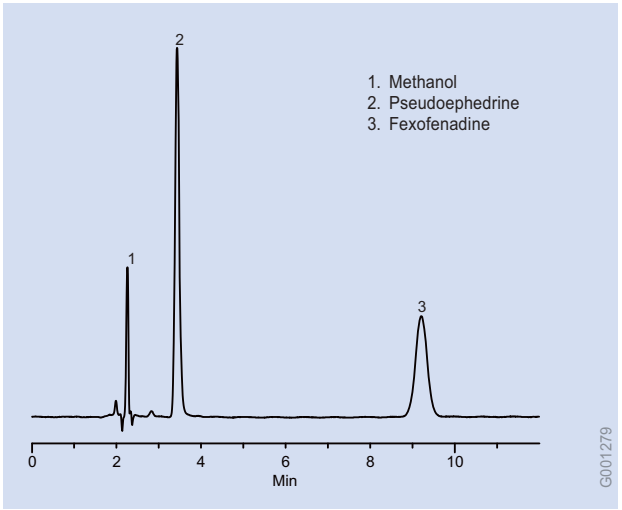
Carbohydrates (HPLC)

Column: SUPELCOSIL LC-NH_2, 25cm x 4.6mm ID, 5µm particles
Cat. No.: 58338
Mobile Phase: acetonitrile:water (75:25)
Flow Rate: 2mL/min
Det.: refractive index
Inj.: 10µL, 150µg each sugar



Alkaloids (HPLC)

Column: Discovery RP-AmideC16, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 505013
Mobile Phase: methanol:25mM KH_2PO_4, pH 3.0 (20:80)
Flow Rate: 2mL/min
Temp.: 35°C
Det.: UV, 254nm
Inj.: 10µL



Allegra Ingredients (HPLC)

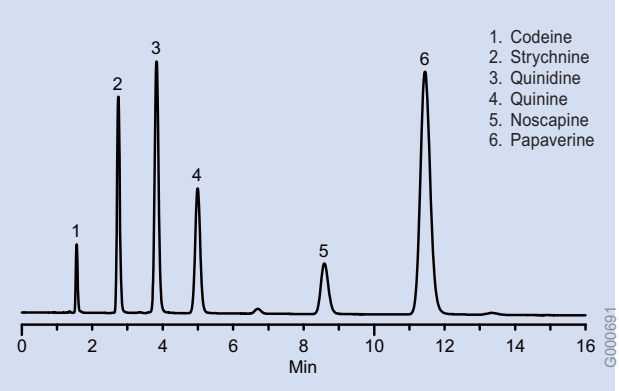
Column: Discovery Cyano, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 59356-U
Mobile Phase: acetonitrile:25mM KH_2PO_4, pH 7.0 (15:85)
Flow Rate: 1mL/min
Temp.: 25°C
Det.: UV, 254nm

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Liquid Chromatography

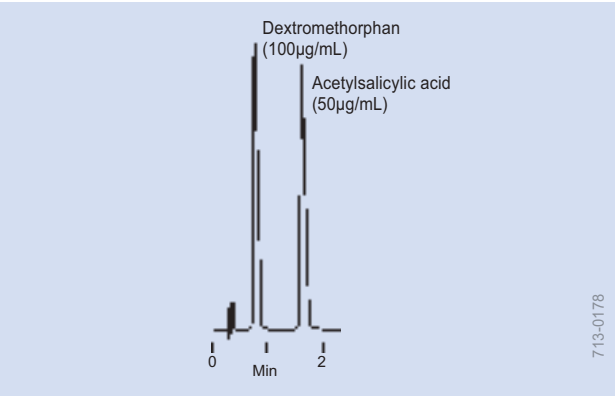
SUPELCO

HPLC Applications
Drugs



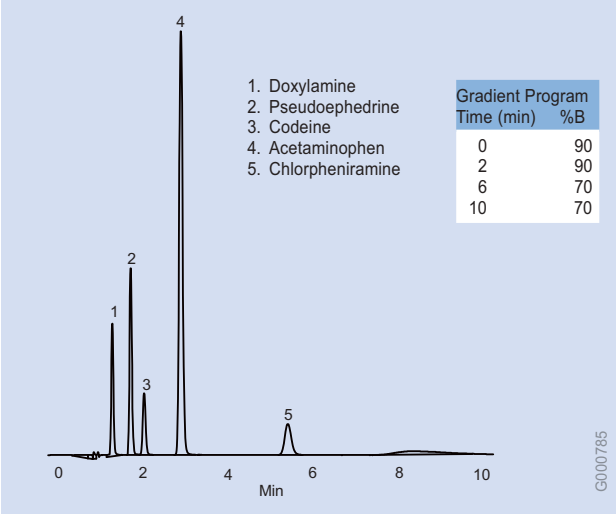
Amides (HPLC)

Column: Discovery RP-AmideC16, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 505013
Mobile Phase: 80:20 25mM Potassium Phosphate (pH 3.0):MeOH
Flow Rate: 2.0mL/min
Temp.: 35°C
Det.: UV at 254nm
Inj.: 10µL



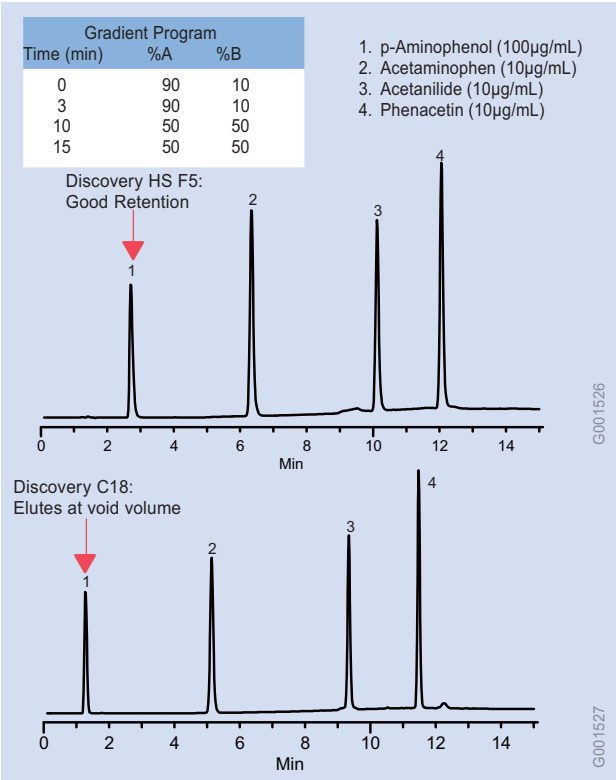
Analgesics (HPLC)

Column: SUPELCOSIL LC-ABZ, 5cm x 4.6mm ID, 5µm particles
Cat. No.: 59141
Mobile Phase: acetonitrile:25mM KH_2PO_4, pH 2.3 with phosphoric acid (20:80)
Flow Rate: 2mL/min
Det.: UV, 230nm
Inj.: 5µL mobile phase, analyte quantities shown



Analgesics and Antihistamines in Dosage Form (HPLC)

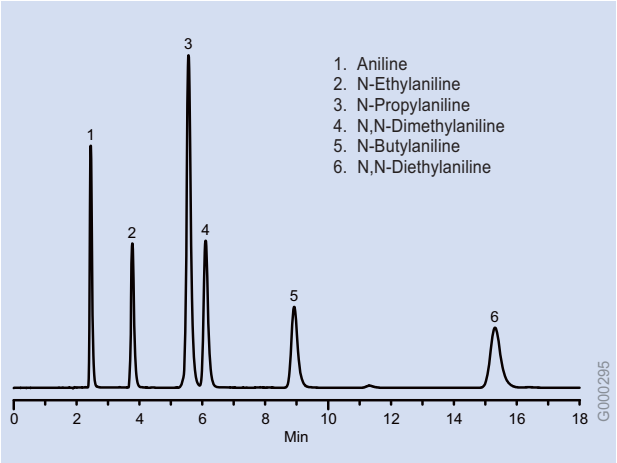
Column: Discovery RP-AmideC16, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 505013
Mobile Phase: A = acetonitrile
B = 25mM KH_2PO_4, pH 2.3
Flow Rate: 2mL/min
Temp.: ambient
Det.: UV, 214nm
Inj.: 10µL



Analgesic Drugs (HPLC)

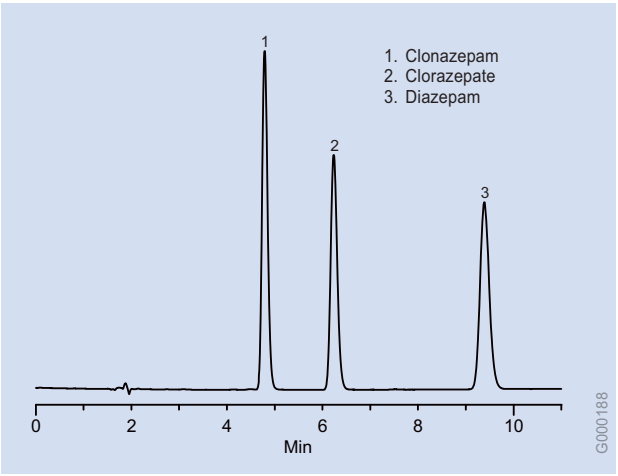
Columns: 15cm x 4.6mm ID, 5µm particles
Cat. Nos.: 567516-U (HS F5), 504955 (C18)
Mobile Phase: (A) 10mM ammonium acetate, 0.1% formic acid; (B) MeOH
Flow Rate: 1.5mL/min
Temp.: 35°C
Det.: UV at 254nm
Inj.: 10µL

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Aniline Homologs (HPLC)

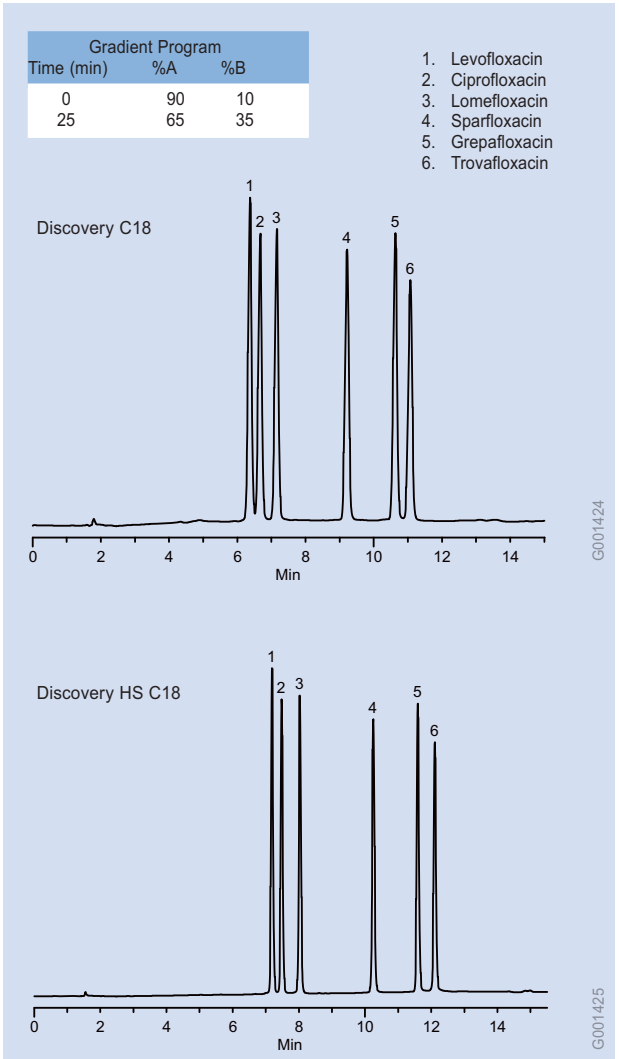
Column: Discovery C18, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 504955
Mobile Phase: MeOH:H_2O (60:40)
Flow Rate: 1mL/min
Temp.: 30°C
Det.: UV, 254nm



Anticonvulsants (HPLC)

Column: Discovery C18, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 504955
Mobile Phase: acetonitrile:25mM KH_2PO_4, pH7.0 (40:60)
Flow Rate: 1mL/min
Temp.: 40°C
Det.: UV, 254nm
Inj.: 10µL

Gradient Program		
Time (min)	%A	%B
0	90	10
25	65	35



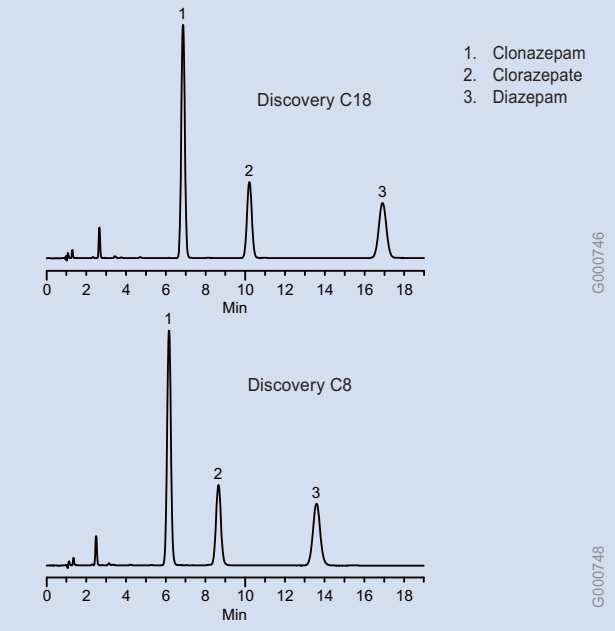
Antibiotics (Fluoroquinolones from Tablets) (HPLC)

Columns: 15cm x 4.6mm ID, 5µm particles
Cat. Nos.: 504955 (C18), 568522-U (HS C18)
Mobile Phase: (A) 25 mM potassium phosphate (pH 3.0)
(B) CH_3CN
Flow Rate: 1.0mL/min
Temp.: 35°C
Det.: UV, 220nm
Inj.: 10µL

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Liquid Chromatography
SUPELCO

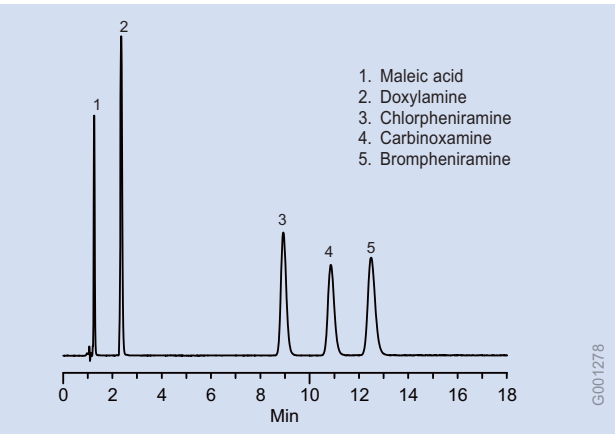
HPLC Applications

Drugs



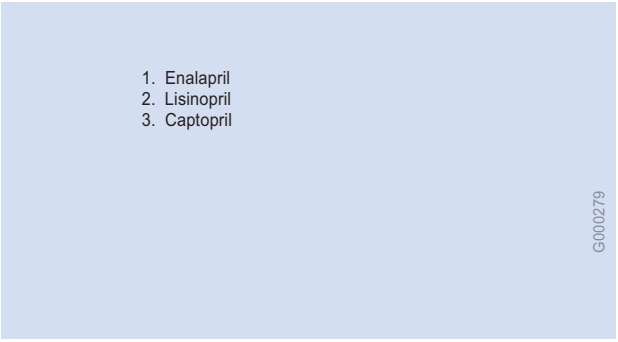
Anticonvulsants (HPLC)

Columns: 15cm x 4.6mm ID, 5µm particles
Cat. Nos.: 504955 (C18), 59353-U (C8)
Mobile Phase: 70:30 water:CH_3CN
Flow Rate: 2.0mL/min
Det.: UV, 254nm
Temp.: 20°C
Inj.: 10µL



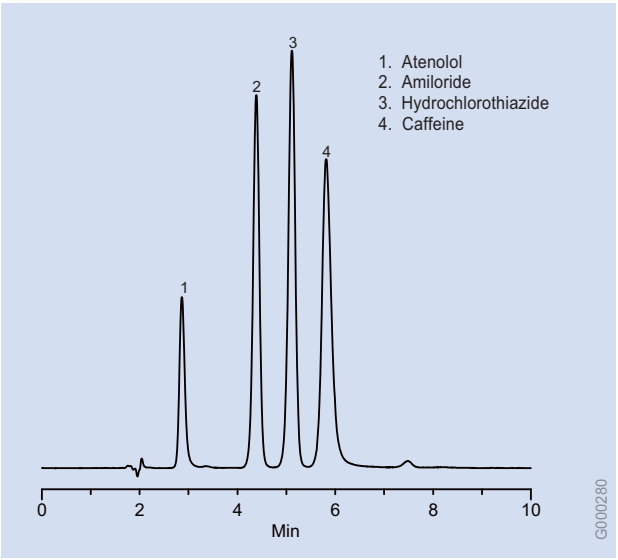
Antihistamines (HPLC)

Column: Discovery C8, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 59353-U
Mobile Phase: acetonitrile:25mM KH_2PO_4, pH 2.3 (8:92)
Flow Rate: 2mL/min
Temp.: 25°C
Det.: UV, 254nm
Inj.: 2µL



Antihypertensive ACE Inhibitors (HPLC)

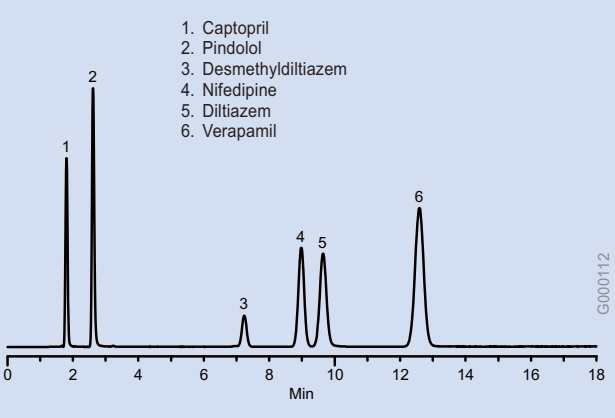
Column: Discovery RP-AmideC16, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 505013
Mobile Phase: acetonitrile:25mM KH_2PO_4, pH 2.3 (33:67)
Flow Rate: 0.6mL/min
Temp.: 35°C
Det.: UV, 214nm
Inj.: 3µL



Antihypertensive-Diuretic Combination (HPLC)

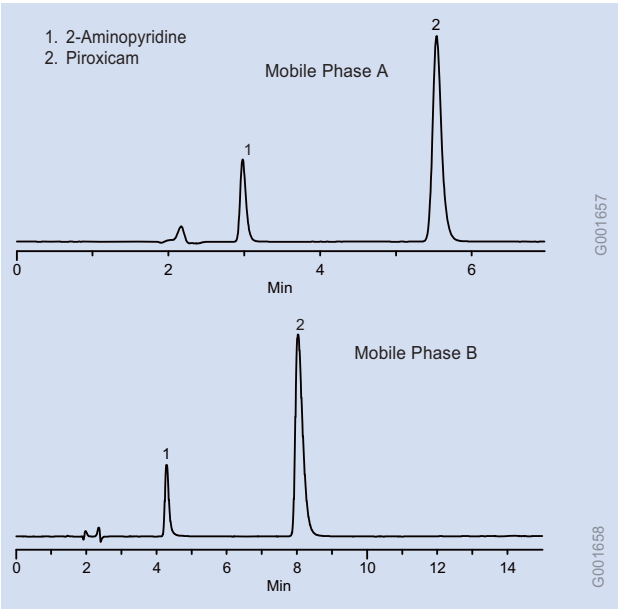
Column: Discovery RP-AmideC16, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 505013
Mobile Phase: methanol: 25mM K_2HPO_4, pH 7.0 (22:78)
Flow Rate: 1mL/min
Temp.: 30°C
Det.: UV, 254nm
Inj.: 10µL

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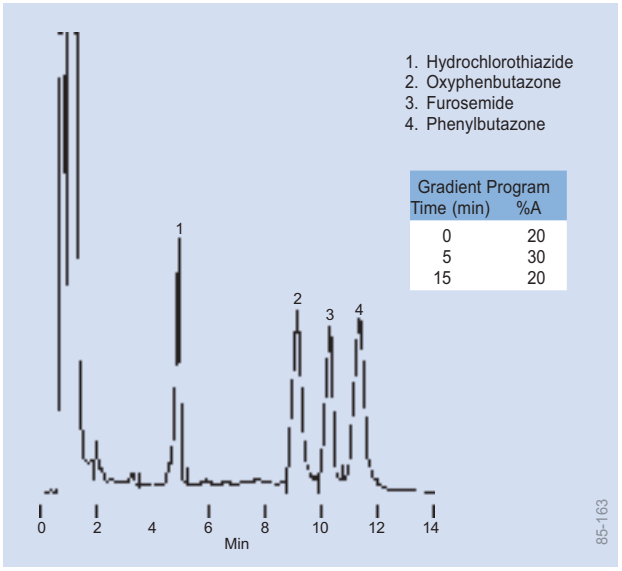
Antihypertensive Drugs (HPLC)
(Beta/Calcium Channel Blockers and ACE Inhibitor)

Column: Discovery RP-AmideC16, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 505013
Mobile Phase: methanol:25mM KH_2PO_4, pH 7.0 (40:60)
Flow Rate: 1mL/min
Temp.: 35°C
Det.: UV, 214nm
Inj.: 5µL



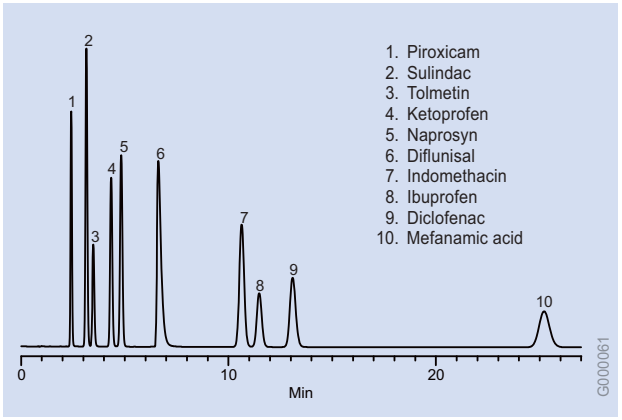
Anti-Inflammatory Drugs
(Aminopyridine and Piroxicam) (HPLC)

Columns: Discovery C18, 15cm x 4.6mm ID, 5µm particles
Cat. Nos.: 504955
Mobile Phase: A = 85:15, 10 mM potassium phosphate (pH 2.5): CH_3CN
B = 85:15, 10 mM potassium phosphate (pH 6.8): CH_3CN
Flow Rate: 1.0mL/min
Det.: UV, 220nm
Inj.: 5µL



Anti-Inflammatory Drugs and Diuretics in Serum (HPLC)

Column: Hisep, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 58935
Mobile Phase: A = acetonitrile, B = 180mM ammonium acetate, pH 5.4
Flow Rate: 2mL/min
Temp.: 30°C
Det.: UV, 267nm
Inj.: 10µL horse serum containing 5µg/mL hydrochlorothiazide, 10µg/mL each other drug



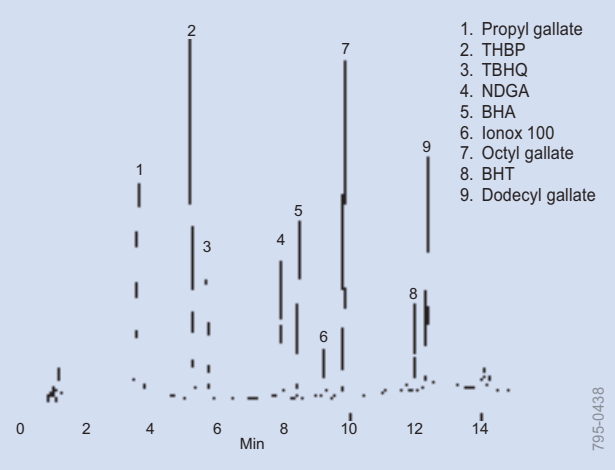
Anti-Inflammatory Drugs, Non-Steroidal (HPLC)

Column: Discovery RP-AmideC16, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 505013
Mobile Phase: acetonitrile:25mM KH_2PO_4, pH 3.0 (40:60)
Flow Rate: 1mL/min
Temp.: 30°C
Det.: UV, 230nm
Inj.: 10µL, 1µg/mL each analyte

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Liquid Chromatography
SUPELCO

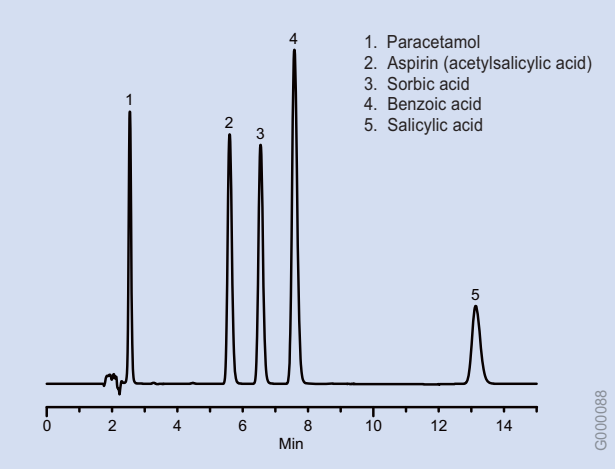
HPLC Applications

Drugs



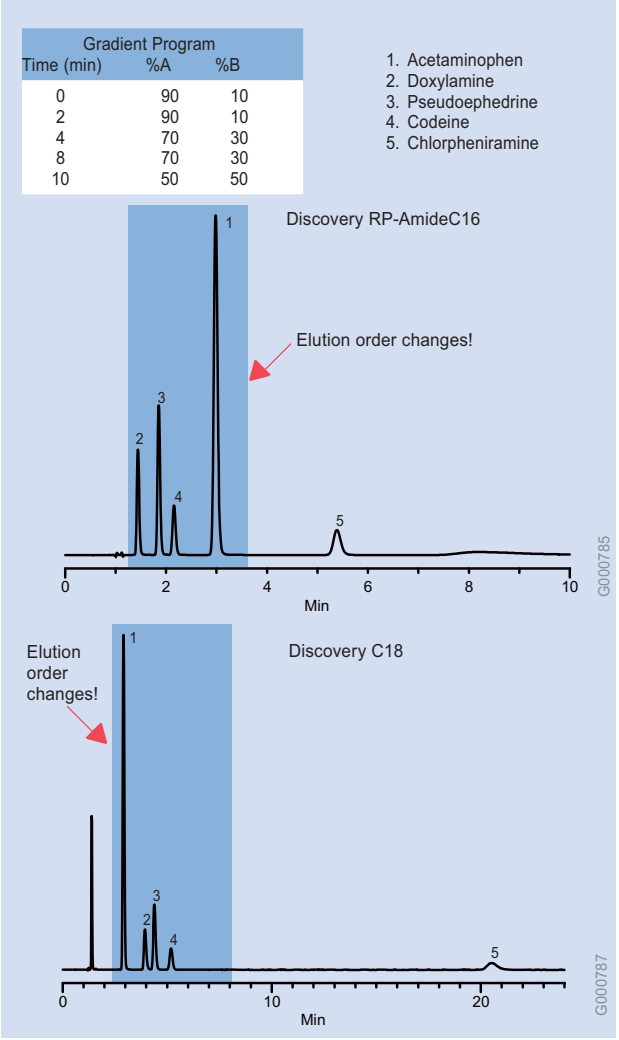
Antioxidants (HPLC)

Column: SUPELCOSIL LC-18, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 58230-U
Mobile Phase: A = 5% acetic acid in deionized water
B = acetonitrile:methanol (1:1)
70% A/30% B to 100% B, linear gradient over 10 min, hold 10 min
Flow Rate: 2.0mL/min
Det.: UV, 280nm
Inj.: 10µL , 20µg/mL each antioxidant (Cat. No. 47192)



Antipyretics/Analgesics/Antifungals (HPLC)

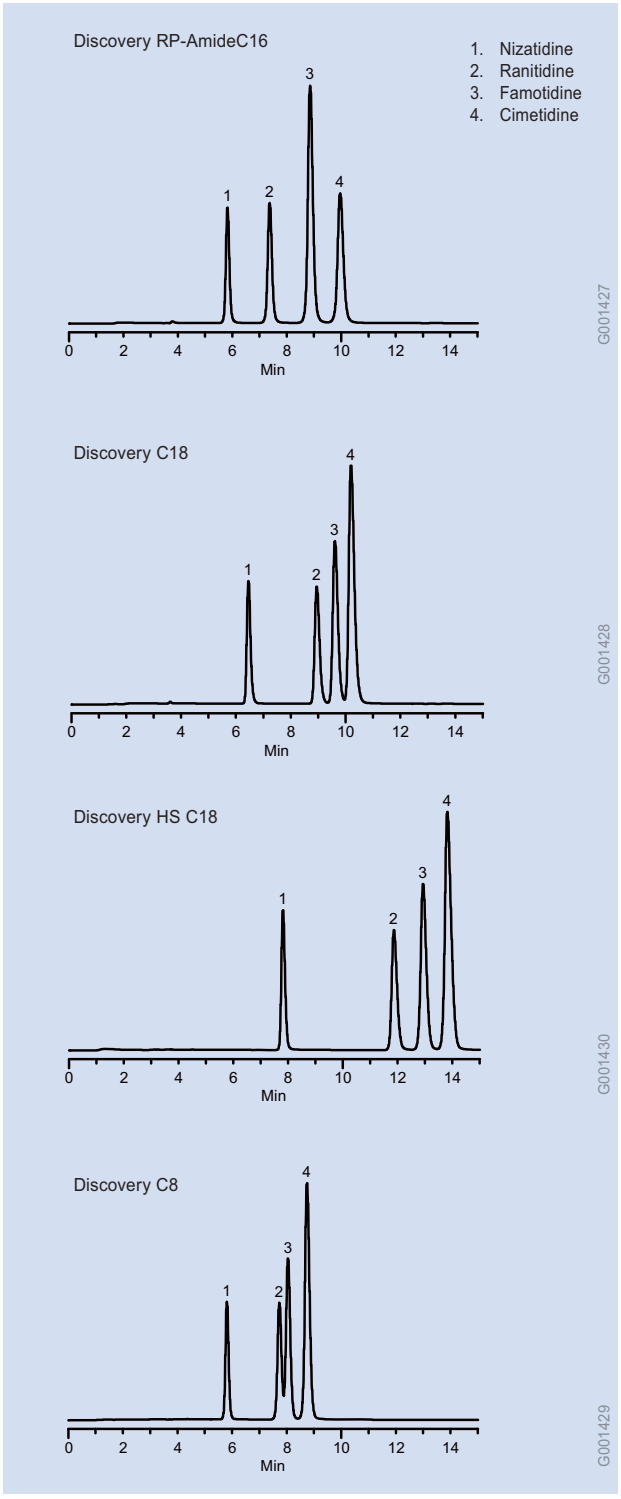
Column: Discovery RP-AmideC16, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 505013
Mobile Phase: 0.1% TFA in (25:75) acetonitrile:water
Flow Rate: 1mL/min
Temp.: 30°C
Det.: UV, 254nm
Inj.: 10µL



Antitussive/Antihistamine/Antipyretic Mix (HPLC)

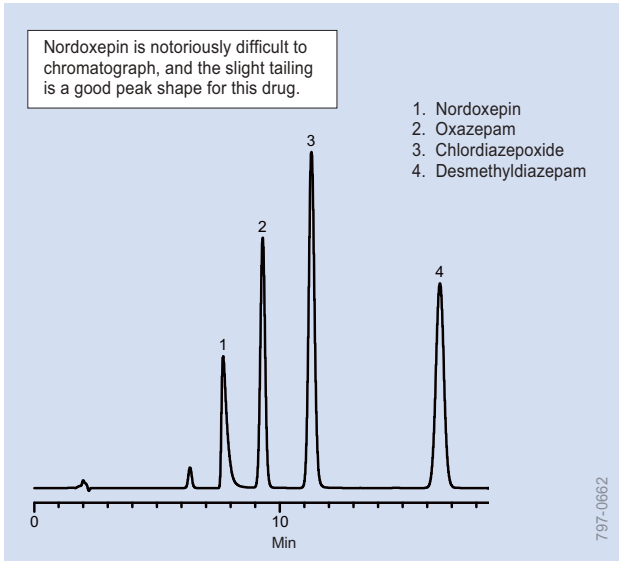
Columns: 15cm x 4.6mm ID, 5µm particles
Cat. Nos.: 505013 (RP-AmideC16), 504955 (C18)
Mobile Phase: (A) 25 mM Potassium Phosphate (pH 2.3)
(B) CH_3CN
Flow Rate: 2.0mL/min
Temp.: ambient
Det.: UV, 214nm
Inj.: 10µL

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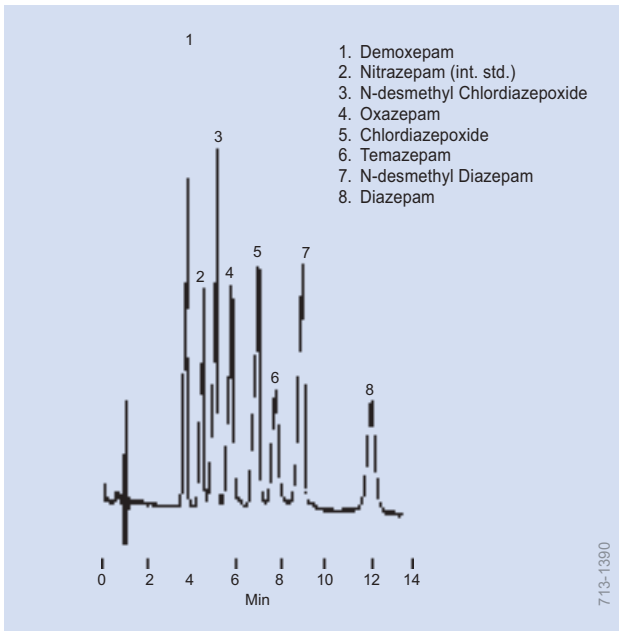
Antiulcer Compounds (HPLC)

Columns: 15cm x 4.6mm ID, 5µm particles
Cat. Nos.: 505013 (RP-AmideC16), 504955 (C18), 569252-U (HS C18), 59353-U (C8)
Mobile Phase: MeOH:25mM H_3PO_4/KOH, pH 3.0 (15:85)
Flow Rate: 0.5mL/min
Temp.: ambient
Det.: UV, 215nm
Inj.: 3µL



Anxiolytics (HPLC)

Column: Discovery C18,15cm x 4.6mm ID, 5µm particles
Cat. No.: 504955
Mobile Phase: acetonitrile:25mM KH_2PO_4, pH 7.0 (30:70)
Flow Rate: 1mL/min
Temp: 20°C
Det.: UV, 254nm
Inj.: 10µL

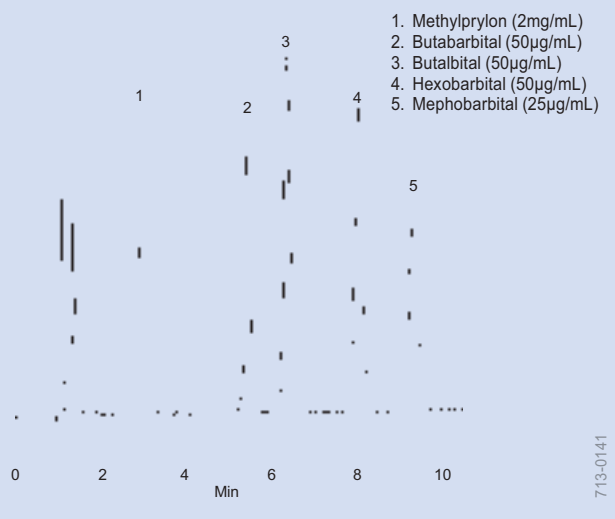


Anxiolytics (HPLC)

Column: SUPELCOSIL LC-8, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 58220-U
Mobile Phase: methanol:acetonitrile:0.005M KH_2PO_4 and 0.1M ammonium acetate buffer (pH 6.0 with glacial acetic acid), 26.5:16.5:57 (v/v/v)
Flow Rate: 2mL/min
Temp.: 30°C
Det.: UV, 245nm
Sample: 10µL

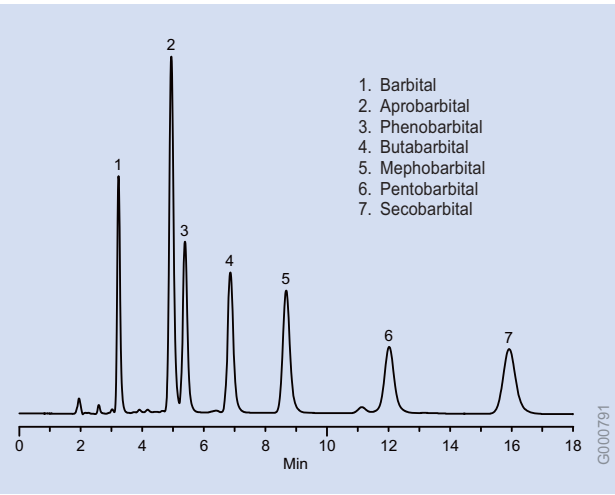
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HPLC Applications
Drugs



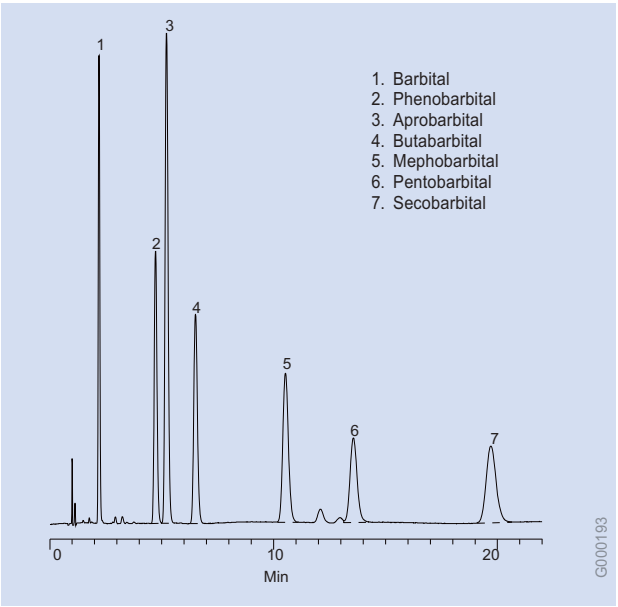
Barbiturates (HPLC)

Column: SUPELCOSIL LC-ABZ, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 59140-U
Mobile Phase: acetonitrile:25mM potassium phosphate buffer, pH 6.9 (25:75)
Flow Rate: 1.5mL/min
Det.: UV, 254nm
Inj.: 25µL



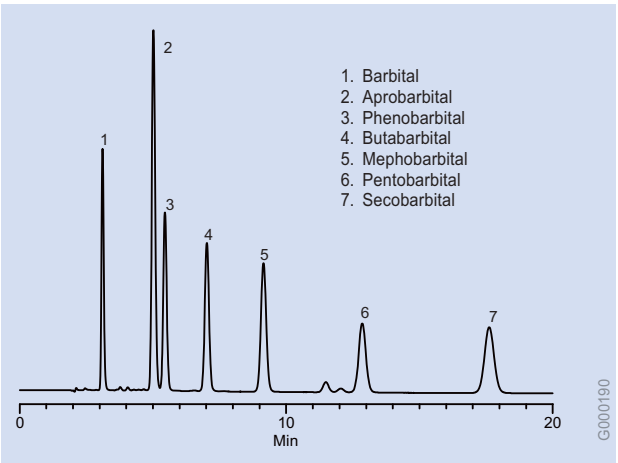
Barbiturates (HPLC)

Column: Discovery C8, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 59353-U
Mobile Phase: 55:45 water:MeOH
Flow Rate: 1.0mL/min
Det.: UV at 214nm
Temp.: ambient
Inj.: 5µL



Barbiturates (HPLC)

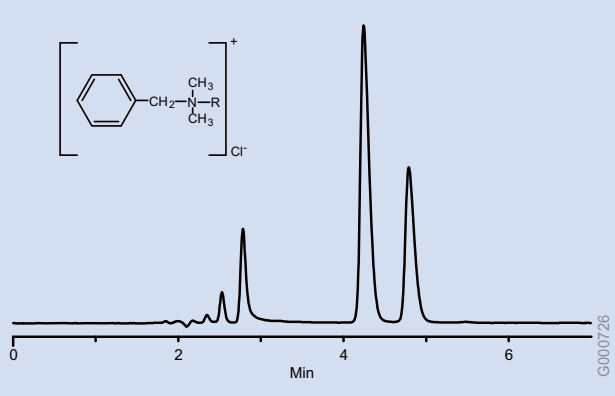
Column: Discovery RP-AmideC16, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 505013
Mobile Phase: methanol:acetonitrile, 60:40:water, 25:75
Flow Rate: 2mL/min
Temp.: 30°C
Det.: UV, 214nm
Inj.: 2µL



Barbiturates (HPLC)

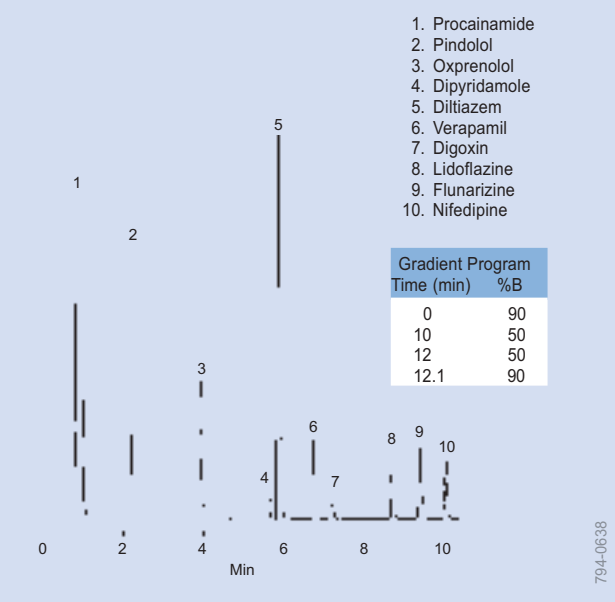
Column: Discovery C18, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 504955
Mobile Phase: 55:45 water:MeOH
Flow Rate: 1.0mL/min
Temp.: ambient
Det.: UV, 214nm
Inj.: 10µL

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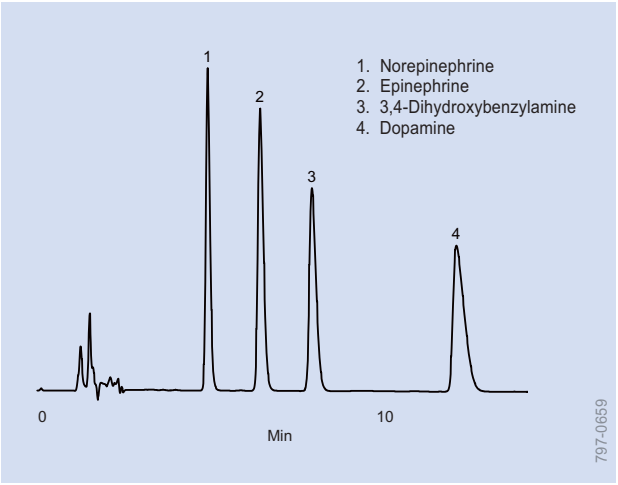
Benzalkonium Chlorides (HPLC)

Column: Discovery Cyano, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 59356-U
Mobile Phase: CH_3CN:acetate buffer, pH 4.5, (60:40)
Flow Rate: 1mL/min
Temp.: ambient temp.
Det.: UV, 254nm
Sample: Undefined C8 to C18 Benzalkonium Chlorides



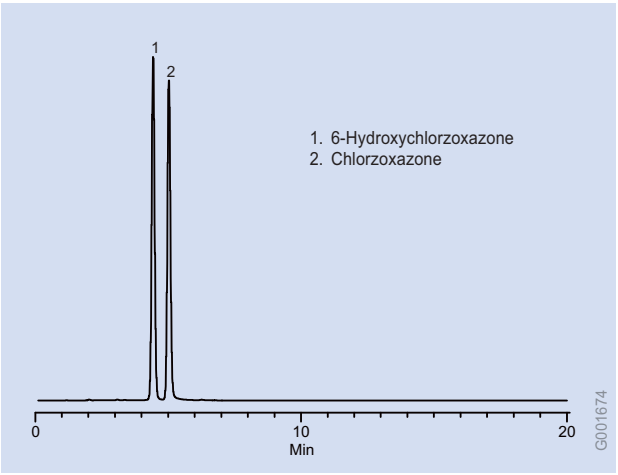
Cardiac Drugs (HPLC)

Column: SUPELCOSIL ABZPlus, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 59196
Mobile Phase: A = acetonitrile
B = 25mM KH_2PO_4 (pH 3.0)
Flow Rate: 2mL/min
Det.: UV, 220nm
Inj.: 20µL methanol:water, 50:50 (30µg/µL pindolol and diltiazem,100µg/mL dipyridamole, 50µg/mL other analytes)



Catecholamines (HPLC)

Column: Discovery C18, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 504955
Mobile Phase: acetonitrile:50mM KH_2PO_4, pH 3.0 with H_3PO_4, 100mg/L EDTA, 200mg/L 1-octane-sulfonic acid (5:95)
Flow Rate: 1mL/min
Temp.: 20°C
Det.: UV, 254nm
Inj.: 10µL

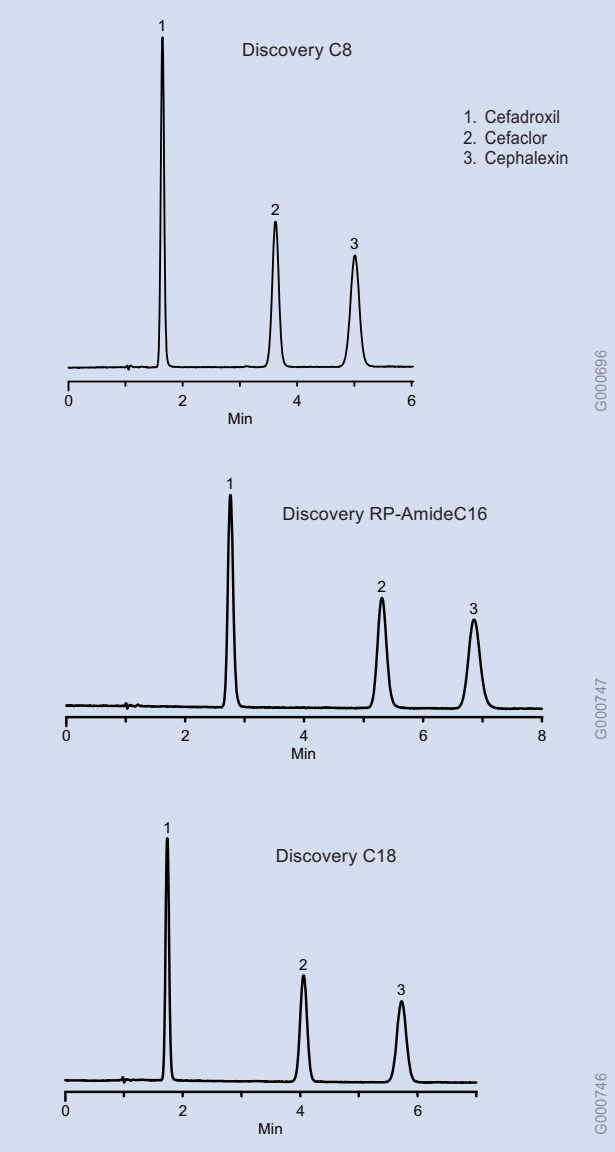


Chlorzoxazone (HPLC)

Column: Discovery HS PEG, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 567416-U
Mobile Phase: 70:30 20mM acetic acid in water (pH 4.5 with ammonium hydroxide):CH_3CN
Flow Rate: 1.0mL/min
Temp.: 30°C
Det.: UV, 285nm
Inj.: 10µL

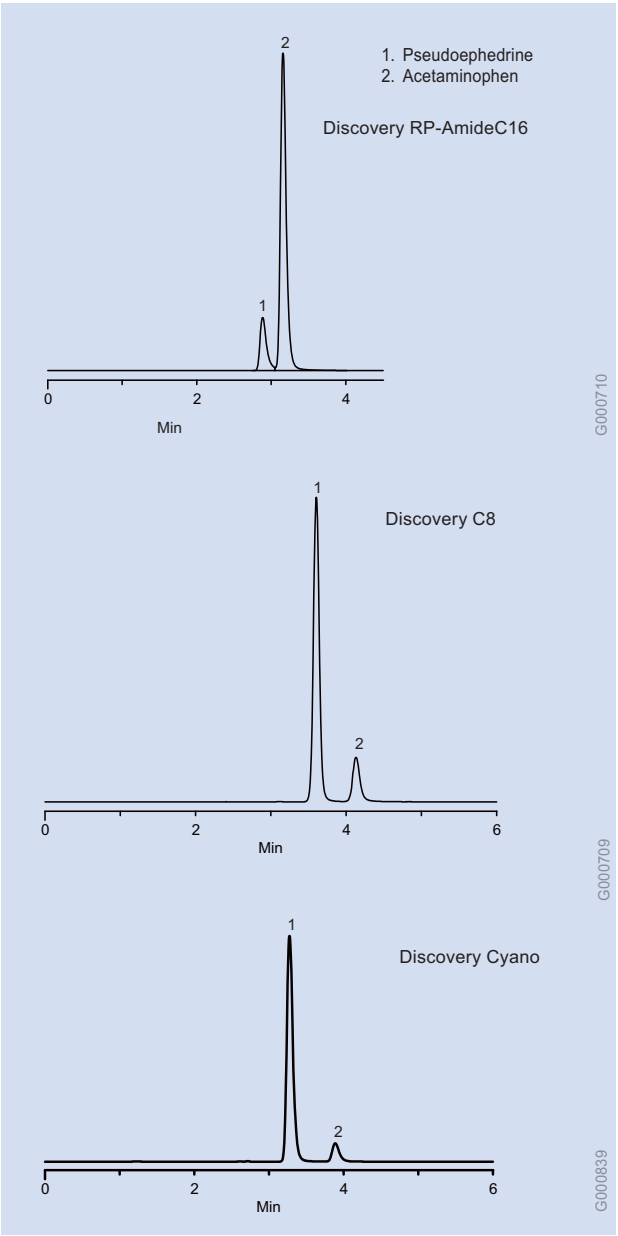
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HPLC Applications
Drugs



Cephalosporins (HPLC)

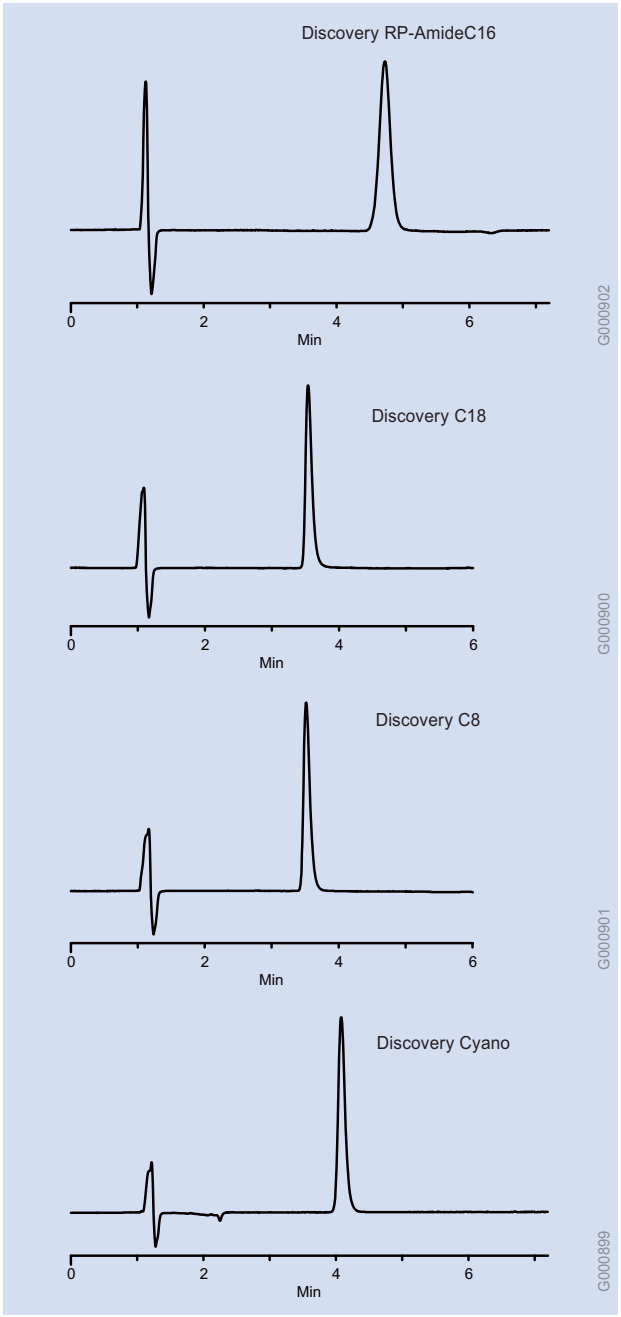
Column:	15cm x 4.6mm ID, 5µm particles
Cat. Nos.:	59353-U (C8), 505013 (RP-AmideC16), 504955 (C18)
Mobile Phase:	methanol:25mM KH_2PO_4, pH 3.0, (20:80) for C18 and C8, (10:90) for RP-Amide C16
Flow Rate:	2mL/min
Temp.:	20°C
Det.:	UV, 254nm
Inj.:	1µL



Cold Remedy Ingredients/Antihistamines (HPLC)

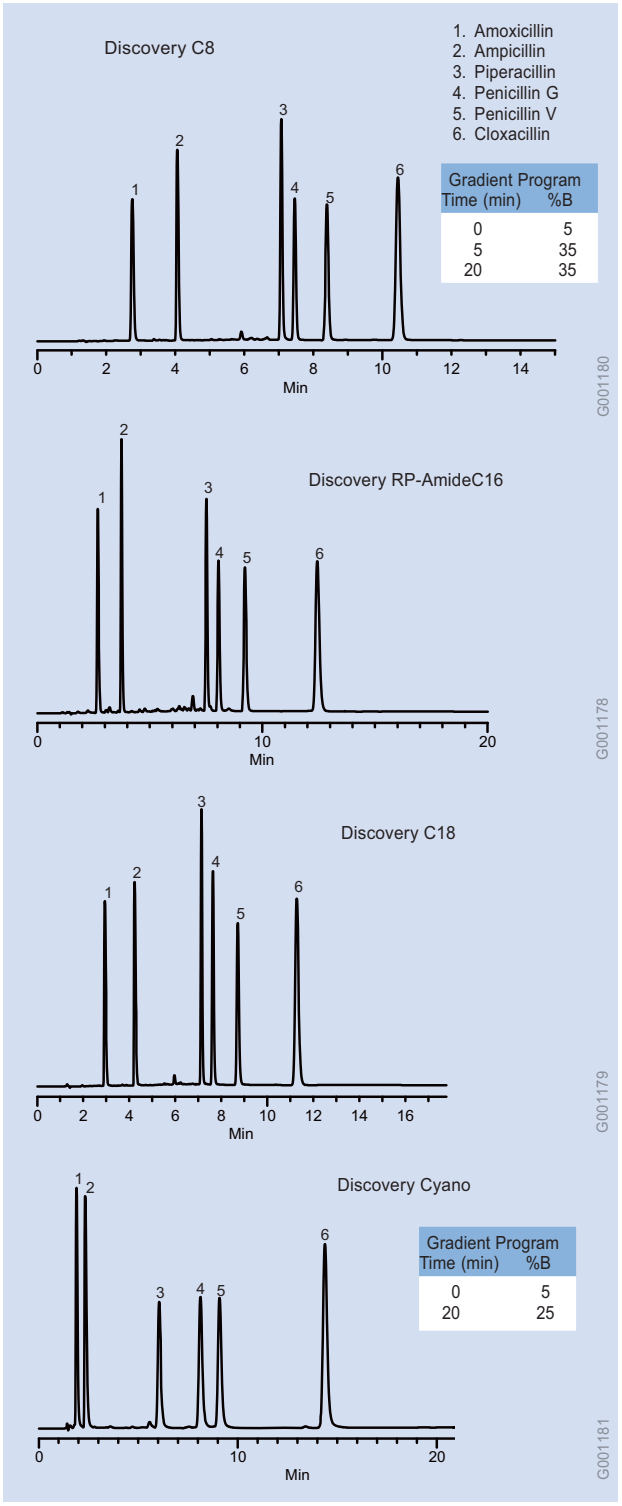
Columns:	15cm x 4.6mm ID, 5µm particles
Cat. Nos.:	505013 (RP-AmideC16), 59353-U (C8), 59356-U (Cyano)
Mobile Phase:	acetonitrile:25mM KH_2PO_4 pH 7.0 (15:85)
Flow Rate:	1mL/min
Temp.:	20°C
Det.:	UV, 214nm
Inj.:	1µL

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Fluoxetine (Prozac) (HPLC)

Columns: 15cm x 4.6mm ID, 5µm particles
Cat. Nos.: 505013 (RP-AmideC16), 504955 (C18), 59353-U (C8), 59356-U (Cyano)
Mobile Phase: CH_3CN:25mM KH_2PO_4, pH 7.0 (40:60)
Flow Rate: 2mL/min
Temp.: 30°C
Det.: UV, 214nm
Inj.: 1µL



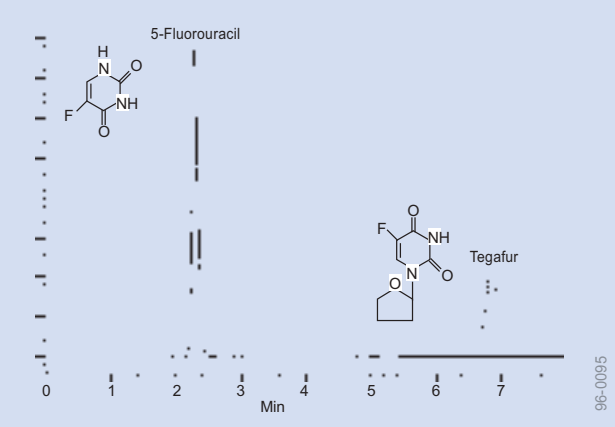
β-Lactam Antibiotics (HPLC)

Column: 15cm x 4.6mm ID, 5µm particles
Cat. Nos.: 59353-U (C8), 505013 (RP-AmideC16), 504955 (C18), 59356-U (Cyano)
Mobile Phase: A = 0.01% TFA in water; B = 0.01% TFA in CH_3CN
Flow Rate: 1.5mL/min
Temp.: 30°C
Det.: UV, 254nm

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Liquid Chromatography
SUPELCO

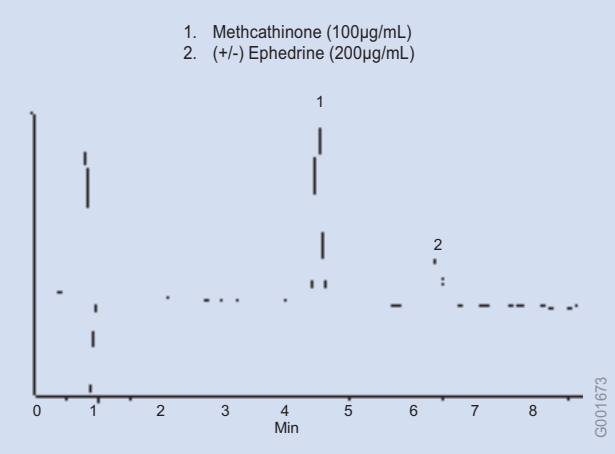
HPLC Applications

Drugs



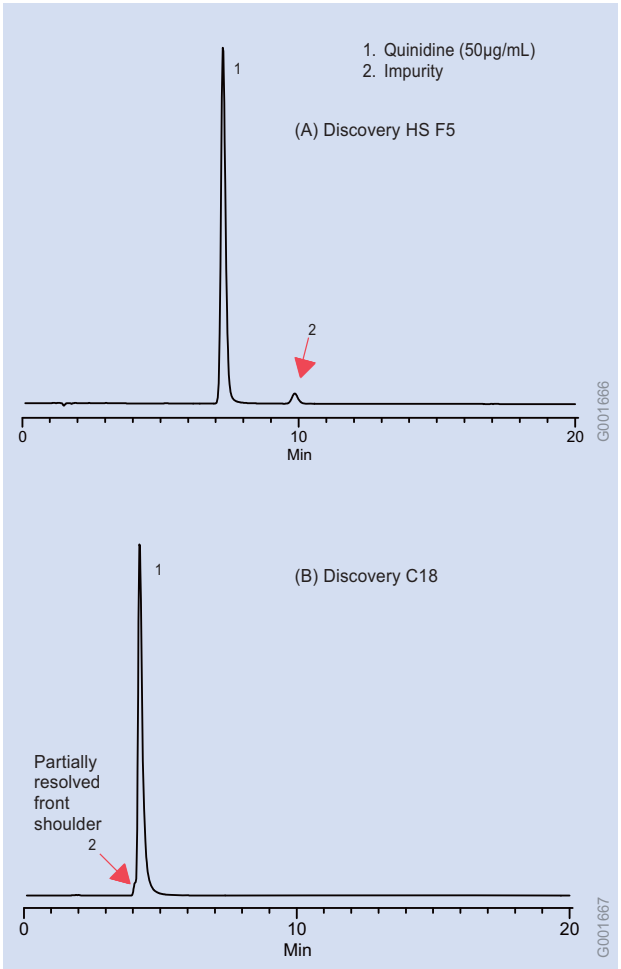
5-Fluorouracil and Tegafur (HPLC)

Column: SUPELCOGEL TPR-100, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 59154
Mobile Phase: acetonitrile:water (10:90)
Flow Rate: 1.0mL/min
Temp.: 30°C
Det.: UV, 270nm



Methcathinone and Ephedrine (HPLC)

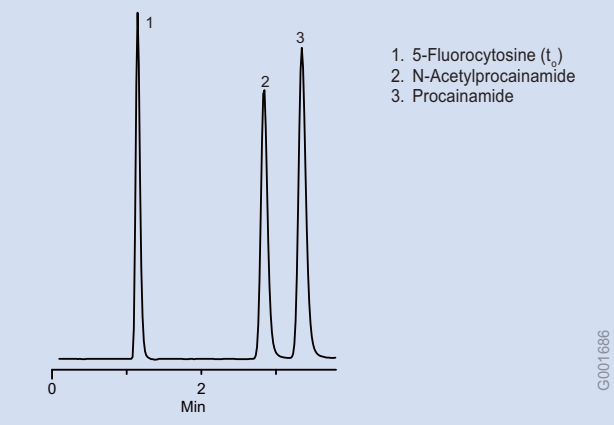
Column: Discovery HS F5, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 567516-U
Mobile Phase: (30:70) 10mM Ammonium Acetate (pH 6.98): CH_3CN
Flow Rate: 2.0mL/min
Temp.: 35°C
Det.: Photodiode Array
Inj.: 5µL



Quinidine and Trace Impurity (HPLC)

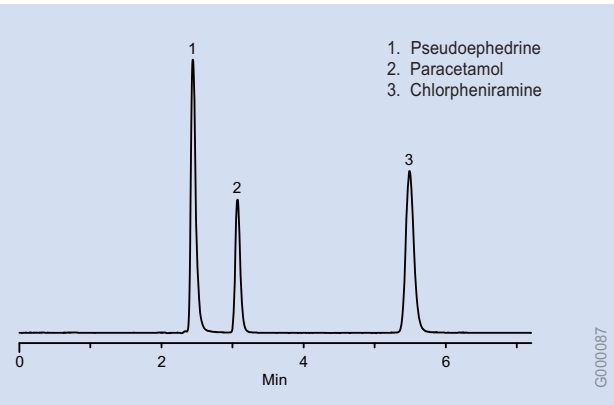
Columns: 15cm x 4.6mm ID, 5µm particles
Cat. Nos.: 567516-U (HS F5), 504955 (C18)
Mobile Phase: 25 mM ammonium phosphate (pH 7.0):CH_3CN varying ratios: (A) 35:65, (B) 70:30
Flow Rate: 1.0mL/min
Temp.: 30°C
Det.: UV, 235nm
Inj.: 10µL

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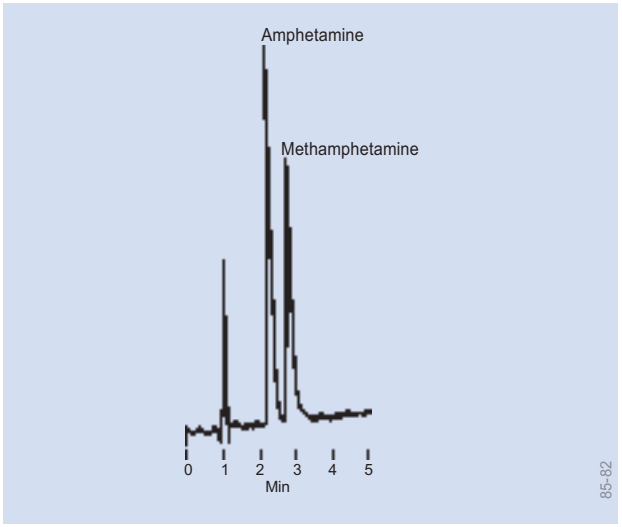
Procainamides (HPLC)

Column: Discovery HS F5, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 567516-U
Mobile Phase: (65:35) 25 mM ammonium phosphate (pH 7):CH_3CN
Flow Rate: 1.0mL/min
Temp.: 30°C
Det.: UV, 280nm
Inj.: 5µL
Sample: 50µg/mL of each



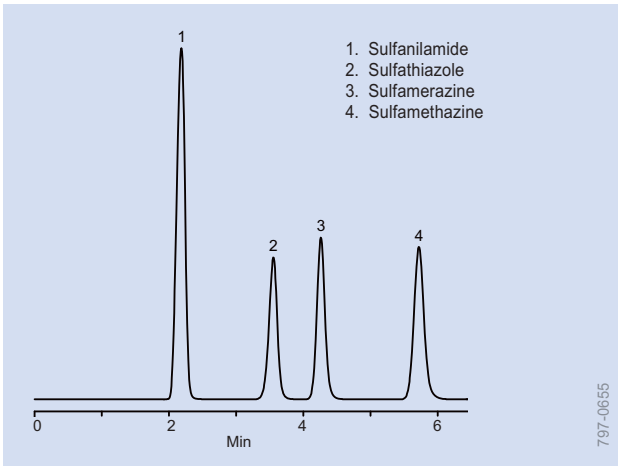
Sinus Medications (HPLC)

Column: Discovery RP-AmideC16, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 505013
Mobile Phase: acetonitrile:50mM KH_2PO_4, pH 3.0 (25:75)
Flow Rate: 1mL/min
Temp.: 30°C
Det.: UV, 220nm
Inj.: 10µL



Stimulants, Amphetamine (HPLC)

Column: Suplex pKb-100, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 58932
Mobile Phase: acetonitrile:25mM K_2HPO_4, pH 7.0 with phosphoric acid (15:85)
Flow Rate: 2mL/min
Det.: UV, 254nm
Inj.: 10µL mobile phase (50µg/mL each analyte)

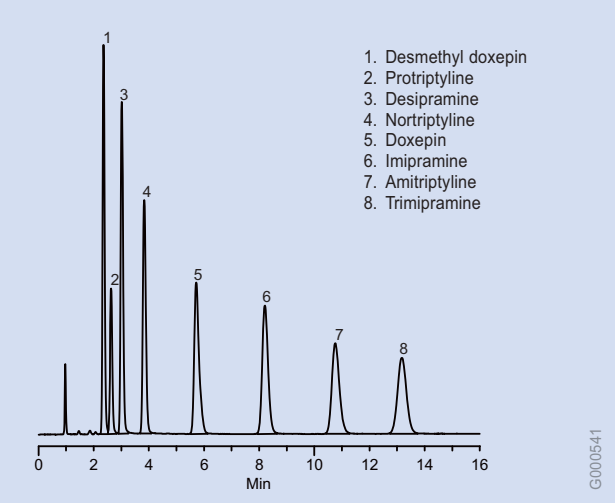


Sulfa Drugs (HPLC)

Column: Discovery C18,15cm x 4.6mm ID, 5µm particles
Cat. No.: 504955
Mobile Phase: methanol:water with 1% CH_3COOH (20:80)
Flow Rate: 1mL/min
Temp.: 20°C
Det.: UV, 254nm
Inj.: 10µL

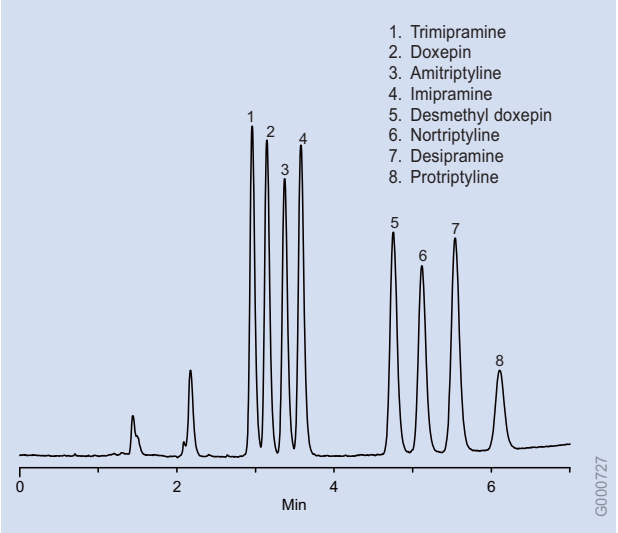
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HPLC Applications
Drugs



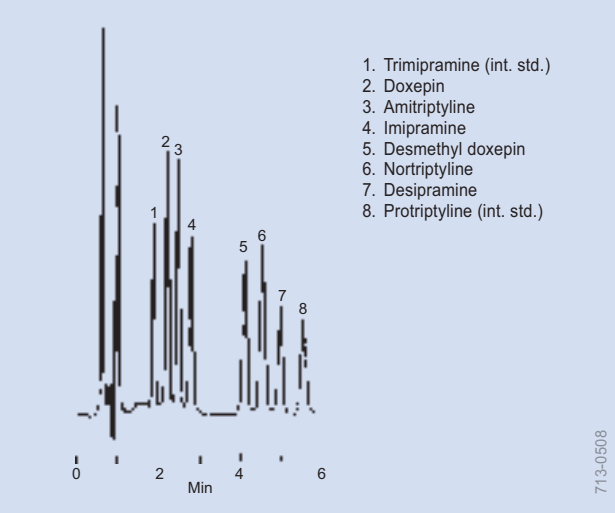
Tricyclic Antidepressants (HPLC)

Column: Discovery C8, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 59353-U
Mobile Phase: methanol:10mM K_2HPO_4, pH 7.0
Flow Rate: 2mL/min
Temp.: 40°C
Det.: UV, 254nm



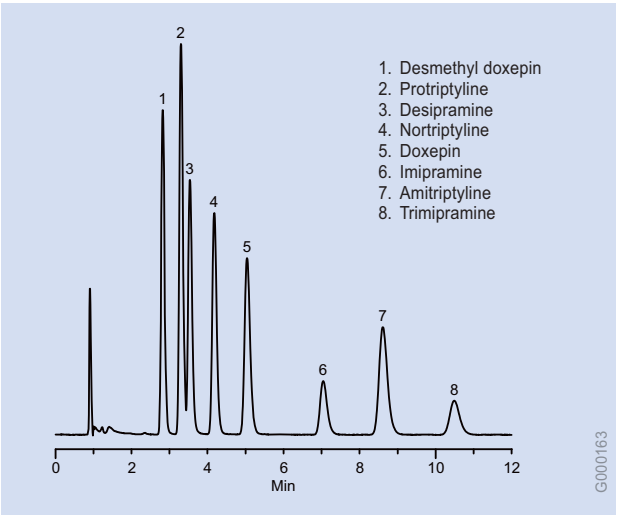
Tricyclic Antidepressants (HPLC)

Column: Discovery Cyano, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 59356-U
Mobile Phase: acetonitrile:methanol:10mM K_2HPO_4, pH 7.0, 60:20:20
Flow Rate: 1mL/min
Temp.: 35°C
Det.: UV, 254nm



Tricyclic Antidepressants (HPLC)

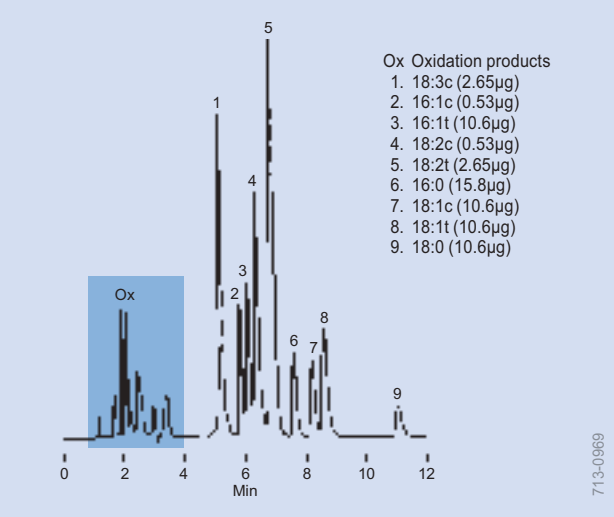
Column: SUPELCOSIL LC-PCN, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 58377
Mobile Phase: acetonitrile:methanol:0.01M dipotassium hydrogen phosphate, pH 7.0 with phosphoric acid (60:15:25)
Flow Rate: 2mL/min
Temp.: 30°C
Det.: UV, 215nm
Inj.: 50ng each drug



Tricyclic Antidepressants (HPLC)

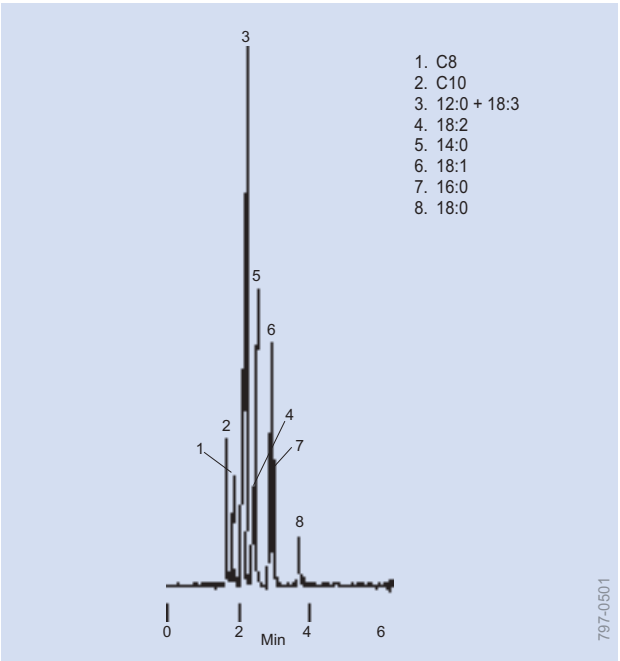
Column: Discovery RP-AmideC16, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 505013
Mobile Phase: methanol:25mM KH_2PO_4, pH 7, 60:40
Flow Rate: 2mL/min
Temp.: 40°C
Det.: UV, 230nm
Inj.: 10µL

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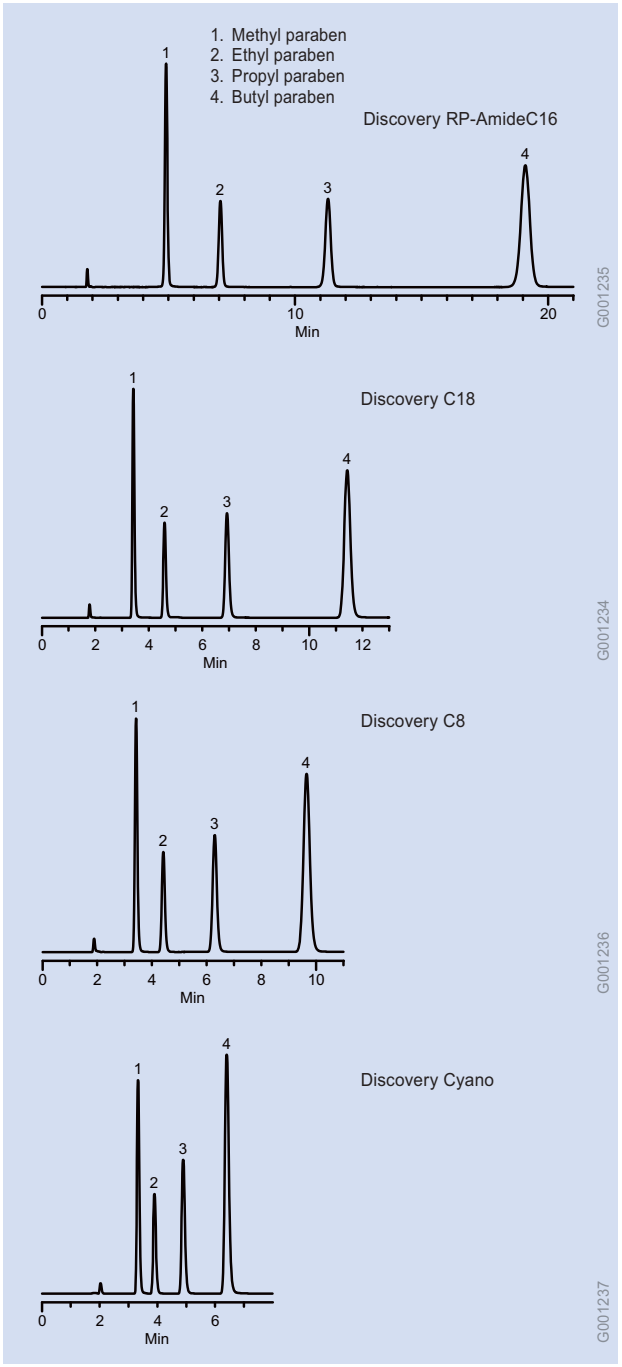
Fatty Acids, Free (HPLC)

Column: SUPELCOSIL LC-8, 15cm x 4.6mm ID, 3µm particles
Cat. No.: 58983
Mobile Phase: acetonitrile:tetrahydrofuran: 0.1% phosphoric acid (50.4:21.6:28)
Flow Rate: 1mL/min
Temp.: 35°C
Det.: UV, 215nm
Inj.: 10µL



Fatty Acid Methyl Esters (HPLC)

Column: SUPELCOSIL LC-18, 25cm x 4.6mm ID, 5µm particles
Cat. No.: 58298
Mobile Phase: acetonitrile:acetone (59.0:41.0, v/v)
Flow Rate: 1.0mL/min
Det.: RI
Sample: 10µL of 9% C8 to C18 saturated and unsaturated FAMEs in mobile phase



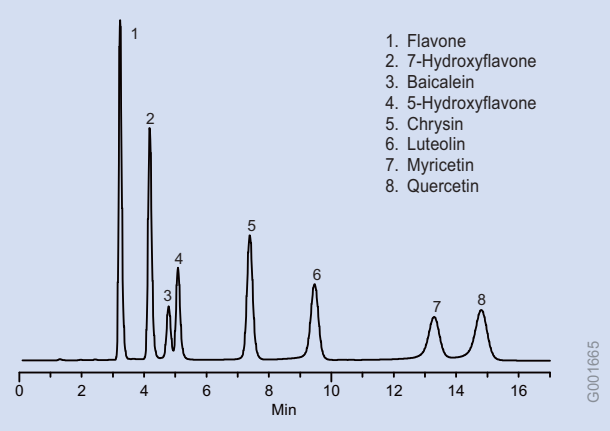
Paraben Preservatives (HPLC)

Columns: 15cm x 4.6mm ID, 5µm particles
conditions for RP-AmideC16, C18,and C8
Cat. Nos.: 505013 (RP-AmideC16), 504955 (C18), 59353-U (C8)
Mobile Phase: $CH_3CN:H_2O$, (40:60)
Flow Rate: 1mL/min
Temp.: 20°C
Det.: UV, 254nm
Inj.: 10µL
conditions for Cyano
Cat. No.: 59356-U (Cyano)
Mobile Phase: $CH_3CN:H_2O$, (30:70)
Flow Rate: 1mL/min
Temp.: 20°C
Det.: UV, 254nm
Inj.: 10µL

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco
Liquid Chromatography
SUPELCO

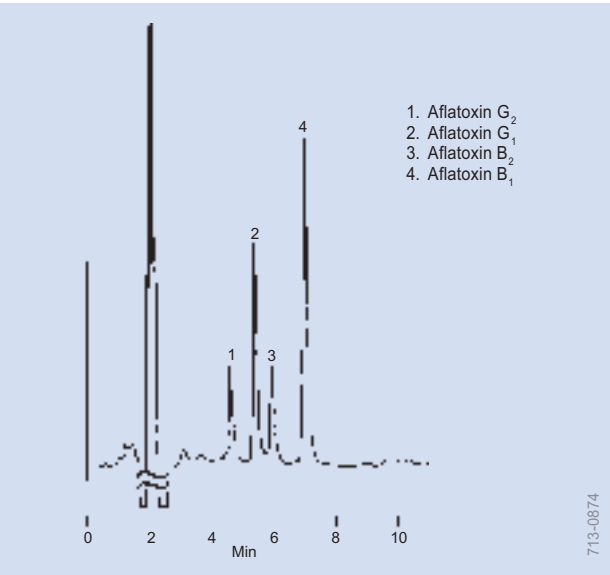
HPLC Applications

Flavor, Mycotoxins, Nucleosides, Nucleotides



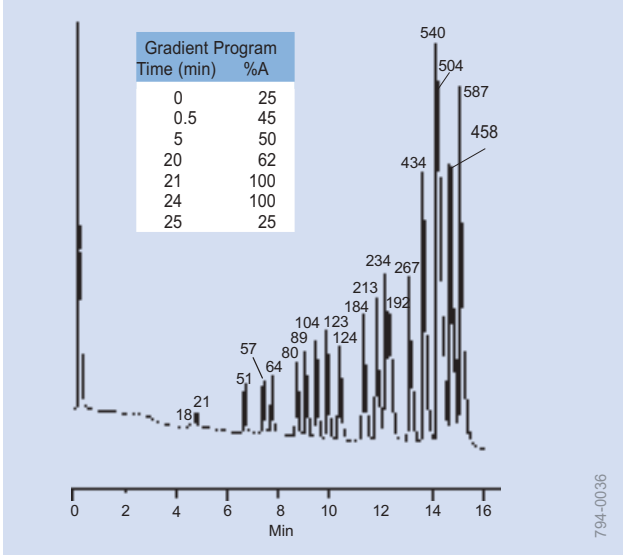
Flavones (HPLC)

Column: Discovery HS PEG, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 567416-U
Mobile Phase: 45:55 0.1% formic acid in water : 0.1% formic acid in MeOH
Flow Rate: 1.0mL/min
Temp.: 30°C,
Det.: UV, 254nm
Inj.: 10µL



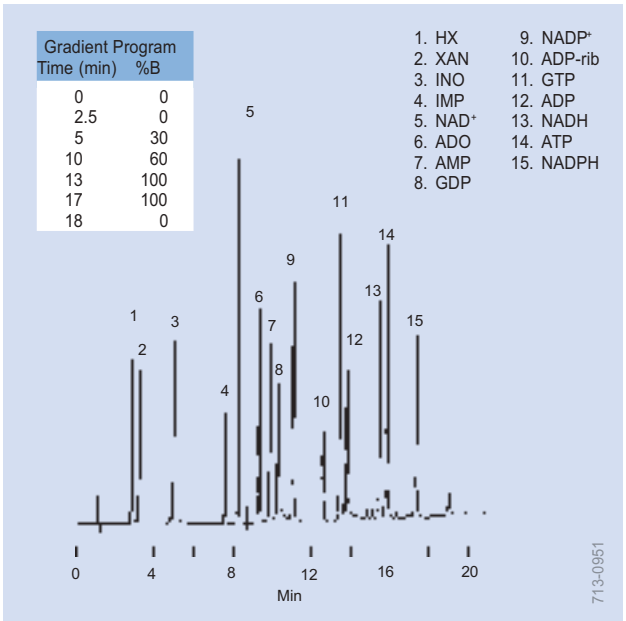
Aflatoxins (SPE/HPLC)

Sample: cornmeal spiked with aflatoxins (30ppb G_2 and B_2, 100ppb G_1 and B_1) Blend 50g sample for 1 min in 100mL methanol:water (8:2) and filter.
Extraction Tube: Supelclean LC-CN, 3mL, 0.5g packing
Cat. No.: 57013
Conditioning: 2mL 0.5% aqueous acetic acid
Sample Addition: 1mL filtered extract + 4mL 0.5% aqueous acetic acid
Washing: 500µL 20% THF in 0.5% aqueous acetic acid, then 2mL hexane, Dry packing under nitrogen. 3mL 25% THF in hexane, Dry packing 1 min under nitrogen.
Elution: 2 x 2mL 1% THF in methylene chloride
Evaporate eluate to dryness under nitrogen. Reconstitute with 100µL of methanol, then dilute with 100µL of 0.5% aqueous acetic acid.
Column: SUPELCOSIL LC-18, 25cm x 4.6mm ID, 5µm particles (with guard column)
Cat. No.: 58298
Mobile Phase: methanol:acetonitrile:water (22.5:22.5:55)
Flow Rate: 1.5mL/min
Det.: VIS, 365nm
Inj.: 100µL



pBR322 DNA-Hae III Digest (HPLC)

Column: TSKgel DEAE-NPR, 3.5cm x 4.6mm ID, 2.5µm particles (with 5mm DEAE-NPR guard column)
Cat. No.: 813075
Mobile Phase: A = 1M NaCl/25mm Tris-HCl, pH 9.0
B = 25mM Tris-HCl, pH 9.0
Flow Rate: 1mL/min
Temp.: ambient
Det.: UV, 260nm
Inj.: 20µL of 50µg/mL HAE III digest of pBR322 DNA



Nucleotides (HPLC)

Column: SUPELCOSIL LC-18-T, 15cm x 4.6mm ID, 3µm particles
Cat. No.: 58970-U
Mobile Phase: A = 0.1M potassium phosphate buffer/4mM tetrabutylammonium hydrogen sulfate, pH 6.0
B = A:methanol (70:30), pH 7.2
Flow Rate: 1.5mL/min
Det.: UV, 254nm
Inj.: 20µL deionized water (25-530µM each analyte)

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Gradient Program			
Time (min)	%A	%B	%C
0	100	—	—
7.2	100	—	—
12	90	10	—
15	75	25	—
19.2	40	60	—
21.6	38	62	—
27	—	100	—
48	—	—	100
55	—	—	100

Selective, Quantitative Analysis

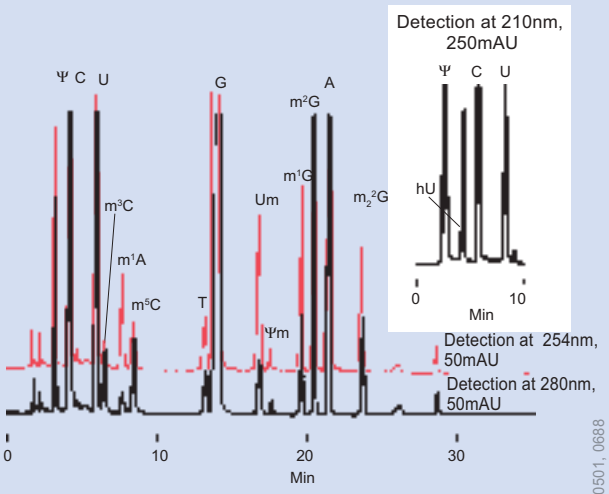
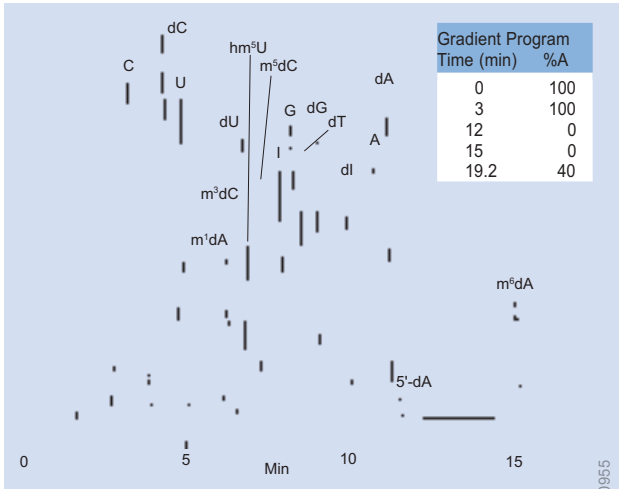


Figure provided by Dr. C.W. Gehrke and Mr. K.C. Kuo of the Interdisciplinary Chromatography-Mass Spectrometry Laboratories, University of Missouri (Columbia, MO, USA).

Single Species tRNAs (HPLC)

Columns: SUPELCOSIL LC-18-S, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 58931
Mobile Phase: A = 0.01M KH_2PO_4 (pH 5.3):methanol, 97.5:2.5
B = 0.01M KH_2PO_4 (pH 5.1):methanol, 80:20
C = 0.01M KH_2PO_4 (pH 4.9):acetonitrile, 65:35
Equilibration: solvent A, 15 min at 1mL/min
Flow Rate: 1mL/min
Temp.: 26°C
Det.: UV, 210nm, 254nm, 280nm
Inj.: 50µL hydrolysate buffer (pH 7.8) containing 5µg bovine tRNA ^{Leu} hydrolysate



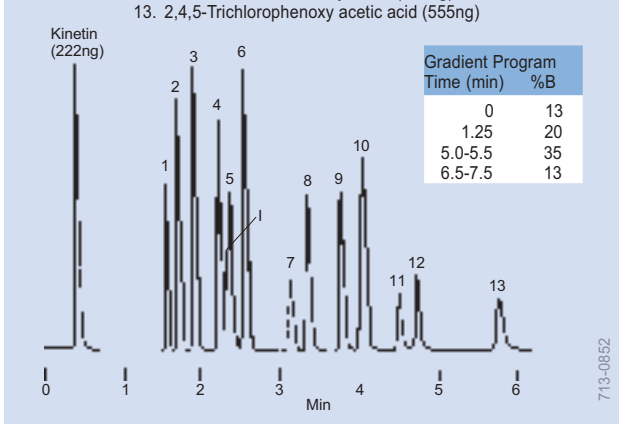
Gradient Program	
Time (min)	%A
0	100
3	100
12	0
15	0
19.2	40

Figure provided by Dr. C. W. Gehrke and Mr. K. C. Kuo, University of Missouri-Columbia, Experimental Station Chemical Laboratories, Columbia, MO USA.

Deoxyribonucleosides and Ribonucleosides (HPLC)

Column: SUPELCOSIL LC-18-S, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 58931
Mobile Phase: 0.05M K_2HPO_4/KH_2PO_4, pH 4.0:methanol
A = 97.5:2.5, B = 80:20
Flow Rate: 1.0mL/min
Temp.: 30°C
Det.: UV, 254nm
Inj.: nucleoside standards in water

1. 6-Benzylaminopurine riboside (445ng)
2. Indole-3-acetic acid (222ng)
3. Abscisic acid (222ng)
4. α-Naphthalene acetamide (222ng)
I Abscisic acid impurity
5. Colchicine (555ng)
6. Indole-3-propanoic acid (222ng)
7. p-Chlorophenoxy acetic acid (333.5ng)
8. Indole-3-butyric acid (333.5ng)
9. α-Naphthalene acetic acid (333.5ng)
10. β-Naphthalene acetic acid (333.5ng)
11. 2,4-Dichlorophenoxy acetic acid (555ng)
12. Indole-3-acetic acid ethyl ester (445ng)
13. 2,4,5-Trichlorophenoxy acetic acid (555ng)



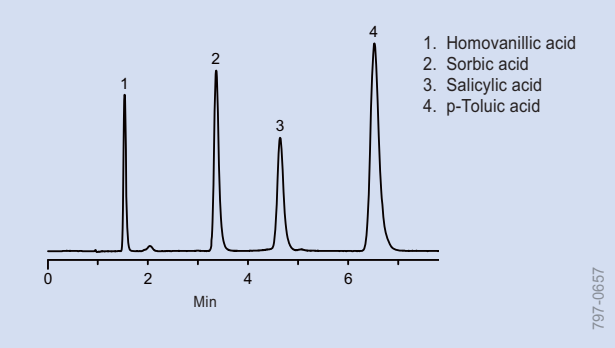
Gradient Program	
Time (min)	%B
0	13
1.25	20
5.0-5.5	35
6.5-7.5	13

Plant Growth Regulators (HPLC)

Column: SUPELCOSIL LC-18-DB, 3.3cm x 4.6mm ID, 3µm particles
Cat. No.: 58978
Mobile Phase: A = 1% acetic acid/1mM tetrabutylammonium phosphate in water, pH 2.8
B = acetonitrile
Flow Rate: 2mL/min
Temp.: 35°C
Det.: UV, 280nm
Inj.: compounds in 13:87 A:B

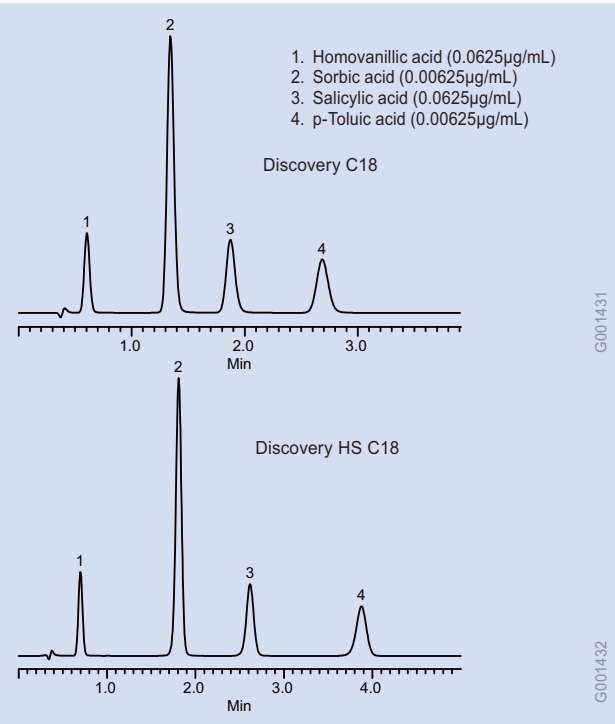
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HPLC Applications
Organic Acids



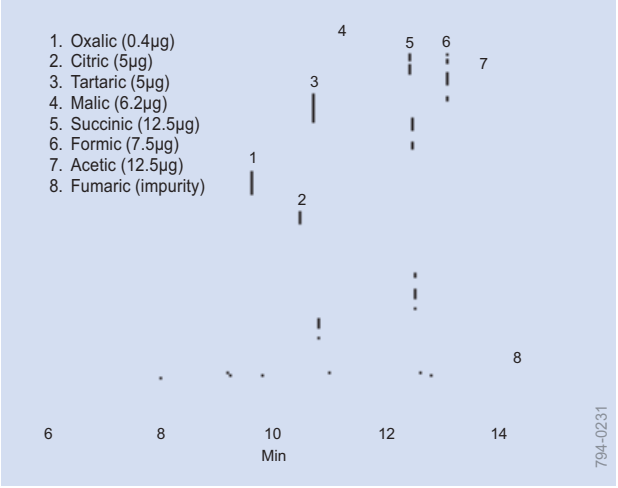
Organic Acids (HPLC)

Column: Discovery C18, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 504955
Mobile Phase: methanol:water, 0.1% TFA (40:60)
Flow Rate: 1mL/min
Temp.: 20°C
Det.: UV, 254nm
Inj.: 10µL, 1mg/mL each analyte



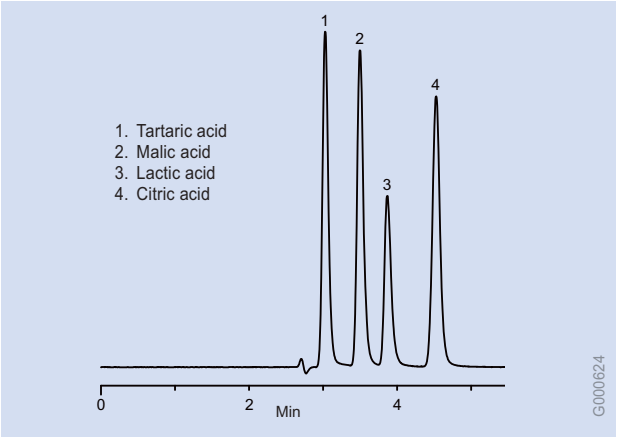
Organic Acids (HPLC)

Columns: 5cm x 4.6mm ID, 5µm particles
Cat. Nos.: 504947 (C18), 568520-U (HS C18)
Mobile Phase: 60:40 0.1%TFA in water:MeOH
Flow Rate: 2.0mL/min
Temp.: 20°C
Det.: UV, 254nm
Inj.: 10µL



Organic Acids (HPLC)

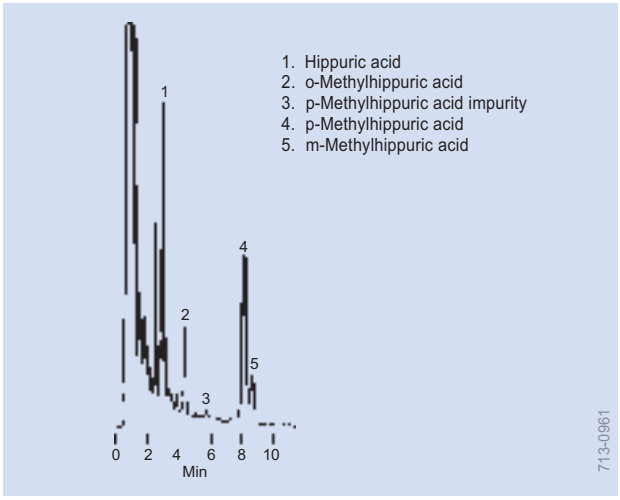
Column: SUPELCOGEL C-610H, 30cm x 7.8mm ID
Cat. No.: 59320-U
Mobile Phase: 0.1% phosphoric acid
Flow Rate: 0.5mL/min
Det.: UV, 210nm
Inj.: 5µL



α-Hydroxy Aliphatic Acids (HPLC)

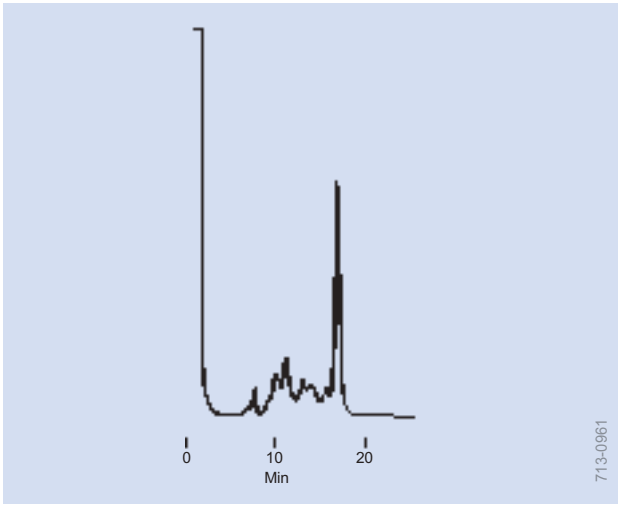
Column: Discovery RP-AmideC16, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 505013
Mobile Phase: 25mM KH_2PO_4, pH 3.0
Flow Rate: 1mL/min
Temp.: 30°C
Det.: UV, 220nm
Inj.: 10µL

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



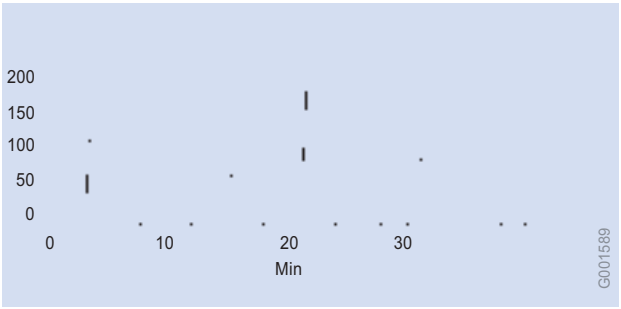
Hippuric and Methylhippuric Acids (HPLC)

Column: SUPELCOSIL LC-18, 7.5cm x 4.6mm ID, 3µm particles
Cat. No.: 58984
Mobile Phase: tetrahydrofuran:10mM KH_2PO_4, pH 3.0 with phosphoric acid (3:97)
Flow Rate: 1.5mL/min
Det.: UV, 260nm
Inj.: 10µL spiked urine (300µg/mL HA, o-MHA; 150µg/mL m-MHA, p-MHA)



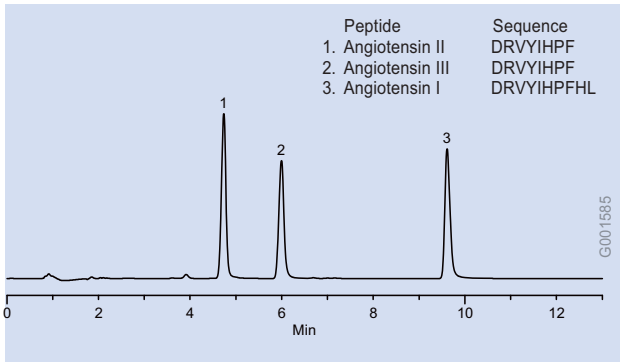
α-Amylase, Crude (HPLC)

Column: TSKgel Ether-5PW, 7.5cm x 7.5mm ID, 10µm particles
Cat. No.: 808641
Mobile Phase: A = 0.1M phosphate buffer + 1.1M Na_2SO_4, pH 7.0
B = 0.1M phosphate buffer
A to B over 60 min
Flow Rate: 1.0mL/min
Det.: UV, 280nm



Amyloid ß-Protein Fragment 10-35 (HPLC)

Columns: Discovery BIO Wide Pore C18, 25cm x 4.6mm ID, 5µm particles
Cat. No.: 568223-U
Mobile Phase: (A) 0.1% TFA in water
(B) 25:75, (0.1% TFA in water): (0.1% TFA in CH_3CN)
Flow Rate: 1.3mL/min
Temp: 30°C
Det.: UV, 215nm
Inj.: 10µL, 1mg/mL in water
Gradient: 35-55%B in 20 min, 55%B for 5 min, 35%B for 5 min



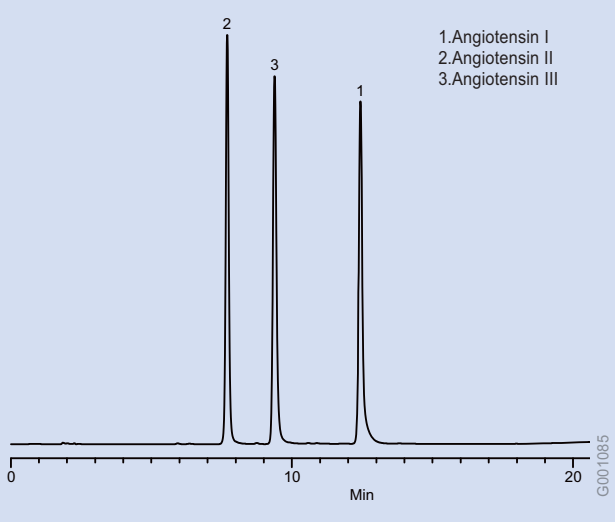
Angiotensins (HPLC)

Column: Discovery BIO Wide Pore C18, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 568222-U
Mobile Phase: (A) 65:35, (10mM NH_4OAc, pH 7):(50% CH_3CN in 20mM NH_4OAc, pH 7)
(B) 25:75, (10mM NH_4OAc, pH 7):(50% CH_3CN in 20mM NH_4OAc, pH 7)
Flow Rate: 1.0mL/min
Temp: ambient
Det.: UV, 215nm
Inj.: 6µL (10µg each) in water
Gradient: 0-100%B in 12.5 min

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

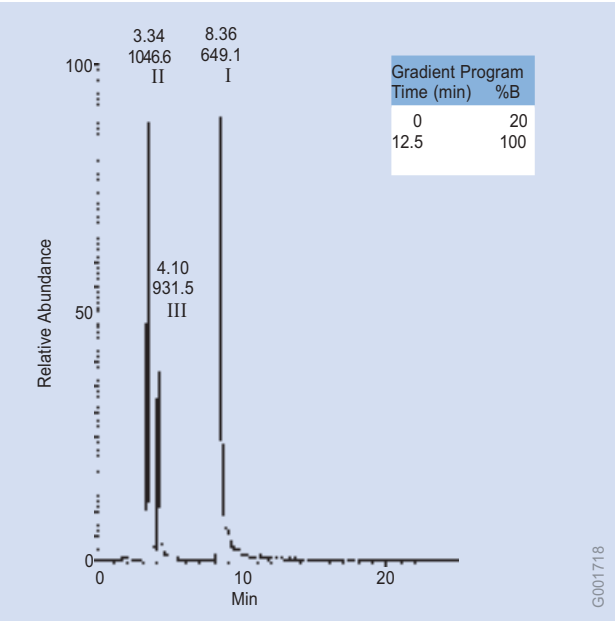
HPLC Applications

Peptides and Proteins



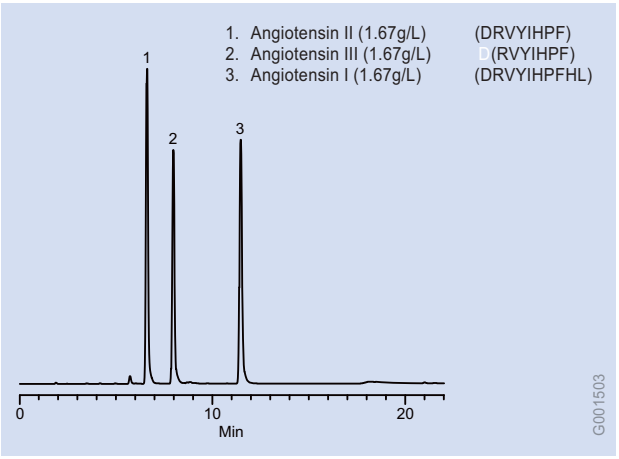
Angiotensins (HPLC)

Column:	Discovery C18, 15cm x 4.6mm ID, 5µm particles
Cat. No.:	504955
Mobile Phase:	(A) 5mM $(NH_4)H_2PO_4/NH_4OH$, pH 7.0 (B) 5mM $(NH_4)H_2PO_4/NH_4OH$, pH 7.0: CH_3CN (50:50)
Flow Rate:	1mL/min
Temp.:	35°C
Det.:	UV, 220nm
Gradient:	30-60% B in 15 min



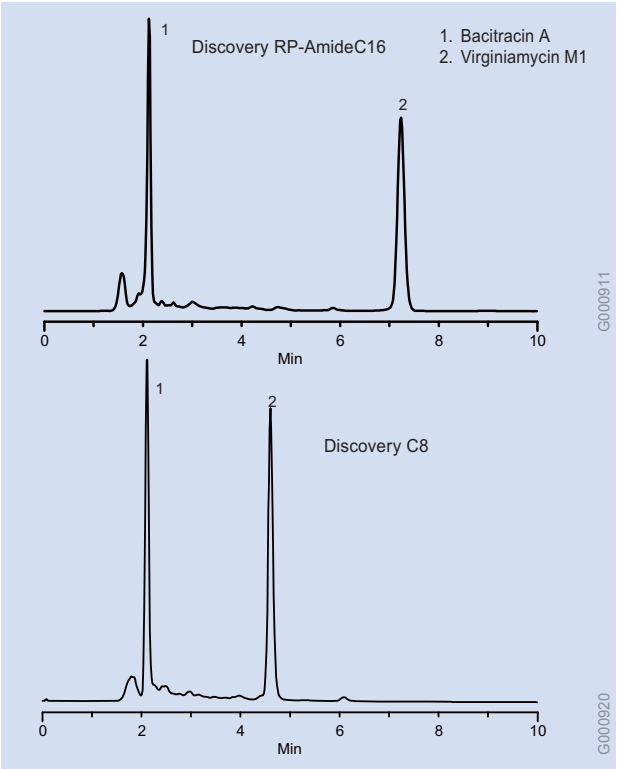
Angiotensins Capillary Separation (HPLC)

Column:	Discovery BIO Wide Pore C18, 10cm x 0.32mm ID, 3µm particles
Cat. No.:	65527-U
Solution x:	10mM NH_4OAc/NH_4OH, pH 7.0
Solution y:	50:50 (20mM NH_4OAc/NH_4OH, pH 7.0) : CH_3CN
Mobile Phase A:	x:y, 65:35
Mobile Phase B:	x:y, 25:75
Flow Rate:	6µL/min
Det.:	+ES, source 2.5kV, capillary 12V, 130° C
Temp.:	ambient
Inj.:	50pmol



Angiotensins (HPLC)

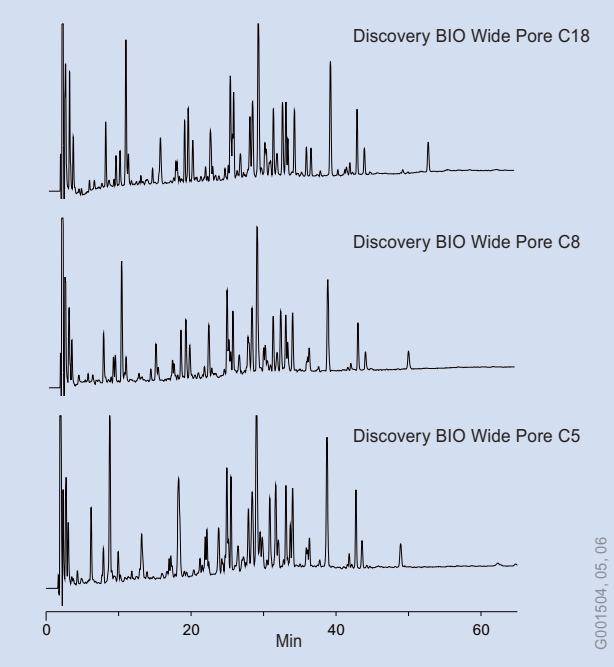
Column:	Discovery BIO Wide Pore C8, 15cm x 4.6mm ID, 5µm particles
Cat. No.:	568322-U
Mobile Phase:	(A) 10mM $NH_4H_2PO_4/NH_4OH$, pH 7 (B) 50:50, (20mM $NH_4H_2PO_4/NH_4OH$, pH 7):CH_3CN
Flow Rate:	1mL/min
Temp:	30°C
Det.:	UV, 215nm
Inj.:	6µL in water
Gradient:	30-60% B in 15 min



Antibiotics, Peptide (HPLC)

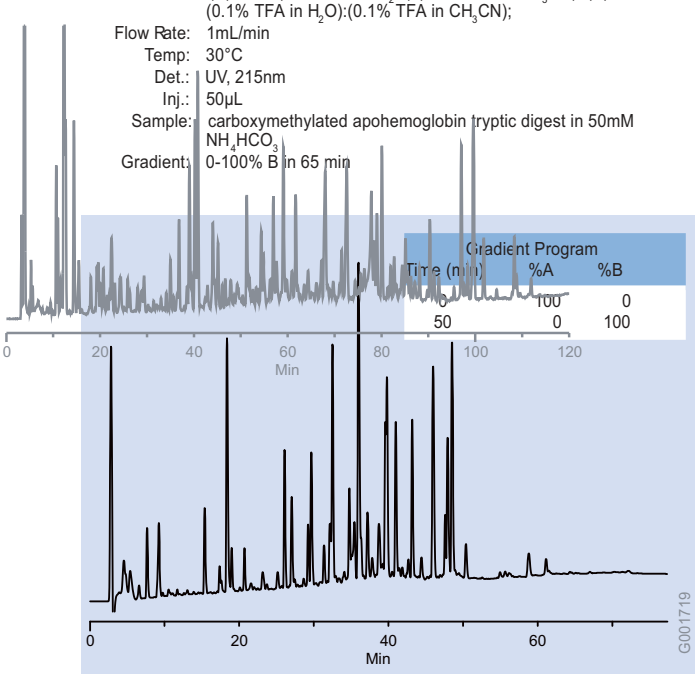
Columns:	15cm x 4.6mm ID, 5µm particles
Cat. Nos.:	505013 (RP-AmideC16), 59353-U (C8)
Mobile Phase:	25mM KH_2PO_4, pH 3:acetonitrile, 60:40
Flow Rate:	1mL/min
Temp.:	35°C
Det.:	UV, 220nm
Inj.:	10µL 25mM KH_2PO_4, pH 3 containing 50µg/mL each analyte

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



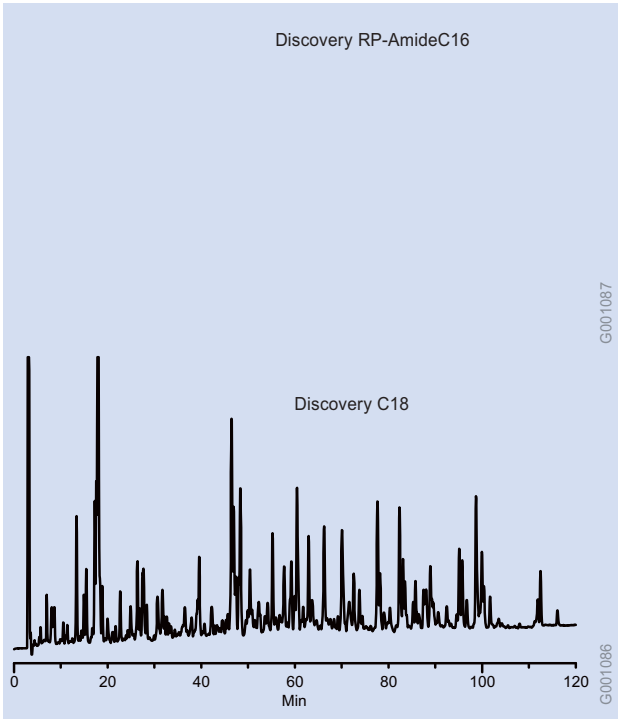
Apohemoglobin, Carboxymethylated, Tryptic Digest (HPLC)

Columns: 15cm x 4.6mm ID, 5µm particles
Cat. Nos.: 568222-U (C18), 568322-U (C8), 568422-U (C5)
Mobile Phase: (A) 95:5, (0.1% TFA in H_2O):(0.1% TFA in CH_3CN); (B) 50:50, (0.1% TFA in H_2O):(0.1% TFA in CH_3CN);
Flow Rate: 1mL/min
Temp: 30°C
Det.: UV, 215nm
Inj.: 50µL
Sample: carboxymethylated apohemoglobin tryptic digest in 50mM NH_4HCO_3
Gradient: 0-100% B in 65 min



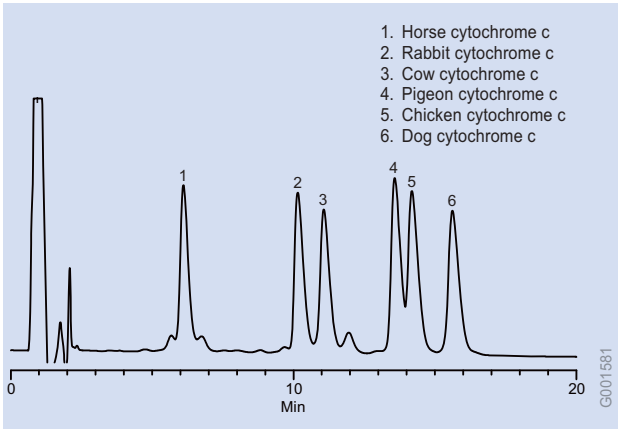
Apohemoglobin (Horse), Carboxymethylated, Tryptic Digest (HPLC)

Column: Discovery BIO Wide Pore C18, 15cm x 2.1mm ID, 3µm particles
Cat. No.: 567202-U
Mobile Phase A: water/0.1% TFA
Mobile Phase B: 50:50, (water/0.1% TFA) : (CH_3CN/0.1% TFA)
Flow Rate: 0.208mL/min
Temp: 35°C
Det.: UV, 215nm
Inj.: 5µL
Sample: digest



Carboxyamido-methylated BSA Tryptic Digest (HPLC)

Columns: 25cm x 4.6mm ID, 5µm particles
Cat. Nos.: 505013 (RP-AmideC16), 504955 (C18)
Mobile Phase: (A) 0.1% TFA, 1% CH_3CN in H_2O
(B) 0.1% TFA, 40% CH_3CN
Flow Rate: 1 mL/min
Det.: UV, 215nm
Temp.: 35°C
Gradient: 0-100% B in 130 min

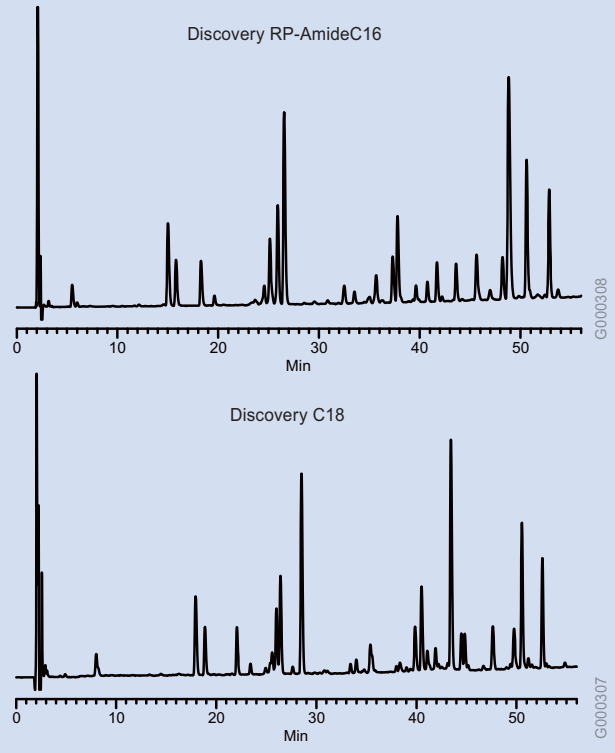


Cytochrome c (HPLC)

Column: Discovery BIO Wide Pore C18, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 568222-U
Mobile Phase: (A) 70:30, (0.1% TFA in water):(0.1% TFA in CH_3CN); (B) 64:36, (0.1% TFA in water):(0.1% TFA in CH_3CN)
Flow Rate: 1.0mL/min
Temp: ambient
Det.: UV, 220nm
Inj.: 12µL each at 0.8mg/mL in 0.1%TFA
Gradient: 0-100%B in 30 min

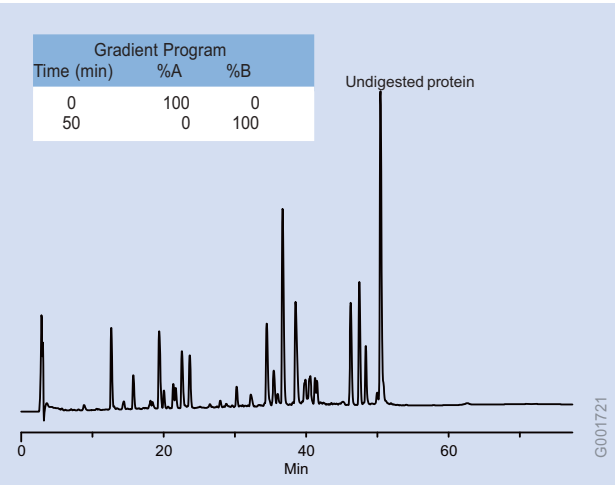
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Cytochrome c Tryptic Digest (HPLC)

Columns: 15cm x 4.6mm ID, 5µm particles
Cat. Nos.: 505013 (RP-AmideC16), 504955 (C18)
Mobile Phase: (A) 0.1% TFA, 3% n-propanol in H_2O
(B) 0.1% TFA, 3% n-propanol in CH_3CN
Flow Rate: 1mL/min
Temp.: 35°C
Gradient: 1 - 37% B in 72 min



Carboxymethylated Cytochrome c (Chicken) Tryptic Digest (HPLC)

Column: Discovery BIO Wide Pore C18, 15cm x 2.1mm ID, 3µm particles
Cat. No.: 567202-U
Mobile Phase A: water/0.1% TFA
Mobile Phase B: 50:50, (water/0.1% TFA) : (MeCN/0.1% TFA)
Flow Rate: 0.208mL/min
Temp: 35°C
Det.: 215nm
Inj.: 5µL
Sample: digest

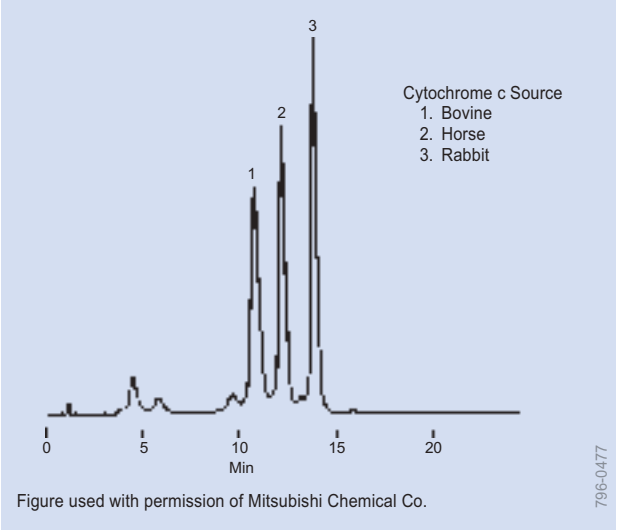
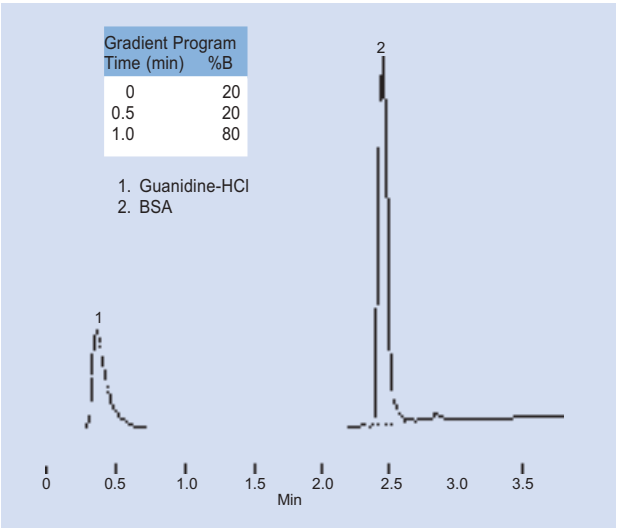


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Cytochrome c Species Variants (HPLC)

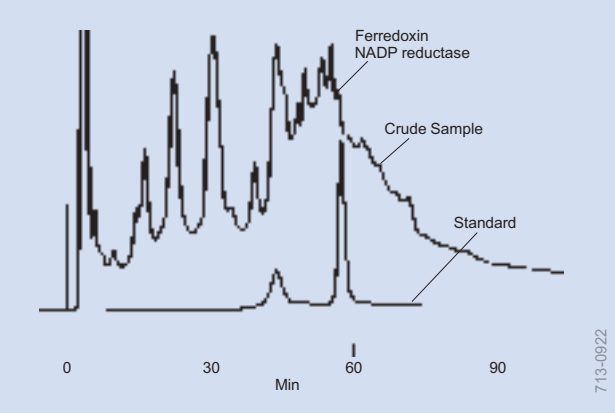
Column: ProtEx-SP, 5cm x 4.6mm ID, 5µm particles
Cat. No.: 54740-U
Mobile Phase: A = 20mM Bis-Tris HCl, pH 7.0
B = A + 0.5M NaCl
24-69% B over 20 min
Flow Rate: 0.5mL/min
Det.: UV, 280nm
Inj.: 10µg each variant



Desalting of Proteins (HPLC)

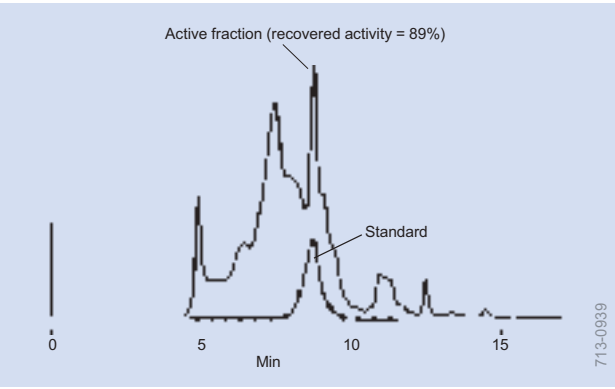
Column: Supelguard LC-308, 2cm x 4.6mm ID, 5µm particles, 300Å pores
Cat. No.: 59511-U
Mobile Phase: A = 0.1% TFA in water
B = 0.09% TFA in acetonitrile
Flow Rate: 2mL/min
Det.: UV, 220nm
Inj.: 40µL of 200µg BSA in 3M guanidine-HCl

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Ferredoxin NADP Reductase (HPLC)

Column: TSKgel Phenyl-5PW column, 7.5cm x 7.5mm ID, 10µm particles
Cat. No.: 807573
Mobile Phase: 60 min decreasing linear gradient from 1.5M to 0M ammonium sulfate in 0.1M sodium phosphate buffer, pH 7
Flow Rate: 0.5mL/min
Temp.: 25°C
Det.: UV, 280nm
Inj.: 3mg (crude) or 0.2mg (standard)



Glutathione S-Transferase (HPLC)

Column: TSKgel G3000SW$_{XL}$, 30cm x 7.8mm ID, 5µm particles
Cat. No.: 808541
Mobile Phase: 0.3M NaCl/0.05M NaH $_2$PO$_4$, pH 7.0
Flow Rate: 1mL/min
Temp.: 25°C
Det.: UV, 220nm
Inj.: 100µL crude glutathione S-transferase preparation from guinea pig liver (0.7mg)

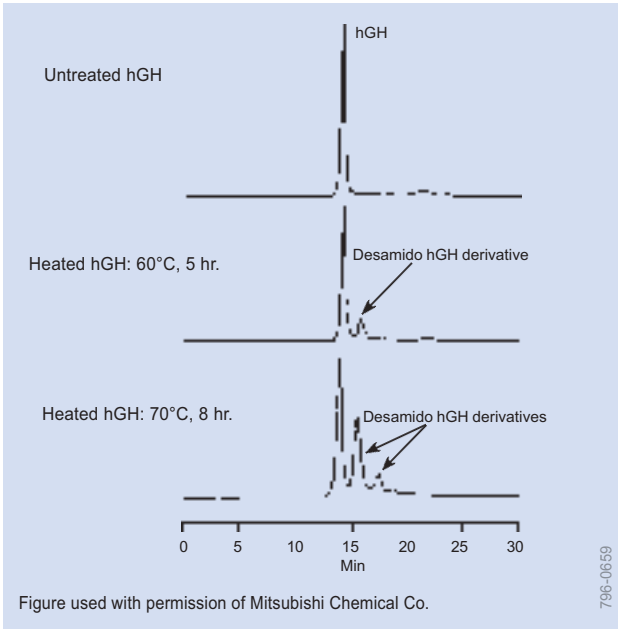
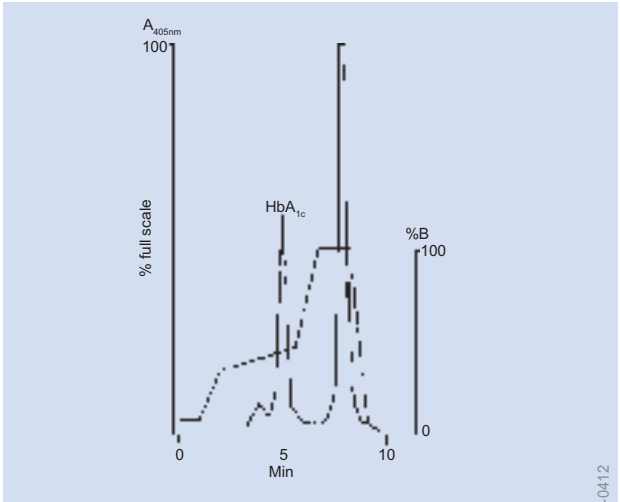


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Purity Evaluation of Human Growth Hormone (hGH) (HPLC)

Column: ProtEx-DEAE, 5cm x 4.6mm ID, 5µm particles
Cat. No.: 54742
Mobile Phase: A = 20mM Tris-HCl, pH 8.0
B = A + 0.5M NaCl
5-70% B over 30 min
Flow Rate: 0.5mL/min
Inj.: 10mg hGH



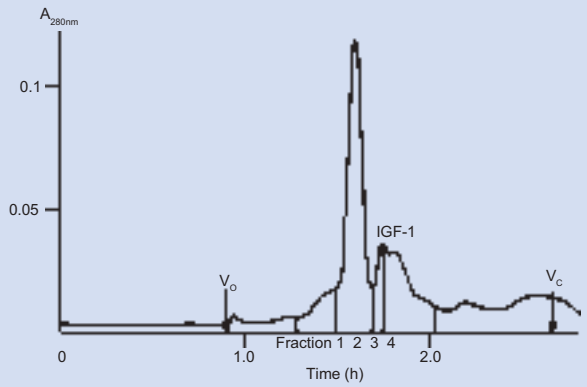
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Hemoglobin HbA $_{1c}$ (HPLC)

Column: Mono S HR5/5, 10µm particles
Cat. No.: 54808
Mobile Phase: A = 0.01M malonate-NaOH, pH 5.7
B = 0.3M LiCl in mobile phase A
Flow Rate: 2.0mL/min
Det.: VIS, 405nm
Inj.: 50µL hemolysate diluted 1:5

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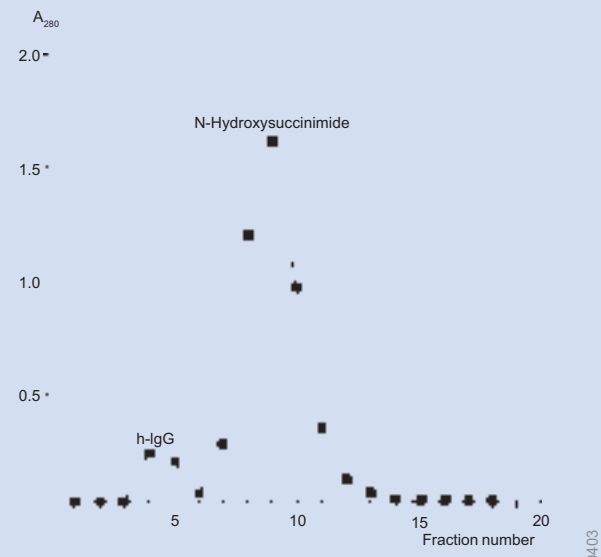


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794-0420

IGF-1, Insulin-like Growth Factor-1 (HPLC)

Column: HiLoad 16/60 Superdex 75 prep grade, 34µm particles
Cat. No.: 54802-U
Mobile Phase: 0.15M ammonium acetate, pH 6.0
Flow Rate: 0.75mL/min
Det.: UV, 280nm
Inj.: IGF-1, ZZ fusion protein and uncleaved material

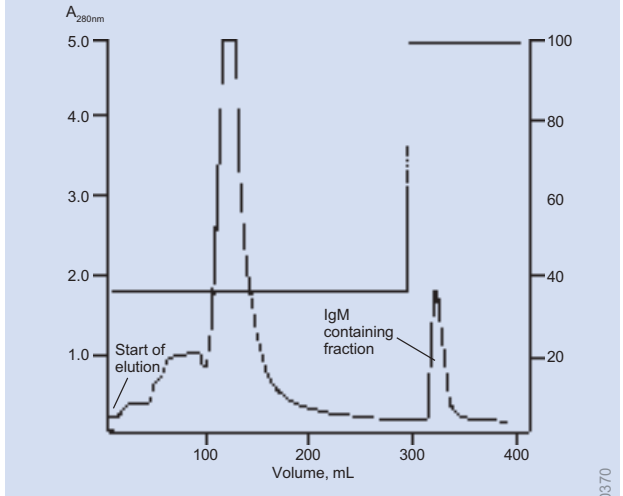


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796-0403

Immunoglobulins, IgG, Human (HPLC)

Column: HiTrap Desalting, 5mL
Cat. No.: 54822
Mobile Phase: 0.2M sodium carbonate buffer, pH 8.5
Flow Rate: syringe use
Det.: UV, 280nm
Inj.: 0.5mL unbound human IgG in 0.2M sodium carbonate buffer after coupling to a HiTrap NHS 1mL column. Fraction volume 0.5mL

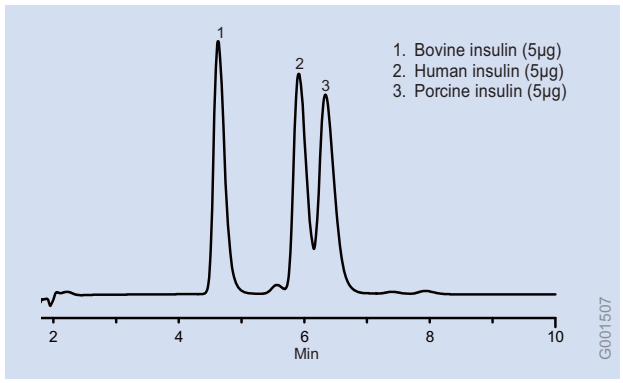


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794-0370

Immunoglobulins, IgM (HPLC)

Medium: Q Sepharose Fast Flow
Cat. No.: Q1126-100ML
Column: 30cm x 50mm ID
Mobile Phase: A = 0.02M NaH_2PO_4, pH 6.5
B = A + 0.5M NaCl, pH 6.5
Flow Rate: 25cm/hr
Det.: UV, 280nm
Inj.: culture supernatant

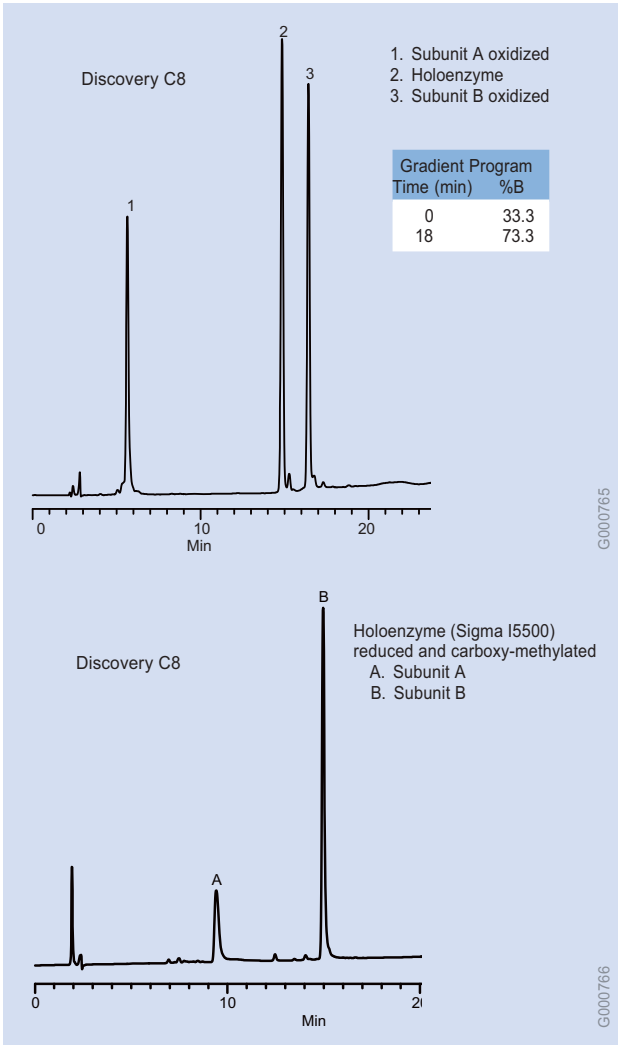


G001507

Insulin (HPLC)

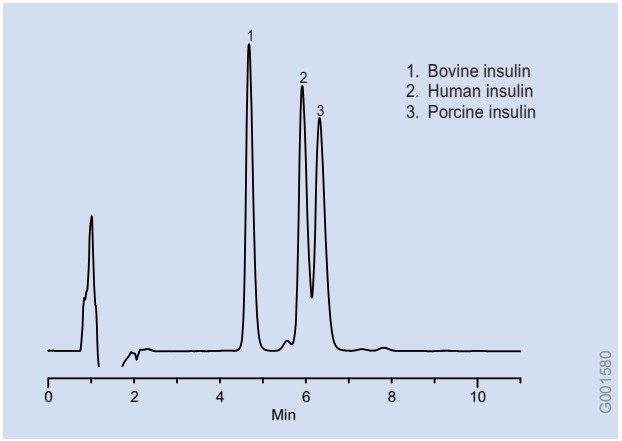
Column: Discovery BIO Wide Pore C8, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 568322-U
Mobile Phase: (A) 71:29, (0.1% TFA in H_2O):(0.1% TFA in CH_3CN);
(B) 68:32, (0.1% TFA in H_2O):(0.1% TFA in CH_3CN)
Flow Rate: 1mL/min
Temp: 30°C
Det.: UV, 215nm
Inj.: 50µL in 0.1% TFA
Gradient: 0-100% B in 30min

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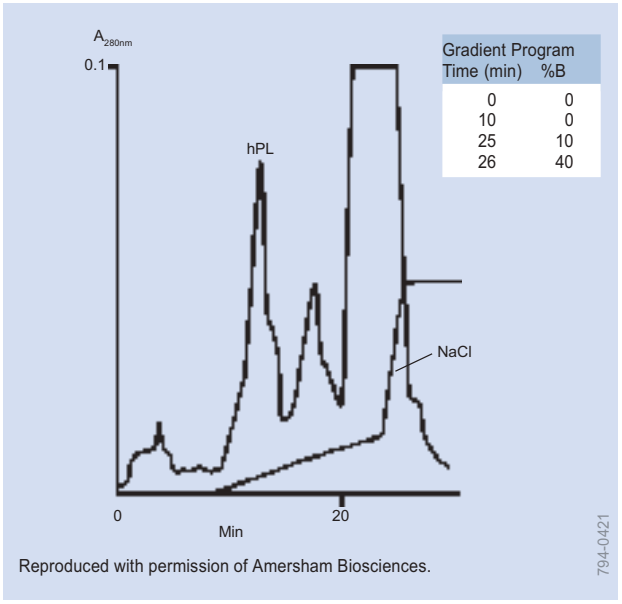
Insulin, Bovine (HPLC)

Columns: Discovery C8, 5cm x 4.6mm ID, 5µm particles
Cat. Nos.: 59353-U
Mobile Phase: 25mM KH_2PO_4, pH 3:acetonitrile, 60:40
Mobile Phase: A = 50mM H_2NaPO_4, 50mM Na_2SO_4, pH 3.0 (w/H_3PO_4), 5% acetonitrile
B = 50mM H_2NaPO_4, 50mM Na_2SO_4, pH 3.0 (w/H_3PO_4), 50% acetonitrile
Flow Rate: 1mL/min
Temp: 35°C
Det.: UV, 220nm



Insulin (HPLC)

Column: Discovery BIO Wide Pore C5, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 568422-U
Mobile Phase: (A) 71:29, (0.1% TFA in water):(0.1% TFA in CH_3CN);
(B) 68:32, (0.1% TFA in water):(0.1% TFA in CH_3CN)
Flow Rate: 1.0mL/min
Temp: ambient
Det.: UV, 215nm
Inj.: 5µL each at 1mg/mL in 0.1%TFA
Gradient: 0-100%B in 30 min



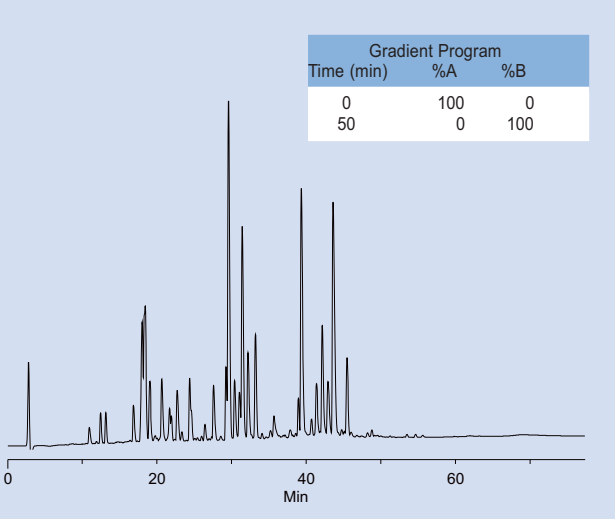
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Lactogen, Human Placental (HPLC)

Column: Mono Q HR5/5, 10µm particles
Cat. No.: 54807
Mobile Phase: A = 20mM bis-Tris, pH 6.0
B = A + 1M NaCl
Flow Rate: 1.0mL/min
Det.: UV, 280nm
Inj.: 2.5mL hPL fraction from size exclusion medium

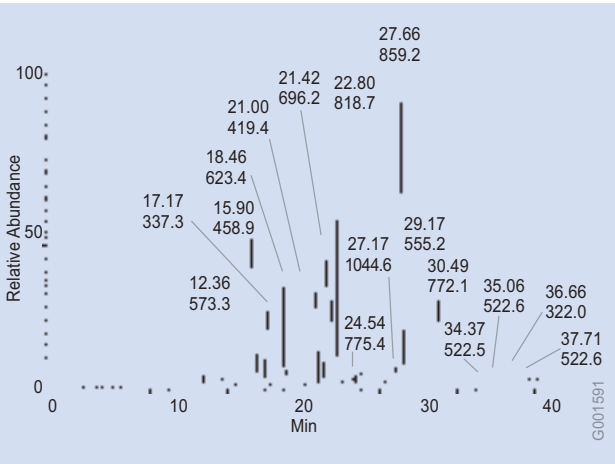
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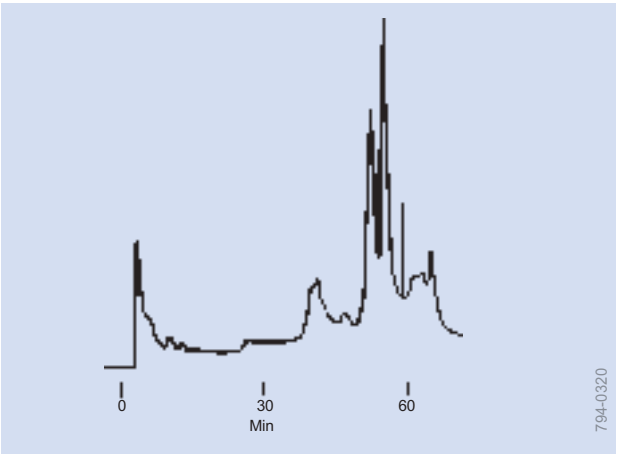
ß-Lactoglobulin (Cow), Carboxymethylated, Tryptic Digest (HPLC)

Column: Discovery BIO Wide Pore C18, 15cm x 2.1mm ID, 3µm particles
Cat. No.: 567202-U
Mobile Phase A: water/0.1% TFA
Mobile Phase B: 50:50, (water/0.1% TFA) : (MeCN/0.1% TFA)
Flow Rate: 0.208mL/min
Temp.: 35°C
Det.: 215nm
Inj.: 5µL
Sample: digest



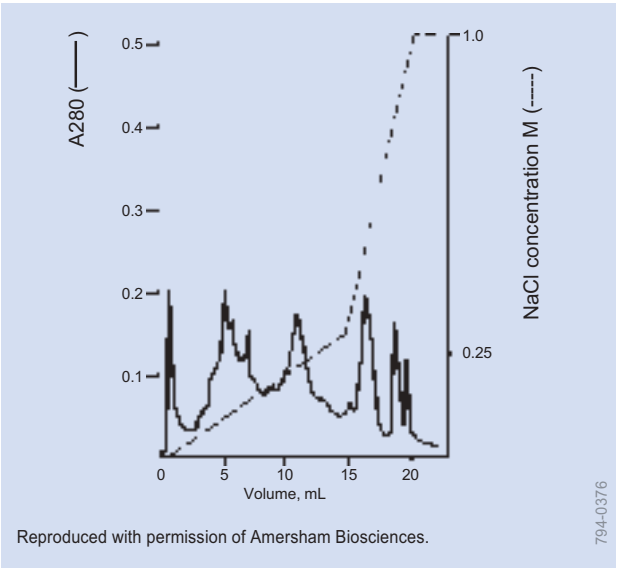
ß-Lactoglobulin Tryptic Digest, Capillary Separation (HPLC)

Column: Discovery BIO Wide Pore C18, 15cm x 0.5mm ID, 5µm particles
Cat. No.: 65519-U
Mobile Phase: (A) 0.1% TFA in water; (B) 0.1% TFA in CH_3CN
Flow Rate: 14µL/min
Temp.: 30°C
Inj.: 500pmol (5µL) ß-Lactoglobulin tryptic digest in 50mM NH_4HCO_3
Gradient: 5-40%B in 70 min
MS conditions: +ESI mode Capillary Temp 130°C, Source Voltage 2.5KV, Capillary Voltage 12V



Lipoxidase, Commercial (HPLC)

Column: TSKgel Phenyl-5PW, 7.5cm x 7.5mm ID, 10µm particles
Cat. No.: 807573
Mobile Phase: A = 0.1M phosphate buffer, pH 7.0 + 1.5M $(NH_4)_2SO_4$
B = 0.1M phosphate buffer, pH 7.0
linear gradient, 0% B to 100% B over 60 min
Flow Rate: 0.5mL/min
Det.: UV, 280nm

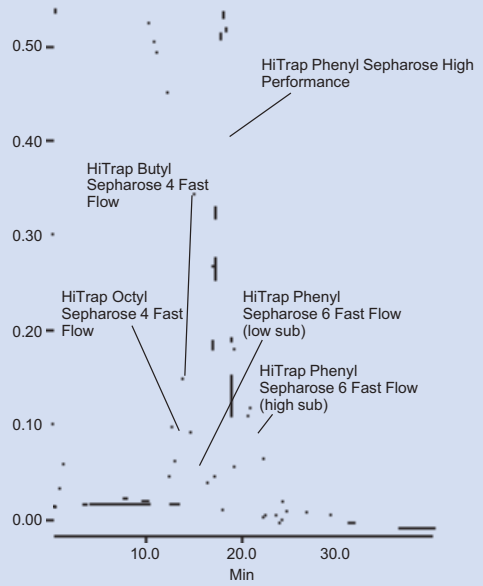


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Liver Extract, Bovine (HPLC)

Column: Mono Q HR5/5, 10µm particles
Cat. No.: 54807
Mobile Phase: A = 50mM diethanolamine, pH 8.8
B = 50mM diethanolamine + 1.0M NaCl, pH 8.8
Flow Rate: 1.0mL/min
Det.: UV, 280nm
Inj.: 100µL, 1.6mg protein

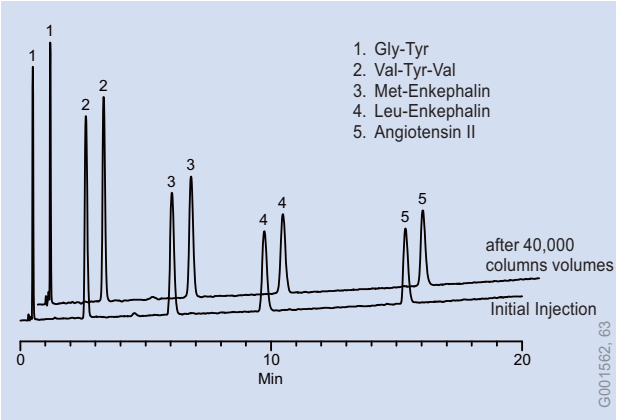
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Monoclonal Antibody (HPLC)

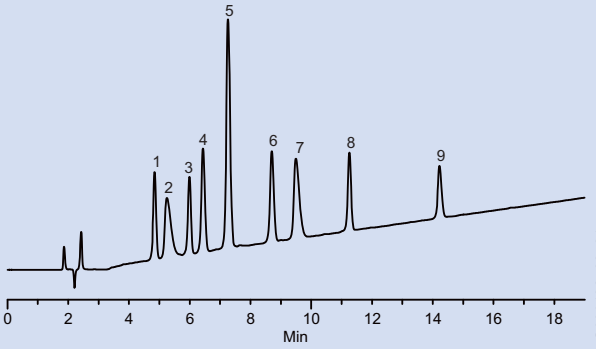
Column: HiTrap HIC cartridges
Cat. No.: 54814
Mobile Phase: A = 50mM sodium phosphate, 1.0M ammonium phosphate, pH 7.0
B = 50mM sodium phosphate, pH 7.0
Flow Rate: 1.0mL/min
Det.: UV, 280nm
Inj.: 100µL anti-lac cl 507, 8.8mg/mL



Peptides (HPLC)

Column: Discovery BIO Wide Pore C18, 5cm x 4.6mm ID, 5µm particles
Cat. No.: 568220-U
Mobile Phase: (A) 5:95, (0.5% TFA in water):(0.5% TFA in CH_3CN);
(B) 25:75, (0.5% TFA in water):(0.5% TFA in CH_3CN)
Flow Rate: 2.0mL/min
Temp: 70°C
Det.: UV, 220nm
Inj.: 5µL, 2.5µg each peptide (Sigma Peptide Mix, Cat. No. H 2016) in mobile phase A
Gradient: 2-24%B in 22 min, 8 min at 100%A

	Peptide	Sequence
1.	Arg^8-vasopressin	CFQNCPRG-amide; disulfide
2.	Bradykinin, fragment 1-5	RPPGF
3.	Oxytocin	CYQNCPLG-amide; disulfide
4.	Met-enkephalin	YGGFM
5.	Luteinizing hormone releasing hormone	PEHWSYGLRPG-amide
6.	Leu-enkephalin	YGGFL
7.	Bradykinin	RPPGFSPFR
8.	Bombesin	PEQRLGNQWAVGHLM-amide
9.	Substance P	RPKPQQFFGLM-amide

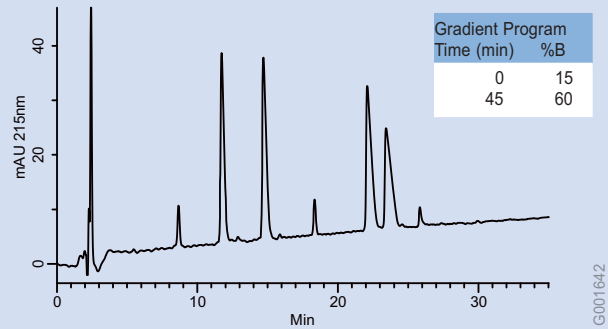


Peptides (HPLC)

Column: Discovery BIO Wide Pore C5, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 568422-U
Mobile Phase: (A) 0.1% PFPA (pentafluoropropionic acid) in water:CH_3CN (81:19);
(B) 0.1% PFPA in water:CH_3CN (62:38)
Flow Rate: 1.0mL/min
Temp: 30°C
Det.: UV, 215nm
Inj.: 10µL, ~0.25µg each peptide (Sigma Peptide Mix, Cat. No. P 2693) in mobile phase A
Gradient: 0-100%B in 19 min

Peptide 1: ac-GGGLGGAGGLK-amide
Peptide 2: ac-KYGLGGAGGLK-amide
Peptide 3: ac-GGALKALKGLK-amide
Peptide 4: ac-KYALKALKGLK-amide

Gradient Program	
Time (min)	%B
0	15
45	60



Peptides, Basic, No TFA (HPLC)

Columns: Discovery BIO Wide Pore C18, 15cm x 2.1mm ID, 5µm particles
Cat. No.: 568202-U
Mobile Phase A: 25mM formic acid in water
Mobile Phase B: 50:50 (25mM formic acid in water) : (20mM formic acid in CH_3CN)
Flow Rate: 0.208mL/min
Det.: UV, 215nm
Temp.: 35°C
Inj.: 0.5µL (~0.25µg ea peptide)
Sample: RP Peptide Ionic Interactions Standard, p/n RPS-I0020 (Alberta Peptide Institute)

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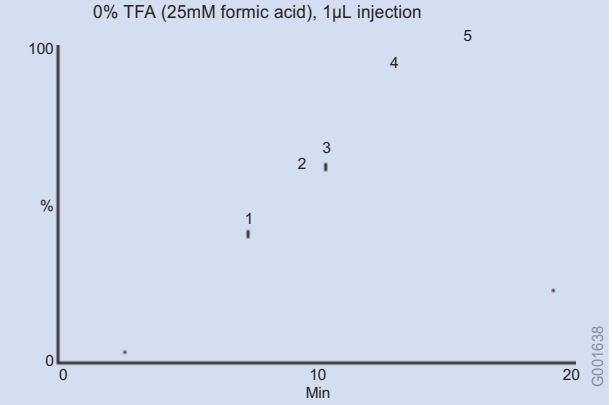
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Gradient Program		
Time (min)	%A	%B
0	90	10
20	50	50

Peptide 1: ac-RGAGGLGLGK-amide
Peptide 2: ac-RGGGGLGLGK-amide
Peptide 3: ac-RGAGGLGLGK-amide
Peptide 4: ac-RGVGGLGLGK-amide
Peptide 5: ac-RGVVGLGLGK-amide



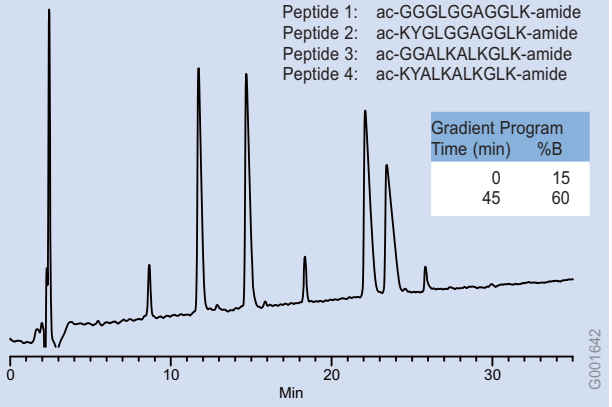
Peptides, Alberta Mix, No TFA (HPLC)

Column: Discovery BIO Wide Pore C18, 15cm x 2.1mm ID, 3µm particles
Cat. No.: 567202-U
Mobile Phase A: 25mM formic acid in water,
Mobile Phase B: 50:50 (25mM formic acid in water) : (20mM formic acid in CH_3CN)[a],
Flow Rate: 0.208mL/min[b]
Det.: +ES
Temp.: ambient
Inj.: 1µL
Sample: RP Peptide Performance Standard, p/n RPS-P0010 (Alberta Peptide Institute)

a) molarity of formic acid adjusted to provide minimum baseline drift
b) linear velocity equal to 1mL/min on 4.6mm ID columns

Peptide 1: ac-GGGLGGAGGLK-amide
Peptide 2: ac-KYGLGGAGGLK-amide
Peptide 3: ac-GGALKALKGLK-amide
Peptide 4: ac-KYALKALKGLK-amide

Gradient Program	
Time (min)	%B
0	15
45	60



Peptides, Synthetic (HPLC)

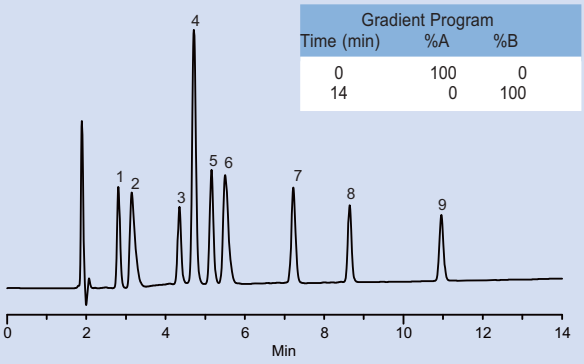
Columns: Discovery BIO Wide Pore C18, 15cm x 2.1mm ID, 5µm particles
Cat. No.: 568202-U
Mobile Phase A: 25mM formic acid in water
Mobile Phase B: 50:50 (25mM formic acid in water):(20mM formic acid in CH_3CN)
Flow Rate: 0.208 mL/min
Det.: UV, 215nm
Temp.: 35°C
Inj.: 0.5µL (~0.25µg ea peptide)
Sample: RP Peptide Ionic Interactions Standard, p/n RPS-I0020 (Alberta Peptide Institute)

TFA mobile phase:

Peak	Peptide	Amino Acid Sequence
1.	Arg[8]-vassopressin	CYFQNCPRG-amide; disulfide
2.	Bradykinin, fragment 1-5	RPPGF
3.	Oxytocin	CYIQNCPLG-amide; disulfide
4.	LHRH*	pEHWSYGLRPG-amide **
5.	Met-enkephalin	YGGFM
6.	Bradykinin	RPPGFSPFR
7.	Leu-enkephalin	YGGFL
8.	Bombesin	pEQRLGNQWAVGHLM-amide **
9.	Substance P	RPKPQQFFGLM-amide

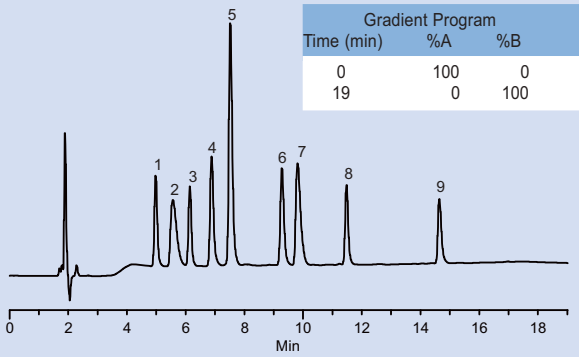
* Luteinizing Hormone Releasing Hormone
** pE is pyroglutamate

Gradient Program		
Time (min)	%A	%B
0	100	0
14	0	100



PFPA (penta-fluoropropionic acid) mobile phase:

Gradient Program		
Time (min)	%A	%B
0	100	0
19	0	100

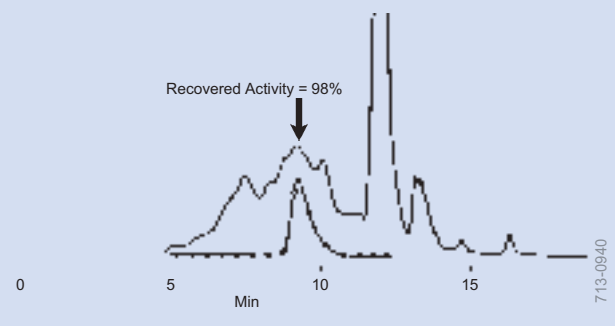


Peptides, Synthetic (HPLC)

TFA:
Column: Discovery BIO Wide Pore C18, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 568222-U
Mobile Phase A: 80:20, (water/0.1%TFA) : (CH_3CN/0.1%TFA)
Mobile Phase B: 66:34, (water/0.1%TFA) : (CH_3CN/0.1%TFA)
Flow Rate: 1.0mL/min;
Det.: UV, 215nm
Temp.: 30°C
Inj.: 10µL Sigma Peptide Mix P2693 (~25µg ea. Peptide)

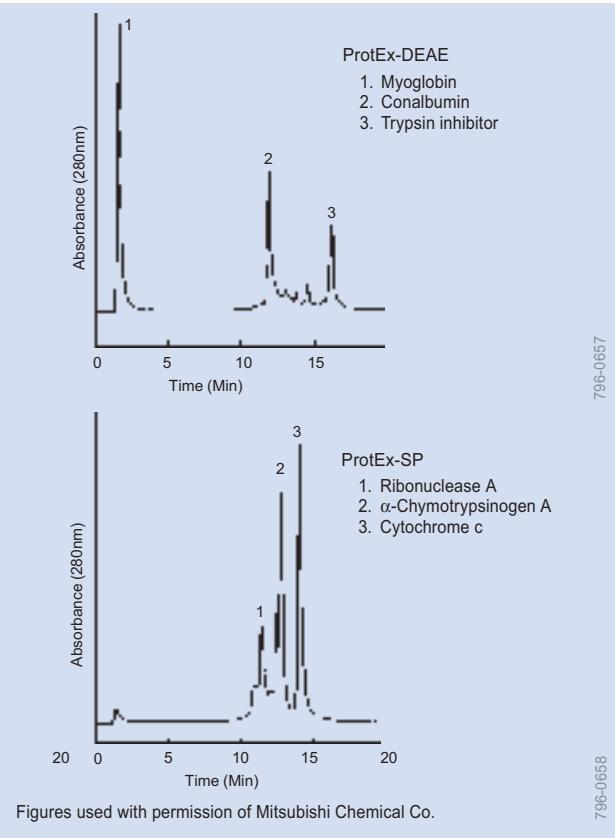
PFPA:
Column: Discovery BIO Wide Pore C18, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 568222-U
Mobile Phase A: 81:19, (water/0.1%PFPA) : (CH_3CN/0.1%PFPA)
Mobile Phase B: 62:38, (water/0.1%PFPA) : (CH_3CN/0.1%PFPA)
Flow Rate: 1.0mL/min
Det.: UV, 215nm
Temp.: 30°C
Inj.: 10µL Sigma Peptide Mix P2693 (~25µg ea. Peptide)

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Peroxidase (HPLC)

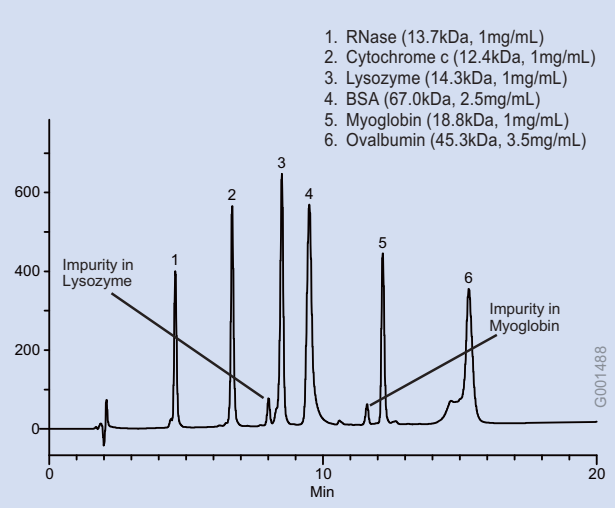
Column: TSKgel G3000SW$_{XL}$, 30cm x 7.8mm ID, 5µm particles
Cat. No.: 808541
Mobile Phase: 0.3M NaCl/0.05M phosphate buffer, pH 7.0
Flow Rate: 1mL/min
Temp.: 25°C
Det.: UV, 220nm
Inj.: 100µL crude peroxidase preparation from Japanese horseradish (0.15mg)



Figures used with permission of Mitsubishi Chemical Co.

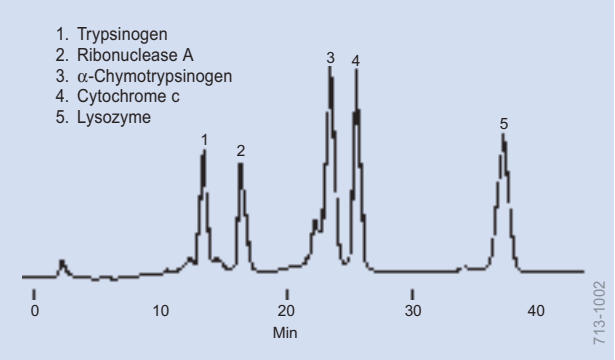
Proteins (HPLC)

Column: ProtEx-DEAE or ProtEx-SP, 5cm x 4.6mm ID, 5µm particles
Cat. No.: 54742 (ProtEx-DEAE) or 54740-U (ProtEx-SP)
Mobile Phase: Left: A = 20mM Tris-HCl, pH 8.0, B = A + 0.5M NaCl
5-100% B over 15 min
Right: A = 20mM sodium phosphate, pH 7.0,
B = A + 0.5M NaCl
5-100% B over 15 min
Flow Rate: 0.5mL/min
Det.: UV, 280nm
Inj.: 10µg trypsin inhibitor, 5µg conalbumin, myoglobin or
10µg ribonuclease A, 5µg cytochrome c, a-chymotrypsinogen A



Proteins (HPLC)

Columns: Discovery BIO Wide Pore C5, 15cm x 4.6mm ID, 5µm particles
Cat. No. : 568422-U
Mobile Phase: 75:25, (0.1% TFA in water):(0.1% TFA in CH_3CN);
Flow Rate: 1.0mL/min
Temp: ambient
Det.: UV, 220nm
Inj.: 12µL in 0.1%TFA
Gradient: 0-100%B in 25 min

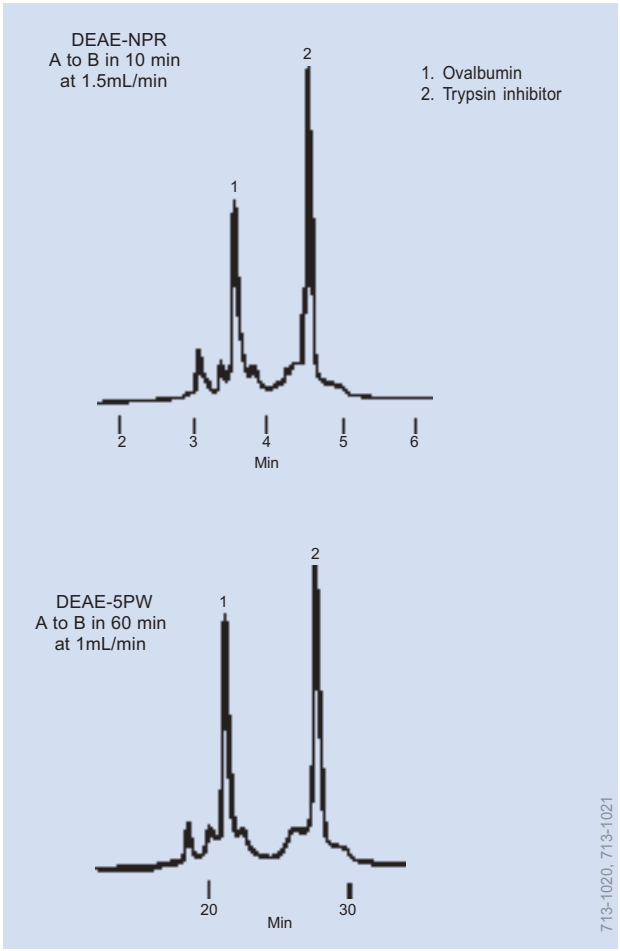


Proteins (HPLC)

Column: TSKgel CM-5PW, 7.5cm x 7.5mm ID, 10µm particles
Cat. No.: 813068
Mobile Phase: A = 0.1M NaH_2PO_4 buffer, pH 7.0
B = 0.5M NaCl, A to B in 60 min
Flow Rate: 1.0mL/min
Det.: UV, 280nm

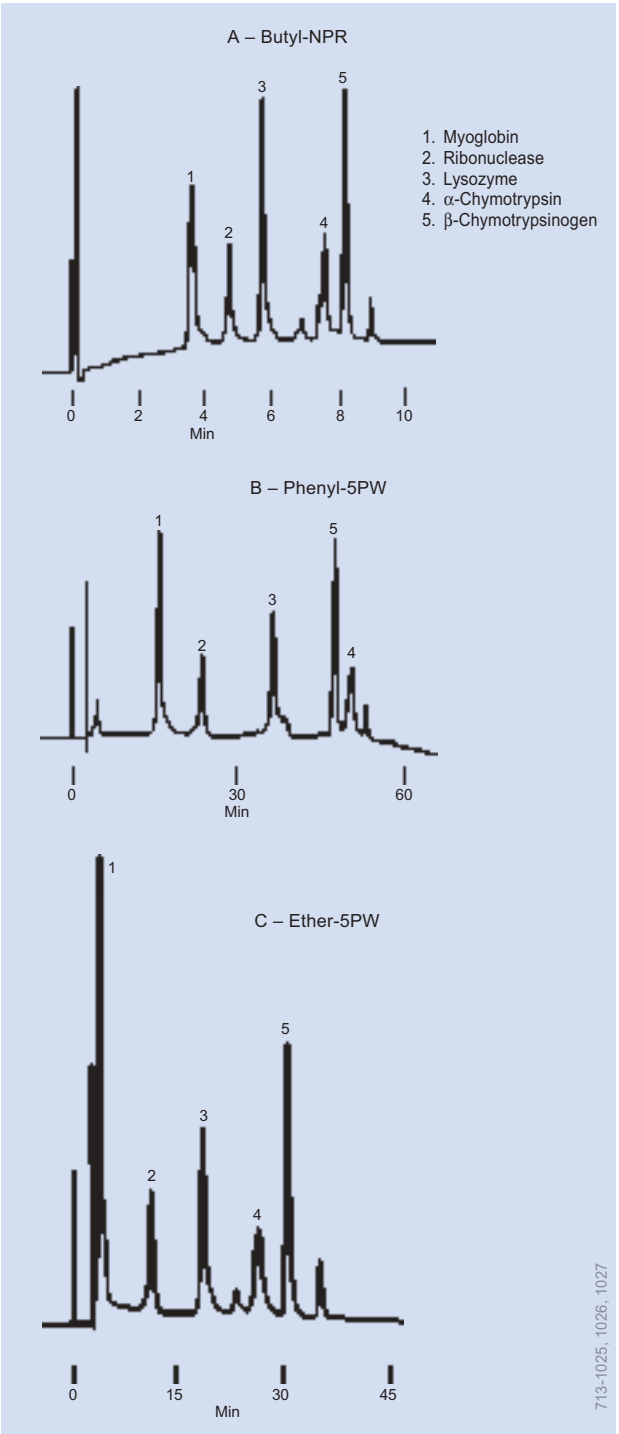
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HPLC Applications
Peptides and Proteins



Proteins (HPLC)

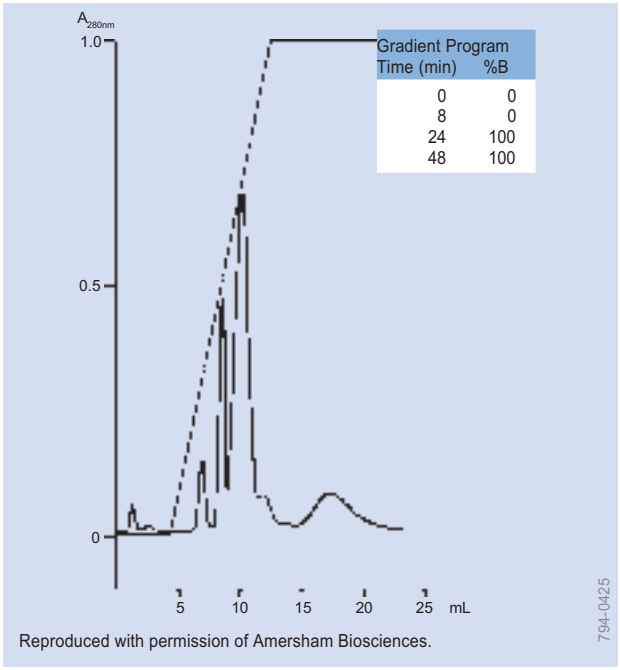
Column A:	TSKgel DEAE-NPR, 3.5cm x 4.6mm ID, 2.5µm particles
Cat. No.:	813075
Column B:	TSKgel DEAE-5PW, 7.5cm x 7.5mm ID, 10µm particles
Cat. No.:	807164
Mobile Phase:	A = 20mM Tris-HCl buffer, pH 8.0
	B = 0.5M NaCl in A
Det.:	UV, 280nm



Proteins (HPLC)

Column A:	TSKgel Butyl-NPR, 3.5cm x 4.6mm ID, 2.5µm particles
Cat. No.:	814947
Column B:	TSKgel Phenyl-5PW, 7.5cm x 7.5mm ID, 10µm particles
Cat. No.:	807573
Column C:	TSKgel Ether-5PW, 7.5cm x 7.5mm ID, 10µm particles
Cat. No.:	808641
Mobile Phase:	A = 0.1M phosphate buffer, pH 7.0 plus $(NH_4)_2SO_4$, 2.3M to 0M in12 min
	B & C = 0.1M phosphate buffer, pH 7.0 plus $(NH_4)_2SO_4$, 1.8M to 0M in 60 min
Flow Rate:	1mL/min
Det.:	UV, 280nm

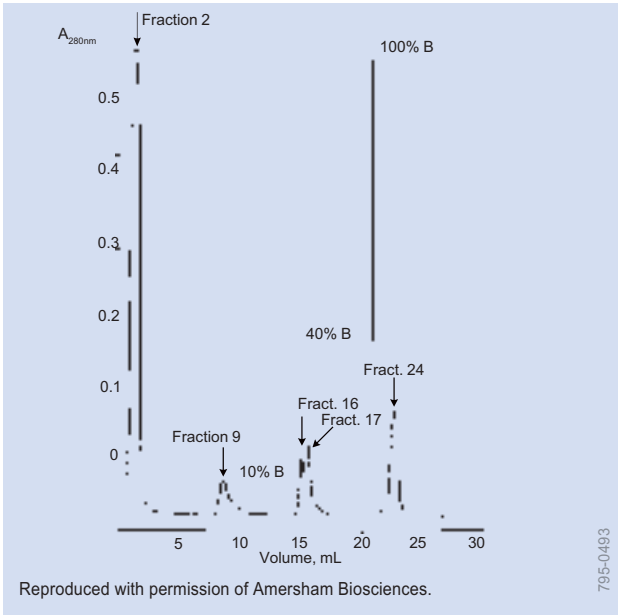
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Proteins, Egg White (HPLC)

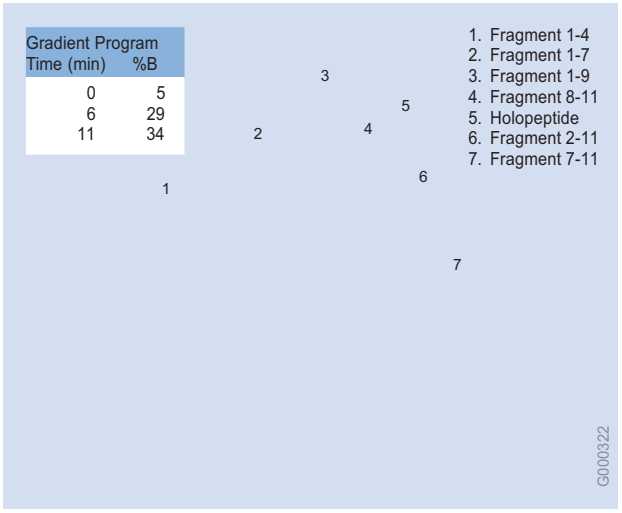
Column: HiTrap Chelating, 1mL
Cat. No.: 54834
Mobile Phase: A = 0.2M NaH_2PO_4, 1M NaCl, pH 7.2
B = 0.02M NaH_2PO_4, 1M NH_4Cl, pH 7.2
Flow Rate: 0.5mL/min
Temp.: 40°C
Det.: UV, 280nm
Inj.: 200µL egg white



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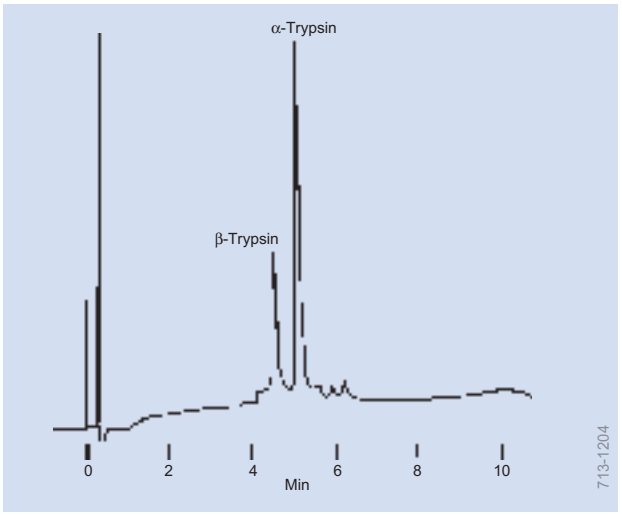
Proteins, Milk (HPLC)

Column: HiTrap SP, 1mL
Cat. No.: 54817
Mobile Phase: A = 50mM Na acetate, pH 6.0
B = 50mM Na acetate/1.0M NaCl , pH 6.0
Flow Rate: 1mL/min
Det.: UV, 280nm
Inj.: 0.5mL filtered casein-precipitated human milk (buffer exchanged to mobile phase A)



Substance P and Its Fragments (HPLC)

Column: Discovery C18, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 504955
Mobile Phase: A = water + 0.1% TFA
B = acetonitrile + 0.1% TFA
Flow Rate: 1mL/min
Temp.: 35°C
Det.: UV, 220nm
Inj.: Substance P in initial mobile phase



Trypsin (HPLC)

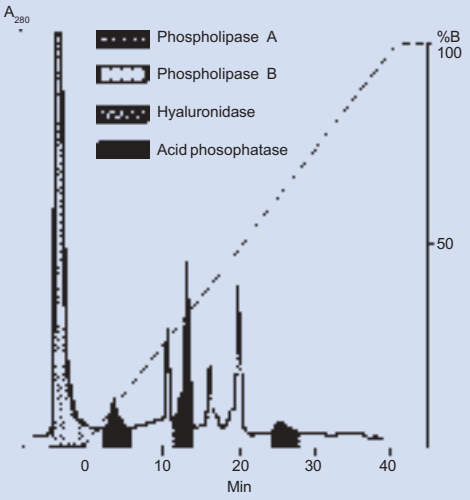
Column: TSKgel Butyl-NPR, 3.5cm x 4.6mm ID, 2.5µm particles
Cat. No.: 814947
Mobile Phase: 2M to 0M ammonium sulfate in 20mM Tris-HCl buffer, pH 7.5 in 10 min
Flow Rate: 1.0mL/min
Det.: UV, 280nm
Inj.: commercial trypsin sample

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Liquid Chromatography

SUPELCO

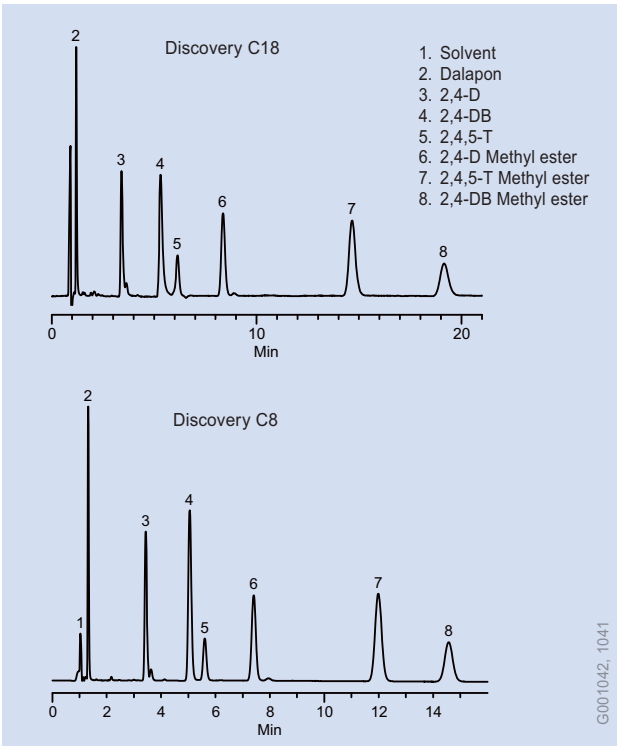
HPLC Applications
Peptides, Proteins, Pesticides



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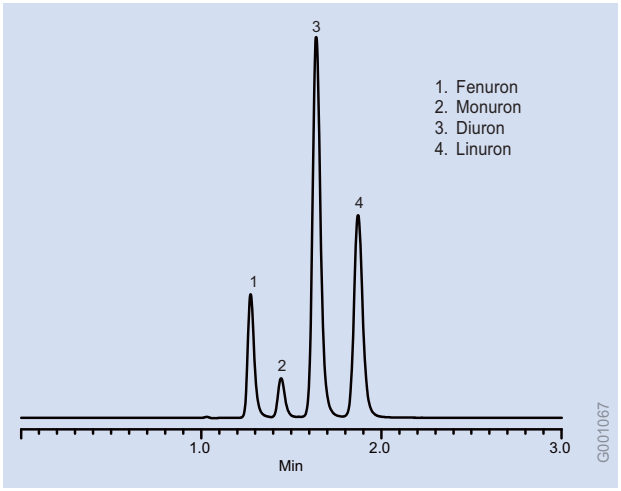
Venom, White-Faced Hornet (HPLC)

Column: Mono S HR5/5, 10µm particles
Cat. No.: 54808
Mobile Phase: A = 50mM BICINE, pH 8.4
B = A + 0.35M NaCl
Flow Rate: 1.0mL/min
Det.: UV, 280nm
Inj.: 7mg venom in mobile phase A



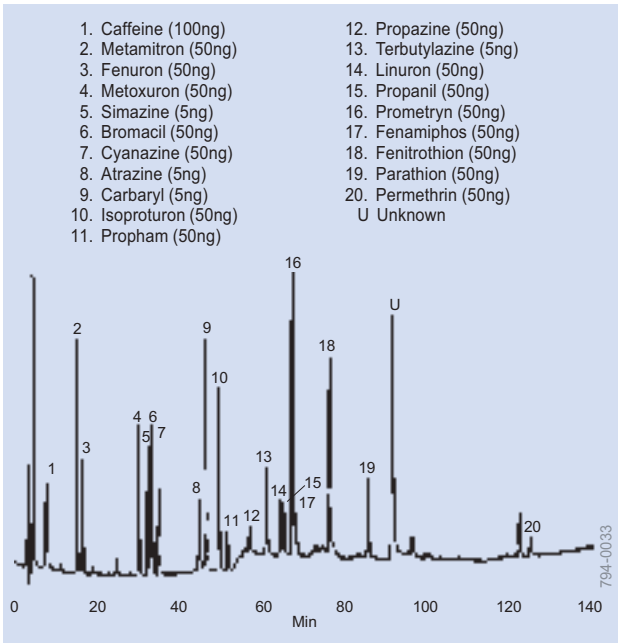
Organo-Acid Pesticides (HPLC)

Columns: 15cm x 4.6mm ID, 5µm particles
Cat. Nos.: 504955 (C18), 59353-U (C8)
Mobile Phase: 60:40 25mM potassium phosphate, (pH 2.3):CH_3CN
Flow Rate: 2.0mL/min
Det.: UV, 214nm
Temp.: 20°C
Inj.: 1µL



Urea Pesticides (HPLC)

Column: Discovery Cyano, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 59356-U
Mobile Phase: 60:40 water:CH_3CN
Flow Rate: 2.0mL/min
Temp.: 20°C
Det.: UV, 214nm
Inj.: 1µL

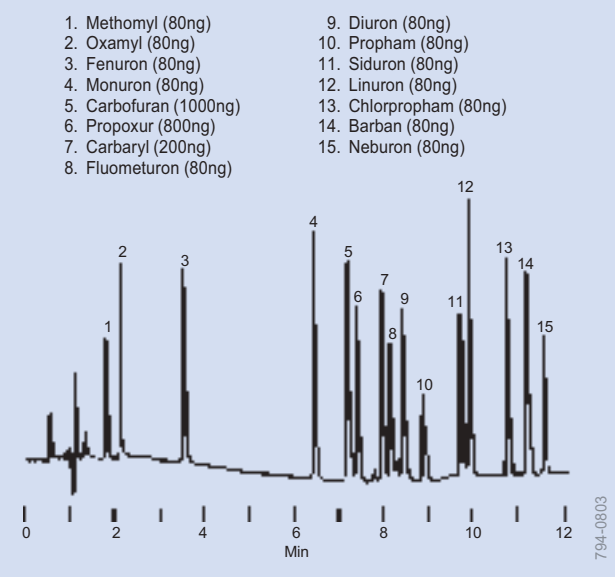


Figures reproduced courtesy of Dr. Claude Corvi, Laboratories Cantonal de Chimie, Geneva, Switzerland.

Pesticides and Herbicides (HPLC)

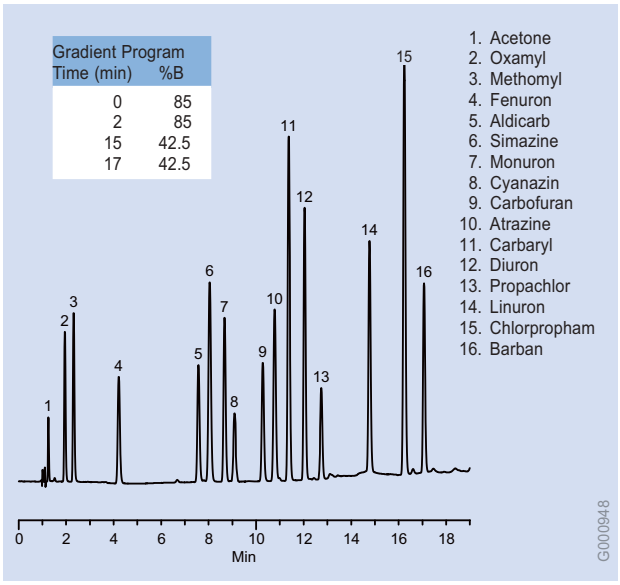
Column: SUPELCOSIL LC-ABZ, 25cm x 4.6mm ID, 5µm particles
Cat. No.: 59142
Mobile Phase: 10% to 90% acetonitrile in water at 0.5%/min
Flow Rate: 1mL/min
Temp.: 40°C
Det.: UV, 225nm
Inj.: 50µL water, spiked with analytes

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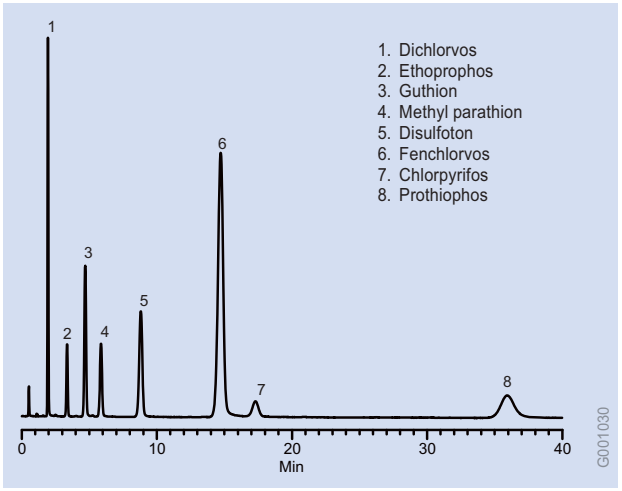
Carbamate and Urea Pesticides (HPLC)

Column: SUPELCOSIL LC-8, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 58220-U
Mobile Phase: acetonitrile:water gradient, 18:82 to 65:35 in 9 min, hold 3 min
Flow Rate: 2.0mL/min
Temp.: 35°C
Det.: UV, 240nm
Inj.: 10µL



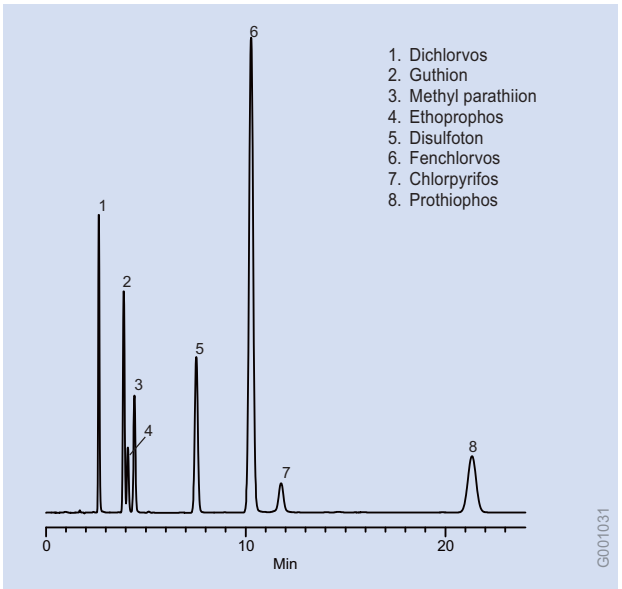
Urea/Carbamate/Triazine/An iline Pesticides (HPLC)

Column: Discovery C18, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 504955
Mobile Phase: A = acetonitrile
B = water
Flow Rate: 2mL/min
Temp.: 20°C
Det.: UV, 214nm
Inj.: 1µL



Organophosphorus Pesticides (HPLC)

Column: Discovery Cyano, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 59356-U
Mobile Phase: 75:25 water:CH_3CN
Flow Rate: 2.0mL/min
Temp.: 20°C
Det.: UV, 214nm
Inj.: 1µL



Organophosphorus Pesticides (HPLC)

Column: Discovery RP-AmideC16, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 505013
Mobile Phase: acetonitrile:water, 60:40
Flow Rate: 1mL/ min
Temp.: 20°C
Det.: UV, 214nm
Inj.: 1µL

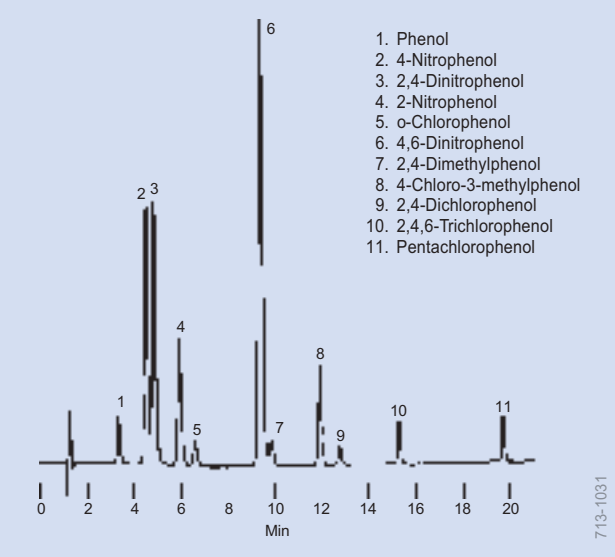
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Liquid Chromatography

SUPELCO

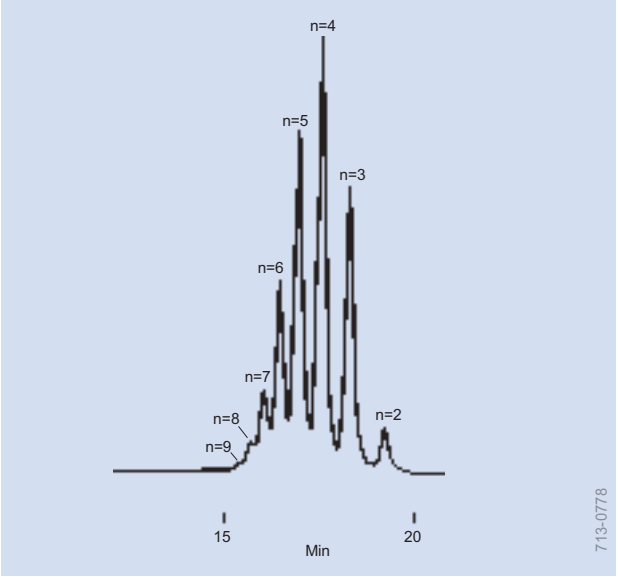
HPLC Applications

Phenols, Polymers, Oligomers



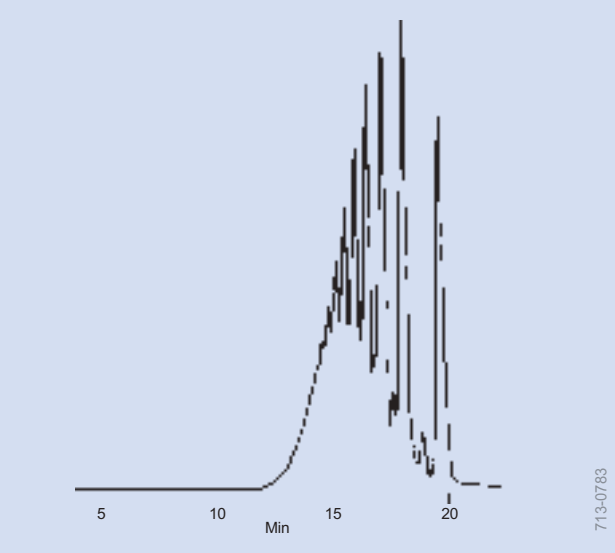
Phenols (HPLC)

Column: SUPELCOSIL LC-8, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 58220-U
Mobile Phase: 1% acetic acid/methanol:1% acetic acid/water, 35:65 to 100:0 (20 min), return to 35:65 (5 min)
Flow Rate: 1.5mL/min
Temp.: 30°C
Det.: UV, 280nm



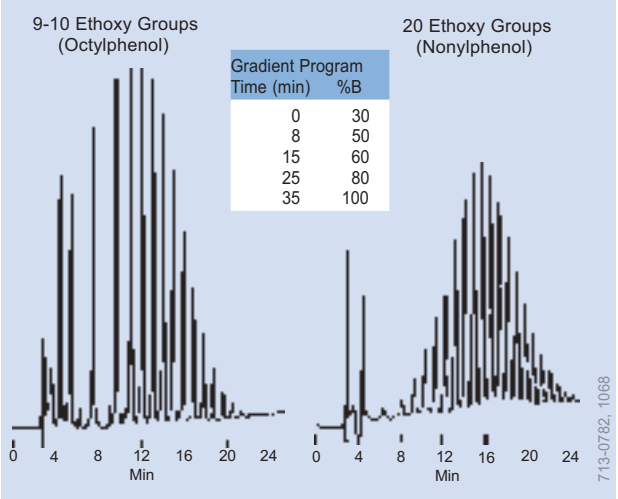
Polyethylene Glycol 200 (HPLC)

Column: TSKgel G-OLIGO-PW, 30cm x 7.8mm ID, 6µm particles*
Cat. No.: 808031
Mobile Phase: distilled water
Flow Rate: 1mL/min
Det.: refractive index
*Two columns in series.



Epoxy Resin, Epikote 1001 (HPLC)

Column: TSKgel G3000H$_{XL}$, 30cm x 7.8mm ID, 6µm particles*
Cat. No.: 816136
Mobile Phase: tetrahydrofuran
Flow Rate: 1mL/min
Det.: UV, 254nm
*Two columns in series.



Nonionic Surfactants (HPLC)

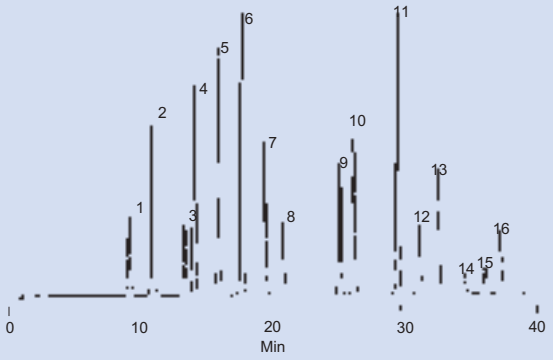
Column: SUPELCOSIL LC-Diol, 25cm x 4.6mm ID, 5µm particles
Cat. No.: 58201
Mobile Phase: A = hexane:methylene chloride (95:5)
B = hexane:methylene chloride:methanol (50:40:10)
Flow Rate: 1mL/min
Temp.: 35°C
Det.: UV, 280nm
Inj.: 10µL methylene chloride containing 20µg surfactant

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1. Naphthalene 1000ng/mL
2. Acenaphthylene 2000ng/mL
3. Acenaphthene 1000ng/mL
4. Fluorene 200ng/mL
5. Phenanthrene 100ng/mL
6. Anthracene 100ng/mL
7. Fluoranthene 200ng/mL
8. Pyrene 100ng/mL
9. Benzo(a)anthracene 100ng/mL
10. Chrysene 100ng/mL
11. Benzo(b)fluoranthene 200ng/mL
12. Benzo(k)fluoranthene 100ng/mL
13. Benzo(a)pyrene 100ng/mL
14. Dibenzo(a,h)anthracene 200ng/mL
15. Benzo(ghi)perylene 200ng/mL
16. Indeno(1,2,3-cd)pyrene 100ng/mL

Gradient Program	
Time (min)	% ACN
0	50
5	50
30	100
45	100

Flow increased at 2.0 min



PAHs in Water (SPME/HPLC)

Sample: 5µL PAH mix (Cat. No. 4-8743) in 5mL water
SPME Fiber: polydimethylsiloxane, 100µm film
Cat. No.: 57301
Extraction: immersion, 30 min (rapid stirring)
Desorption*: static, 200µL acetonitrile:water, 40:60, 2 min
Column: SUPELCOSIL LC-PAH, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 58318
Mobile Phase: acetonitrile:water gradient (see program)
Flow Rate: 0-2 min: 0.2mL/min 2-45 min: 1.0mL/min
Det.: UV, 254nm

*Requires SPME/HPLC interface.

1. 2-OH-DMBA(t-diol)
2. 7-OHM-12-MBA-(t-10,11-diol)
3. 7-M-12-OHMBA-(t-8,9-diol)
4. 7-OHM-12-MBA-(t-8,9-diol)
5. 7-OHM-(t-3,4-diol)
6. Mixed diols, incl. DMBA-(t-8,9-diol & t-10, 11-diol)
7. Position of 7,12-bis-OHMBA
8. 7-OHM-12-MBA-2-ol
9. 7-OHM-12-MBA-(3-ol)
10. 7-M-12-OHMNA-4-ol
11. 7-OHM-12-MBA-4-ol
12. 7-M-12-OHMBA-(3-ol)
13. 7-M-12-OHMBA-2-ol
14. 7-OHM-12-MBA
15. 7-M-12-OHMBA
16. DMBA-2-ol
17. DMBA-3-ol
18. DMBA-4-ol
19. DMBA

(parentheses = tentative identifications)

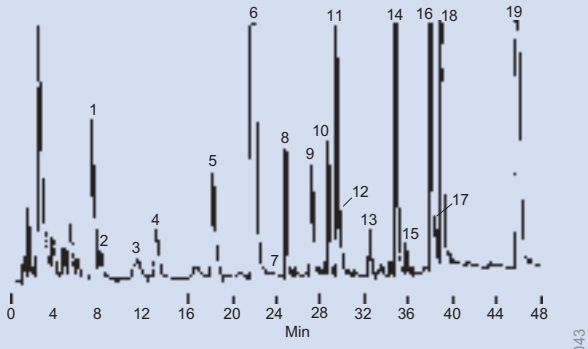
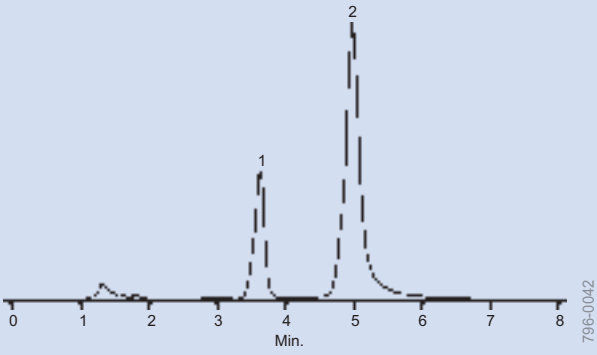


Figure provided by Drs. J. Milner and J. Grunau, University of Illinois, Urbana, Illinois, USA.

Metabolites of 7,12-Dimethylbenzo(a)anthracene (HPLC)

Column: SUPELCOSIL LC-18, 25cm x 4.6mm ID, 5µm particles
Cat. No.: 58298
Mobile Phase: methanol:water, 50:50 (10 min) to 100:0 at 2.5% /min
Flow Rate: 0.8mL/min
Det.: fluorescence
Inj.: rat liver, 9000 x g supernatant fraction from Aroclor-treated animals

1. 2,7-Dihydroxynaphthalene (300µg/mL)
2. 2,3-Dihydroxynaphthalene (1000µg/mL)



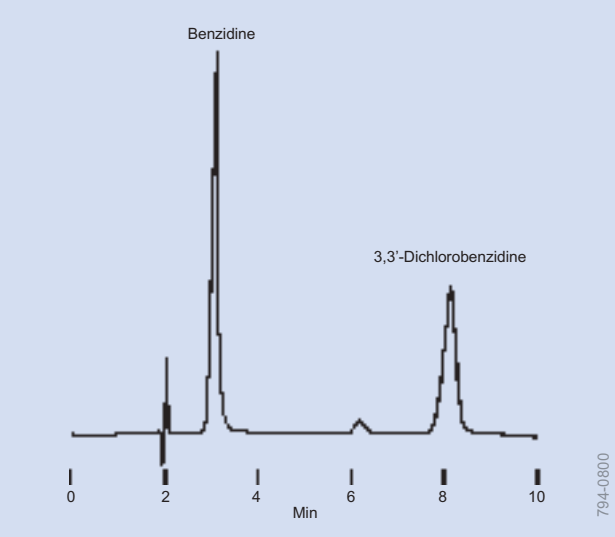
Chelating Agent, DERT Test (HPLC)

Column: SUPELCOGEL TPR-100, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 59154
Mobile Phase: ammonium acetate (25mM, pH 7):acetonitrile (55:45)
Flow Rate: 1.0mL/min
Temp: ambient
Det.: UV, 254nm
Inj.: 10µL

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco
Liquid Chromatography
SUPELCO

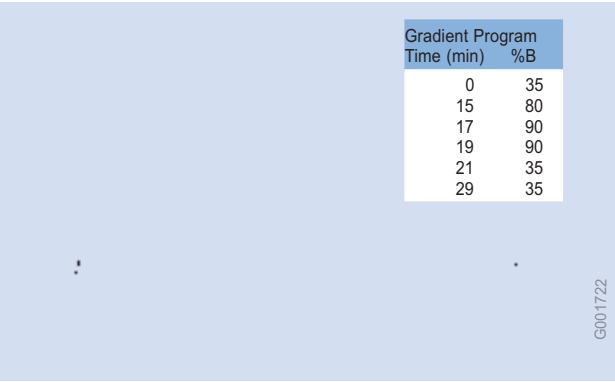
HPLC Applications

Semivolatiles, Toxins, Vitamins



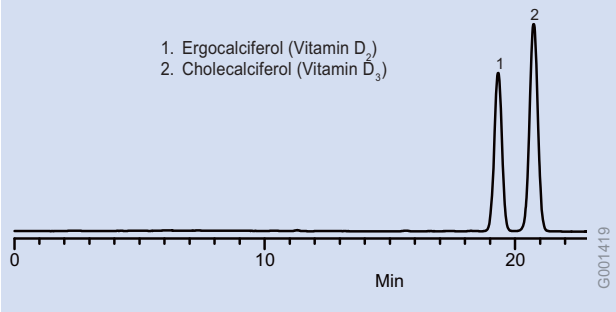
Benzidines by US EPA Method 605 (HPLC)

Column: SUPELCOSIL LC-1, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 58210-U
Mobile Phase: 0.1M acetate buffer (pH 4.7):acetonitrile, 80:20
Flow Rate: 1mL/min
Det.: UV, 254nm
Inj.: 10µL (0.5µg each analyte)



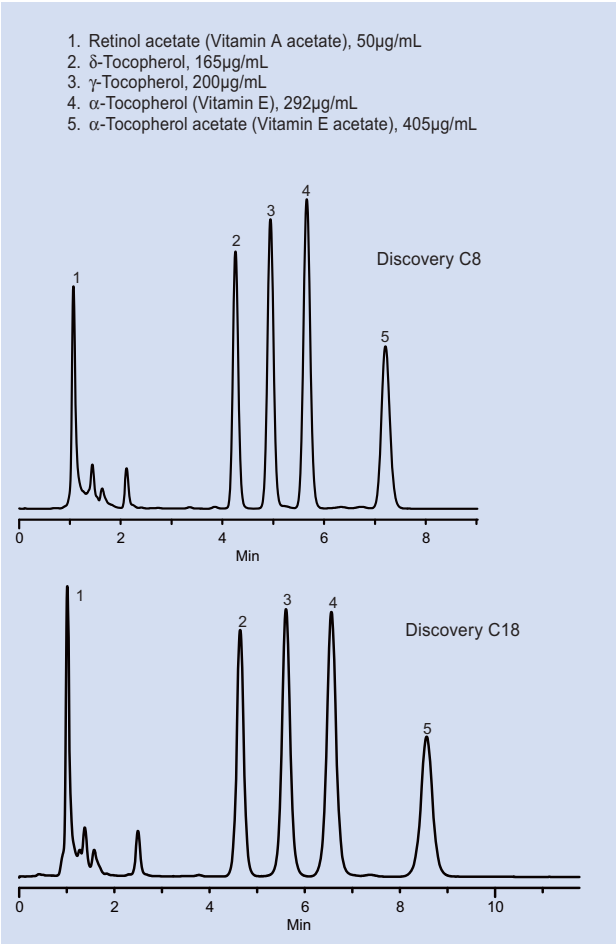
Bufalin Toxin (HPLC)

Column: Discovery BIO Wide Pore C18, 25cm x 4.6mm ID, 5µm particles
Cat. No.: 568223-U
Mobile Phase: A = 0.1% TFA in water
B = 0.1% TFA in acetonitrile:water (3:1)
Flow Rate: 1.3mL/min
Temp: ambient
Det.: UV, 298nm
Inj.: 10µL bufalin, 0.5mg/mL in acetonitrile



Vitamins, Fat Soluble (D_2 and D_3) (HPLC)

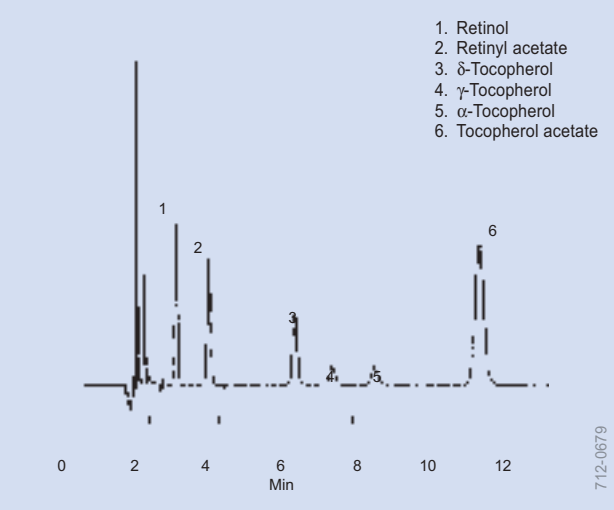
Column: Discovery HS C18, 15cm x 4.6mm ID, 3µm particles
Cat. No.: 569252-U
Mobile Phase: 100% CH_3CN
Flow Rate: 0.8mL/min
Temp: 30°C
Det.: UV, 290nm
Inj.: 10µL, 50µg/mL of each analyte



Vitamins, Fat Soluble (A and E) (HPLC)

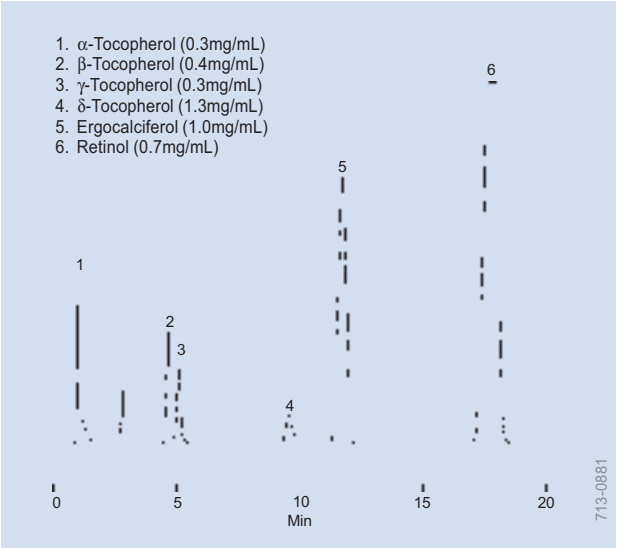
Column: 15cm x 4.6mm ID, 5µm particles
Cat. Nos.: 59353-U (C8), 504955 (C18)
Mobile Phase: Discovery C18, MeOH:H_2O (95:5),
Discovery C8 CH_3CN:H_2O (90:10)
Flow Rate: 2mL/min
Temp: 30°C
Det.: UV, 290nm
Inj.: 10µL

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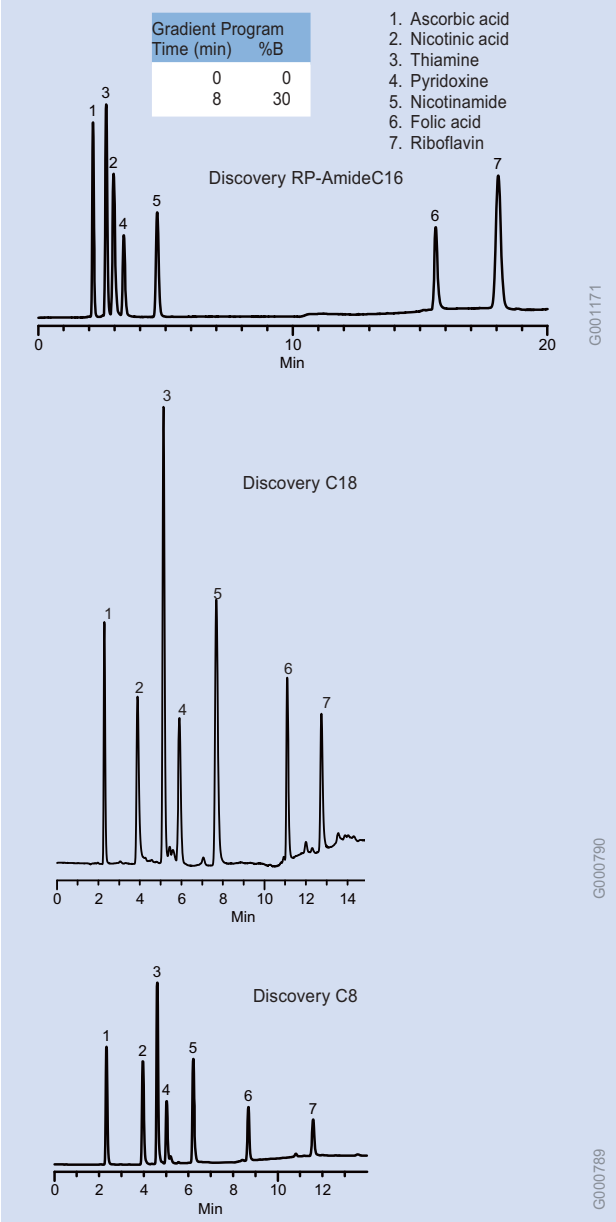
Vitamins, Fat Soluble (A and E) (HPLC)

Column: SUPELCOSILLC-18, 25cm x 4.6mm ID, 5µm particles
Cat. No.: 58298
Mobile Phase: methanol:deionized water (98:2)
Flow Rate: 2mL/min
Det.: UV, 325nm (retinol, retinyl acetate) or 290nm (tocopherols, tocopherol acetate)
Inj.: 20µL methanol
(0.2-1mg/mL each analyte)



Vitamins, Fat Soluble (A and E) (HPLC)

Column: SUPELCOSIL LC-Si, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 58200-U
Mobile Phase: hexane:amyl alcohol (99.65:0.35)
Flow Rate: 2mL/min
Det.: UV, 280nm
Inj.: 20µL



Vitamins, Water Soluble (HPLC)

Column: Discovery RP-Amide, 15cm x 4.6mm ID, 5µm particles
Cat. Nos.: 505013 (RP-AmideC16),
Mobile Phase: MeOH:50mM KH_2PO_4 , pH 4.5 (30:70)
Temp.: 35°C
Det.: UV, 220nm
Inj.: 10µL

Column: Discovery C18 or C8, 15cm x 4.6mm ID, 5µm particles
Cat. Nos.: 504955 (C18), 59353-U (C8)
Mobile Phase: 50mM KH_2PO_4, pH 4.5 to MeOH:50mM KH_2PO_4, pH4.(30:70) in 12 min (Discovery C8) or 8 min (Discovery C18)
Flow Rate: 1mL/min
Temp.: ambient temp.
Det.: UV, 254nm
Inj.: 1µL

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Liquid Chromatography
SUPELCO

DISCOVERY

Did you know...



The quality control of the Discovery SPE Products mak them ideal for virtually any sample prep application

Discovery SPE products are specifically designed, tested, and quality controlled for the stringent requirements of the pharmaceutical industry, but are appropriate for many other applications as well.

Discovery Reversed-Phase SPE products allow for greater and more reproducible recoveries for the quick and effective extraction, isolation, and concentration of compounds from biological fluids and other aqueous sample matrices.

Discovery Normal Phase SPE products enable you to quickly and effectively extract, isolate, purify, and concentrate polar compounds from non-polar solutions. Highly selective properties allow separation of structurally similar molecules through successive wash / elutions with increasingly polar solutions.

Discovery Ion-Exchange SPE products offer excellent selectivity toward charged molecular species, enabling the user to extract, isolate, purify, and concentrate charged ionizable pharmaceuticals (basic or acidic) from both polar and non-polar sample matrices.

Sample Preparation

Supelco services include...

- Custom Capabilities

If you have special needs beyond what is listed, please inquire about a custom order.

- Available When You Need It
- Easy Ordering
- On-Time Delivery
- Superior Support

TechTip

Tube adapters allow the SPE user to connect SPE tubes in a series (male luer tip of one SPE tube to the reservoir mouth of another SPE tube). A larger empty syringe barrel can be stacked on top of a smaller SPE tube to act as a larger load reservoir. Stack one SPE tube on top of another to provide different extraction selectivities, or it can serve as an adapter for positive pressure methods (e.g. from a syringe or nitrogen line).



Sample Preparation

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Solid Phase Extraction (SPE)
Discovery Products

Solid Phase Extraction Products

Designed to meet the exacting requirements of pharmaceutical and clinical analysis, Discovery SPE products are ideal for all application areas including: Food & Beverage, Environmental, Petrochemical, Argiculture, Consumer Products and more...

The multitude of phase chemistries and hardware configurations available within the Discovery SPE line offer the comprehensive level of selection and flexibility required to handle today's increasingly complex and diverse sample prep challenges.

Each Discovery SPE product includes an extensive Certificate of Analysis ensuring optimal performance and reproducible properties for each Discovery product shipped from Supelco.

Discovery SPE allows you to:

- Achieve greater and more reproducible recoveries for diverse compounds from difficult sample matrices
- Removes endogenous sample interference for improved accuracy and sensitivity
- Concentrate target analytes for increased sensitivity
- Protects analytical instrument from unwanted sample matrix components

Discovery SPE offers the quality and performance you need to bridge the sample prep gap between sample collection and analysis.

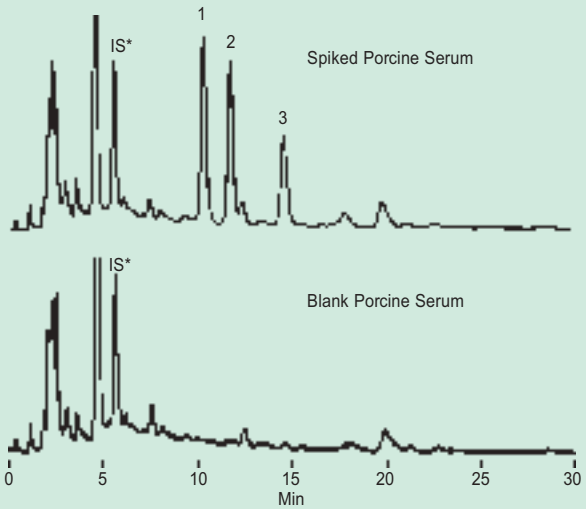
Discovery SPE Products:

- Developed, tested and quality controlled for pharmaceutical and clinical applications
- Twelve different phase chemistries ranging from polymerically bonded C18 to polyamide adsorbents
- Available in 96-well plate configurations for high throughput parallel processing
- Available in Buchner Funnel configurations for easier scalability (combinatorial chemistry clean-up)
- Ultra clean phases for highly sensitive analyses
- Narrower pore size distribution for improved extraction selectivity
- Acid washed to reduce metal chelating activity
- Consistent particle size and specific surface area coverage to ensure reproducible recoveries
- Low fines (<12µm) content to minimize injection port fouling

PROPERTIES

Base Silica:	Irregular shape, acid washed
Mean Particle Size:	50µm
Mean Pore Diameter:	70Å
Total Pore Volume:	0.9cm³/g
Specific Surface Area:	480m²/g
Endcapped:	Yes

Extraction of Anti-Ulcer Compounds from Porcine Serum using Discovery DSC-18 SPE

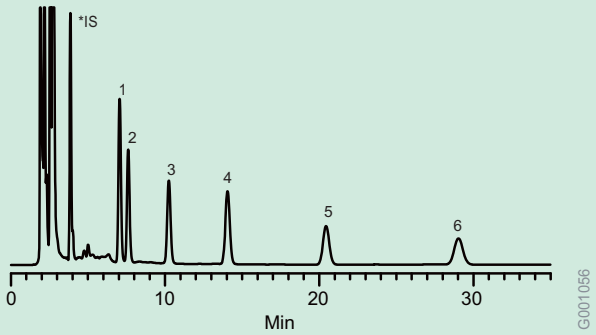


Compound	Concentration (µg/mL)	%Recovery ± RSD (n = 6)
1. Ranitidine	0.25	92.5 ± 5.4
	0.50	95.5 ± 5.1
2. Cimetidine	0.25	94.5 ± 5.2
	0.50	98.2 ± 3.2
3. Nizatidine	0.25	97.0 ± 7.0
	0.50	94.8 ± 3.4

Analyzed with a Discovery C18 HPLC Column, 15cm x 4.6mm ID, 5µm particles

* IS = Famotidine (internal standard).

Barbiturates from serum, using 500mg/3mL Discovery DSC-18Lt SPE tubes and Zymark RapidTrace SPE Workstation.



Analyzed with a Discovery C18 HPLC column, 15cm x 4.6mm ID, 5µm particles.

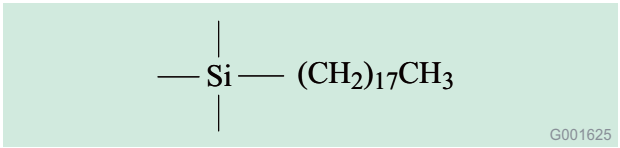
Efficiency of Recovery

Compound	Concentration (µg/mL)	%Recovery	%RSD (n=6)
1. Phenobarbital	0.5	96.2	±1.6
	1.0	94.9	±1.7
2. Aprobarbital	0.5	98.5	±2.1
	1.0	100.8	±0.8
3. Butabarbital	0.5	97.2	±1.9
	1.0	98.7	±1.8
4. Mephobarbital	0.5	99.7	±2.4
	1.0	101.0	±2.0
5. Pentobarbital	0.5	96.4	±1.7
	1.0	96.4	±1.9
6. Secobarbital	0.5	98.2	±1.7
	1.0	97.7	±1.8

* IS = Barbital (internal standard).

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Discovery DSC-18 SPE Products



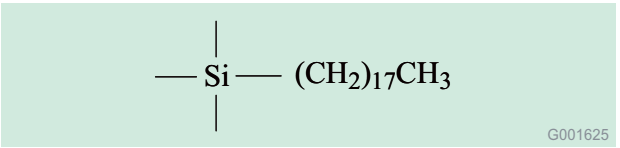
Retention Mechanism:Reversed-phase

Sample Matrix Compatibility: Aqueous solutions (biological fluids, water)

- Polymerically bonded, octadecyl (18%C), endcapped
- Higher 18%C loading for increased binding capacities and higher recoveries
- The least selective phase: retains most organic analytes from aqueous matrices
- Can also be used for desalting aqueous matrices
- Beneficial for extracting structurally diverse analytes from the same sample

DESCRIPTION	QTY.	CAT. NO.	PRICE
SPE TUBES			
50mg/1mL	108	52601-U	
100mg/1mL	108	52602-U	
500mg/3mL	54	52603-U	
500mg/6mL	30	52604-U	
1g/6mL	30	52606-U	
2g/12mL	20	52607-U	
5g/20mL	20	52608-U	
10g/60mL	16	52609-U	
SPE 96-WELL PLATES			
100mg/well	1	575603-U	
50mg/well	1	575602-U	
25mg/well	1	575601-U	
BULK PACKING			
Bulk packing	100g	52600-U	

Discovery DSC-18Lt SPE Products



Retention Mechanism:Reversed-phase

Sample Matrix Compatibility: Aqueous solutions (biological fluids, water)

- Monomerically bonded, octadecyl (11%C), endcapped
- Increased retention for moderately polar hydrophobic molecules
- Used to elute very large hydrophobic molecules that are too strongly retained on DSC-18.
- Offers opportunity to differentiate between drug metabolites in bioanalysis applications
- Use this less retentive phase for the rapid release of hydrophobic compounds using weaker organic solvents at lower volumes

DESCRIPTION	QTY.	CAT. NO.	PRICE
SPE TUBES			
50mg/1mL	108	52610-U	
100mg/1mL	108	52611-U	
500mg/3mL	54	52613-U	
500mg/6mL	30	52615-U	
1g/6mL	30	52616-U	
2g/12mL	20	52618-U	
5g/20mL	20	52621-U	
10g/60mL	16	52622-U	
SPE 96-WELL PLATES			
100mg/well	1	575606-U	
50mg/well	1	575605-U	
25mg/well	1	575604-U	
BULK PACKING			
Bulk packing	100g	52623-U	

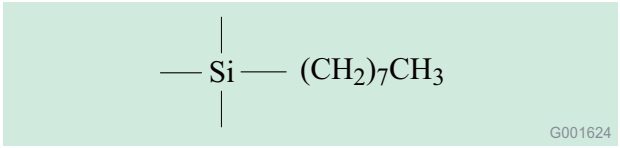
Note: Unless stated otherwise, tubes are polypropylene. Frits are polyethylene with 20µm pores.

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Solid Phase Extraction (SPE)

Discovery SPE Tubes

Discovery DSC-8 SPE Products



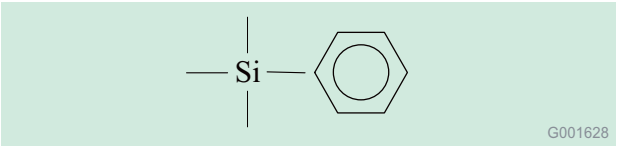
Retention Mechanism:Reversed-phase

Sample Matrix Compatibility: Aqueous solutions (biological fluids, water)

- Monomerically bonded, octyl (9%C), endcapped; lower carbon content than DSC-18Lt
- Used to elute very large hydrophobic molecules too strongly retained on DSC-18 or DSC-18Lt
- Use this less retentive phase for the rapid release of hydrophobic molecules using weaker organic solvents at lower volumes
- Inorganic buffers of sufficient ionic strength may be used for elution

DESCRIPTION	QTY.	CAT. NO.	PRICE
SPE TUBES			
50mg/1mL	108	52703-U	
100mg/1mL	108	52707-U	
500mg/3mL	54	52713-U	
500mg/6mL	30	52714-U	
1g/6mL	30	52716-U	
2g/12mL	20	52717-U	
5g/20mL	20	52718-U	
10g/60mL	16	52722-U	
SPE 96-WELL PLATES			
100mg/well	1	575627-U	
50mg/well	1	575628-U	
25mg/well	1	575629-U	
BULK PACKING			
Bulk packing	100g	57223-U	

Discovery DSC-Ph SPE Products



Retention Mechanism:Reversed-phase

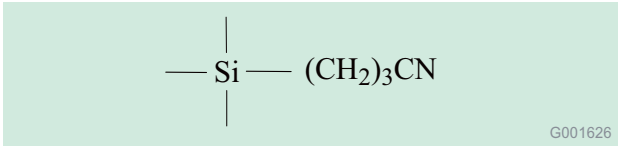
Sample Matrix Compatibility: Aqueous solutions (biological fluids, water)

- Monomerically bonded, phenyl (7%C), endcapped
- Similar in polarity to DSC-8; however, electron dense aromatic ring offers unique selectivity and retention
- Offers improved retention of conjugated ring structures over aliphatic functional groups.

DESCRIPTION	QTY.	CAT. NO.	PRICE
SPE TUBES			
50mg/1mL	108	52723-U	
100mg/1mL	108	52725-U	
500mg/3mL	54	52727-U	
500mg/6mL	30	52728-U	
1g/6mL	30	52731-U	
SPE 96-WELL PLATES			
100mg/well	1	575630-U	
50mg/well	1	575631-U	
25mg/well	1	575632-U	
BULK PACKING			
Bulk packing	100g	57227-U	

Note: Unless stated otherwise, tubes are polypropylene. Frits are polyethylene with 20µm pores.

Discovery DSC-CN SPE Products



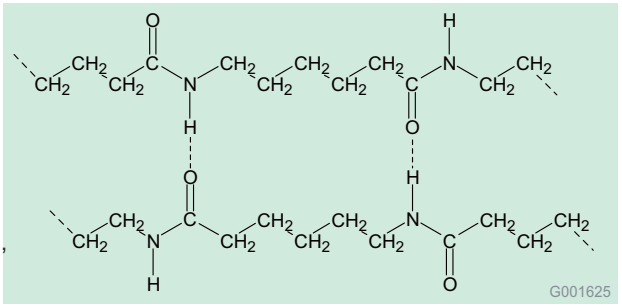
Retention Mechanism:Reversed-phase or Normal phase

Sample Matrix Compatibility: Aqueous solutions (biological fluids, water) when used in reversed-phase; or organic solvents, oils, and lipids when used in normal phase

- Monomerically bonded, cyanopropyl (7%C), endcapped
- Can be used in either reversed-phase or normal phase
- Ideal for very hydrophobic analytes that may be irreversibly retained on more hydrophobic sorbents such as DSC-18
- Less retentive than DSC-Si or DSC-Diol when used in normal phase (organic matrices such as hexane or oils)
- Allows for the rapid release of very polar molecules irreversibly retained on very polar sorbents

DESCRIPTION	QTY.	CAT. NO.	PRICE
SPE TUBES			
50mg/1mL	108	52693-U	
100mg/1mL	108	52694-U	
500mg/3mL	54	52695-U	
500mg/6mL	30	52696-U	
1g/6mL	30	52697-U	
2g/12mL	20	52698-U	
5g/20mL	20	52699-U	
10g/60mL	16	52700-U	
SPE 96-WELL PLATES			
100mg/well	1	575624-U	
50mg/well	1	575625-U	
25mg/well	1	575626-U	
BULK PACKING			
Bulk packing	100g	57222-U	

Discovery DPA-6S SPE Products



Retention Mechanism:Reversed-phase

Sample Matrix Compatibility: Aqueous or methanolic solutions

- Polyamide Resin: Particle Size: 50-160µm, Surf pH: 4.5-7.5, Density: 0.2-0.3cm³/g, Water Content: < 5%
- Used to adsorb polar compounds (-OH groups, esp. phenolic compounds) from aqueous or methanolic solutions under the reversed-phase mechanism through strong hydrogen bonding between compound hydroxyl groups and amide groups of the resin
- Useful for extracting tannins, chlorophyll, humic acid, pharmacologically active terpenoids, flavanoids, gallic acid, catechol A, protocatechuic acid, and phloroglucinol
- Also useful for extracting aromatic carboxylic acids and nitroaromatic compounds
- Irreversibly retains quinones

DESCRIPTION	QTY.	CAT. NO.	PRICE
SPE TUBES			
50mg/1mL	108	52624-U	
250mg/3mL	54	52625-U	
250mg/6mL	30	52626-U	
500mg/6mL	30	52627-U	
1g/12mL	20	52629-U	
2g/20mL	20	52631-U	
5g/60mL	16	52632-U	
BULK PACKING			
Bulk packing	50g	52633-U	
BUCHNER FUNNELS			
110mm ID x 66mm H; 50g/800mL	1	52634-U	

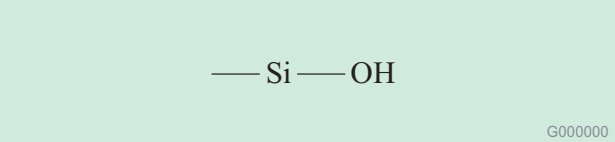
Note: Unless stated otherwise, tubes are polypropylene. Frits are polyethylene with 20µm pores.

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Solid Phase Extraction (SPE)

Discovery SPE Tubes

Discovery DSC-Si SPE Products



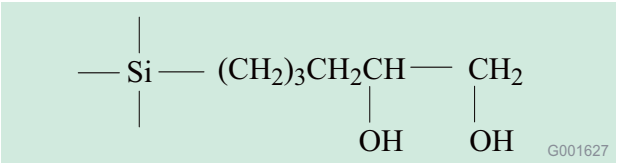
Retention Mechanism:Normal phase

Sample Matrix Compatibility: Organic solvents, oils, and lipids

- Unbonded acid washed silica sorbent ideal for normal phase SPE and other modified flash techniques
- Often used to separate or remove structurally similar molecules through successive elutions with increasingly polar solutions
- The most polar normal phase sorbent available
- Excellent capacity for purifying solution phase combinatorial chemistry reactions when removing target molecules from reaction by-products and excess reagents
- Available in Büchner Funnel configurations for easy scala

DESCRIPTION	QTY.	CAT. NO.	PRICE
SPE TUBES			
50mg/1mL	108	52652-U	
100mg/1mL	108	52653-U	
500mg/3mL	54	52654-U	
500mg/6mL	30	52655-U	
1g/6mL	30	52656-U	
2g/12mL	20	52657-U	
5g/20mL	20	52658-U	
10g/60mL	16	52659-U	
SPE 96-WELL PLATES			
100mg/well	1	575609-U	
50mg/well	1	575608-U	
25mg/well	1	575607-U	
BULK PACKING			
Bulk Packing	100g	52651-U	
BUCHNER FUNNELS			
50mmID x 30mmH; 12.5g	6	52591-U	
70mmID x 40mmH; 25g	6	52592-U	
90mmH x 48mmH; 50g	6	52593-U	
110mmID x 66mmH; 100g	6	52594-U	

Discovery DSC-Diol SPE Products



Retention Mechanism:Normal phase

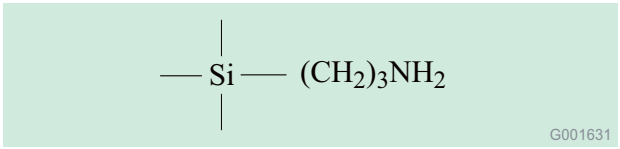
Sample Matrix Compatibility: Organic solvents, oils, and lipids

- Polymerically bonded, 2,3-Dihydroxypropoxypropyl (7%C)
- Polar sorbent most commonly used for normal phase applications (polar extractions from non-polar matrices)
- The sorbent's dihydroxy groups facilitates strong hydrogen bonding
- Excellent selectivity when extracting structurally similar molecules

DESCRIPTION	QTY.	CAT. NO.	PRICE
SPE TUBES			
50mg/1mL	108	52747-U	
100mg/1mL	108	52748-U	
500mg/3mL	54	52751-U	
500mg/6mL	30	52752-U	
1g/6mL	30	52753-U	
SPE 96-WELL PLATES			
100mg/well	1	575636-U	
50mg/well	1	575637-U	
25mg/well	1	575638-U	
BULK PACKING			
Bulk packing	100g	57229-U	

Note: Unless stated otherwise, tubes are polypropylene. Frits are polyethylene with 20µm pores.

Discovery DSC-NH_2 SPE Products



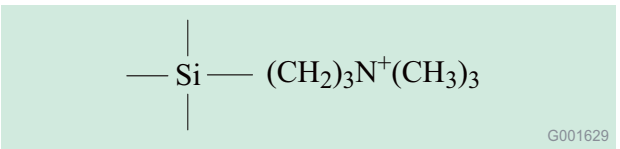
Retention Mechanism:Normal phase or Anion-exchange

Sample Matrix Compatibility: Organic or aqueous solutions

- Polymerically bonded, aminopropyl phase that is very polar in nature (hydrogen bonding) allowing for both normal phase and ion exchange applications
- A weak anion exchanger with a pKa of 9.8. At pH 7.8 or below, the functional groups are positively charged
- Ion exchange capacity is ~ 0.43 meq/g.
- Allows the rapid release of very strong anions such as sulfonic acids that may be retained irreversibly by strong anion exchangers
- Can be used in some reversed-phase applications (due to ethyl spacer); however, it is predominately used as an ion-exch or normal phase sorbent due to its polar nature

DESCRIPTION	QTY.	CAT. NO.	PRICE
SPE TUBES			
50mg/1mL	108	52635-U	
100mg/1mL	108	52636-U	
500mg/3mL	54	52637-U	
500mg/6mL	30	52638-U	
1g/6mL	30	52640-U	
2g/12mL	20	52641-U	
5g/20mL	20	52642-U	
10g/60mL	16	52644-U	
SPE 96-WELL PLATES			
100mg/well	1	575615-U	
50mg/well	1	575616-U	
25mg/well	1	575617-U	
BULK PACKING			
Bulk packing	100g	57212-U	

Discovery DSC-SAX SPE Products



Retention Mechanism:Anion-exchange

Sample Matrix Compatibility: Organic or aqueous solutions

- A polymerically bonded quarternary amine that remains positively charged at all pH levels
- Counter ion is Cl^-
- Ion exchange capacity is ~ 0.14 meq/g
- Commonly used when extracting weaker cations (e.g., carboxylic acids) that may not bind strongly enough to weaker anion-exchangers
- Selectivity can be modified by changing the counter ion with the appropriate buffer during conditioning

DESCRIPTION	QTY.	CAT. NO.	PRICE
SPE TUBES			
50mg/1mL	108	52661-U	
100mg/1mL	108	52662-U	
500mg/3mL	54	52664-U	
500mg/6mL	30	52665-U	
1g/6mL	30	52666-U	
2g/12mL	20	52667-U	
5g/20mL	20	52668-U	
10g/60mL	16	52669-U	
SPE 96-WELL PLATES			
100mg/well	1	575618-U	
50mg/well	1	575619-U	
25mg/well	1	575620-U	
BULK PACKING			
Bulk packing	100g	57214-U	

Note: Unless stated otherwise, tubes are polypropylene. Frits are polyethylene with 20µm pores.

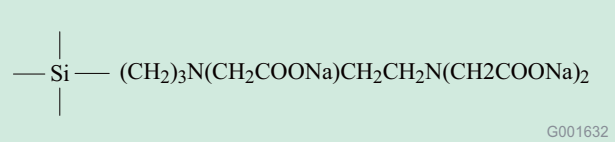
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SUPELCO

Solid Phase Extraction (SPE)

Discovery SPE Tubes

Discovery DSC-WCX SPE Products



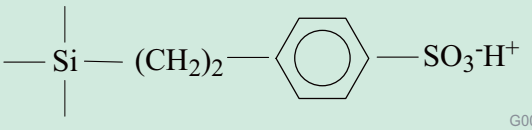
Retention Mechanism:Cation exchange

Sample Matrix Compatibility: Organic or aqueous solutions

- A polymerically bonded, carboxy propyl phase with a pKa of 4.8
- Counter ion is Na
- Ion exchange capacity is ~ 0.15 meq/g
- Carries a negative charge at pH 6.8 or above
- A pH of 2.8 or below neutralizes this phase for easier elution of strong cationic analytes that are neutralized only at extreme basic conditions
- Typically used when dealing with very strong cationic (high pKa) compounds that may be irreversibly retained on strong cation exchangers

DESCRIPTION	QTY.	CAT. NO.	PRICE
SPE TUBES			
50mg/1mL	108	52737-U	
100mg/1mL	108	52739-U	
500mg/3mL	54	52741-U	
500mg/6mL	30	52742-U	
1g/6mL	30	52743-U	
2g/12mL	20	52744-U	
5g/20mL	20	52745-U	
10g/60mL	16	52746-U	
SPE 96-WELL PLATES			
100mg/well	1	575633-U	
50mg/well	1	575634-U	
25mg/well	1	575635-U	
BULK PACKING			
Bulk packing	100g	57228-U	

Discovery DSC-SCX SPE Products



Retention Mechanism:Cation exchange

Sample Matrix Compatibility: Organic or aqueous solutions

- A polymerically bonded, benzene sulfonic acid functional group, pKa (<1.0)
- Counter ion is H
- Silica support allows for use with very organic solvents (no shrinking/swelling)
- Excellent capacity (0.8meq/g) for cleaning up solution phase combinatorial chemistry reactions (removing target molecules from reaction by-products and excess reagents)
- The presence of the benzene ring offers some mixed-mode capabilities (hydrophobic interactions) that should be considered when extracting cations from aqueous matrices

DESCRIPTION	QTY.	CAT. NO.	PRICE
SPE TUBES			
50mg/1mL	108	52684-U	
100mg/1mL	108	52685-U	
500mg/3mL	54	52686-U	
500mg/6mL	30	52688-U	
1g/6mL	30	52689-U	
2g/12mL	20	52690-U	
5g/20mL	20	52691-U	
10g/60mL	16	52692-U	
SPE 96-WELL PLATES			
100mg/well	1	575621-U	
50mg/well	1	575622-U	
25mg/well	1	575623-U	
BULK PACKING			
Bulk packing	100g	57221-U	

Note: Unless stated otherwise, tubes are polypropylene. Frits are polyethylene with 20µm pores.

Solid Phase Extraction (SPE)
Supelclean ENVI SPE Tubes and Disks

Supelclean ENVI SPE Products:

- Developed, highly tested, and quality controlled for environmental applications
- Seven different phase chemistries ranging from our unique ENVI-Carb carbon adsorbents to ENVI-18 DSKs – reversed phase SPE membranes for large volume water samples
- Available in glass tubes, Teflon and stainless steel frit configurations for EPA compliance
- Ultra clean phases for highly sensitive analyses
- Documented applications in compliance to standardized EPA methodology
- Consistent particle size and specific surface area to ensure reproducible recoveries

PROPERTIES	
Base Silica:	Irregular shape, acid washed
Mean Particle Size:	45µm
Mean Pore Diameter:	60Å
Total Pore Volume:	0.8cm³/g
Specific Surface Area:	475m²/g
Endcapped:	Yes

Supelclean ENVI-18 SPE Products

Retention Mechanism:Reversed-phase

Sample Matrix Compatibility:Aqueous solutions (drinking, ground, waste water)

- Polymerically bonded, octadecyl (17%C), endcapped
- Excellent for cleaning, extracting and concentrating pollutants from aqueous environmental samples
- Higher 17%C loading for increased binding capacities and higher recoveries
- Higher carbon loading also offers greater resistance to extreme pH conditions
- Used for extracting herbicides, fungicides, and pesticides from waste material

DESCRIPTION	QTY.	CAT. NO.	PRICE
SPE TUBES			
100mg/1mL	108	57062	
500mg/3mL	54	57063	
500mg/6mL	30	57064	
1g/6mL	30	505706	
2g/12mL	20	57114	
5g/20mL	20	57137	
10g/60mL	16	57138	
BULK PACKING			
Bulk packing	100g	57219	

Supelclean ENVI-8 SPE Products

Retention Mechanism:Reversed-phase

Sample Matrix Compatibility:Aqueous solutions (drinking, ground, waste water)

- High 14%C loading for increased binding capacities and higher recoveries
- Higher carbon loading also offers greater resistance to extreme pH conditions
- Excellent for cleaning, extracting and concentrating pollutants from aqueous environmental samples
- Used for extracting herbicides, fungicides, and pesticides from waste material

DESCRIPTION	QTY.	CAT. NO.	PRICE
SPE TUBES			
100mg/1mL	108	57230-U	
500mg/3mL	54	57231	
500mg/6mL	30	57232	
1g/6mL	30	57233	
5g/20mL	20	57139	
10g/60mL	16	57140-U	
SPE TUBES (GLASS TUBES; TEFLON FRITS)			
500mg/3mL	27	57106	
500mg/6mL	20	57107	

Supelclean ENVI-18 & ENVI-8 DSK SPE Discs

The SPE membrane equivalents of ENVI-18 and ENVI-8 packed bed SPE sorbents

Retention Mechanism:Reversed-phase

Sample Matrix Compatibility:Aqueous solutions (drinking water)

- Porous glass fiber membranes embedded with C18 or C8 modified silica particles.
- Provides faster flow rates and exhibits less clogging than Teflon discs for the extraction of organic contaminants from drinking water samples
- Typical applications include polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), phthalates, semivolatile organics, paraquat and diquat, pesticides and herbicides

DESCRIPTION	QTY.	CAT. NO.	PRICE
ENVI-18DSK SPE DISKS			
47mm Diam.	24	57171	
90mm Diam.	12	57170-U	
ENVI-8DSK SPE DISKS			
47mm Diam.	24	57172	

Note: Unless stated otherwise, tubes are polypropylene. Frits are polyethylene with 20µm pores.

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Solid Phase Extraction (SPE)

Supelclean ENVI SPE Tubes

Supelclean ENVI-Carb SPE Products

Graphitized Non-Porous Carbon

Retention Mechanism:Reversed-phase

Sample Matrix Compatibility: Aqueous solutions (drinking, ground, waste water)

- Extreme affinity for organic polar and non-polar compounds from both non-polar and polar matrices when used under reversed-phase conditions
- Carbon surface comprised of hexagonal ring structures, interconnected and layered into graphitic sheets
- Non-porous nature of the carbon phase allows for rapid processing, adsorption does not require analyte dispersion into solid phase pores
- Independent investigators have found ENVI-Carb extremely useful for the rapid sample preparation of over 200 pesticides from various matrices including ground water, fruits and vegetable

DESCRIPTION	QTY.	CAT. NO.	PRICE
ENVI-CARB (SURF. AREA 100MG; 120/400 MESH)			
250mg/3mL	54	57088	
250mg/6mL	30	57092	
500mg/6mL	30	57094	
1g/12mL	20	57127-U	
2g/12mL	20	57128	
5g/20mL	20	57129	
10g/60mL	16	57130	
Bulk Packing	50g	57210-U	
ENVI-CARB C (SURF. AREA 10MG; 80/100 MESH)			
1g/12mL	20	57149	
ENVI-CARB X (SURF. AREA 250MG; 120/400 MESH)			
Bulk Packing	50g	10439-U	
ENVI-CARB Y (SURF. AREA 25MG; 120/400 MESH)			
Bulk Packing	50g	10464-U	

Supelclean ENVI-Chrom P SPE Products

Styrene/divinyl benzene co-polymer

Retention Mechanism:Reversed-phase or Adsorption

Sample Matrix Compatibility: Aqueous solutions

- Particle Size: 80-160µm; Spherical Shape; Pore Size: 110-175Å; Surface Area: 900m²/g
- Highly crosslinked, neutral, specially cleaned styrene-divinylbenzene resin used to retain hydrophobic compounds with some hydrophilic functionality under reversed phase conditions
- Highly resistant to extreme pH conditions
- Typical applications include aromatics and phenolic compounds from aqueous sample matrices
- Used for priority pollutant phenols from aqueous samples

DESCRIPTION	QTY.	CAT. NO.	PRICE
ENVI-CHROM P SPE TUBES (GLASS TUBES; TEFLON FRITS)			
100mg/1mL	108	57143	
250mg/3mL	54	57224	
250mg/6mL	30	57225-U	
500mg/6mL	30	57226	
ENVI-CHROM P BULK PACKING			
Bulk packing	50g	57217	

Supelclean ENVI-Florisil

Magnesium Silicate

Retention Mechanism:Normal phase or Adsorption

Sample Matrix Compatibility: Organic solutions

- Mesh: 100/120; Available with Teflon or stainless steel frits
- Tested for US Environmental Protection Agency (EPA) Contract Laboratory Program (CLP) statement of work for pesticides
- Highly polar material that strongly adsorbs to polar compounds from nonpolar matrices under normal phase conditions
- Typical applications include alcohols, aldehydes, amines, herbicides, pesticides, PCBs, ketones, nitro compounds, organic acids, and phenols

DESCRIPTION	QTY.	CAT. NO.	PRICE
ENVI-FLORISIL			
500mg/3mL, Teflon	54	57058	
500mg/6mL, SS	30	57046	
1g/6mL, SS	30	57053	

Note: Unless stated otherwise, tubes are polypropylene. Frits are polyethylene with 20µm pores.

Reversed Phase Supelclean SPE Tubes

Extract nonpolar to moderately polar analytes from aqueous samples.

DESCRIPTION	QTY.	CAT. NO.	PRICE
LC-18 (OCTADECYL, ~10% C, ENDCAPPED)			
100mg/1mL	108	504270	
500mg/3mL	54	57012	
500mg/6mL	30	57054	
1g/6mL	30	505471	
2g/12mL	20	57117	
5g/20mL	20	57135-U	
10g/60mL	16	57136	
Bulk Packing	100g	57202	
LC-8 (OCTYL, ~7% C, ENDCAPPED)			
100mg/1mL	108	504157	
500mg/3mL	54	505145	
500mg/6mL	30	57052	
Bulk Packing	100g	57201	
LC-4 (BUTYLDIMETHYL, 500Å PORES, ENDCAPPED)			
500mg/3mL	54	57089	
LC-PH (PHENYL, ~5.5% C, ENDCAPPED)			
100mg/1mL	108	504599	
500mg/3mL	54	505269	
HISEP (HYDROPHOBIC SITES SHIELDED BY A HYDROPHILIC SURFACE; FOR PROTEIN EXCLUSION)			
500mg/3mL	54	57076-U	

Normal Phase Supelclean SPE Tubes

Extract moderately polar to polar analytes from nonaqueous samples.

DESCRIPTION	QTY.	CAT. NO.	PRICE
LC-CN (CYANOPROPYL, ~7% C, ENDCAPPED)			
100mg/1mL	108	504386	
500mg/3mL	54	57013	
500mg/6mL	30	57056	
5g/20mL	20	57141	
10g/60mL	16	57142	
LC-NH_2 (AMINOPROPYL, ~5% C)			
100mg/1mL	108	504483	
500mg/3mL	54	57014	
Bulk Packing	100g	57205	
LC-DIOL (DIOL, ~7% C)			
100mg/1mL	108	504718	
500mg/3mL	54	57016	

Adsorption Supelclean SPE Tubes

No bonded phase; extract polar analytes from nonpolar samples (LCP-Si, LC-Florisil, LC-Alumina).

DESCRIPTION	QTY.	CAT. NO.	PRICE
LC-SI (SILICA GEL)			
100mg/1mL	108	504041	
500mg/3mL	54	505048	
500mg/6mL	30	505374	
1g/6mL	30	57051	
2g/12mL	20	57116	
5g/20mL	20	57133	
10g/60mL	16	57134	
Bulk Packing	100g	57200	
LC-FLORISIL (MAGNESIUM SILICATE, 100/120 MESH)			
1g/6mL	30	57057	
2g/12mL	20	57115	
5g/20mL	20	57131	
10g/60mL	16	57132	
Bulk Packing	100g	57209	
LC-ALUMINA-N (ALUMINA FOR NEUTRAL pH (~6.5) BROCKMANN ACT. I, 60/325 MESH)			
1g/3mL	54	57086	
2g/6mL	30	57087	
Bulk Packing	100g	57208	
LC-ALUMINA-A (ALUMINA FOR ACIDIC pH (~5) BROCKMANN ACT. I, 60/325 MESH)			
1g/3mL	54	57082-U	
2g/6mL	30	57083-U	
Bulk Packing	100g	57206	
LC-ALUMINA-B (ALUMINA FOR BASIC pH (~8.5) BROCKMANN ACT. I, 60/325 MESH)			
1g/3mL	54	57084	
2g/6mL	30	57085	

Ion Exchange Supelclean SPE Tubes

Interaction based on ionic attraction.

DESCRIPTION	QTY.	CAT. NO.	PRICE
LC-SAX (QUATERNARY AMINE, Cl^- COUNTERION)			
100mg/1mL	108	504815	
500mg/3mL	54	57017	
Bulk Packing	100g	57203	
LC-SCX (ALIPHATIC SULFONIC ACID, Na^+ COUNTERION)			
100mg/1mL	108	504920	
500mg/3mL	54	57018	
Bulk Packing	100g	57204	
LC-WCX (CARBOXYLIC ACID, Na^+ COUNTERION)			
100mg/1mL	108	505595	
500mg/3mL	54	57061	

Note: Unless stated otherwise, tubes are polypropylene. Frits are polyethylene with 20µm pores.

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Solid Phase Extraction (SPE)

Method Development Kits, Discovery 96-Well Plates

Supelclean SPE Method Development Kits

KIT:	KIT A	KIT B	KIT C	KIT RP-3	KIT NP-3	KIT IX-1	KIT IX-3
Packing	Sorbent Qty./Tube Size						
LC-Si	500mg/3mL	100mg/1mL	500mg/6mL 1g/6mL		500mg/3mL		
LC-8	500mg/3mL	100mg/1mL	500mg/6mL	500mg/3mL			
LC-18	500mg/3mL	100mg/1mL 1g/6mL	500mg/6mL	500mg/3mL			
LC-CN	500mg/3mL	100mg/1mL	500mg/6mL	500mg/3mL		100mg/1mL	500mg/3mL
LC-Diol	500mg/3mL	100mg/1mL			500mg/3mL		
LC-NH_2	500mg/3mL	100mg/1mL			500mg/3mL	100mg/1mL	500mg/3mL
LC-Ph	500mg/3mL	100mg/1mL		500mg/3mL			
LC-SAX	500mg/3mL	100mg/1mL				100mg/1mL	500mg/3mL
LC-SCX	500mg/3mL	100mg/1mL				100mg/1mL	500mg/3mL
LC-WCX	500mg/3mL	100mg/1mL				100mg/1mL	500mg/3mL
LC-Alumina-A			2g/6mL		1g/3mL		
LC-Alumina-B			2g/6mL		1g/3mL		
LC-Alumina-N			2g/6mL		1g/3mL		
LC-Florisil			1g/6mL				
QTY. EA. TUBE:	6	12	3	12	6	24	12
CAT. NO.:	57019	57009-U	57075-U	57071	57074-U	57072	57073
PRICE:							



Discovery 96-Well Plates

Discovery 96-Well Plates answer the challenge of high throughput pharmaceutical screening and analysis. The uniform flow dynamics inherent with well plate technology offers a higher level of reproducibility and throughput while maintaining excellent recoveries and increased sensitivity. These plates are packed with the same high-quality phases used in our Discovery SPE line.

DESCRIPTION	QTY.	CAT. NO.	PRICE
DSC-18 SPE 96-WELL PLATES			
100mg/well	1	575603-U	
50mg/well	1	575602-U	
25mg/well	1	575601-U	
DSC-18LT SPE 96-WELL PLATES			
100mg/well	1	575606-U	
50mg/well	1	575605-U	
25mg/well	1	575604-U	
DSC-8 SPE 96-WELL PLATES			
100mg/well	1	575627-U	
50mg/well	1	575628-U	
25mg/well	1	575629-U	
DSC PH SPE 96-WELL PLATES			
100mg/well	1	575630-U	
50mg/well	1	575631-U	
25mg/well	1	575632-U	
DSC-CN SPE 96-WELL PLATES			
100mg/well	1	575624-U	
50mg/well	1	575625-U	
25mg/well	1	575626-U	
DSC-SI SPE 96-WELL PLATES			
100mg/well	1	575609-U	
50mg/well	1	575608-U	
25mg/well	1	575607-U	

DESCRIPTION	QTY.	CAT. NO.	PRICE
DSC-DIOL SPE 96-WELL PLATES			
100mg/well	1	575636-U	
50mg/well	1	575637-U	
25mg/well	1	575638-U	
DSC-NH_2 SPE 96-WELL PLATES			
100mg/well	1	575615-U	
50mg/well	1	575616-U	
25mg/well	1	575617-U	
DSC-SAX SPE 96-WELL PLATES			
100mg/well	1	575618-U	
50mg/well	1	575619-U	
25mg/well	1	575620-U	
DSC-WCX SPE 96-WELL PLATES			
100mg/well	1	575633-U	
50mg/well	1	575634-U	
25mg/well	1	575635-U	
DSC-SCX SPE 96-WELL PLATES			
100mg/well	1	575621-U	
50mg/well	1	575622-U	
25mg/well	1	575623-U	
DSC-PS/DVB SPE 96-WELL PLATES			
50mg/well	1	575611-U	
25mg/well	1	575610-U	

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Solid Phase Combinatorial Chemistry

In recent years, advances in combinatorial chemistry (CombiChem) have made a tremendous impact on the pharmaceutical industry by dramatically accelerating the drug discovery process. However, for each synthesis a purification step is required to remove the target molecule from reaction by-products and excess reagents. Because many reactions contain polar to moderately polar reagents, by-products, and products that can be selectively extracted with normal phase SPE, modified flash techniques utilizing silica packed SPE hardware have become a routine procedure for purifying solution-phase combinatorial reactions.

Discovery SPE products offer combinatorial chemists an excellent opportunity for developing a simple and standardized high throughput purification method for their combinatorial libraries.

In normal phase SPE, polar compounds are retained or adsorbed onto the sorbent via polar-polar interactions when loaded in the presence of an organic sample matrix. Provided that the products, by-products, and reagents display varying polarities, choosing solvents with increasing polarity will allow for sequential elution of key compounds. In most combinatorial flash purification techniques, compounds not of interest are retained on the stationary phase. The products are then collected for analysis in the load flow through, or if weakly adsorbed, they can be selectively removed with a subsequent wash step.

Many combinatorial chemistry labs are synthesizing and characterizing extensive drug libraries. Chemists are therefore employing modified flash chromatography techniques in a 96-well SPE format for the purpose of sample clean-up and baseline impurity removal. In many combinatorial chemistry labs, capacity is a primary concern for such applications. In our studies, we have determined the binding capacity of 4-Fluoro-3-nitrobenzoic acid when loaded into a DSC-Si SPE 96-well plate (100mg/well). Our results show that ~12.5mg of the Fluoro compound can be loaded onto 100mg DSC-Si before beakthrough occurs. Breakthrough determination was analyzed via HPLC analysis (see Table A).

Table A. Binding Capacity of 4-Fluoro-3-Nitrobenzoic acid on DSC-Si (100mg/well)

LOAD AMOUNT*	BREAKTHROUGH AMOUNT
2.5mg	No Breakthrough
5.0mg	No Breakthrough
10.0mg	No Breakthrough
12.5mg	No Breakthrough
15.0mg	0.10 % Breakthrough Occured

* Sample Matrix in 200µL Methylene Chloride
n = 3 for each load amount.

RELATED INFORMATION

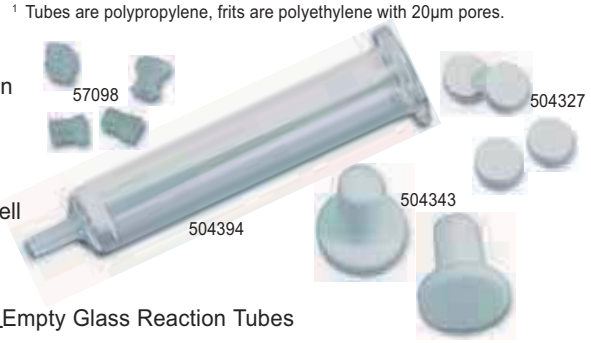
For more information on Combinatorial Chemistry request the following free technical literature.

No.	Title
EDZ	Sigma-Aldrich Combinatorial Chemistry Handbook
DGQ	Aldrich Polymer Products CD - Catalog and Reference Guide

Discovery DCS-Si SPE Products

DESCRIPTION	QTY.	CAT. NO.	PRICE
SPE TUBES			
50mg/1mL	108	52652-U	
100mg/1mL	108	52653-U	
500mg/3mL	54	52654-U	
500mg/6mL	30	52655-U	
1g/6mL	30	52656-U	
2g/12mL	20	52657-U	
5g/20mL	20	52658-U	
10g/60mL	16	52659-U	
SPE-96 WELL PLATES			
100mg/well	1	575609-U	
50mg/well	1	575608-U	
25mg/well	1	575607-U	
BULK PACKING			
Bulk Packing	100g	52651-U	
BÜCHNER FUNNELS			
50mmID x 30mmH; 12.5g	6	52591-U	
70mmID x 40mmH; 25g	6	52592-U	
90mmH x 48mmH; 50g	6	52593-U	
110mmID x 66mmH; 100g	6	52594-U	

[1] Tubes are polypropylene, frits are polyethylene with 20µm pores.



Empty Glass Reaction Tubes

Inert glass tubes, Teflon frits and Teflon closures

- Reduce interferences and contamination of your reaction mixtures
- Resistant to aggressive solvents and chemical solutions
- High flow frit porosity allows for gravity or rapid vacuum rinsing

DESCRIPTION	QTY.	CAT. NO.	PRICE
6mL glass tubes, Teflon frits	24	504394	
Teflon Tube adapters with port	24	504335	
6mL solid Teflon caps	24	504343	
Male luer plugs, PP	12	504351	
Female luer plugs, PP	12	57098	
Replacement Teflon frits for 6mL glass tubes	60	504327	

Combigel XE-305 Support

Our version of Amberlite XE-305. A proprietary, underivatized, polystyrene resin with unique swelling properties that make it ideal for solid phase combinatorial chemistry reactions.

DESCRIPTION	QTY.	CAT. NO.	PRICE
Bulk Packing	50g	502537B	

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Solid Phase Extraction (SPE)

Custom Products, Hardware Configuration

Custom SPE products

Supelco's line of SPE products comprised of an array of sorbents, resins and hardware configurations including polypropylene tu glass tubes, 96-well plates, Büchner funnels, and various positive pressure cartridges. Scattered throughout our standard SPE line you'll see the availability of these various SPE devices at varying degrees. Supelco offers custom manufacturing services you can optimize your sample processing procedure to the parameters dictated by your sample prep objectives. If there's a cert permutation of phase chemistry, bed weight and hardware configuration you require that's not listed within our standard product line, please inquire. To request a price quote or inquire on the feasibility of Supelco manufacturing a custom SPE product, pl contact our Order Processing representatives:

Telephone: 800-247-6628, 814-359-3441

Fax: 800-447-3044, 814-359-3044

Email: supelco@sial.com



Polypropylene SPE Tubes

Standard Design Supelco's standard Discovery and Supelclean SPE tubes are comprised primarily of straight-walled serelogical grade polypropylene syringe barrels. Each of the 20+ available bonded phases and resins are available in an array of bed weights and volumes ranging from 1, 3, 6, 12, 20, and 60mL.

Flangeless Design Flangeless (tabless/wingless) 1 and 3mL SPE tubes that can be eluted directly into 96-well collection plates, using the Gilson Nebula Series SPE 215 System.

Reversible Design Our reversible SPE tubes allows for both forward and reverse flow capabilities offering great utility in trace enrichment applications. The tubes consist of a female luer inlet and a male luer outlet. Reversible tubes are available in 0.5, 1, and 2mL configurations.



Glass Tubes

Inert glass tubes (3 & 6mL) are available for preparations that demand high purity extracts and increased solvent compatibility.



Teflon and Stainless Steel Frits

Use Teflon or stainless steel frits when solvent compatibility and tube cleanliness are of concern. Stainless steel frits are not available with glass SPE tubes.



Discovery SPE 96-Well Plates

Process up to 96 samples at once using Discovery SPE 96-Well Plates. The well plates are a one-piece 2mL polypropylene square well design which will fit most standard well plate manifolds. Available bed weights include 25, 50, & 100mg/well. The well plates are compatible with most robotic and automated liquid handling systems:

- TomTec Quadra 96
- Packard Multi-Probe
- Gilson SPE 215
- Beckman Biomek



Büchner Funnels

Our Büchner funnels are sturdy two piece polypropylene units offering excellent chemical resistance, making them invaluable tools for large scale pharmaceutical preparations. The upper half of the Büchner funnels come pre-packed with the Supelco resin or bonded phase of your choice. Holding the packed bed in place are two polyethylene frits layered tight with a thermally welded retaining ring. Available Büchner funnel dimensions and bed weights include:

- 55mmID x 30mmH, 12.5g
- 90mmID x 48mmH, 50g
- 70mmID x 40mmH, 25g
- 110mmID x 66mmH, 100g

Rezorian Cartridges

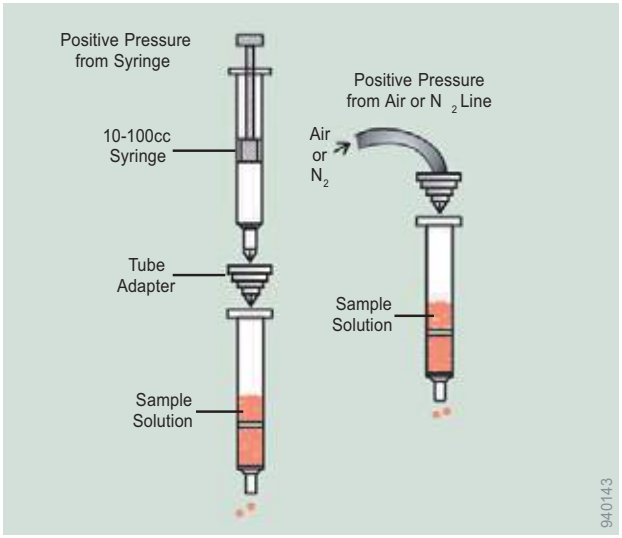
Our disposable Rezorian Luer-Lock syringe-tip cartridges are fast and convenient for isolating, purifying, and concentrating molecules from a variety of sample matrices. Use where positive pressure is preferred. Rezorian cartridges, pre-packed with the Supelco bonded-phase or resin of your choice, are available in 1 & 5mL configurations.



Polypropylene SPE Tube Components

These components can be used for packing your own SPE material.

DESCRIPTION	QTY.	CAT. NO.	PRICE
EMPTY POLYPROPYLENE SPE TUBES WITH POLYETHYLENE FRITS (20µm PORE SIZE)			
1mL	108	57023	
3mL	54	57024	
6mL	30	57026	
12mL	20	57176	
20mL	20	57177	
60mL	16	57178	
EMPTY POLYPROPYLENE SPE TUBES (NO FRITS)			
1mL	108	57240-U	
3mL	54	57241	
6mL	30	57242	
12mL	20	57179	
20mL	12	57021	
60mL	12	57022	
POLYETHYLENE FRITS (20µm PORE SIZE)			
For 1mL Tubes	216	57244	
For 3mL Tubes	108	57180-U	
For 6mL Tubes	60	57181	
For 12mL Tubes	40	57182-U	
For 20mL Tubes	40	57183	
For 60mL Tubes	32	57184	
STAINLESS STEEL FRITS (20µm PORE SIZE)			
For 6mL Tubes	60	57246-U	
TEFLON FRITS (20µm PORE SIZE)			
For 1mL Tubes	216	57185	
For 3mL Tubes	108	57186	
For 6mL Tubes	60	57187	
For 12mL Tubes	40	57188	
For 20mL Tubes	40	57189	
For 60mL Tubes	32	57190-U	
CAPS FOR POLYPROPYLENE SPE TUBES (ENCLOSES TOP OF SPE TUBES)			
For 1mL Tubes	108	52171-U	
For 3mL Tubes	54	52172-U	
For 6mL Tubes	30	52173-U	
For 12mL Tubes	20	52174-U	
For 20mL Tubes	20	52175-U	
For 60mL Tubes	20	52176-U	
MALE & FEMALE LUER PLUGS (SEALS LUER OUTLETS ON SPE TUBES)			
Male Luer Plugs	12	504351	
Female Luer Plugs	12	57098	

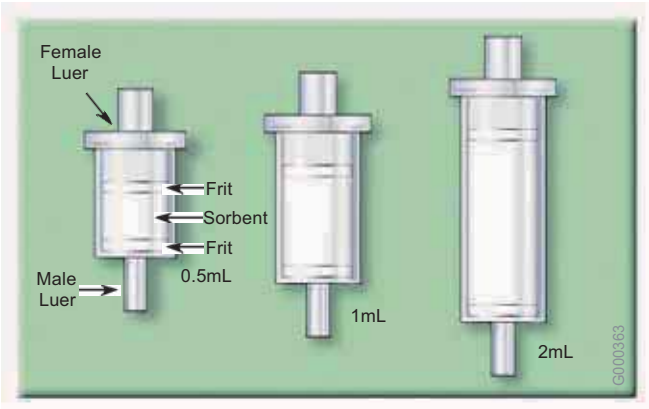


Tube Adapters

Tube adapters serve many purposes. They can be used to stack one SPE tube on top of another to provide different selectivities. A larger empty syringe barrel can be stacked on top of a smaller SPE tube to act as a larger load reservoir. Or, they can serve as an adapter for positive pressure methods (e.g. from a syringe or air/N_2 line).

DESCRIPTION	QTY.	CAT. NO.	PRICE
SPE TUBE ADAPTERS FOR POLYPROPYLENE TUBES			
For 1, 3, 6mL tubes	12	57020-U	
For 12, 20, 60mL tubes	6	57267	
AUTOTRACE SPE TUBE ADAPTERS*			
For 3mL Tubes	6	57123	
For 6mL Tubes	6	57126	

* Allows SPE tubes to be used with AutoTrace Automated Systems



Empty Reversible SPE Tubes

Our reversible SPE tubes provide good utility in trace enrichment applications by permitting forward and reverse flows. These tubes consist of a female luer inlet and a male luer outlet, and are constructed of polypropylene. Reversible tubes are available in 0.5, 1, and 2mL configurations with maximum bed wieghts of 175, 350, and 700mg respectively. Tubes are available pre-packed with the Supelco bonded-phase or resin of your choice through our custom service (see previous page).

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Solid Phase Extraction (SPE)
SPE Vacuum Manifolds

Visiprep SPE Vacuum Manifolds

Visiprep Solid Phase Extraction Vacuum Manifolds allow you to simultaneously process up to 12 or up to 24 SPE tubes. Precise flow control is provided through each SPE tube by rotating the independent, screw-type valves in the cover. This precise control ensures the packing will not dry out in some tubes while others finish draining. A solvent-resistant vacuum bleed gauge and valve offer better sealing and vacuum control, via a screw-type mechanism fitted with a Teflon seal. The stand-alone cover with legs prevents the Teflon solvent guides from resting on the work surface and becoming damaged or contaminated.

The glass basin will not dissolve, fog, or discolor when exposed to solvents, and an optional polypropylene splash guard inserts into the basin to eliminate splashing.

The polypropylene collection vessel rack accommodates autosampler vials, small scintillation vials, 10mm and 16mm test tubes, and 1mL, 2mL, 5mL, and 10mL volumetric flasks. An optional plate for the 12-port model enables you to collect samples in up to ten 20mL scintillation vials.

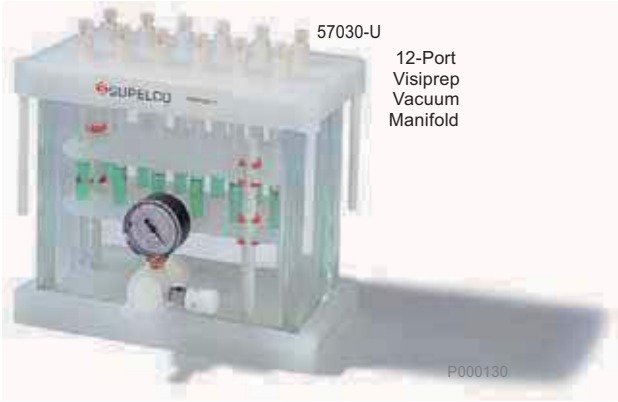
A Visiprep DL (Disposable Liner) Solid Phase Extraction Vacuum Manifold eliminates the possibility of contamination from one sample to the next in the same manifold port. A disposable Teflon solvent guide runs through each flow control valve. The guide acts as a liner, ensuring that all surfaces that come in contact with the sample can be replaced following each extraction. The guide consists of two parts: a polypropylene luer hub which attaches to the SPE tube and the thin-walled length of Teflon tubing that acts as the liner/solvent guide. The luer hub fits snugly into a matching slot on the flow control valve stem. As the SPE tube is rotated, the valve pinches or releases the liner, stopping or starting flow. Includes 100 liners.

57250-U



24-Port Visiprep Vacuum Manifold

57030-U



12-Port Visiprep Vacuum Manifold

12-Port Visiprep DL (Disposable Liner) Vacuum Manifold

57044

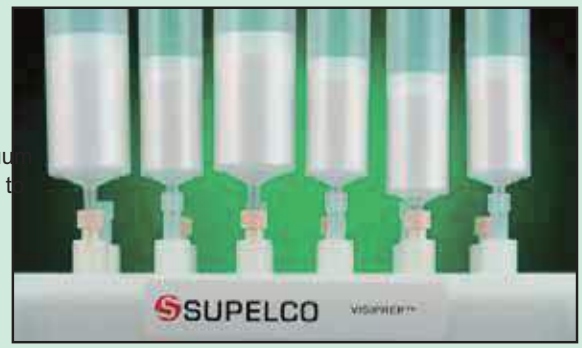


DESCRIPTION	CAT. NO.	PRICE
VISIPREP SOLID PHASE EXTRACTION MANIFOLD		
12-Port Model	57030-U	
24-Port Model	57250-U	
VISIPREP DL (DISPOSABLE LINER) SPE VACUUM MANIFOLD		
12-Port Model	57044	
24-Port Model	57265	

Long Stem Flow Control Valves

Equip alternate valves in your 12-port or 24-port Visiprep vacuum manifold with these long stem flow control valves if you intend to use all ports of the manifold with 12mL, 20mL, or 60mL tubes.

Not for use with DL manifolds.



DESCRIPTION	CAT. NO.	PRICE
Long stem flow control valves (pk. of 6)	57048	



PlatePrep Vacuum Manifold

The PlatePrep vacuum manifold consists of a clear acrylic top allowing for easier inspection of flow rates during SPE 96-well plate processing. The polypropylene base offers excellent chemical resistance while a single remote vacuum gauge/bleed valve controls flow through all the wells.

Use this compact vacuum manifold in conjunction with a Discovery SPE 96-well plate to process up to 96 samples concurrently. The single valve control, parallel processing capabilities, and uniform flow dynamics allow for easier method development, reduces clutter, and allow for greater reproducibility. Unused wells can be covered and used at a later date.

Starter Kit Includes:

- 1 PlatePrep Vacuum Manifold
- 1 96 Sq. Well Collection Plate, 2mL, PP
- 2 Disposable Reservoir/Waste Trays, PVC
- 1 96 Sq. Well Piercable Cap Mat
- 5 Reagent Reservoirs
- 1 Cluster Tube Rack

DESCRIPTION	QTY.	CAT. NO.	PRICE
Supelco PlatePrep Vacuum Manifold	1	57192-U	
96-Well Plate Starter Kit with PlatePrep Manifold	1	575650-U	
PLATEPREP VACUUM MANIFOLD REPLACEMENT PARTS			
Acrylic Clear Top	1	57193-U	
Polypropylene Base	1	57194-U	
Gasket/Connector Replacement Kit	1	57195-U	
Remote Vacuum Gauge/ Bleed Valve Assembly	1	57161-U	
96-WELL SPE ACCESSORY ITEMS			
96 Sq. Well Collection Plates, 0.35mL, PP	50	575651-U	
96 Sq. Well Collection Plates, 1mL, PP	50	575652-U	
96 Sq. Well Collection Plates, 2mL, PP	50	575653-U	
Disposable Reservoir/ Waste Tray, PVC	25	575654-U	
96 Sq. Well Piercable Cap Mats	50	575655-U	
Reagent Reservoirs	100	R9259-100EA	
Cluster Tube Rack	1	Z372226-1PAK	



Supelco Preppy Vacuum Manifold

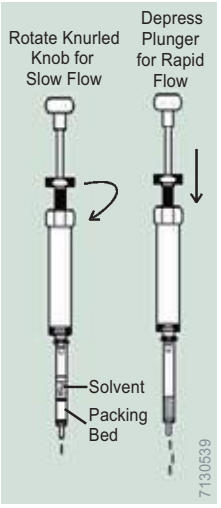
The Preppy manifold is our simplest and most economical manifold. It too enables the analyst to simultaneously prepare up to 12 samples. It consists of a chemical-resistant cover and gasket, a glass basin, a vacuum release vent, 12 individual control valves with knurled tops, and stainless steel solvent guide needles.

Two optional collection racks are available; one holds both 1 and 4mL autosampler vials, and the other holds 12 or 20mL vials. An optional vacuum gauge/bleed valve assembly can be installed to allow precise control of the vacuum used with the Preppy manifold.

DESCRIPTION	CAT. NO.	PRICE
PREPPY VACUUM MANIFOLD		
12-Port Model	57160-U	
PREPPY REPLACEMENT PARTS		
Cover with flow control valves and solvent needle guides	57158-U	
COLLECTION VESSEL RACKS		
For 1 or 4mL vials	57159-U	
For 15 or 20mL vials	57162-U	
ACCESSORIES		
Vacuum Gauge/Bleed Valve Assembly	57161-U	

Single SPE Tube Processor

Visi-1 processor provides two rates of flow control



Our Visi-1 Single SPE Tube Processor provides precise flow control through a single 1mL, 3mL, or 6mL SPE tube. There is no faster, more convenient, or more reliable method for processing one or a few samples.

Simply fill the SPE tube with the appropriate solution, attach it to the Visi-1 processor, and rotate the knurled knob clockwise. The solution will pass through the tube in a slow, uniform rate, consistent with the most reproducible results for SPE. Use the plunger to expel the last drop of solvent from the tip of the tube. Remove the tube from the processor, introduce the next solution, and repeat the process.

DESCRIPTION	CAT. NO.	PRICE
Visi-1 Single SPE Tube Processor	57080-U	

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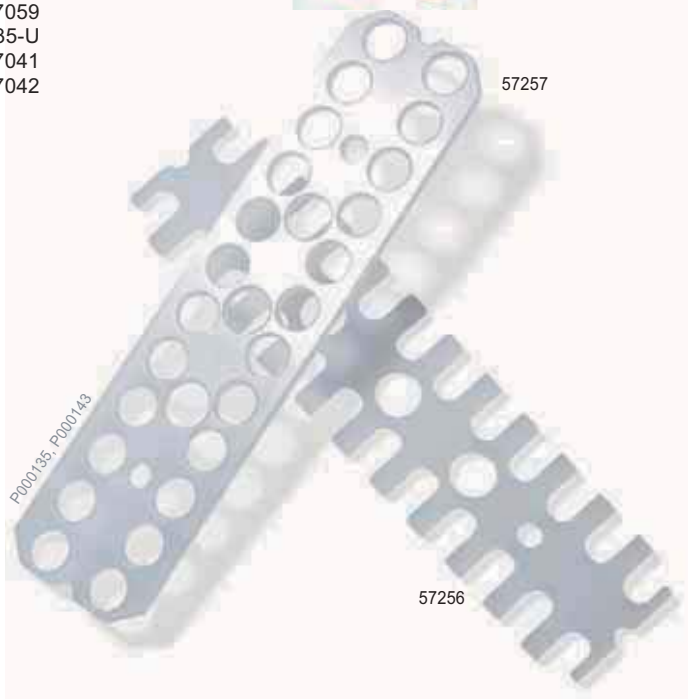
Solid Phase Extraction (SPE)
Vacuum Manifold Accessories

Replacement Parts and Optional Components for Visiprep Manifolds

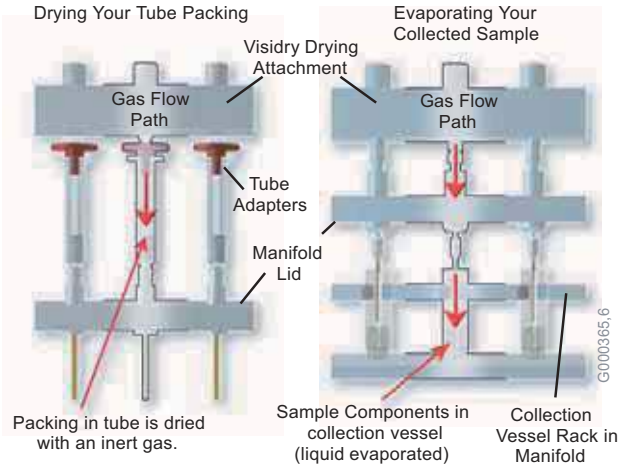
DESCRIPTION	CAT. NO.	PRICE
FOR 12-PORT MANIFOLD		
Cover, 12 flow control valves, gasket[1]	57031-U	
Cover, 12 DL flow control valves, gasket[2]	57029	
Gaskets (pk. of 2)	57033	
Glass basin	57049	
Glass basin, vacuum gauge and bleed valve[2]	57034	
Collection rack (base, 3 support rods, center plate, 10mm test tube plate, 12 retaining clips)[3]	57037	
Plate for 1/2/5/10mL volumetric flasks[3]	57038	
Plate for 16mm test tubes[3]	57039	
Plate for 2mL autosampler vials[3]	57040-U	
Plate for 20mL scintillation vials	57043	
Splash guard	57045-U	
FOR 24-PORT MANIFOLD		
Cover, 24 flow control valves, gasket[4]	57251	
Cover, 24 DL flow control valves, gasket[5]	57266	
Gaskets (pk. of 2)	57254	
Glass basin	57253	
Glass basin, vacuum gauge and bleed valve[6]	57252	
Collection rack (base, 2 support rods, center plate, 10mm test tube plate, 8 retaining clips)[6]	57255	
Plate for 16mm test tubes[6]	57257	
Plate for 2mL autosampler vials[6]	57258	
FOR 12-PORT OR 24-PORT MANIFOLD		
Flow control valves (pk. of 2)[7]	57032	
Solvent guide needles, Teflon (pk. of 12)[1,8]	57047	
Solvent guide needles, stainless steel (pk. of 12)[7]	57036	
Disposable liner flow control valves (pk. of 2)[9]	57028	
Liner guide needles, stainless steel (pk. of 12)[4,10]	57027	
Disposable valve liners, Teflon (pk. of 100)[2,5]	57059	
Vacuum gauge and bleed valve	57035-U	
Retaining clips for collection racks (pk. of 12)	57041	
Test tubes, 10 x 75mm (pk. of 12)[1,2,8,10]	57042	

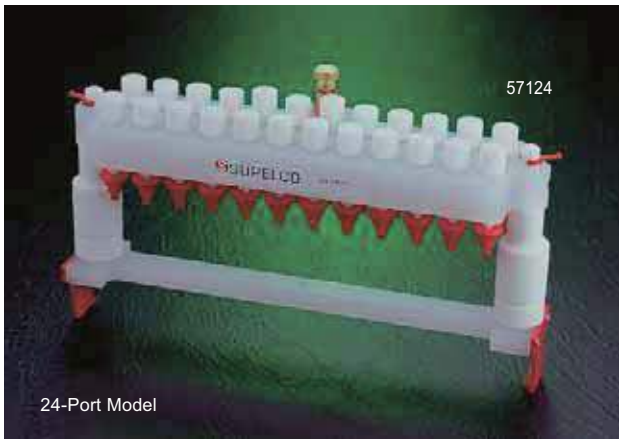
[1] Included with 57030-U
[2] Included with 57044
[3] Included with 57030-U and 57044
[4] Included with 57250-U
[5] Included with 57265
[6] Included with 57250-U and 57265
[7] For 57030-U and 57250-U
[8] 2 packages included with 57250-U
[9] For 57044 and 57265
[10] 2 packages included with 57265





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Visidry Drying Attachment

The Visidry Drying Attachment was designed for our Visiprep Vacuum Manifold (Cat. No. 57100-U also fits our economical Preppy manifold). The Visidry unit installs in minutes, dries up to 12 or up to 24 SPE tubes at one time, and can be used with any inert gas supply. It is also useful for evaporating and concentrating recovered samples. Gas flow to each port can be independently adjusted.

NOTE: The Visidry drying attachment cannot be used to dry 12mL, 20mL, or 60mL SPE tubes.

DESCRIPTION	CAT. NO.	PRICE
VISIDRY DRYING ATTACHMENT		
12-Port Model	57100-U	
24-Port Model	57124	
REPLACEMENT PARTS FOR VISIDRY DRYING ATTACHMENT		
Control knobs (pk. of 2)	57095	
Retaining “C” clips (pk. of 2)	57096	
Female luer plugs (pk. of 12)	57098	

Long Stem Flow Control Knobs

If you have equipped your Visiprep Vacuum Manifold with long stem flow control valves, these control knobs will enable you to attach the Visidry Drying Attachment without removing the long stem valves.

NOTE: These knobs cannot be used with a 24-port manifold being used to process 12mL, 20mL, or 60mL tubes.

DESCRIPTION	CAT. NO.	PRICE
Long Stem Flow Control Knobs (pk. of 6)	57093	

P000120

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Solid Phase Extraction (SPE)
Vacuum Manifold Accessories

Visiprep Large Volume Samplers for Direct Sample Extraction

For continuous “hands off” direct transfer of multiple liquid samples

A Visiprep large volume sampler enables you to transfer low viscosity samples directly from any sample container to conventional solid phase extraction tubes on a Visiprep SPE vacuum manifold.

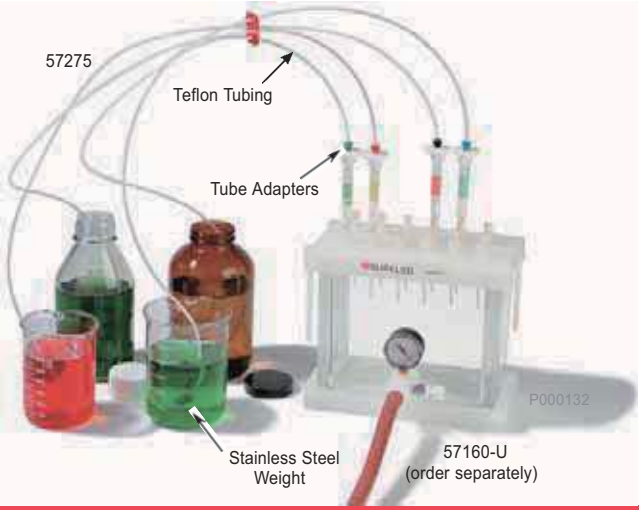
Two samplers are available. One sampler has three tube adapters compatible with 12mL, 20mL, or 60mL polypropylene SPE tubes. Simultaneous extraction of 12 samples on a 12-port Visiprep manifold requires four of these samplers. The other sampler has four tube adapters for 3mL or 6mL SPE tubes. To simultaneously extract 12 samples, three samplers are required.

The samplers consist of 1/8-inch Teflon tubing with a screw fitting at one end and a stainless steel weight at the other end. To use the sampler, feed the weighted end into a sample container until it touches the bottom. Insert the tube adapters into the conditioned SPE tubes on your Visiprep manifold. Turn on the vacuum to the Visiprep manifold and open the manifold flow control valves, and the samples will be delivered to the SPE tubes. The flow rate of sample through each tube can be independently controlled by using the flow control valves. Both the screw fittings and the Teflon tubing on the samplers are color-coded for easy sample identification.

Also fits Preppy SPE Vacuum Manifold.

DESCRIPTION	CAT. NO.	PRICE
VISIPREP LARGE VOLUME SAMPLER		
for 12mL, 20mL, or 60mL SPE tubes (3 adapters)	57272	
for 3mL or 6mL SPE tubes (4 adapters)	57275	
REPLACEMENT PARTS		
1/8" Teflon tubes, color-coded (pk. of 4)	57276	
Nuts and ferrules, color-coded (pk. of 4)	57277	
Stainless steel weights (pk. of 4)	57278	
TUBE ADAPTERS, 1/4-28 THREADS		
For 3mL or 6mL tubes (pk. of 4)	57273-U	
For 12mL, 20mL, or 60mL tubes (pk. of 3)	57274-U	

[1] Also, you must equip alternate manifold valves with long stem flow control knobs to accommodate 12mL, 20mL, or 60mL SPE tubes.





Vacuum Guage / Bleed Valve Assembly

Install in-line to allow control of vacuum

DESCRIPTION	CAT. NO.	PRICE
Vacuum Guage / Bleed Valve Assembly	57161-U	



Trap Kit for SPE Vacuum Manifolds

When installed between a Visiprep SPE vacuum manifold and the vacuum source, a Supelco SPE Vacuum Pump Trap collects all liquids that are aspirated through the SPE tubes, preventing contamination of the vacuum pump. The easily assembled kit contains a polypropylene filtering flask, a one-hole rubber stopper, 4" (10cm) of polypropylene tubing and 5' (1.5m) of red rubber vacuum hose.

DESCRIPTION	CAT. NO.	PRICE
SPE Vacuum Pump Trap Kit	57120-U	



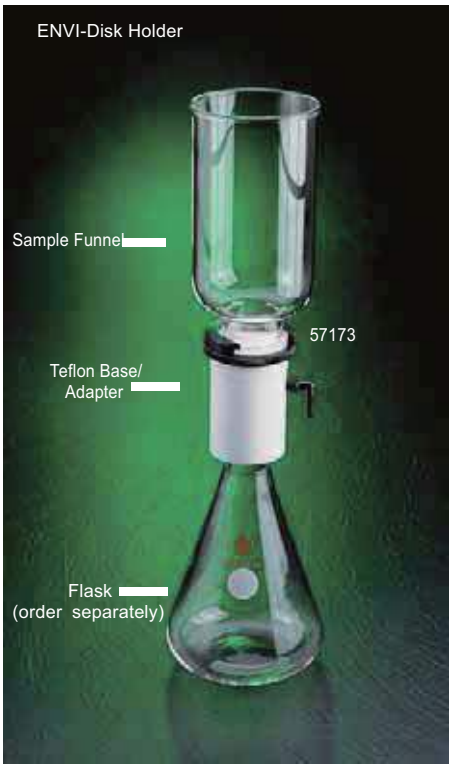
SPE Elution Rack

This versatile stand-alone elution rack can be used with a variety of SPE tubes and receiving vessels, for simultaneous gravity feed extraction of up to 12 tubes. When using reversible tubes with luer endfittings, you can attach an empty syringe barrel to the tube to serve as a solvent reservoir. By assembling the plates in appropriate combinations, you can configure the rack to accept the following:

- 1mL, 3mL, or 6mL syringe barrel-type tubes
- Closed cartridge (reversible) tubes
- 5mL or 10mL volumetric flasks
- 2mL or 4mL vials
- Test tubes up to 15mm ID x 10cm

DESCRIPTION	CAT. NO.	PRICE
SPE Elution Rack	21043-U	

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ENVI-Disk Holder

Use the ENVI-Disk Holder with 47mm ENVI-DSK SPE disks. The unique design of the holder allows each disk to be installed and held firmly in place without wrinkling or tearing. A screw clamp provides uniform pressure on the disk and the sealing surfaces to prevent troublesome leaks – spring-loaded clamps cannot offer the sealing integrity of the ENVI-Disk Holder.

The unit consists of a 1-liter sample funnel, a threaded screw clamp, a Teflon disk support, and a Teflon filter base/adapter with a vacuum attachment fitting. The filter base fits onto any standard 1-liter flask that has a 40/35 tapered ground glass neck. Use 25 x 250mm test tubes to collect disk eluates. The flask and collection tubes are not included with the holder, but can be purchased separately.

To use the holder, place the base/adapter on the 1-liter flask and center an ENVI-Disk on the disk support in the base. Loosen the screw clamp to install the funnel, then tighten to secure the unit. Attach the base/adapter to a vacuum source, and the unit is ready to use.

DESCRIPTION	CAT. NO.	PRICE
ENVI-Disk Holder	57173	
Flask, 1-liter, 40/35 fitting [1]	Z290610-1EA	
Collection Tube, 25 x 250mm [1]	57175	

[1] Order separately – not included with holder.



ENVI-Disk Holder Manifold

The ENVI-Disk Holder Manifold holds one to six ENVI-Disk Holders with flasks, allowing you to simultaneously extract up to six 1-liter samples. Each of the six stations is controlled through an independent flow control valve. These valves are designed to vent the flask to the atmosphere when moved from the open to the closed position. The flow rate is controlled by the needle valve on the manifold.

The unit includes a sturdy polymer base with six stations, six flow control valves, a needle valve, a vacuum gauge, and vacuum tubing. A 1-liter glass bottle in the manifold acts as a trap, to protect the vacuum source in the event of an overflow from one of the sample flasks.

DESCRIPTION	CAT. NO.	PRICE
ENVI-Disk Holder Manifold	57174	



ENVI-Disk Clamp

- Eliminates leaks
- Attaches to any 34/45 tapered flask

When used with a standard 47mm glass filtration apparatus, the ENVI-Disk Clamp creates a better seal, eliminating leaks with SPE extraction disks or when filtering HPLC mobile phase solvents.

Use only with a filtration glassware funnel base that has a removable filtration stage, such as Supelco Mobile Phase Filtration Apparatus 1 (Cat. No. 58061) or 2 (Cat. No. 58062-U), or with a funnel base (Cat. No. 58064 or 58068). It cannot be used with a permanent fritted glass filtration stage or stainless steel holder screen.

DESCRIPTION	CAT. NO.	PRICE
ENVI-Disk Clamp, 47mm assembly	57260-U	
Replacement Teflon stage	57261	

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Air Monitoring
Solvent Desorption Tubes

Introduction

In addition to capturing analytes of interest from air, a sampling device must ensure minimal background interference, sufficient capacity or breakthrough volume for the application for which it is intended, and provide an acceptable pressure drop during sampling. Supelco sampling media meet these requirements, and conform to NIOSH, OSHA, US EPA, and ASTM specifications as required. Consistency and reproducibility are met through our stringent quality control testing. Many of the adsorbents we manufacture are proprietary and have a unique and superior performance characteristics. Examples of these materials include our carbon molecular sieves and graphitized carbo



LpDNPH Cartridges

Use LpDNPH cartridges for sampling carbonyls (e.g., formaldehyde) in ambient, indoor, and industrial atmospheres. Carbonyls are trapped on a high purity silica adsorbent coated with 2,4-dinitrophenylhydrazine, where they are converted to the hydrazone derivatives. The derivatives are eluted from the cartridge in acetonitrile and are analyzed by HPLC. The S10x cartridge fits automated samplers (e.g., XonTech, Inc., ATEC Atmospheric Technology). Use in a XonTech unit requires a special, reusable adapter (Cat. No. 505307). The S10L cartridge is for analysts who prefer the shorter dimensions and do not need an adapter for sampling. The cartridge, reversible and eluted by connecting it to a syringe barrel,[1] acts as a reservoir for gravity-fed elution solvent. H10, H30, and H300 cartridges contain higher loadings of 2,4-DNPH, making them suitable for use in high concentration environments. The disposable ozone scrubber is similar to an S10L cartridge, containing 1.5g of high purity potassium iodide (ozone capacity at least 100,000ppb/hour).

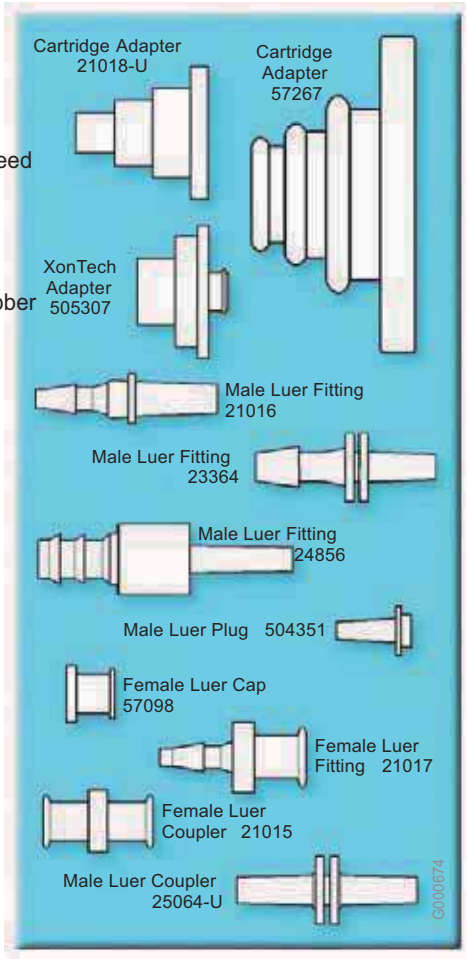
SPECIFICATIONS				
PARAMETER	S10 SERIES	H10	H30	H300
Bed Wt.	350mg	350mg	1g	10g
mg DNPH/cartridge	1	3	8.6	86
Cartridge Volume (mL)	3	3	6	20
Cartridge Length (cm)	S10: 7.5 S10x: 3.8 S10L: 4.0	7.5	7.7	9.8
Pressure Drop (inches water@200cc/min)	<3.5	<3.5	<1	<1
Theoretical Capacity (µg total carbonyls/cartridge)	75	225	643	6400

DESCRIPTION	QUANTITY	CAT. NO.	PRIC
S10	10	21026-U	
S10 Starter Kit[2]	10	21024-U	
S10	50	21014	
S10x	10	505293	
S10L	10	505358	
H10	10	505315	
H30	10	505323	
H300	10	505331	
Ozone Scrubber	10	505285	
Accessories			
Cartridge Adapters			
for S10, H10, H30	10	21018-U	
for H300	6	57267	
XonTech Adapters for S10x	10	505307	
Male Luer Fittings			
to 1/8" tubing	20	21016	
to 3/16" tubing	20	23364	
to 1/4" tubing	10	24856	
Female Luer Fittings	20	21017	
Female Luer Couplers	20	21015	
Male Luer Couplers	20	25064-U	
Lapel Clips	6	21019-U	
Bar Code Labels	100 nos	21012	
Polypropylene Tubes, 6mL[3]	30	57242	
Universal Elution Rack	1	21043-U	

[1] We recommend a 6mL polypropylene tube, Cat. No. 57242.

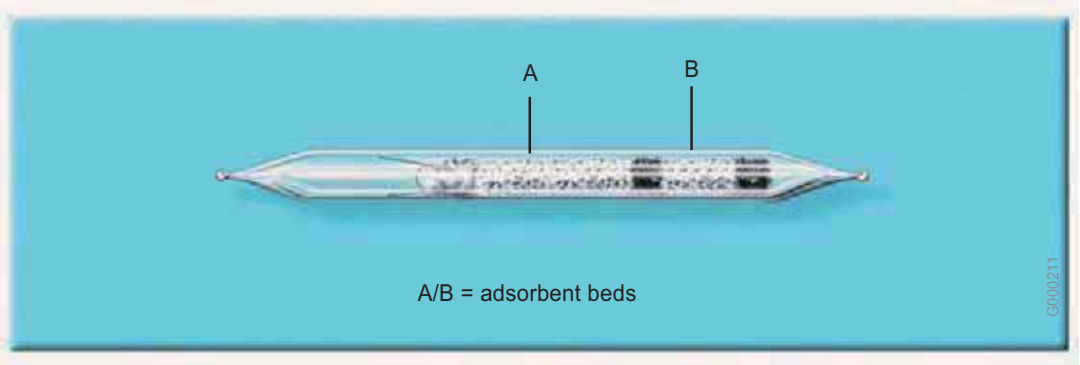
[2] 10 cartridges plus adapters and male luer fittings for various air sampling pumps.

[3] Reservoirs for S10L cartridges.



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Air Monitoring
Solvent Desorption Tubes



ORBO NO.	ADSORBENT	BED WT. (mg) A/B	OD x LENGTH (mm)	SKC INC. EQUIVALENT	QTY.	CAT. NO.	PRICE
CHARCOAL							
32 large	Activated coconut charcoal (20/40)	400/200	8 x 100	226-09	50	20228	
32 small	Activated coconut charcoal (20/40)	100/50	6 x 75	226-01	50	20267-U	
33	Activated petroleum charcoal (20/40)	700/390	8 x 150	226-36	50	20259	
34	Activated coconut charcoal, specially treated	400/200	8 x 105	–	25	20211	
301[1]	Charcoal (20/40)	150	6 x 75	–	50	20039	
303[1]	Petroleum charcoal (20/40)	100/50	6 x 75	226-38	50	20040-U	
304[1]	Charcoal (low Ni) (20/40)	120/60	6 x 80	–	50	20041	
306[1]	Petroleum charcoal (20/40)	400/200	8 x 110	–	50	20073-U	
351[1]	4-tert-butyl catechol on charcoal	100/50	6 x 75	226-73	50	20042	
353[1]	HBr on petroleum charcoal	100/50	6 x 75	226-38-03	25	20044	
354[1]	Alkali-treated charcoal (AVL Barneby Cheney, 580-19)	100/50	6 x 75	226-67	50	20045	
355[1]	4-tert-butyl catechol on charcoal	110/55	6 x 75	–	50	20046	
356[1]	4-tert-butyl catechol on char coal	400/200	8 x 110	–	50	20047	
CARBON							
91	Carbosieve S-III carbon molecular sieve	130/65	6 x 75	226-121	25	20360	
90	Carboxen-564[3] carbon molecular sieve[4]	160/80	6 x 75	226-81	25	20358	
92	Carboxen-564 carbon molecular sieve[4]	160/80	6 x 75	226-81	25	20362	
78	HBr on Carboxen-564 carbon molecular sieve	400/200	6 x 110	–	25	20355	
100	Carbotrap (20/40)	350/175	7 x 110	–	25	20255-U	
101	Carbotrap (20/40)	100/50	6 x 75	–	25	20254-U	
77[1]	H_2SO_4-treated carbon bead (20/30)	500/250	8 x 150	226-29	50	20036	
SILICA GEL							
52 small	Activated silica gel (20/40)	150/75	6 x 75	226-10	50	20229	
52 large	Activated silica gel (42/60)	150/150	8 x 75	226-48	50	20263	
507	Silica gel (20/40)	520/260	8 x 110	226-15	50	20870-U	
53	Activated silica gel (20/40) with glass fiber filter	400/200	7 x 100	226-10-03	50	20265	
502[1]	Activated silica gel (20/45)	100/50	6 x 75	226-51	50	20030-U	
504[1]	Activated silica gel (45/60)	150/75	6 x 75	–	50	20031	
506[1]	Activated silica gel (45/60)	300/150	8 x 75	226-10-04	50	20032	
554[1]	H_2SO_4-coated silica gel (20/40)	150/75	6 x 75	226-53	50	20033	
FLORISIL							
60	Florisil (30/45)	100/50	6 x 75	226-39	50	20351	
POROUS POLYMERS							
42 small	Supelpak 20E (20/40)	66/33	6 x 75	–	50	20262	
42 large	Supelpak 20P (20/40)	100/50	10 x 100	–	50	20264-U	
43	Supelpak 20U (20/40)[4]	100/50	8 x 100	226-30-04	50	20258	
44	Supelpak 20E (20/40)[4]	100/50	8 x 100	226-30-04	50	20260-U	
49P	Supelpak 20P (20/40) with glass fiber filter (OVS-2)	270/140	–	226-30-16	10	20350	
23	2-(Hydroxymethyl)piperidine on Supelpak 20N (20/40)	120/60	6 x 85	226-118	25	20257-U	
24	2-(Hydroxymethyl)piperidine on Supelpak 20N (20/40)	150/75	6 x 105	226-117	25	20231	

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Air Monitoring
Solvent Desorption Tubes

ORBO NO.	ADSORBENT	BED WT. (mg) A/B	OD X LENGTH (mm)	SKC INC. EQUIVALENT	QTY.	CAT. NO.	PRICE
POROUS POLYMERS (CONT'D)							
25	2-(Hydroxymethyl)piperidine on Supelpak 20N (20/40)	450/225	8 x 115	226-27	25	20357	
70	5% Na_2CO_3 on Chromosorb P (30/60)	335/185	8 x 100	–	50	20256-U	
47	Supelpak 70	100/50	6 x 90	226-95	50	20349	
402	Tenax TA 35/60	100/50	8 x 100	226-35-03	50	20832-U	
403[1]	Tenax TA 60/80, acetone/methanol-treated	100/50	6 x 85	–	50	20034	
601[1]	Amberlite XAD-8 (16/50)	100	6 x 75	226-30-08	50	20048	
605[1]	Amberlite XAD-2 (20/50)	100/50	6 x 100	–	50	20049	
608[1]	Amberlite XAD-2 (20/50)	150/75	8 x 110	226-30-05	50	20050-U	
609[1]	Amberlite XAD-2 (20/50)	400/200	8 x 110	226-30-06	50	20051	
613[1]	Amberlite XAD-4	80/40	6 x 75	226-93	50	20052	
65M[1]	XAD-4 with MCE filter (OVS-2)	160/80	-	-	10	20028-U	
65P[1]	XAD-4 with glass fiber filter (OVS-2)	160/80	-	-	10	20029-U	
615[1]	Amberlite XAD-7 (15/50)	100/50	6 x 75	226-94	50	20053	
655[1]	Amberlite XAD-7 (20/60), H_3PO_4 (phosphoric acid)-treated	80/40	6 x 75	226-98	–	20054	
657[1]	Amberlite XAD-7, 1-(2-pyridyl)piperazine-coated	80/40	6 x 90	–	50	20055	
706[1]	Chromosorb 102 (20/40)	100/50	8 x 100	226-107	50	20057	
710[1]	Chromosorb 108 (60/80)	400/200	10 x 100	226-113	50	20058	
711[1]	Chromosorb 106 (60/80)	600/300	10 x 115	226-111	50	20059	
751[1]	Silvered Chromosorb P	30	6 x 20	–	50	20060	
1101[1]	Porapak QS (50/80)	100/50	6 x 75	226-59-09	50	20061	
1102[1]	Porapak P (50/80)	100/50	6 x 75	226-114	50	20062	
1103[1]	Porapak Q (50/80)	150/75	6 x 100	226-115	50	20063	
1104[1]	Porapak R (50/80)	70/35	6 x 75	226-59-04	50	20064	

ORBO NO.	DESCRIPTION	OD	SKC INC. EQUIVALENT	QTY.	CAT. NO.	PRICE
COATED FILTERS[5]						
80	1-(2-Pyridyl)piperazine on glass fiber filter	37mm	–	25	20811	
80 kit	ORBO-80 filter with cassettes (unassembled)	37mm	225-9002	25	20812-U	
828[6]	Silver nitrate-impregnated Whatman #4	37mm	225-9008	25	20070-U	

[1] Tubes made on request.
[2] German Pat. No. 1935500. Patent holder: Badische Anilin-& Soda-Fabrik Aktiengesellschaft.
[3] US Pat. No. 4,839,331.
[4] Similar tubes QA tested for different methods. Refer to Appendix to Technical Bulletin 769, Literature No. 411091).
[5] Assembled cassettes are available on request.
[6] Coated filters made on request.

ORBO Accessories

DESCRIPTION	CAT. NO.	PRICE
ORBO tube cutter	20596	
Replacement sapphire blade	20575	
Puller/inserter tool, pk. of 2	22406	



Puller/Inserter Tool
22406

ORBO Tube Cutter
20596



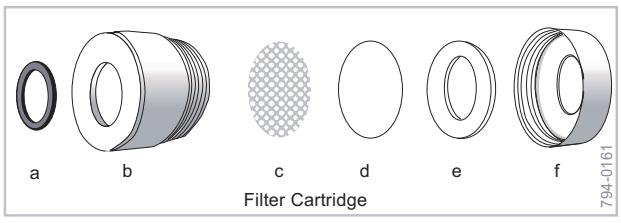
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SPECIFICATIONS FOR SMALL PUF (LOW VOLUME)		
	ORBO-1000 Small PUF	ORBO-1500 PUF/XAD-2/PUF Layers
Dimensions	22mm OD x 7.6cm length	PUF: 22mm OD x 30mm length XAD-2: 1.5g PUF: 22mm OD x 30mm length
Sampling Rate	1-5L/min	1-5L/min
PUF Density	0.022g/cm ^{3}	0.022g/cm ^{3}
Applications	ASTM D4861 – Pesticides/PCBs ASTM D4947 – Chlordane/Heptachlor EPA IP-8 – Pesticides/PCBs EPA TO-10A – Pesticides/PCBs	Pesticides/PCBs

SPECIFICATIONS FOR LARGE PUF (HIGH VOLUME)		
	ORBO-2000 Large PUF	ORBO-2500 PUF/XAD-2/PUF Layers
Dimensions	6cm OD x 7.6cm length	PUF: 6cm OD x 50mm length XAD-2: 10g PUF: 6cm OD x 25mm length
Sampling Rate	20-225L/min	20-225L/min
PUF Density	0.022g/cm ^{3}	0.022g/cm ^{3}
Applications	ASTM D6209 - PAHs EPA IP-7 – PAHs EPA TO-4A – Pesticides/PCBs EPA TO-9A – Dioxins EPA TO-13A – PAHs	Pesticides/PCBs PAHs Dioxins



P000745



ORBO PUF Cartridges

Several US EPA and ASTM methods require a polyurethane foam (PUF) adsorbent cartridge for monitoring semivolatiles in stack, ambient, indoor, and workplace atmospheres. A low pressure drop across the cartridge facilitates high volume sampling. Refer to the table for descriptions of our PUF cartridges. We thoroughly clean our PUF plugs, then test them to ensure absence of contamination.

DESCRIPTION	QTY.	CAT. NO.	PRICE
SMALL PUF CARTRIDGES AND COMPONENTS			
ORBO-1000 Assembled Cartridge – Glass holder with cleaned PUF plug	3	20557	
Cleaned PUF Plugs (7.6cm length)	3	20600-U	
ORBO-1500 Assembled Cartridge – Glass holder with cleaned X AD-2 resin and PUF plugs	3	21233-U	
Cleaned XAD-2 Resin (Supelpak-2)	100g	20279	
Glass Holder for Small PUFs	1	20556	
LARGE PUF CARTRIDGES AND COMPONENTS			
ORBO-2000 Assembled Cartridge – Glass holder, screen, and cleaned PUF plug	1	20037	
Cleaned PUF Plugs (7.6cm length)	1	20038	
ORBO-2500 Assembled Cartridge – Glass holder with cleaned XAD-2 resin and PUF plugs	1	21235-U	
Cleaned XAD-2 Resin (Supelpak-2)	100g	20279	
Glass Holder and Screen for Large PUFs	1	20563	
Stainless Steel Screens for Large PUFs (55mm diam.)	2	21008-U	

Filter Cartridge

An optional filter cartridge can be attached to the inlet of an ORBO-1000 or ORBO-1500 cartridge, to trap aerosol and particulate forms of semivolatiles. The filter cartridge contains a replaceable 32mm diameter quartz microfiber filter with a stainless steel support screen.

Filter Cartridge Assemblyincludes
1 O-ring (a), 1 filter cartridge body (b),
1 stainless steel screen (c), 1 quartz filter (d), 1 filter ring (e), 1 cartridge screw cap (f), and 2 end caps.

Filter Cartridge consists of 1 O-ring (a),
1 filter cartridge body (b),
1 filter ring (e), and 1 cartridge screw cap (f).

DESCRIPTION	QTY.	CAT. NO.	PRICE
Filter Cartridge Assembly		21031	
Filter Cartridge		21033	
Filter Cartridge Replacement Parts			
O-Rings (a)	2	21037	
Filter Cartridge Body (b)	1	21034	
Stainless Steel Screens, 32mm diam. (c)	2	21039-U	
Quartz Filters, 32mm diam. (d)	10	21038	
Filter Ring (e)	1	21035	
Cartridge Screw Cap (f)	1	21036	
End Caps	2	21041-U	

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Air Monitoring
Impingers, Bubblers and Accessories





Impingers and Bubblers

These borosilicate glass impingers (for particles) and bubblers (for gases and vapors) are ideal for NIOSH and OSHA methods that require collection of airborne contaminants by drawing them into a solution. Available with ground glass joints or threaded Teflon micro-connectors.

Threaded Midget Impingers and Bubblers—Make your sampling more convenient with these borosilicate glass apparatus. The vial can be capped after sampling, thus reducing sample handling in the field (no transferring of samples from reservoir to a separate vial). The reservoir may be easily replaced with a standard or graduated screw-top vial of the same size.

Threaded Midget Impinger—20mm threads, standard glass stem. 6-dram vial (22mL) included.

SPECIFICATIONS	
Length (without vial):	143mm (5 5/8")
Vial Capacity:	22mL

Threaded Midget Bubbler—20mm threads. Fritted glass stem. Back pressure <7" of water with 15mL water. 6-dram vial (22mL) included.

SPECIFICATIONS	
Length (without vial):	143mm (5 5/8")
Vial Capacity:	22mL
Graduation Mark:	15mL

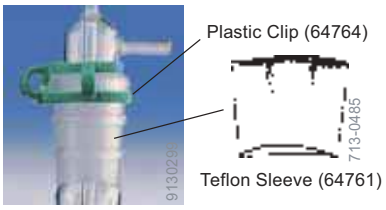
Spill-Resistant Midget Bubbler—24mm threads. Fritted glass stem. Back pressure <7" of water with 15mL water. 10.7-dram vial (40mL) included.

SPECIFICATIONS	
Length (without vial):	143mm (5 5/8")
Vial Capacity:	40mL
Graduation Mark:	15mL

Standard Midget Impinger and Bubbler

SPECIFICATIONS	
Length:	186mm (7.3")
Reservoir Length:	152mm (6")
Reservoir Capacity:	25mL
Graduations:	5mL
Glass Joint:	24/40 taper
Impinger:	standard glass stem
Bubbler:	fritted glass stem

DESCRIPTION	CAT. NO.	PRICE
Threaded Midget Impinger, pk. of 2	64712-U	
Threaded Midget Bubbler	64834-U	
Spill-Resistant Midget Bubbler	64832	
Standard Midget Impinger	20270-U	
Standard Midget Bubbler	64835-U	



Plastic Clips/ Teflon Sleeves

Plastic clips fit over the connection on our 24/40 taper ground glass joints to ensure secure connections. Use full length Teflon sleeves in ground glass joints for inert, tight seals without the possibility of frozen joints.

DESCRIPTION	CAT. NO.	PRICE
Plastic Clips, pk. of 5	64764	
Teflon Sleeves, pk. of 5	64761	



In-Line Impinger Trap

Bottom cap allows easy emptying. 15mL capacity for absorbing solution. Can be packed with charcoal or other adsorbent (not included). Cap and Teflon liner included. Length: 152mm (6"); 20mm threads.

DESCRIPTION	CAT. NO.	PRICE
In-Line Impinger Trap	64833	



Holder

Insert your impinger, bubbler, or in-line trap in this holder and attach the holder to your lapel, shirt pocket, or belt.

DESCRIPTION	CAT. NO.	PRICE
Holder	20271	

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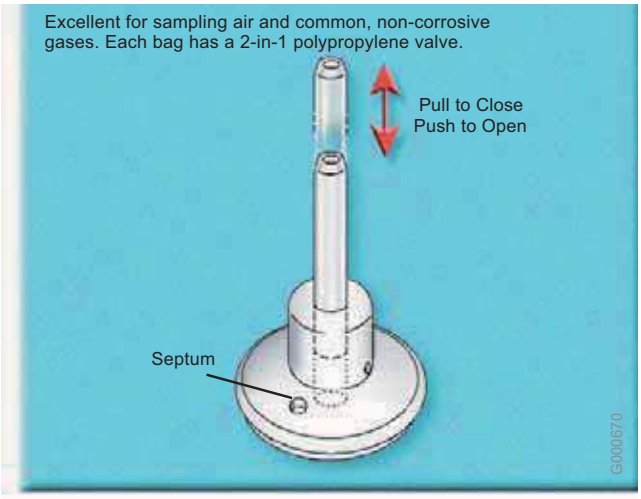


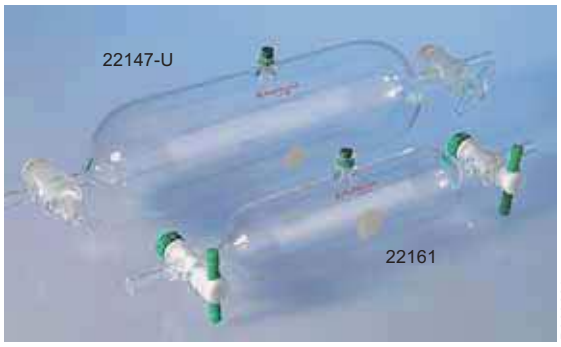
Tedlar Air & Gas Sampling Bags

Tedlar gas sampling bags are recommended in many US EPA methods, including TCLP and methods 3, 5, 18, 25, 25a, 40, 106 and others. Our Tedlar bags are an excellent value, and have several features which elevate them beyond competitors' versions. Our patented polypropylene 2-in-1 valve has a unique push-pull operation. This exclusive, ergonomic feature allows you to operate the bag's valve effectively with one hand, while preparing a connection or withdrawing an aliquot with the other hand. Equally important, the valve consistently achieves a positive open or closed setting.

Our unique valve and seam-sealing process ensure that these bags are sturdy and virtually leak-proof, even under the most demanding sampling and shipping conditions. We use 2 mil du Pont Tedlar material for superior inertness and impermeability, and assemble the bags in a controlled environment to eliminate contamination during manufacture.

MAXIMUM VOLUME	BAG SIZE (INCHES)	QTY.	CAT. NO.	PRICE
1 liter	7 x 7	10	24633	
2 liters	9 x 9	10	24654	
5 liters	12 x 12	10	24655	
10 liters	12 x 19	10	24634	
25 liters	18 x 25	5	24656	





Gas Sampling Bulbs

Use these glass bulbs to trap and transport a gas sample, then remove an aliquot (through the plug-type septum) for analysis. Oven annealed to resist damage during transportation and on-site use. Available with Teflon or high vacuum glass stopcocks. One half-hole cylindrical Thermogreen septum is included with each bulb.

NOMINAL VOLUME	CAT. NO.	PRICE
GLASS STOPCOCKS		
125mL	22146-U	
250mL	22147-U	
500mL	22148-U	
1000mL	22144-U	
TEFLON STOPCOCKS		
125mL	22161	
250mL	22162-U	
500mL	22163-U	
1000mL	22145-U	
Accessories		
Thermogreen Septa, half-hole, pk. of 100	20668	
Teflon Stopcock Plug	64779-U	



Static Dilution Bottle

- Two-liter, round-bottom flask with a threaded neck
- Accommodates a Mininert valve

Use the static dilution bottle to prepare gaseous volatile organic standards, using a technique developed by the US EPA for air analyses. Simply inject neat compound through the valve and allow it to vaporize; then withdraw the aliquots using a gas-tight syringe. Multicomponent standards are conveniently prepared and may be stored for at least one week.

DESCRIPTION	CAT. NO.	PRICE
Static Dilution Bottle	21992	
Replacement 24mm Mininert valve	33304	
Replacement Mininert septa, pk. of 50	33310-U	
Septum Inserter	33311	

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Air Monitoring
Filters and Cassettes



High-quality cassettes, filters, and accessories for air sampling.

P000847



P000662

Filter Products

We have carefully selected these cassettes, filters, and accessories to best meet your air sampling needs. These products, cited in numerous Occupational Safety and Health Administration (OSHA) and National Institute of Occupational Safety and Health (NIOSH) methods in the United States, are universally respected for quality and reliability.

DESCRIPTION	QTY.	CAT. NO.	PRICE
ASSEMBLED CASSETTES			
25mm, 3-piece, with GN-4 Metricel membrane, 0.8µm pores (carbon-filled polypropylene)	50	23371	
25mm, 3-piece, with GN-4 Metricel membrane, 0.8µm pores (banded orange)	50	23374	
37mm, 3-piece, with GN-4 Metricel membrane, 0.8µm pores	48	23368	
EMPTY CASSETTES			
13mm, 2-piece, with washer (Swinney filter holder)	5	23367	
25mm, 3-piece	50	23372	
37mm, 2-piece	100	23369	
37mm, 3-piece, with spacer ring	100	23370-U	
FILTERS			
Mixed Cellulose Ester (MCE) Membrane Filters, with pads			
25mm GN-4 Metricel membrane, 0.8µm pores	100	23380-U	
37mm GN-4 Metricel membrane, 0.8µm pores	100	23381	
37mm GN-6 Metricel membrane, 0.45µm pores	100	23379	
Polyvinyl Chloride Membrane Filters, with pads			
37mm GLA-5000 membrane, 5µm pores	100	23387	
Polytetrafluoroethylene (PTFE) Membrane Filters, with pads			
37mm TF-1000 membrane, 1µm pores	100	23383	
25mm Zefluor filter membrane, 0.5µm pores	100	23395	
37mm Zefluor filter membrane, 1µm pores	50	23391	
37mm Zefluor filter membrane, 2µm pores	50	23390-U	
37mm Zylon filter membrane, 5µm pores	50	23389	
Borosilicate Glass Fiber Filters (Binder-Free), no pads			
13mm A/E glass fiber filter, 1µm pores	500	23376	
25mm A/E glass fiber filter, 1µm pores	500	23377	
37mm A/E glass fiber filter, 1µm pores	500	23378	
SUPPORT PADS			
37mm	100	23385	
37mm	500	23382	
ACCESSORIES			
Sealing bands for 25mm cassettes	100	23365	
Sealing bands for 37mm cassettes	100	23366	
PTFE seal washer for Swinney filter holder	each	23388	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Thermal Desorption Tubes for DYNATHERM Instruments

Supelco offers a complete line of both prepacked and empty tubes for the DYNATHERM Thermal Desorbers. Each tube is individually numbered, thermally conditioned, and batch tested for back-pressure and background. The prepacked Standard Sampling Tubes are sealed in our exclusive TDS storage containers and the Fast-Flow Tubes are sealed with Swagelok fittings. All of the prepacked sampling tubes incorporate a glass frit at the inlet, which increases their performance. The FocusingTtubes are used to refocus the sample for better chromatography of the early eluting compounds.

DYNATHERM Standard Sampling Tubes

Fits: Models 850 / 890 TDU and ACEM-900 and MTDU.

TUBE	QTY	CAT. NO.	PRICE
6mm OD x 4.5" Long, 4mm ID			
Cabotrap 100	1	20872	
Cabotrap 150	1	20381	
Carbotrap 200	1	20873	
Carbotrap 217	1	20895-U	
Carbotrap 300	1	20875	
Carbotrap 302	1	20356	
Carbotrap 317	1	20877	
Carbotrap 349	1	20243	
Carbotrap 400	1	20882	
Tenax TA	1	20896-U	
Empty fritted tubes	3	20380-U	
Empty non-fritted tubes	5	20235-U	

Note: Tubes listed above also fit the OI Analytical Air Tube Desorber or DMP-16.

DYNATHERM Fast-Flow Sampling Tubes

These tube have a 7mm ID that allow faster flow rates to pass through the tubes while sampling. Fits only ACEM-900 and MTDU equipped with the fast-flow option ("FF" designation). Sealed using Swagelok fittings.

TUBE	QTY	CAT. NO.	PRICE
10mm OD x 4.5" Long (6mm OD Ends) 7mm ID			
Carbotrap 217	1	20724	
Carbotrap 317	1	20881	
Tenax TA	1	20894	
Empty fritted FF Tube	1	20893-U	

DYNATHERM Focusing Tubes

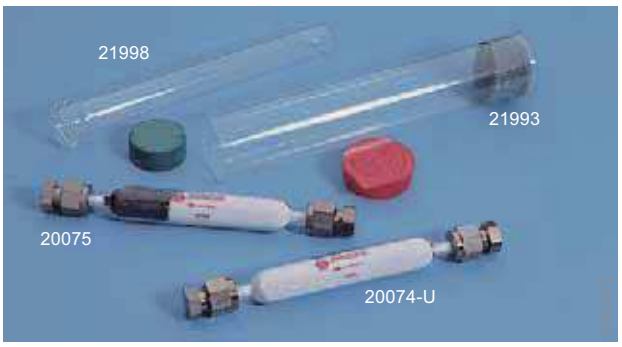
TUBE	QTY	CAT. NO.	PRICE
FITS: MODEL 850 / 890 TDU			
6mm OD x 4.5" Long 2mm ID			
Carbotrap 200	1	20244	
Carbotrap 300	1	20382	
Carbotrap 370	1	20373	
Empty tube w/taper	3	20386	
Empty tube straight bore	5	20237	
6mm OD x 4.5" Long 1mm ID			
Carbotrap 201	1	20361	
Carbotrap 301	1	20354	
Empty tube w/taper	3	20385	
FITS: ACEM-900			
6mm OD x 7.25" Long 1mm ID			
Carbotrap 201	1	20865	
Empty tube w/taper	1	20892-U	



Tube Conditioning Units

These units allow you to re-condition your DYNATHERM Standard Tubes (6mm OD x 11.5cm long)

DESCRIPTION	CAT. NO.	PRICE
Single-Tube Conditioning Unit, 115 VAC	22832	
Six-Tube Conditioning Unit, 115 VAC	22833	



VOST Stack Sampling Tubes

VOST Tubes (Volatile Organic Sampling Train) are designed to meet the specifications in US EPA SW-846, Method 0030. Each tube is individually numbered, pre-conditioned, and sealed with stainless steel Swagelok fitting before being placed in a glass storage container. Each lot is tested for background and backpressure. 16mm OD x 5" Long (1/4" OD Ends)

TUBE	QTY	CAT. NO.	PRICE
VOST 100			
Tenax TA 35/60 mesh	1	20074-U	
VOST 200			
Tenax TA:Petroleum Charcoal, 2:1	1	20075-U	
Empty VOST Tube	1	21993	
VOST Storage Container (Screw Cap Glass)	1	21998	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Air Monitoring
Thermal Desorption Tubes

Thermal Desorption Tubes PerkinElmer Instruments

Supelco offers both Stainless Steel and Glass prepacked sampling tubes that are fully compatible with the ATD-50 the ATD-400 and the new TurboMatrix™ instrument. Each tube has a unique number. The tubes are thermal conditioned and tested for background and backpressue. The tubes are sold in packs of 10 Each tube is sealed with Swagelok fittings.

Fits: ATD-50, ATD-400 and TurboMatrix. 1/4" OD x 3.5" Long. Stainless steel 5mm ID, glass 4mm ID.



P000802-3

TUBE	QTY	CAT. NO.	PRICE
STAINLESS STEEL			
Cabotrap-100 (Carbotrap- B)	10	25052	
Cabotrap-202	10	25058-U	
Carbotrap-300	10	25050	
Carbotrap-349	10	25057-U	
Air Toxics™	10	25051	
Carbosieve SIII°	10	25053	
Tenax GR	10	25054	
Tenax TA	10	25055	
Chromosorb-106	10	25056-U	
Empty Tubes			
Empty Tube without caps	1	25049	
Empty Tubes with TMX Brass Storage Caps	10	28014-U	
Empty Tubes with TMX Brass Storage Caps	50	28015-U	
GLASS			
Cabotrap 100 (Carbotrap B)	10	25087	
Cabotrap 202	10	25093-U	
Carbotrap 300	10	25085	
Carbotrap 349	10	25092-U	
Air Toxics™	10	25086	
Carbosieve S-III™	10	25088	
Tenax GR	10	25089	
Tenax TA	10	25090-U	
Chromosorb 106	10	25091	
Empty Tubes			
Empty Tube without caps	1	25084	
Empty Tubes with TMX Brass Storage Caps	10	28013-U	

Thermal Desorption Tubes for Tekmar-Dohrmann Instruments

Supelco offers both stainless steel and glass prepacked tubes for the Tekmar-Dohrman Instruments. The prepacked tubes are thermally conditioned and tested for background levels and backpressure. The 1/4" OD tubes are sealed in our exclusive TDS3 storage container. The 1/2" OD tubes are sealed in glass storage container.

Fits: AEROTrap 6000


P000848

TUBE	QTY	CAT. NO.	PRICE
STAINLESS STEEL, 1/4" OD X 7" LONG, 5mm ID			
Carbotrap-100	1	20241	
Carbotrap-300	1	20370-U	
Tenax TA	1	20913-U	
Empty Tube	1	20920-U	
GLASS, 1/4" OD X 7" LONG, 4mm ID			
Carbotrap-300	1	20912-U	
Tenax TA	1	20970-U	
Empty Tube	1	20918	
STAINLESS STEEL, 1/2" OD X 7" LONG, 12mm ID			
Tenax TA	1	20984	
Empty Tube	1	20924	
Glass Storage Container	1	20853	
GLASS, 1/2" OD X 7" LONG, 10mm ID			
Carbotrap-300	1	20983	
Tenax TA	1	20988	
Empty Tube	1	20922	
Glass Storage Container	1	20853	

Accessories for PerkinElmer Thermal Desorption Tubes

TUBE	QTY	CAT. NO.	PRICE
PASSIVE SAMPLING ACCESSORIES (STAINLESS STEEL TUBES ONLY)			
Diffusion Caps (Standard)	10	28017-U	
Diffusion Caps (w/ Silicone Membrane)	10	28018-U	
Pen Clips	10	28016-U	
STORAGE END CAPS (FITS GLASS OR SS TUBES)			
PTFE Storage End Caps for ATD-400	20	28019-U	
Brass Storage End Caps for TurboMatrix	20	28011-U	
Replacement PFA Ferrules for Brass Storage Caps	20	28012-U	


28011-U


28017-U


28018-U


28012-U


28016-U

P000801, 804-806, 808

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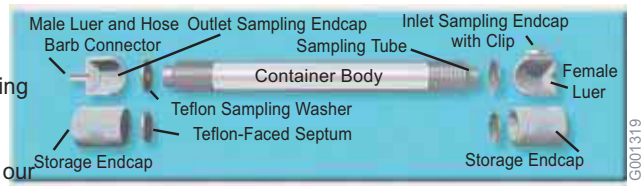
Thermal Desorption Tubes for the GERSTEL ThermoDesorption System

Supelco offers both stainless steel and glass prepacked sampling tubes that are fully compatible with the GERSTEL instrument. Each tube is thermally conditioned, and batch tested for back pressure and background. The prepacked tubes are sealed in our exclusive TDS[3] storage containers. All of the prepacked glass sampling tubes incorporate a glass frit at the inlet, which increases their performance, and are individually numbered. The stainless steel tubes use a SS screen at both inlet and outlet to keep the adsorbent beds secure during use. Fits: Models TDS A & TDS 2.

6mm OD x 7" Long, 4mm ID

TUBE	QTY	CAT. NO.	PRICE
STAINLESS STEEL			
Carbotrap 300	1	28273-U	
Carbosieve S-III	1	28274-U	
Tenax GR	1	28272-U	
Tenax TA	1	28271-U	
Chromosorb 106	1	28275-U	
Empty non-fritted tubes	1	28276-U	
Stainless Steel Screens (Fits both SS & glass tubes)	10	28277-U	
GLASS			
Carbotrap 300	1	28283-U	
Carbosieve S-III	1	28284-U	
Tenax GR	1	28282-U	
Tenax TA	1	28281-U	
Chromosorb 106	1	28285-U	
Empty fritted tubes	1	28286-U	
Empty non-fritted tubes [1]	1	28287-U	
Stainless Steel Screens (Fits both SS & glass tubes)	10	28277-U	

[1] Stainless Steel tube includes 2 SS screens



TDS[3] Thermal Desorption Storage Containers

Use our TDS[3] storage sampling system to simplify the Thermal Desorption sample prep process. The TDS[3] storage containers will maintain the sample integrity of both the tubes to be sampled or those which already have a sample adsorbed. The optional Sampling Caps convert the TDS[3] storage container into a convenient tube holder that makes connecting the tube to the sampling pump very easy.

MANUFACTURER	TUBE DIMENSIONS OD X LENGTH	CAT. NO.	PRICE
Perkin-Elmer	1/4" x 3.5"(8.9cm)	25097-U	
Markes Int'l Ltd.	1/4" x 3.5"(8.9cm)	25097-U	
Dynatherm**	6mm x 4.5" (11.5cm)	25096-U	
Entech	6mm x 4.5" (11.5cm)	25096-U	
OI Analytical	1/4" (6mm) x 4.5" (11.5cm)	25096-U	
Chrompack	6mm x 6.3" (16.0cm)	25098-U	
Gerstel	6mm X 7" (17.8cm)	25095-U	
Tekmar	1/4" X 7" (17.8cm)	25095-U	
Dynatherm***	6mm x 7.25" (18.4cm)*	25099-U	
CDS Analytical	1/4" x 8" (20.3cm)	25100-U	
Envirochem	6mm x 8" (20.3 cm)	25100-U	

Each TDS[3] container includes 10 replacement septa.

* Refocusing tube only.

** Standard sampling tubes

*** ACEM-900 focusing tube

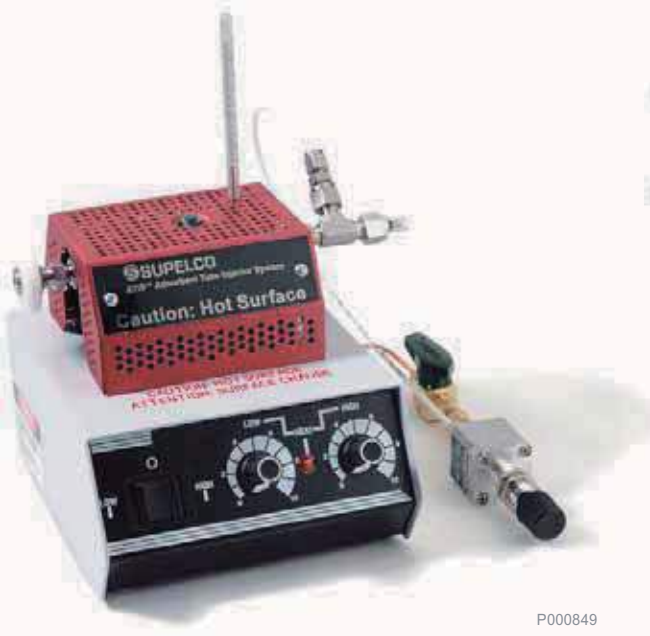
Accessories for TDS[3] Storage Containers

TUBE	QTY	CAT. NO.	PRICE
Replacement Septa for Storage Caps	50	25073	
Sampling Caps Set (Includes one Inlet and one Outlet cap)	1	25069	
Adapters for Hose Connections			
Luer to Hose Barb For 1/4" Tubing	10	24856	
Luer to Hose Barb For 3/16" Tubing	20	23364	
Luer to Hose Barb For 1/8" Tubing	20	21016	
Luer Fittings			
Male Luer Coupler	20	25064-U	
Male Luer Plug (use to seal Inlet Sampling Cap)	12	504351	
Female Luer Plug (use to seal Oulet Sampling Cap)	12	57098	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Air Monitoring

ATIS Adsorbent Tube Injector System



P000849

ATIS™ Adsorbent Tube Injector System

The Supelco ATIS is a sample preparation device for adsorbent tubes. The Adsorbent Tube Injector System employs the technique of flash vaporization to vaporize the sample into a continuous flow of an inert gas, which carries the sample to the adsorbent tube. The sample pathway of the Adsorbent Tube Injector System is constructed of glass and stainless steel. The calibration standard is injected by a syringe through a replaceable septum in the center of the injection glassware, which is heated.

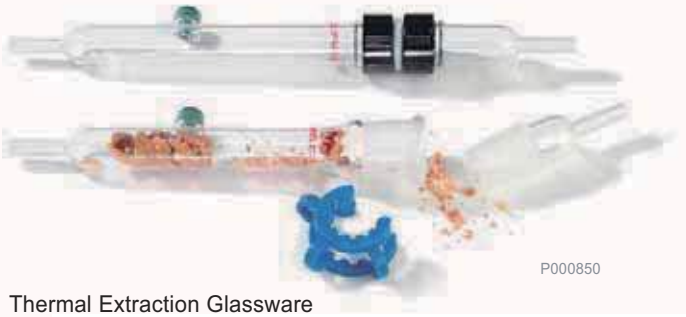
- Injecting calibration standards onto adsorbent tubes, to calibrate your analytical system
- Injecting surrogates and system monitoring compounds onto adsorbent tubes before or after sampling
- Removes moisture from tubes prior to analysis (Dry purging)
- Connect an air-sampling bag to the outlet of the ATIS to vaporize a calibration standards prior to assure complete vaporization.

The ATIS will accept either 1/4" or 6mm OD Thermal Desorption tubes. Included is a Luer/Hose Barb adapters to connect a variety of solvent desorption tubes.

The temperature range of the ATIS is ambient to 120°C. The flow range is 0 to 100mL/min.

The ATIS includes the injection glassware, a constant flow controller with a on/off valve, the heating source, spare parts along with all the necessary fittings and tubing. You simply plumb it to a regulated source of nitrogen or helium and plug it in to the appropriate electrical source.

DESCRIPTION	CAT. NO	PRICE
110VAC Model	28520-U	
220VAC Model	28521-U	
Replacement Injection Glassware	28526-U	

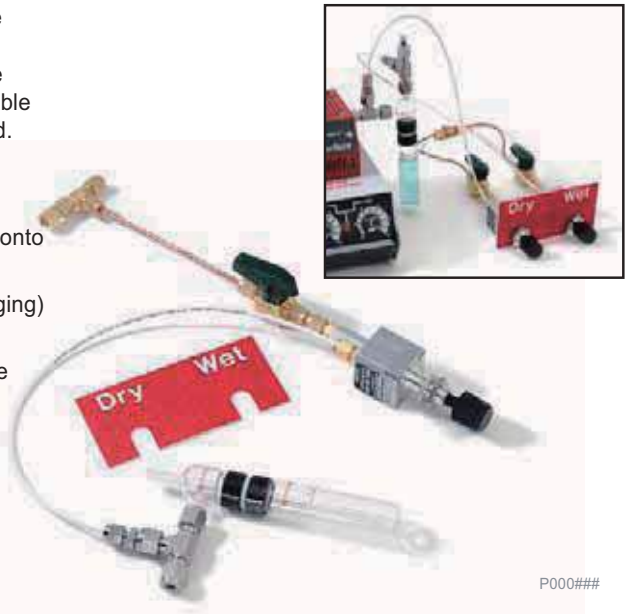


P000850

Thermal Extraction Glassware

Use the ATIS to thermally extract samples onto an adsorbent tube. The opening in the glassware will accepts solid samples up to 1/2" (13mm) in diameter and up to 3" long (76mm) to be inserted into the glassware. The extraction glassware simply slides into the ATIS heating block. Two types of glass joints are available.

DESCRIPTION	CAT. NO	PRICE
20/20 Micro Connector	28523-U	
19/22 Ground Joint	28524-U	



P000###

Purge and Trap/Humidifier Module for the ATIS

A separate module is available that will allow you to purge aqueous samples onto an adsorbent tube at ambient temperatures. This module can also be used to generate a dynamic humidified stream of the carrier gas for spiking calibration standards. The purge and trap module includes purge and trap glassware, and a separate flow controller that allows the user to set a separate purge (wet) flow rate independently of the dry flow rate. The purge and trap module accepts standard 22mL threaded vials to simplify your sample prep.

DESCRIPTION	CAT. NO	PRICE
Purge and Trap Humidifier Module	28522-U	
Replacement Purge & Trap Glassware	28527-U	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



MSA/Auer Detector Tubes

Monitor air contaminants without extractions – analyses – complicated calculations.

MSA/Auer detector tubes contain treated adsorbent granules that react with a specific compound(s), causing the adsorbent to change color. A sample is collected by attaching the detector tube to a special bellows-type pump that draws a known volume of air with each stroke. After sampling, the length of adsorbent bed that has undergone the color change is measured from a scale printed on the tube, allowing direct reading of the vapor concentration – no extraction, no analysis, and no calculations are required.

Detector tubes are particularly useful in situations in which quick screening is required, such as Haz-Mat Response, and for use in various industries in which specific, routine groups of compounds are monitored regularly.

These MSA tubes and pumps are interchangeable with Draeger tubes and pumps. (packs of 10)

SUBSTANCE MEASURED	MEASURING RANGE (ppm)	CAT. NO.	PRICE
Ammonia	2-500	28161-U	
Bromobenzene	5-500	28162-U	
Benzene	0.5-25	28163-U	
Chlorine	0.2-30	28164-U	
Carbon monoxide	5-1000	28166-U	
Carbon monoxide	10-3000	28167-U	
Carbon dioxide	0.1-7.0 vol %	28168-U	
Carbon dioxide	100-3000	28169-U	
Formaldehyde	0.1-55	28171-U	
Hydrogen sulfide	1-200	28172-U	
Hydrogen sulfide	100-4000	28173-U	
Hydrogen chloride	1-30	28174-U	
Hexane	20-3200	28175-U	
Nitrous fumes	0.5-50	28176-U	
Nitrous fumes	50-3000	28177-U	
Nitrogen dioxide	0.5-50	28178-U	
Ozone	0.05-5	28179-U	
Phosphine	0.05-3	28181-U	
Sulfur dioxide	0.5-25	28182-U	
1,1,2-Trichloroethane	10-170	28183-U	
Triethylamine	5-30	28184-U	

Accessories

MSA/Auer Kwik-Ref CD-ROM*	28187-U	

* Contains technical data on all MSA detector tubes



Kwik-Draw Deluxe Detector Tube Pump

- One-hand operation – squeeze handle to compress bellows
- Stroke counter
- End-of-stroke indicator
- Consistent 100mL sample draw

DESCRIPTION	CAT. NO.	PRICE
Kwik-Draw Deluxe Detector Tube Pump	28185-U	

Gas-Tester II H
Detector Tube Pump



- Stroke counter
- End-of-stroke indicator
- Unique locking system
- 100mL sample draw

DESCRIPTION	CAT. NO.	PRICE
Gas-Tester II H Detector Tube Pump	28186-U	



Toximeter II Automatic
Detector Tube Pump

- Preset number of (100mL) pump strokes
- Doubles as a sampling pump for other tubes - bags - impingers
- Constant flow rate of 300cc/min for adsorbent tubes
- 8 hours operating time
- Fault recognition for low battery or blocked flow
- Rechargeable NiCd battery pack included

DESCRIPTION	CAT. NO.	PRICE
Toximeter II Automatic Detector Tube Pump■ with battery pack [1]	28188-U	
Charger, 110V■	28157-U	
Charger, 220V■	28158-U	

■ CE approved.

[1] Protection class: IP54; Ex Protection: EEx ia IIC T4, EEx ia I intrinsic safety approval. Other approvals pending.

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Air Monitoring
Air Sampling Pumps



P000749

Q-MAX Air Sampling Pump

An electronic laminar flow sensor in this easy-to-operate, state-of-the-art sampling pump provides constant flow control, unaffected by changes in battery voltage, temperature, sample load, or altitude. An internal secondary standard calibrates the pump continuously, requiring only monthly calibration with a primary standard. A built-in counter monitors total operating time, and reminds you when a primary calibration is required. The pump also features a low battery function with an indicator light, and blocked flow detection. An LED read-out alternately displays flow rate and elapsed sampling time. Order charger separately.

DESCRIPTION	CAT. NO.	PRICE
Q-MAX Air Sampling Pump[1]■	28160-U	



P000750

Q-MAX Twin Port Sampler

This pump attachment is designed for low flow industrial hygiene sampling, such as gas or vapor monitoring, using sorbent tubes. Two needle valves provide independent flow control for simultaneous collection on two tubes but, by closing the flow to one valve, a single tube can be used. The sampler is compatible with any personal sampling pump capable of a 1.5LPM flow rate at a load of 25 inches of water.
Total flow cannot exceed 500mL/min. Each sampler comes with two tube protectors, one for small tubes (<2" long) and one for large tubes (<4 1/2" long), and tubing required to connect the sampler to the sampling pump.

DESCRIPTION	CAT. NO.	PRICE
Q-MAX Twin Port Sampler[1]	28118-U	

Q-MAX Chargers

DESCRIPTION	CAT. NO.	PRICE
Omega Battery Charger, 12V[2]■	28155-U	
Single Unit Omega Charger, 110V■	28157-U	
Single Unit Omega Charger, 220V■	28158-U	
Five Unit Omega Charger, 110/220 Adapter ■	28159-U	



PAS-500 Micro Air Sampler

This low flow pump is lightweight (4 oz.) and compact (7" high), fitting easily into your shirt pocket. The adsorbent tube connects directly to the inlet of the pump.

The PAS-500 sampler■[3] is versatile. It adapts to fit both 6mm and 8mm diameter tubes. The flow range is 40-200cc/min. An optional low flow adapter enables you to sample at 20cc/min.

The unit is powered by a convenient, easily replaceable 9-volt battery. A full flow regulation feature provides constant voltage to the pump, even as the battery voltage drops. This sampler is intrinsically safe — a built-in resistor limits the power current, preventing any short circuit.

DESCRIPTION	CAT. NO.	PRICE
Includes 6mm tube holder, screwdriver, and two 9-volt batteries	24865	
Accessories		
Tube holder for 6mm sorbent tubes	24867	
Tube holder for 8mm sorbent tubes	24868	
Tube holder for detector tubes	24869	
Attachment clips, pk. of 2	24870-U	
Carrying case for single pump	24871	
Carrying case for 8 pumps	24872	

■ CE approved.
[1] Replacement parts available.
[2] Use to charge battery pack from automobile dashboard (most), or run with charged battery to extend operating time.
[3] Approvals for PAS 500: ETL — Class I Groups A, B, C, D; Class II Groups E, F, G; Class III

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Model 1060 Bag Sampler
24622-U



Model 1063 Six-Port Sampler
24647



Model 1062 Bag Sampler
24623



Model 1067 Dual Channel
Ambient Air Sampler
507113



Field Sampling Pumps

DESCRIPTION	CAT. NO.	PRICE
Model 1060 Single 1-2 Liter Bag Sampler[1]	24622-U	
Model 1062 Single 1 to 10 Liter Bag Sampler[1]	24623	
Model 1063 Six 1 Liter Bag Sampler[1]	24647	
Model 1067 Dual Channel Tube Sampler[2,3,4]	507113	
ACCESSORIES FOR FIELD SAMPLING PUMPS		
Battery Chargers		
110VAC Battery Charger for Model 1060	24643	
110VAC Battery Charger for 1062, 1063	24644	
Universal 110V/220VAC Battery Charger for 1060, 1062, 1063, 1067	24697-U	
Replacement Battery		
Model 1060	24635	
Model 1062, 1063, 1067	24636	
Critical Orifice for Model 1063		
1ml/min	24667	
10ml/min	24668	
25ml/min	24669	
40-mesh filter for critical orifice	24672	

[1] CE Approved

[2] CE approved and in compliance with EMC Directive 89/336/EEC and standards EN 50081-1 and EN 50082-1.

[3] Includes Charger

[4] Includes interchangeable plugs compatible with U.S.-Japan-Canada-Europe-UK. Approvals for charger: BABT, CE, CSA, DEMKO, FIMKO, KEMA, NEMKO, SEMKO, SEQEB, SEV, UL, VDE.

24843



20415



22912



Flow Calbration Devices for Air Sampling Pumps

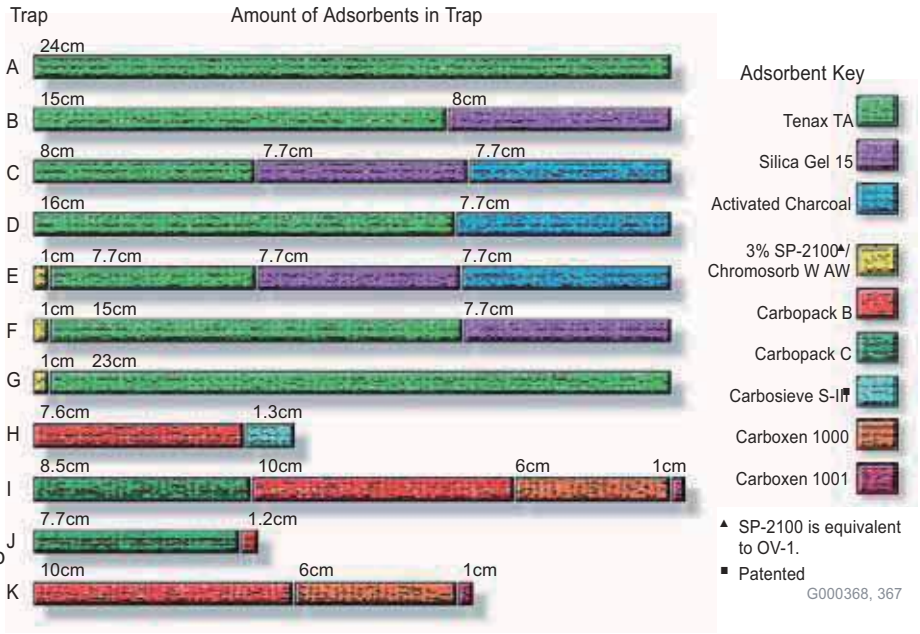
DESCRIPTION	CAT. NO.	PRICE
M-5 1-6000cc/min Mini-Buck Flow Calibrator	24843	
M-30 1-6000cc/min Mini-Buck Flow Calibrator	24845	
M-5 / M-30 110VAC Charger	24844	
M-5 / M-30 220VAC Charger	24846	
Digital Flow Calibrator (5-5000cc/min)	22912	
BUBBLE FLOWMETERS		
500mL Bubble Meter Kit	20414	
Replacement 500mL Bubble Meter	20427-U	
1000mL Bubble Meter Kit	20415	
Replacement 100mL Bubble Meter	20428-U	

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Purge and Trap

Purge Traps

Tubes used in purge and trap analyses generally are packed with multiple beds of adsorbent materials (see figure), so that a broad range of polar and nonpolar, high and low molecular weight compounds can be trapped in a single tube. Each bed protects the next, increasingly active bed, by preventing compounds from being held so strongly that they cannot be desorbed quickly without decomposition. During the purge phase of sampling, lower molecular weight compounds pass through the initial adsorbent beds, but are trapped by succeeding beds. During desorption, the carrier gas passes through the trap in the reverse direction of purge flow, so that higher molecular weight compounds never come in contact with the stronger (innermost) adsorbents.



In selecting adsorbents, the primary concern is the ability of the materials to efficiently trap and release the compounds to be monitored. An adsorbent material that traps and then releases a group of compounds efficiently will help provide high recoveries, sharp peaks, and good resolution, allowing accurate quantification of those analytes. Absence of interference by contaminants or water vapor also is essential for accurate quantification.

VOCARB 3000 purge traps efficiently trap analytes in US EPA Methods 502.2 and 524. Use higher desorption temperatures (250°C) than other traps listed for these methods (180°C), for more rapid transfer of analytes and improved chromatography.

VOCARB 4000 purge traps offer the same general advantages as VOCARB 3000 traps, but can be used with samples containing larger molecular size compounds.

BTEXTRAP purge traps are for analyses of benzene, toluene, ethylbenzene, and xylene. The trap can be baked at high temperatures, making for easier cleanup. Adsorbents in the trap are very stable and do not bleed potentially interfering compounds.

VOCARB and BTEXTRAP purge traps contain hydrophobic adsorbents, which significantly reduce the dry purge time needed to remove moisture.

Purge/Trap Apparatus: Manufacturer and Model

All traps are constructed of 1/8" OD stainless steel and each is produced to the instrument manufacturer's specifications. Each trap is stamped with a letter designation for easy identification of contents.

	Tekmar		OI Analytical		Dynatech
Trap	LSC-1, LSC-2, LSC-2000, 4000 [1]	3000, 3100 [2]	4460 [3]	4560 [4]	"Dyna" Models [5]
PRICE					
A	21059-U	24910-U	21135	24930-U	21075-U
B	21060-U	—	—	24931	21076
C	21061-U	24912-U	21137	24932	21077
D	21062-U	24913-U	21138	—	—
E	20294	24914	21139	24934	21079-U
F	20293	—	21140	—	21080-U
G	20295	24916	21141	24936	21081
PRICE					
H	20321	24917	21142-U	24937	21082
I - VOCARB 4000	20308	24918	21143	24938	21083
J - BTEXTRAP	21064	24919	21145	24939	21084
K - VOCARB 3000	21066-U	24920-U	21131-U	24940-U	21085-U

[1] straight, 12"/30.5cm, Swagelok fitting
[2] straight, 12"/30.5cm, Valco fitting
[3] U-shaped, 11.5"/29.2cm, attached thermocouple
[4] coiled, attached thermocouple
[5] straight, 12"/30.5cm, attached thermocouple

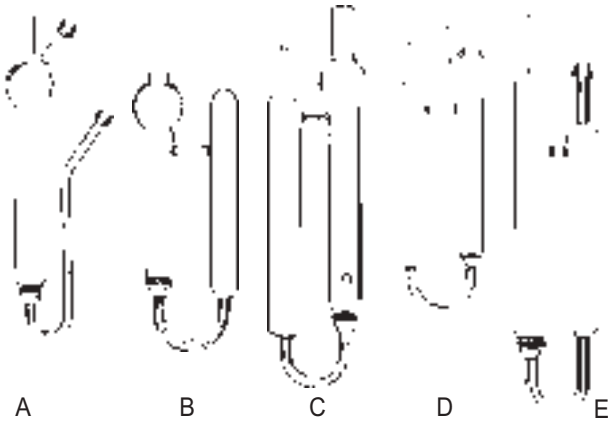
RELATED INFORMATION

Ask for our free Purge and Trap System Guide (Bulletin 916), with troubleshooting guide.

EPA Method	Specified Trap	Supelco-Recommended Trap
502.1	E	I, K (VOCARB 3000)
502.2	E	K
503.1	G	K
524.1	E	K
601	E	K
602	G	J (BTEXTRAP)
603	G	G
624	F	K
1624	F	K
8010	E	K
8015	—	K, J
8020	G	K
8021	G	K
8030	G	G, I (VOCARB 4000)
8031	G	K
8240	E	K
8260	E	K
CLP [6]	B	B

[6] Contract Laboratory Program

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



G000369-373

Fritted Purge Samplers
Note: All 1/4" OD glass ends are ground glass.

DESCRIPTION	TEKMAR EQUIV.	CAT. NO.	PRIC
FOR TEKMAR LSC-2 AND LSC-3 CONCENTRATORS			
For Standard Aqueous Analysis (see A)			
5mL	14-0042-024	22425	
25mL	14-0043-024	22426	
FOR TEKMAR 2000/3000 CONCENTRATORS			
For Standard Aqueous Analysis (see B)			
5mL	14-2337-024	22781	
25mL	14-2334-024	22789	
Fritless Glassware			
5mL	14-2336-024	22780	
25mL	14-2333-024	22788-U	
For AquaTek 50 and 2050 Autosamplers (see C)			
5mL, right stem	14-3544-124	22742-U	
25mL, right stem	14-3546-124	22744	
For US EPA Method 603 Using AquaTek 50 and 2050 Autosamplers (see D)			
5mL, top stem	14-4006-024	22748	
25mL, top stem	14-4007-024	22749	
FOR TEKMAR ALS AUTOSAMPLERS (SEE E)			
5mL	14-0956-024	22429	
25mL	14-0957-024	22430	



DESCRIPTION	TEKMAR EQUIV.	CAT. NO.	PRICE
SEPTA FOR PURGE SAMPLERS			
half-hole (pk. of 100)	—	20668	
NEEDLE SPARGE GLASSWARE			
For LSC-2, LSC-3, 4000, and ALS Concentrators; one-piece design			
5mL/6"	14-2052-024	22724	
25mL/8.25"	14-2053-024	22725-U	
5mL/5.5"	—	22682	
GLASSWARE FOR ALS 2016/2032 SAMPLERS			
Soil sampler, 150mm	12-0507-024	22718-U	
Purge tube,			
6mm x 223mm, needle	14-3913-024	21996	
6mm x 22 3mm, frit	14-3913-124	21997	
REPLACEMENT SAMPLE VALVE AND FITTINGS			
Sample valve for			
Tekmar concentrators[1]	14-0036-050	20971	
Male Luer connector	14-0122-016	20941	
Female Luerconnector	14-0216-016	20942-U	
PURGE AND TRAP SYRINGES			
This purge and trap version of the SampleLock syringe is designed for analyzing drinking water samples according US EPA purge and trap concentration techniques (EPA methods 502.1, 502.2, 503.1, 524.1, and 524.2).			
1005SLPT, 5mL (shown)		26294	
1701N, 10µL (for calibration)	12-0089-052	20972	
1005 TLL, 5mL	14-0069-052	20999	
1025 TLL, 25mL	14-0070-052	20683	

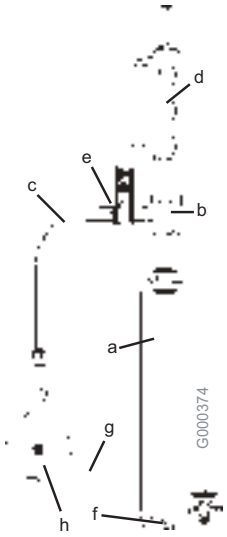
[1] Order Luer connector separately.

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Extraction Glassware

Liquid/Liquid Extraction

US EPA methods specify solvent extraction procedures for semivolatile, pesticide, PCB, and dioxin contaminants in water and haz waste samples. Although analysts encounter a wide range of sample matrices and compounds of interest, the various solvent extra and concentration techniques depend on the same basic principles. Choice of glassware depends on many factors: sample matrix, a characteristics, economy, ease of assembly and cleaning, and compatibility with other glassware. Our selection of glassware inc products for a number of extraction techniques as well as accessories for sample cleanup and solvent recovery. We offer a range modular designs for ease of cleaning, and a choice of connector types.



Modular Liquid/Liquid Extractor

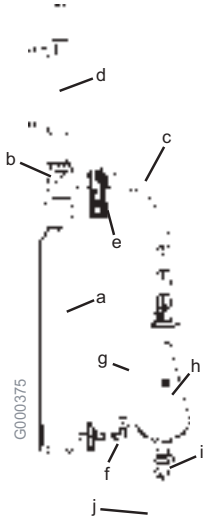
DESCRIPTION	CAT. NO.	PRICE
Modular Liquid/liquid Extractor Kit	64769	
REPLACEMENT COMPONENTS		
Extraction chamber (a)	64770-U	
Fritted drip spout union (b)	64771	
Side arm elbow (c)	64772-U	
Condenser, 250mL, 45/50 (d)	64739	
Elbow union, Teflon, 1/4" x 1/4" (f)	64775-U	
Tubing, Teflon, 1/4" x 13"/33cm (pk. of 2) (g)	64776	
Round bottom flask, 500mL, 24/40 (h)	64678-U	
Teflon sleeves, 24/40 (pk. of 5)	64761	
Plastic clips, 24/40 (pk. of 5)	64764	
Teflon stopcock plug	64779-U	



Liquid/Liquid Extractor

Order support base, flask, and condenser separately.

DESCRIPTION	CAT. NO.	PRICE
Condenser, 250mL, 45/50	64739	
Round bottom flask, 500mL, 24/40	64678-U	
Teflon sleeves, 24/40 (pk. of 5)	64761	
Teflon sleeves, 45/50 (pk. of 2)	64789	
Plastic clips, 24/40 (pk. of 5)	64764	



Supelco Extractor-Concentrator Kit

Combine extraction and concentration functions in one device - This apparatus provides efficient, continuous extraction of organic compounds from a 1-liter water sample into a heavier-than-water solvent, such as methylene chloride. The extracted sample then can be concentrated for analysis.

- Eliminates the need to transfer extracted sample for concentration
- Saves set-up and clean-up time
- Allows recovery of extraction solvent for proper disposal
- Specially designed heating block included (requires heat source)

DESCRIPTION	CAT. NO.	PRICE
Liquid/Liquid Extractor-Concentrator Kit	64807-U	
REPLACEMENT COMPONENTS AND ACCESSORIES		
Extraction chamber (a)	64808	
Drip spout union (b)	64809-U	
Side arm elbow with Snyder column (c)	64810-U	
Condenser, 250mL, 45/50 (d)	64739	
Elbow union, Teflon, 1/4" x 1/4" (f)	64775-U	
Tubing, Teflon, 1/4" x 13"/33cm (pk. of 2) (g)	64776	
Kuderna-Danish flask, 500mL (h)	64710-U	
Receiving vessel, 10mL (i)	64695	
Heating block (j)	64811-U	
Plastic clips, 24/40 (pk. of 5)	64764	
Plastic clips, 19/22 (pk. of 5)	64763	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco





Separatory Funnel

Squibb-type, with glass or Teflon stopcock plug.

CAPACITY	STOPCOCK SIZE	STOPPER SIZE	CAT. NO.	PRICE
WITH GLASS STOPCOCK PLUG				
250mL	4	22	64803-U	
2000mL	6	38	64804-U	
WITH TEFLON STOPCOCK PLUG				
250mL	4	22	64805-U	
2000mL	6	38	64806	





Thimbles

High-purity cellulose, approximately 1.5mm wall thickness, or high-quality borosilicate glass, 40-60µm porous disk.

DESCRIPTION	QTY.	CAT. NO.	PRICE
CELLULOSE THIMBLES			
25 x 80mm	25	64840-U	
33 x 94mm	25	64841-U	
43 x 123mm	25	64842	
GLASS THIMBLES			
25 x 85mm	1	64836-U	
35 x 90mm	1	64837	
45 x 130mm	1	64838	



Soxhlet Extraction Apparatus

For continuous solvent extraction of semivolatile analytes from solid matrices.

Use this inert all-glass system for extracting semivolatile compounds from a solid or semi-solid sample matrix – soil, for example – into an organic extraction solvent, such as hexane, acetone, or methylene chloride. The Soxhlet apparatus is simple to set up and use, and it features ground glass joints for easy dismantling and cleaning.

Soxhlet Apparatus Kits

Order glass or cellulose thimbles separately.

DESCRIPTION	SMALL	MEDIUM	LARGE
Extractor Capacity	50mL	85mL	200mL
Flask Capacity	125mL	250mL	300mL
Extractor Top Joint	ST 34/45	ST 45/50	ST 55/50
Extractor Bottom Joint	ST 24/40	ST 24/40	ST 24/40
Extractor ID	30mm	38mm	50mm
CAT. NO.	64824	64825	64826
PRICE			

Soxhlet Apparatus Replacement Components

DESCRIPTION	CAT. NO.	PRICE
CONDENSER		
Small	64815-U	
Medium	64816-U	
Large	64817-U	
EXTRACTOR		
Small	64818	
Medium	64819-U	
Large	64820-U	
FLASK		
Small	64821-U	
Medium	64822-U	
Large	64823	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Extraction Glassware

Sample Concentration Apparatus

Macro

	GROUND JOINTS CAT. NO.	PRICE	THREADS CAT. NO.	PRICE
Kit*	64685-U		64704-U	
SNYDER COLUMN				
2-ball	64727-U		—	—
3-ball	64693-U[1]		64705-U[2]	
FLASK				
250mL	64729		64708-U	
500mL	64710-U[1]		64706-U[2]	
RECEIVING VESSEL				
4mL	64687-U		64702	
10mL	64695		64703	
15mL	64684-U[1]		64707[2]	
25mL	64731-U		64726	
GLASS STOPPERS, T	19/22			
Solid	64644		—	—
SPRINGS, 13mm (PK. OF 20)				
	64711		—	—
TEFLON SLEEVES (PK. OF 5)				
⅋19/22	64762		—	—
⅋24/40	64761		—	—
PLASTIC CLIPS (PK. OF 5)				
⅋19/22	64763		—	—
⅋24/40	64764		—	—
MICRO CONNECTORS (PK. OF 6)				
⅋20/20	—	—	64700-U[2]	
⅋13/13	—	—	64699-U	
⅋13/20	—	—	64701-U	

Micro

	GROUND JOINTS CAT. NO.	PRICE	THREADS CAT. NO.	PRICE
Kit*	64718		64688-U	
SNYDER COLUMN				
0-ball	64721[3]		—	—
2-ball	64694		—	—
3-ball	64720-U		64696	
FLASK				
40mL	64722[3]		64698[4]	
250mL	64719-U		64708-U	
RECEIVING VESSEL				
2mL	64723[3]		64689-U[4]	
4mL	64687-U		64702	
10mL	64695		64703	
SPRINGS, 13mm (PK. OF 20)				
	64711		——	
TEFLON SLEEVES (PK. OF 5)				
⅋19/22	64762		——	
PLASTIC CLIPS (PK. OF 5)				
⅋19/22	64763		——	
MICRO CONNECTORS (PK. OF 6)				
⅋20/20	—	—	64700-U[4]	
⅋13/13	—	—	64699-U[4]	
⅋13/20	—	—	64701-U	

* Components of kits 64685-U, 64704-U, 64718, and 64688-U are indicated with [1] [2] [3] [4] respectively.

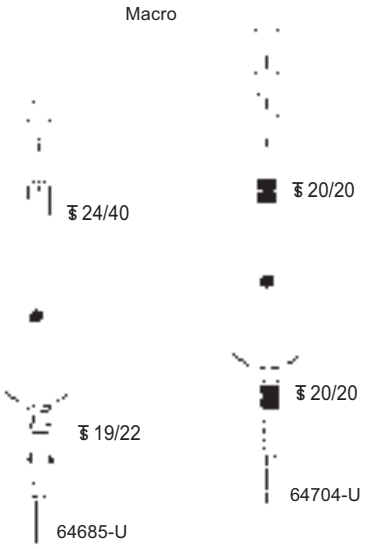
Kuderna-Danish Sample Concentrators

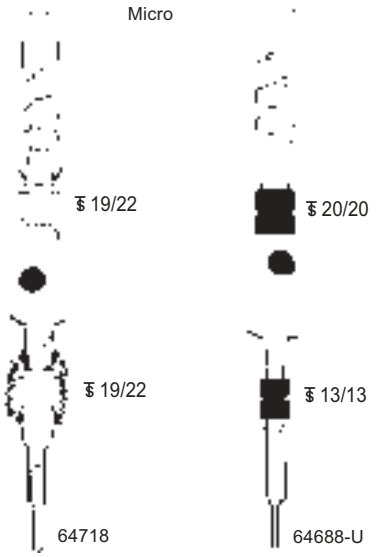
Widely used in semivolatile and pesticide analysis

For US EPA protocol

Developed for concentrating compounds dissolved in volatile solvents

Made in our own glass shop



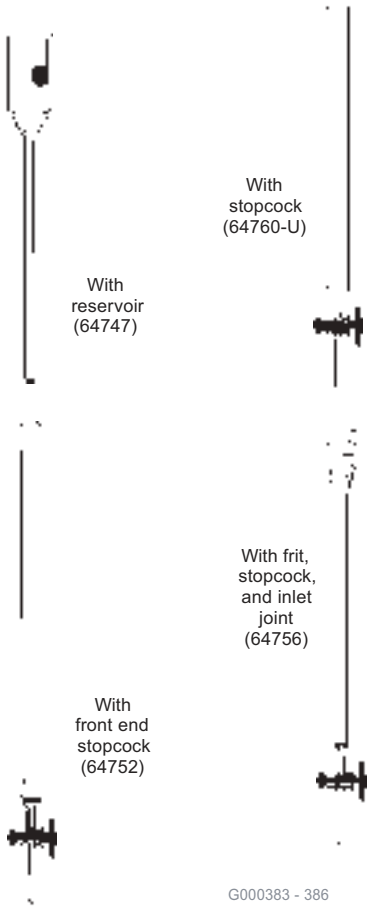


G000379 - 382

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Liquid Chromatography Columns

Described in US EPA Protocol- Fill these columns with appropriate adsorbents when cleaning or drying environmental samples for pesticide or priority pollutant analyses.



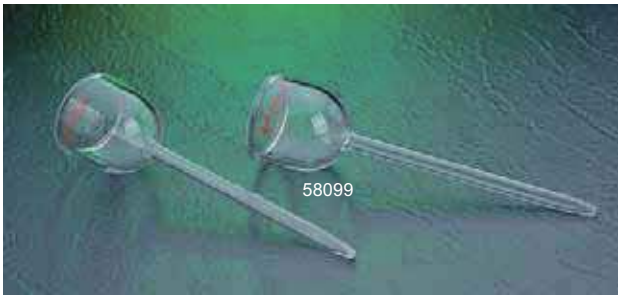
G000383 - 386



P000113

Drying Column with Reservoir

We designed this column (Cat. No. 64785-U) to meet US EPA specifications for drying solvent extracts in procedures for semivolatile organic compounds. The reservoir will hold approximately 60mL of extract – the entire product from one separatory funnel extraction. Holds a 19mm x 10cm bed of sodium sulfate.



P000114

Reusable Sample Cleanup Columns

Each of these glass "champagne" columns consists of a reservoir and a stem ending in a ground tip. The reservoir of the large columns (Cat. No. 58099, 160mm long, 36mm ID, 6mm stem ID) is approximately 30mL; minicolumns (Cat. No. 58098, 81mm long, 17.5mm ID, 3.5mm stem ID) have a 4mL reservoir.

DESCRIPTION	CAT. NO.	PRICE
COLUMN WITH RESERVOIR		
200mm x 7mm ID x 9mm OD column, 280mm overall	64748	
200mm x 9mm ID x 11mm OD column, 280mm overall	64747	
COLUMN WITH TEFLON STOPCOCK		
300mm x 22mm ID x 25mm OD column, 415mm overall	64760-U	
COLUMN WITH COARSE FRIT AND TEFLON STOPCOCK		
300mm x 10.5mm ID x 13mm OD column, 415mm overall	64752	
400mm x 19mm ID x 22mm OD column, 515mm overall	64753-U	
300mm x 22mm ID x 25mm OD column, 415mm overall	64754	
400mm x 22mm ID x 25mm OD column, 515mm overall	64755	
COLUMN WITH COARSE FRIT, TEFLON STOPCOCK AND INLET JOINT		
300mm x 10.5mm ID x 13mm OD column, 415mm overall	64756	
400mm x 19mm ID x 22mm OD column, 515mm overall	64757	
300mm x 22mm ID x 25mm OD column, 415mm overall	64758-U	
400mm x 22mm ID x 25mm OD column, 515mm overall	64759-U	
Replacement Stopcock Plug, Teflon	64779-U	
DRYING/CLEANUP COLUMNS		
Drying column with reservoir	64785-U	
Champagne cleanup columns (pk. of 6)	58099	
Miniature champagne cleanup columns (pk. of 10)	58098	

HELPFUL HINTS

For materials to use in these columns, see Adsorbents in the index.

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Extraction Glassware

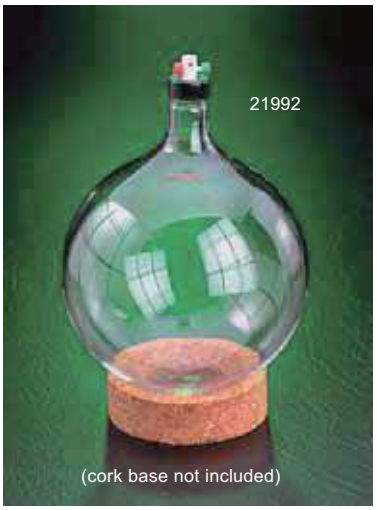
Sample Concentration/Extraction Accessories



Economical Heating Block

Order hot plate separately.

DESCRIPTION	CAT. NO.	PRICE
Heating block	64811-U	



Static Dilution Bottle

Use this bottle to prepare gaseous volatile organic standards, using a technique developed by the US EPA for air analyses. Simply inject neat compound through the valve and allow it to vaporize, then withdraw aliquots, using a gas-tight syringe. Multicomponent standards are conveniently prepared and typically can be stored for at least one week.

Two-liter, round-bottom flask with threaded neck. Accommodates a Mininert valve.

DESCRIPTION	CAT. NO.	PRICE
Static dilution bottle	21992	
Replacement 24mm Mininert valve	33304	
Replacement Mininert septa, pk. of 50	33310-U	
Septum Inserter	33311	



Liquid/Liquid Extraction Flasks

Heat resistant borosilicate glass flasks, excellent for extracting trihalomethanes from drinking water. Also useful for collecting samples, preparing solutions, derivatization reactions, extractions, and many other applications.

DESCRIPTION	QTY.	CAT. NO.	PRICE
THM flask, cap & septum, 10mL	12	64715	
THM flask, cap & septum, 25mL	12	64716-U	
Hole cap only	100	27176	
Teflon-faced silicone rubber septa	100	27177	
Mininert sampling valve, 20mm	12	33303	

Uni-PIN Glass Marking Pen

Writes on virtually any surface, even glass, without fading or smearing. The 0.33mm fineline marker uses a permanent oil-based black ink that is waterproof, and fade and bleed resistant.

DESCRIPTION	CAT. NO.	PRICE
Uni-PIN glass marking pen	64800-U	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Extraction Glassware
Custom Glass Fabrication, Glass Repair

Custom Glassware Fabrication

If you need a unique creation to fit a special job, just let us know about it. We can make a one-of-a-kind piece of apparatus, or meet any other unusual request. We will be pleased to provide you with a quote on custom glassware. All we need is a dimensional drawing or sketch, details of any special design requirements, and your name, address, and phone number.



P000138

Eliminate Analyte Adsorption and Decomposition

Have Us Deactivate Your Glassware and Containers—High concentrations of silanol groups (Si–O–H) on untreated glass surfaces can catalyze decomposition of unstable compounds or adsorb polar compounds through hydrogen bonding. Quantitative analyses of these sensitive compounds become unreliable: recoveries are reduced and analyses can be complicated by decomposition byproducts.

Our elevated temperature organosilanization process derivatizes many of the surface groups, creating a more inert surface. Remaining active groups are shielded from contact with the chemicals in the container. Sigma Chemical Company has approved our process for their demanding biological products; we use it to treat the containers for all of our quantitative standards.

Our process is environmentally friendly – it does not require solvents for diluting the silanization reagent or rinsing the deactivated surface, and an elaborate trapping system confines the reagent vapors. The process also is highly mechanized, making the cost very reasonable.

We offer our deactivation treatment for all of your glassware, vials, and other glass storage containers. Simply send us your glassware – or request silanol deactivation when you purchase Supelco glassware. We will have a quote to you within two days. If you wish, we can provide a certificate of treatment with your deactivated glassware.

Glassware Repairs

Save up to 75% of the cost of replacement—Our staff of talented and experienced glassblowers will consider any glass repair job, regardless of size or complexity. Just ask, and within two days (normally) we will give you our repair quotation. You can save as much as 75%, compared to the cost of a new purchase.

If you do not agree the savings are worthwhile, your package will be returned. Your only cost will be to pay the return shipping charges.

Important Note About Glass Item Repairs

Some glass items shipped to us for repair may be damaged during shipment. Original damage also can be a result of extensive heating and cooling during use. Items damaged in these ways may be deemed unrepairable and, at your option, will be returned in their existing condition.There will be no charge for examining these items – you pay the return postage only.Supelco cannot assume responsibility for any such damage, nor for further damage while attempting to repair the item; nor will we replace the item.

Glassware Repairs

Within two days, you will have our quote!

Just follow these easy directions:

Ship your broken glassware or apparatus to us.Must be clean! Be sure it is carefully packaged and insured.

Also send:

- A brief description of the break
- A list of parts
- Dimensional drawings or sketches

Contact the Supelco Glass Shop

Glass Shop
Supelco
595 North Harrison Road
Bellefonte, PA 16823-0048

FAX: 800-447-3044 or 814-359-5773

Questions? Contact:

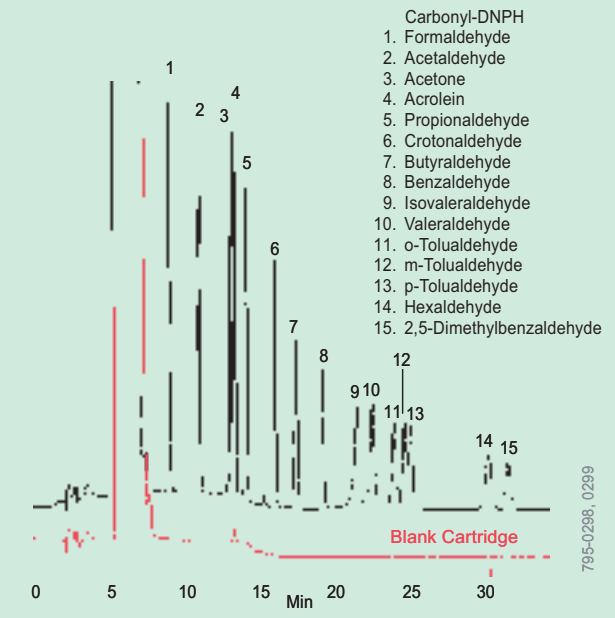
Order Processing:

800-247-6628 (814-359-3441)

Glass Shop:

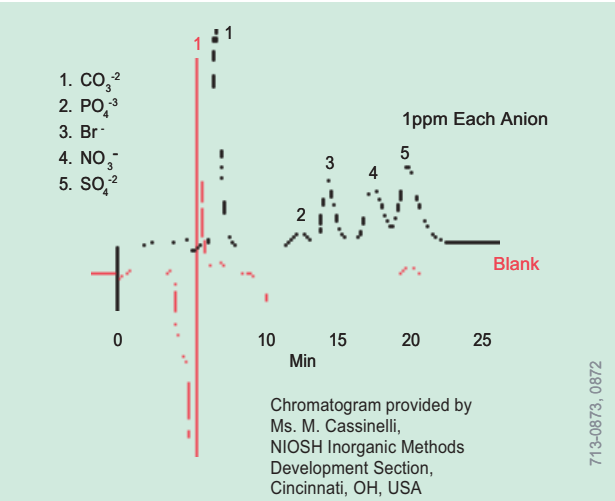
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Sample Preparation Applications
Air Monitoring



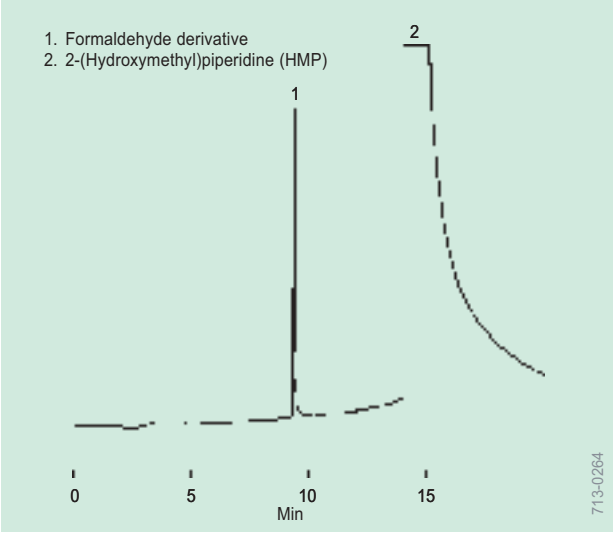
Aldehydes/Ketones in Air by US EPA TO-11, IP-6A, ASTM D5197 (HPLC)

Sample: 5µg each carbonyl-DNPH on LpDNPH cartridge. Cartridge eluted with 5.0mL acetonitrile
Sampling Tube: LpDNPH Cartridge
Cat. No.: 21024
Column: SUPELCOSIL LC-18, 25cm x 4.6mm ID, 5µm particles
Cat. No.: 58298
Mobile Phase: A = acetonitrile:tetrahydrofuran:water, 30:10:60
B = acetonitrile:water, 60:40
0% B for 1 min, linear gradient to 100% B over 10 min
Flow Rate: 1.5mL/min
Det.: VIS, 360nm
Inj.: 25µL of extract



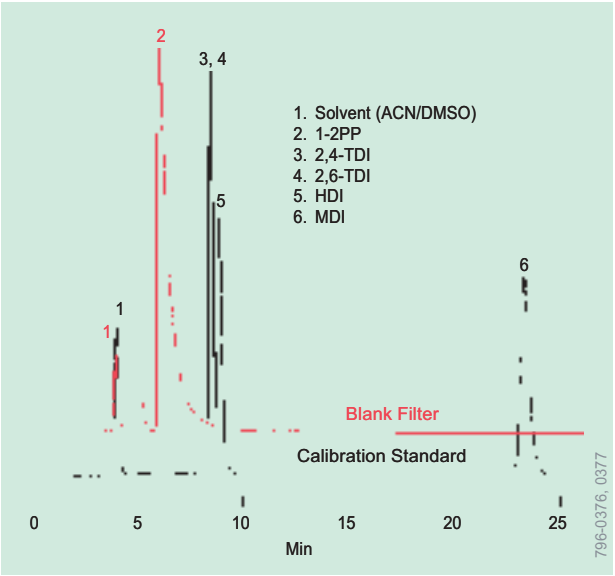
Inorganic Acids by NIOSH Method 7903 (HPLC)

Sample: ORBO-53 tube spiked with inorganic acids (1ppm each component)
Sampling Tube: ORBO-53
Cat. No.: 20265
Column: Dionex S2 Fast Run Anion, 25cm x 3mm ID
Mobile Phase: 3mM $NaHCO_3$/2.4mM Na_2CO_3
Flow Rate: 3.0mL/min
Det.: conductivity (10µSiemens/cm)



Formaldehyde by OSHA Method 52 (GC)

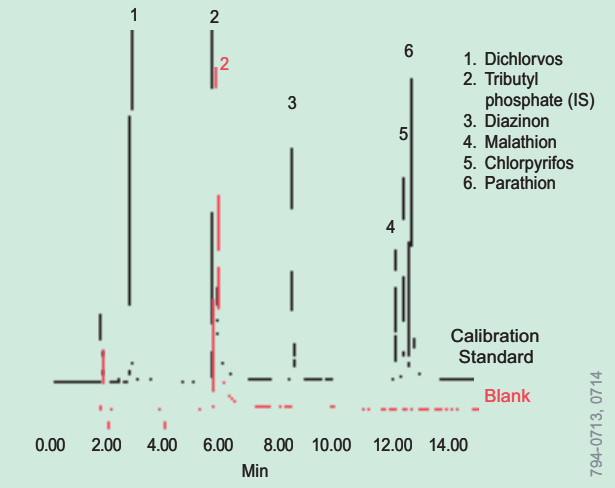
Sample: HMP-coated Supelpak 20 spiked with formaldehyde (10µg)
Sampling Tube: ORBO-24
Cat. No.: 20231
Column: SUPELCOWAX 10, 30m x 0.53mm ID, 0.5µm film
Cat. No.: 25325
Oven: 50°C (2 min) to 200 °C at 10°C/min
Carrier: helium, 7mL/min
Det.: NPD, 220°C
Inj.: 1µL direct, 220 °C



Isocyanates by OSHA 42, 47, ASTM D5836 (HPLC)

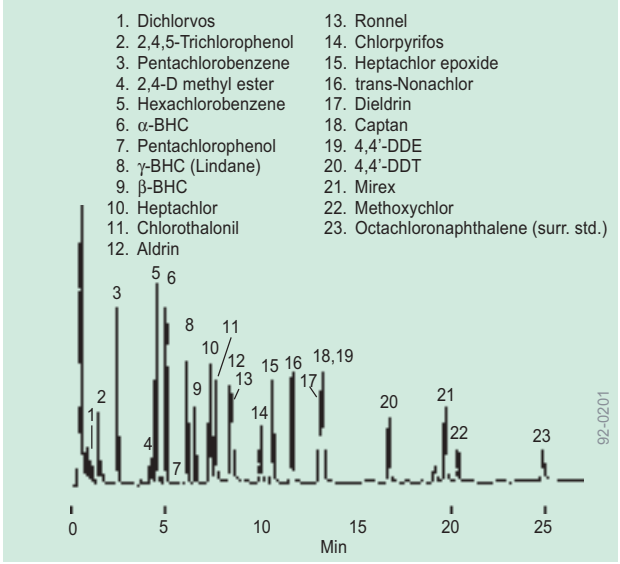
Sample: calibration standard: isocyanate derivatives, 5µg/mL in acetonitrile
blank: 1-(2-pyridyl)piperazine (1-2PP) coated glass fiber filter desorbed in ACN/DMSO, 9:1
Sampling Tube: ORBO-80
Cat. No.: 20811
Column: SUPELCOSIL LC-8, 25cm x 4.6mm ID, 5µm particles
Cat. No.: 58297
Mobile Phase: 0.05M ammonium acetate in water:acetonitrile, 70:30 (pH 6-6.2 with acetic acid)
Flow Rate: linear gradient, 0.7/min to 2mL/min in 15 min
Det.: UV, 254nm
Inj.: 10µL

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



Organophosphorus Pesticides by OSHA Method 62 (GC)

Sample: calibration standard: 12µg/mL each pesticide, 78µg/mL tributyl phosphate (int. std.) in toluene
blank: 270mg Supelpak 20, glass fiber filter desorbed in toluene + 78µg/mL tributyl phosphate
Sampling Tube: ORBO-49P
Cat. No.: 20350
Column: SPB-20, 60m x 0.53mm ID, 1.0µm film (available on request)
Oven: 200°C (2 min) to 250 °C at 4°C/min
Carrier: helium, 8mL/min
Det.: FPD, 300°C
Inj.: 1µL, direct injection, 220 °C (packed column injector)



Pesticides by US EPA Method IP-8, TO-10A, ASTM D4861 (GC)

Sample: polyurethane foam (PUF) spiked with 250ng each pesticide
Sampling Tube: ORBO-1000
Cat. No.: 20557
Column: SPB-608, 30m x 0.53mm ID, 0.5µm film
Cat. No.: 25312
Oven: 150°C (1 min) to 270 °C at 4°C/min
Carrier: helium, 7mL/min
Det.: ECD
Inj: 1µL

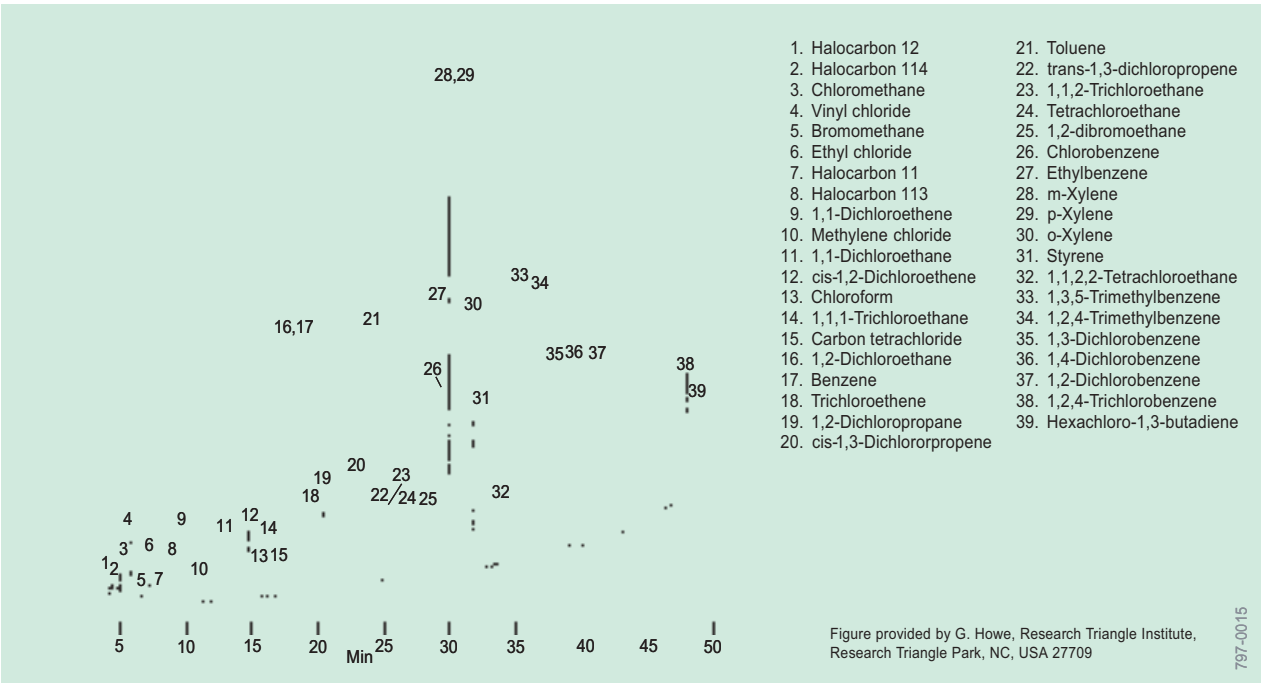


Figure provided by G. Howe, Research Triangle Institute, Research Triangle Park, NC, USA 27709

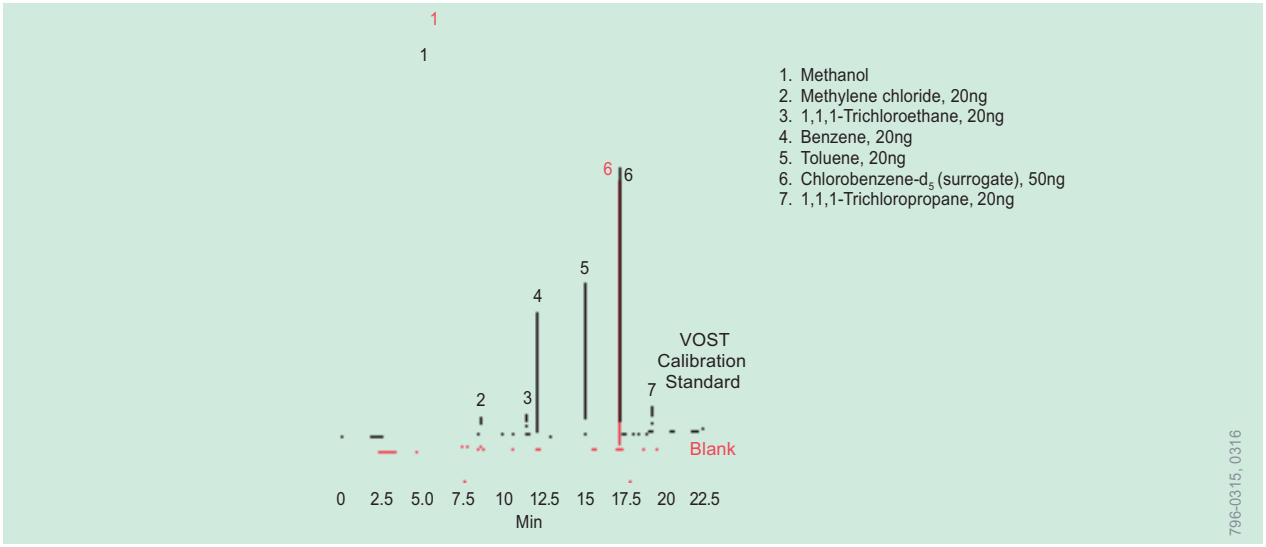
Volatile Organic Compounds by US EPA TO-17 (GC)

Adsorbent Tube: Air Toxics (glass) 10-50ng each analyte introduced onto tube (calibration standard, Cat. No. 41900)
Cat. No.: 25086
GC Column: VOCOL, 60m x 0.25mm ID, 1.5µm film
Cat. No.: 24154
Oven: 37°C (4 min) to 200 °C at 4°C/min, hold 10 min
Carrier: helium, 2mL/min
Det.: FID

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Sample Preparation Applications

Air Monitoring

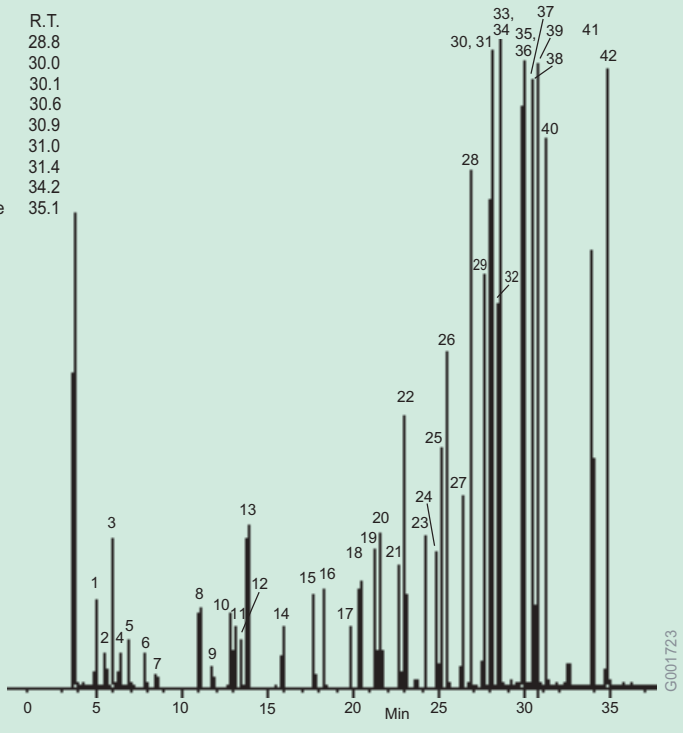


Volatile Compounds by US EPA Method 0030 (VOST) (GC)

Sample: calibration standard: volatiles in methanol; blank: Tenax TA tube with surrogate thermally desorbed into purge & trap system
Sampling Tube: VOST 100
Cat. No.: 20074
Purge Trap: VOCARB 4000
Cat. No.: 20308
Column: SPB-624, 75m x 0.53mm ID, 3.0µm film

Cat. No.: 25432
Oven: 35°C (5 min) to 200 °C at 10°C/min, hold 2 min
Carrier: helium, 8mL/min
Det.: FID, 300°C

		R.T.			R.T.
1.	Halocarbon 12	5.0	34.	o-Xylene	28.8
2.	Chloromethane	5.6	35.	4-Ethyltoluene	30.0
3.	Halocarbon 114	6.0	36.	1,3,5-Trimeth ylbenzene	30.1
4.	Vinyl Chloride	6.4	37.	1,2,4-Trimeth ylbenzene	30.6
5.	1,3-Butadiene	7.0	38.	1,3-Dichlorobenzene	30.9
6.	Bromomethane	7.9	39.	1,4-Dichlorobenzene	31.0
7.	Ethyl Chloride	8.6	40.	1,2-Dichlorobenzene	31.4
8.	Halocarbon 11	11.2	41.	1,2,4-Trichlorobenzene	34.2
9.	Acrylonitrile	11.9	42.	Hexachloro-1,3-butadiene	35.1
10.	1,1-Dichloroethylene	13.0			
11.	Methylene Chloride	13.2			
12.	3-Chlorop ropylene	13.6			
13.	Halocarbon 113	14.0			
14.	1,1-D ichloroethane	16.1			
15.	cis-1,2-Dichloroethane	17.9			
16.	Chloroform	18.5			
17.	1,2 D ichloroethane	20.0			
18.	1,1,1 Trichloroethane	20.6			
19.	Benzene	21.5			
20.	Carbon Tetrachloride	21.8			
21.	1,2-Dichloropropane	22.8			
22.	Trichloroethylene	23.2			
23.	cis-1,3-Dichloropropene	24.3			
24.	trans-1,3-Dichloropropene	25.0			
25.	1,1,2-Trichl oroethane	25.3			
26.	Toluene	25.6			
27.	1,2-Dibromoethane	26.5			
28.	Tetrachloroethylene	27.0			
29.	Chlorobenzene	27.7			
30.	Ethylbenzene	28.1			
31.	m,p-X ylene	28.3			
32.	Styrene	28.6			
33.	1,1,2,2-Tetrachlorethylene	28.8			



Volatiles in Air by Thermal Desorption (GC)

Sample: 20mL JHAP-43 Gas Mix Cat. No. 500429 (1ppm each component)

Thermal Desorption
Thermal Desorber: GERSTEL TDS A
Sampling Tube: Carbotrap 300
Cat. No.: 28283-U
Tube Desorption Temp: 330°C, 6 min
Tube Desorption Flow: 20mL/min, Cryo-Focused to CIS-4 Inlet at -150°C

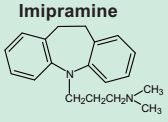
Chromatography
Column: SPB-1, 60m x 0.25mm ID, 3.0µm film (available on request)
Oven: 35°C (8.00 min) to 100°C at 5°C/min, hold 0 min, 230°C at 15°C/min hold 8 min
Carrier: helium 31cm/sec
Det: MS, scan range 35 to 269amu

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Nortriptyline



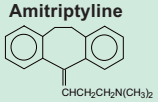
Imipramine



Doxepin



Amitriptyline



G000618-620, G000159

Efficiency of Recovery

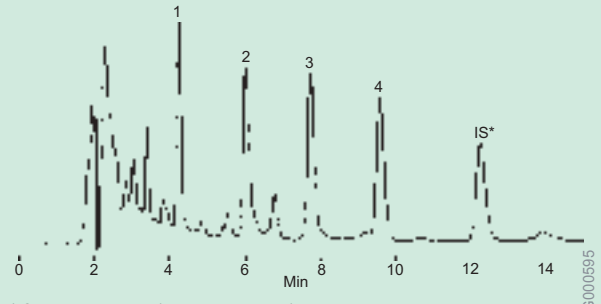
Compound	Concentration (µg/mL)	%Recovery	%RSD (n=6)
1. Nortriptyline	0.10	103.6	±4.5
	0.50	97.5	±4.5
2. Doxepin	0.10	102.2	±3.0
	0.50	100.8	±1.8
3. Imipramine	0.10	92.0	±1.5
	0.50	97.5	±1.7
4. Amitriptyline	0.10	93.6	±1.2
	0.50	95.7	±1.4

SPE Procedure, Using Zymark RapidTrace SPE Workstation

Step	Solvent/ Solution	Volume (mL)	Flow Rate (mL/min)	Comments
1. Condition	MeOH	2.0	5.0	conditions sorbent
2. Condition	H_2O	2.0	5.0	conditions sorbent
3. Load	spiked porcine serum	2.0[A]	0.75	applies serum sample
4. Rinse	20% MeOH in H_2O	2.0	5.0	washes sorbent
5. Purge-Cannula	H_2O	4.0	30.0	cleans sample cannula
6. Rinse	vent	0.1	2.0	positions SPE tube over waste port
7. Dry	N_2	Time = 10 min		dries sorbent
8. Purge-Cannula	MeOH	4.0	30.0	cleans sample cannula
9. Collect	MeOH	1.0	1.0	elutes analytes into collection vessel
10. Collect	vent	6.0	3.0	pushes residual eluent into vessel[B]
11. Purge-Cannula	H_2O	4.0	30.0	cleans sample cannula

[A] 1mL porcine serum spiked with 0.1µg/mL or 0.5µg/mL each analyte basified with 3µL 10N KOH, then diluted with 1mL water

[B] 350µL water added per mL methanolic eluent before analysis.



G000595

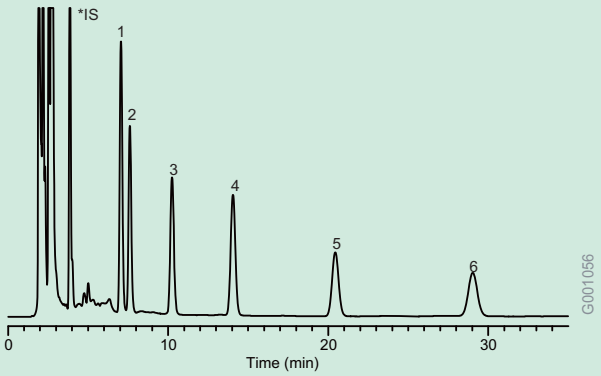
*IS = Trimipramine (Internal standard)

Efficiency of Recovery

Compound	Concentration (µg/mL)	%Recovery	%RSD (n=6)
1. Phenobarbital	0.5	96.2	±1.6
	1.0	94.9	±1.7
2. Aprobarbital	0.5	98.5	±2.1
	1.0	100.8	±0.8
3. Butabarbital	0.5	97.2	±1.9
	1.0	98.7	±1.8
4. Mephobarbital	0.5	99.7	±2.4
	1.0	101.0	±2.0
5. Pentobarbital	0.5	96.4	±1.7
	1.0	96.4	±1.9
6. Secobarbital	0.5	98.2	±1.7
	1.0	97.7	±1.8

SPE Method For RapidTrace SPE Workstation Application

1. Condition & equilibrate each tube/well with 2mL MeOH & 2mL DI Water
2. Load sample
3. Wash each tube/well with 2mL 5% MeOH
4. Vacuum or air dry with for 5-10 min
   This removes any excess water from the sorbent. The presence of water in the final eluent may prolong eluent evaporation.
5. Elute with 1-2mL MeOH
6. Dry eluate with nitrogen purge (40ºC; 15-20 min)
7. Reconstitute with 200µL mobile phase
8. Quantify against internal or external standards via HPLC analyses



G001056

Barbiturates from serum using 500mg/3mL Discovery DSC-18Lt SPE tubes and Zymark's RapidTrace SPE Workstation. *IS = Barbital (internal standard).

Sample Info: 0.5mL porcine serum spike with 0.5µg/mL or 1.0µg/mL each analyte then diluted with 0.5mL water.

Antidepressants (Tricyclic) From Serum Using Zymark RapidTrace SPE Workstation (SPE/GC)

SPE Tube: Discovery DSC-18, 100mg/1mL
Cat. No.: 52602-U
HPLC Column: Discovery C18, 15cm x 4.6mm, 5µm particles, preceded by a 2cm C18 guard column and 0.5µm frit filter
Cat. No.: 504955
Mobile Phase: MeCN:MeOH:25mM KH_2PO_4 (pH 7 with triethylamine) (45:25:30)
Flow Rate: 1mL/min
Temp.: ambient
Det.: UV, 254nm
Inj.: 50µL diluted porcine serum extract

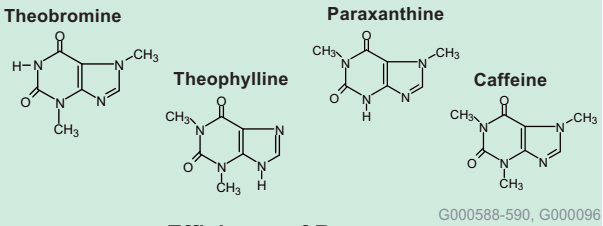
Barbituates From Serum Using Zymark RapidTrace SPE Workstation (SPE/HPLC)

SPE Tube: Discovery DSC-18Lt, 500mg/3mL
Cat. No.: 52613-U
HPLC Column: Discovery C18, 15cm x 4.6mm, 5µm particles, preceded by a 2cm C18 guard column and 0.5µm frit filter
Cat. No.: 504955
Mobile Phase: MeOH/H_2O (40:60)
Flow Rate: 1mL/min
Temp.: 30°C
Det.: UV, 214nm
Inj.: 30µL diluted porcine serum extract

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Sample Preparation Applications

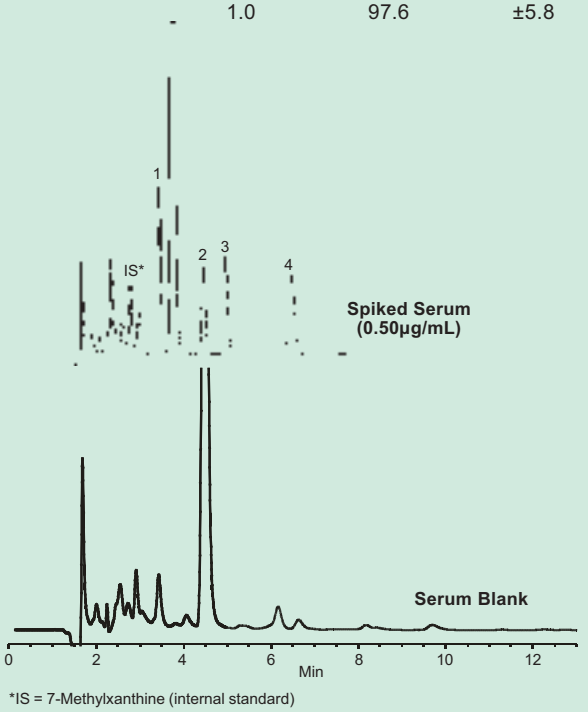
Drugs



G000588-590, G000096

Efficiency of Recovery

Compound	Concentration (µg/mL)	%Recovery	%RSD (n=6)
1. Theobromine	0.1	97.4	±6.8
	0.5	96.4	±8.5
	1.0	96.1	±5.0
2. Paraxanthine	0.1	96.2	±8.4
	0.5	95.2	±8.7
	1.0	95.0	±8.7
3. Theophylline	0.1	97.8	±8.5
	0.5	97.8	±8.8
	1.0	98.5	±5.7
4. Caffeine	0.1	98.8	±3.9
	0.5	95.6	±6.7
	1.0	97.6	±5.8



G000593, G000594

*IS = 7-Methylxanthine (internal standard)

Bronchodilator: Theophylline and Other Caffeine Metabolites from Serum (SPE/HPLC)

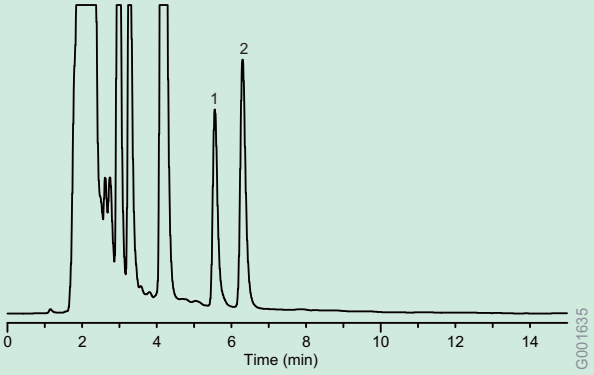
SPE Tube: Discovery DSC-18, 500mg/3mL
Cat. No.: 52603-U
Condition: 2mL methanol, then 2mL water
Apply Sample: 1mL porcine serum spiked with 0.1µg/mL, 0.50µg/mL, or 1.0µg/mL each analyte
Wash and Dry: 2mL 5% methanol in water; dry tube 10 min with nitrogen stream
Elute: 1mL methanol; evaporate to dryness with nitrogen stream at room temperature; reconstitute in 200µL mobile phase containing 0.2µg/mL or 7-methylxanthine (IS)
Column: Discovery RP-AmideC16, 15cm x 4.6mm, 5µm particles, preceded by a 2cm RP-AmideC16 guard column and 0.5µm frit filter
Cat. No.: 505013
Mobile Phase: methanol:1% acetic acid (17:38)
Flow Rate: 1mL/min
Temp.: 30°C
Det.: UV, 272nm
Inj.: 20µL reconstituted porcine serum extract

Efficiency of Recovery

Compound (µg/mL)	Discovery DSC-SCX (n=3) % Recovery	%RSD	Leading Competitor SCX (n=2) %Recovery	%RSD
1. 3-methylpyrazole (1.0)	89.4	±10.2%	67.1	±20%
2. 4-methylpyrazole (1.0)	79.4	±6.8%	50.5	±30%

SPE Procedure

1. Condition & equilibrate with 2mL MeOH & 2mL DI water.
2. Load 1mL urine sample spiked with 1µg/mL of each analyte.
3. Wash with 2mL DI water.
4. Elute with 2mL 5% MeOH in 250mM phosphate buffer, pH 7.4.
5. Quantify against external standards via HPLC analyses.

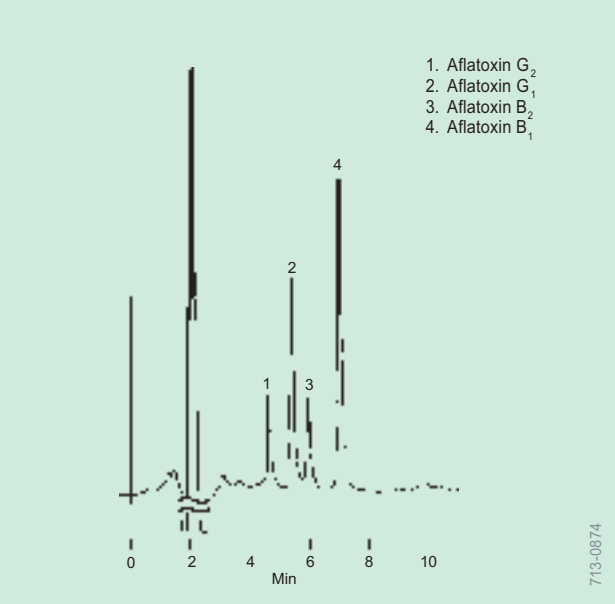


G001635

Competitor Comparison of 3-methylpyrazole and 4-methylpyrazole From Urine Using Discovery DSC-SCX (SPE/HPLC)

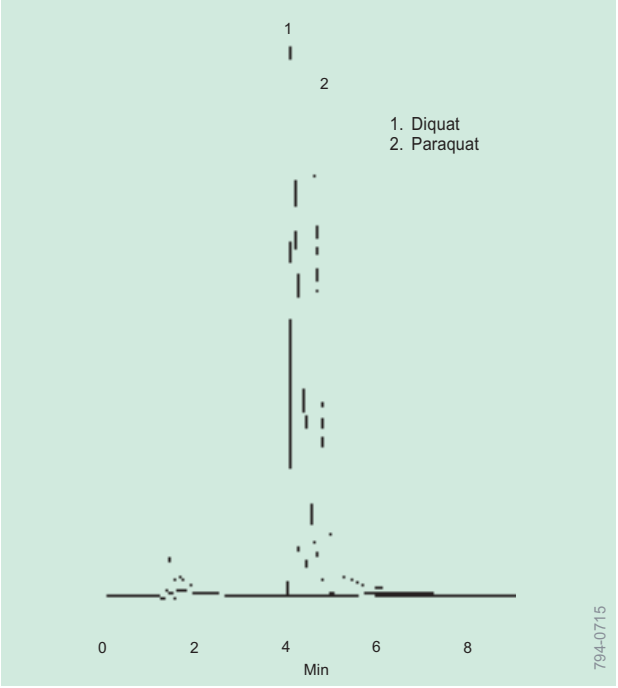
SPE Tube: Discovery DSC-SCX, 500mg/3mL
Cat. No.: 52686-U
HPLC Column: Discovery C18, 15cm x 4.6mm, 5µm particle, preceded by a 2cm guard column and 0.5µm frit filter
Cat. No.: 504955
Mobile Phase: MeOH:5mM phosphate buffer, pH 6 (20:80)
Flow Rate: 1mL/min
Temp.: 30°C
Det.: UV, 220nm
Inj.: 25µL diluted urine extract

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Aflatoxins (SPE/HPLC)

Sample:	cornmeal spiked with aflatoxins (30ppb G_2 and B_2, 100ppb G_1 and B_1) Blend 50g sample for 1 min in 100mL methanol:water (8:2) and filter.
Extraction Tube:	Supelclean LC-CN, 500mg/3mL
Cat. No.:	57013
Conditioning:	2mL 0.5% aqueous acetic acid
Sample Addition:	1mL filtered extract + 4mL 0.5% aqueous acetic acid
Washing:	500µL 20% THF in 0.5% aqueous acetic acid, then 2mL hexane. Dry packing under nitrogen. 3mL 25% THF in hexane. Dry packing 1 min under nitrogen.
Elution:	2 x 2mL 1% THF in methylene chloride. Evaporate eluate to dryness under nitrogen. Reconstitute with 100µL of methanol, then dilute with 100µL of 0.5% aqueous acetic acid.
Column:	SUPELCOSIL LC-18, 25cm x 4.6mm ID, 5µm particles (with guard column)
Cat. No.:	58298
Mobile Phase:	methanol:acetonitrile:water (22.5:22.5:55)
Flow Rate:	1.5mL/min
Det.:	VIS, 365nm
Inj.:	100µL



Paraquat and Diquat (SPE/HPLC)

Refer to US EPA Method 549.1 for full details.

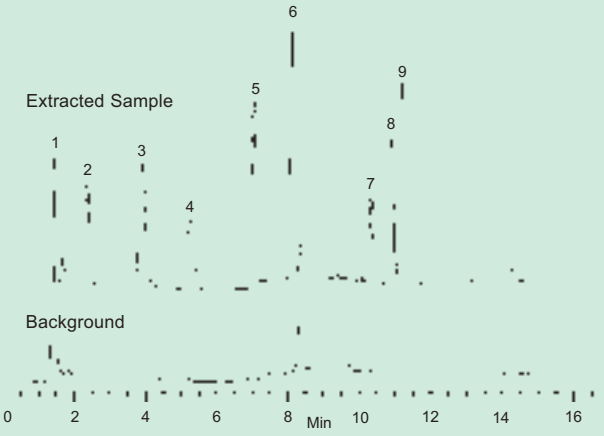
Sample:	250mL drinking water, adjust sample pH to 10.5 ± 0.2 with sodium hydroxide solution (10% w/v) or hydrochloric acid solution (10% v/v)
Extraction Disk:	ENVI-8 DSK, 47mm
Cat. No.:	57172
Conditioning:	10mL methanol 2 x 10 mL reagent water 10mL conditioning solvent A (0.5g cetyl trimethyl ammonium bromide and 5mL conc. ammonium hydroxide in 500mL water, dilute to 1L) 2 x 10mL reagent water 10mL conditioning solvent B (10.0g hexanesulfonic acid, sodium salt and 10mL ammonium hydroxide in 250mL deionized water, dilute to 500mL)
Sample Addition:	adjust vacuum to flow rate of 100mL/min
Extraction:	0.5 to 1.0mL methanol (to cover disk) 2 x 4mL eluting solution (13.5mL orthophosphoric acid and 10.3mL diethylamine in 500mL water, dilute to 1L)
Column:	SUPELCOSIL LC-18, 15cm x 4.6mm ID, 5µm particles
Cat. No.:	58230-U
Mobile Phase:	3.5mL triethylamine and 1.0g 1-hexane-sulfonic acid, sodium salt to 800mL deionized water add orthophosphoric acid to pH = 2.5, dilute to 1L
Flow Rate:	1.0mL/min
Temp.:	35°C
Det.:	Photodiode array, quantify Diquat -308nm, Paraquat -257nm
Inj.:	100µL

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Sample Preparation Applications
Herbicides

1. Tetrachloroterephthalic acid
2. Picloram
3. Dicamba
4. 2,4-D
5. 2,4,5-T
6. 2,4,5-TP
7. Dinoseb
8. Dacthal
9. Pentachlorophenol

Gradient Program	
Time (min)	% B
2.5	40
5.0	60
13.0	60
13.5	40

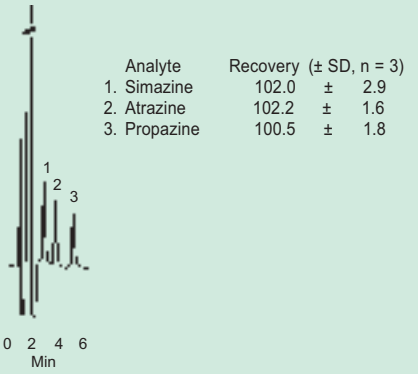


796-0149, 796-0150

Figures provided by A. Lichtman, Nassau County Dept. of Health, Hempstead, New York, USA. Request Application Note No. T196100.

Acidic Herbicides in Water (SPE/HPLC)

Extraction Tube:	ENVI-Carb, 250mg/6mL
Cat. No.:	57092
Column:	polymeric-coated silica-based PAH specialty column, 20cm x 3mm ID, 5µm particles
Supelco Equivalent:	SUPELCOSIL LC-PAH (available on request)
Mobile Phase:	gradient, A = water/0.05% H_3PO_4, B = acetonitrile
Temp.:	50°C
Flow Rate:	0.5mL/min
Det.:	photodiode array: peak width — 0.053 min sampling interval — 0.320 sec, monitor 210nm & 225nm
Inj.:	10µL of extract (4-5ppb each analyte in water)



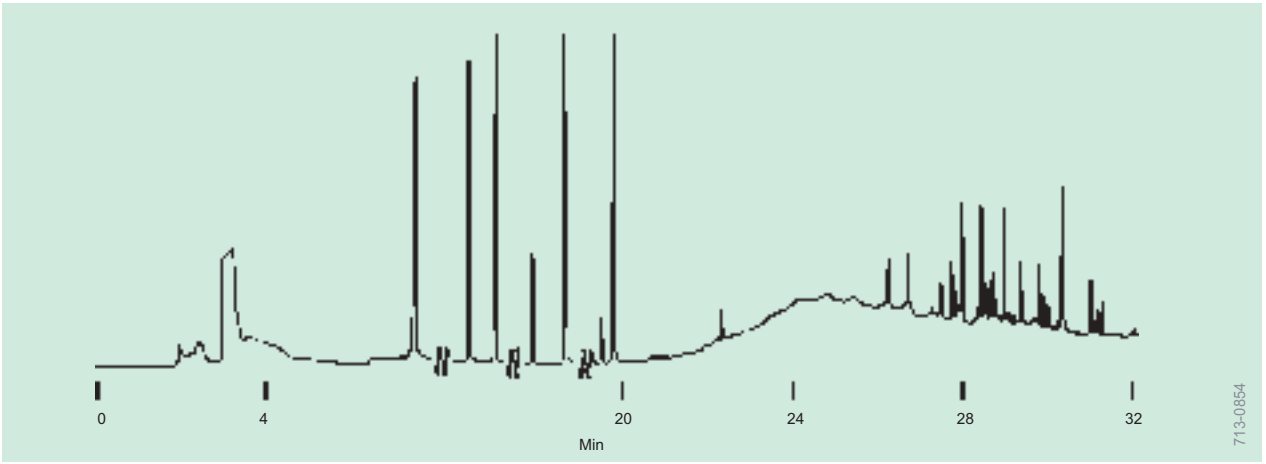
Analyte	Recovery (± SD, n = 3)
1. Simazine	102.0 ± 2.9
2. Atrazine	102.2 ± 1.6
3. Propazine	100.5 ± 1.8

Triazine Herbicides from Grass (SPE/HPLC)

Sample:	5g fresh grass clippings spiked with 2ppm each herbicide. Add 4g anhydrous sodium sulfate and 20mL methylene chloride:acetone (80:20) Shake 20 min and allow mixture to stand 1 min
Extraction Tube:	Supelclean LC-SCX, 500mg/3mL
Cat. No.:	57018
Conditioning:	1mL methylene chloride
Sample Addition:	2mL grass extract
Washing:	2 x 2mL acetonitrile Dry packing for 5 min under nitrogen2 x 2mL deionized water
Elution:	1.5mL methanol Dilute to 2mL with deionized water.
Column:	SUPELCOSIL LC-8-DB, 15cm x 4.6mm ID, 5µm particles *
Cat. No.:	58347
Mobile Phase:	acetonitrile:water (45:55)
Flow Rate:	1.5mL/min
Det.:	UV, 254nm
Inj.:	100µL

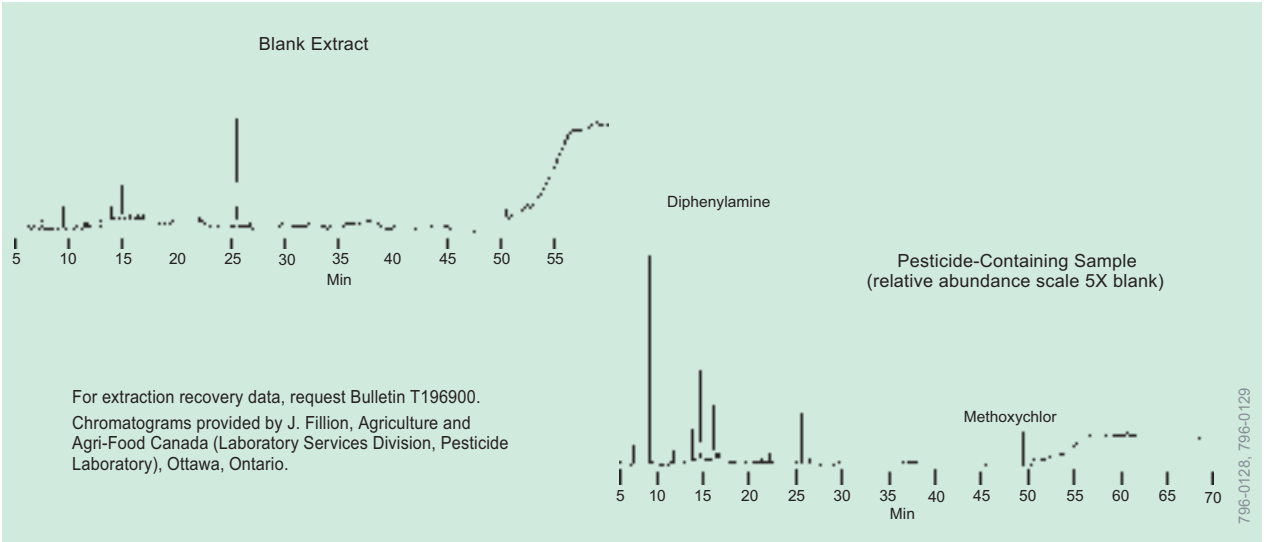
* With Supelguard LC-8-DB column, 2.0cm x 4.6mm ID, 5µm particles

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PCB (SPE/GC)

Sample:	used transformer oil containing 50ppb Aroclor 1254
Extraction Tube:	Supelclean LC-Florisil, 1.0g/6mL
Cat. No.:	57057
Extraction Tube:	Supelclean LC-Si, 1.0g/6mL
Cat. No.:	57051
	Connect tubes in series, LC-Florisil on top
Conditioning:	500µL isooctane
Sample Addition:	0.2g, weigh onto top of frit of tube
Drying:	none
Elution:	5 x 2mL isooctane, up to 10 mL in volumetric flask
Column:	SPB-5, 30m x 0.32mm ID, 0.25µm film
Cat. No.:	24048
Oven:	40°C (4 min) to 300°C at 10°C/min, hold 5 min
Carrier:	nitrogen
Det.:	ECD
Inj.:	1µL splitless (30 sec delay), then split (50:1)



For extraction recovery data, request Bulletin T196900.

Chromatograms provided by J. Fillion, Agriculture and Agri-Food Canada (Laboratory Services Division, Pesticide Laboratory), Ottawa, Ontario.

Pesticides in Fruits and Vegetables (SPE/GC)

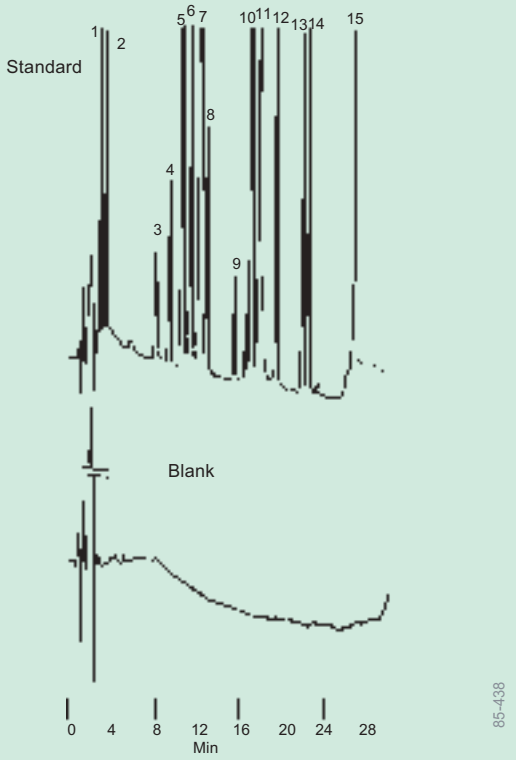
Sample:	homogenize 50g sample in 100mL acetonitrile then add 10g NaCl and homogenize 5min
Extraction Tube:	ENVI-Carb, 500mg/6mL
Cat. No.:	57094
Extraction:	Centrifuge 13mL of acetonitrile layer at high speed for 5 min. Evaporate 10mL aliquot to 0.5mL under nitrogen at 35° C. Transfer sample to SPE tube. Elute pesticides with 20mL acetonitrile:toluene (3:1). Concentrate to 2mL by rotary evaporation. Add 2 x 10mL acetone, co ncentrating material to 2mL after each addition. Add 50µL cis-chlordane in acetone (500ng/µL) then dilute to 2.5mL with acetone.
Supelco Equivalent:	SPB-1701 (available on request)
Column:	14% cyanopropylphenyl/86% dimethylsiloxane, 30m x 0.25mm ID, 0.15µm film
Oven:	70°C (hold 2 min) to 130°C at 25°C; 130°C to 220°C at 2°C/min; 220°C to 280°C at 10°C/min and hold 4.6 min
Carrier:	helium
Det.:	MSD, 285°C
Inj.:	2µL, splitless

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Sample Preparation Applications

Pesticides

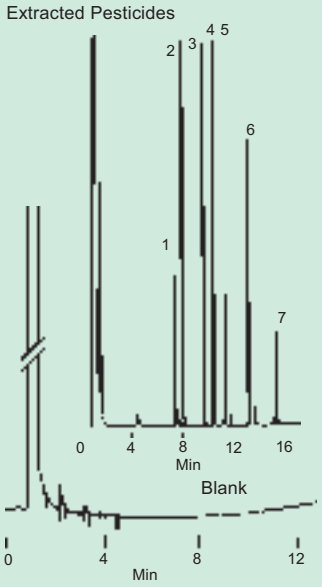
	Analyte	% Recovery (± RSD, n = 5)
1.	Oxamyl	111 ± 9.6
2.	Methomyl	105 ± 5.0
3.	N-1-Naphthylthiourea	—
4.	Aldicarb	92 ± 0.8
5.	Simazine	91 ± 6.5
6.	Monuron	99 ± 3.2
7.	Cyanazine	90 ± 5.4
8.	Metribuzin	97 ± 3.9
9.	Carbofuran	106 ± 6.2
10.	Atrazine	89 ± 5.7
11.	Carbaryl	97 ± 3.5
12.	Diuron	88 ± 5.7
13.	Propham	95 ± 3.2
14.	Propachlor	96 ± 3.8
15.	Linuron	88 ± 5.4



Nonvolatile Pesticides (SPE/HPLC)

Sample: water spiked with pesticides (10-50µg/L each component)
Extraction Tube: Supelclean ENVI-Carb, 250mg/3mL
Cat. No.: 57088
Conditioning: 5mL methylene chloride:methanol (80:20)
1mL methanol
10mL 2% acetic acid in water
Keep bed moist until sample is added.
Sample Addition: 100mL, 5mL/min
Drying: 1 min with vacuum suction
Elution: 0.8mL methanol
2 x 3.5mL methylene chloride:methanol (80:20)
Dry eluate to 500µL under gentle stream of nitrogen
Reconstitute to 1mL with methanol.
Column: SUPELCOSIL LC-18-DB, 25cm x 4.6mm ID, 5µm particles
Cat. No.: 58355-U
Mobile Phase: A = water:acetonitrile (90:10), B = acetonitrile
80% A for 5 min then to 30% A over 30 min
Flow Rate: 1.5mL/min
Det.: UV, 220nm
Inj.: 20µL

	Analyte	% Recovery (± CV)
1.	Hexachlorobenzene	87 ± 11
2.	γ-BHC (Lindane)	99 ± 13
3.	Heptachlor	96 ± 12
4.	Aldrin	94 ± 13
5.	Heptachlor epoxide	98 ± 13
6.	Endrin	93 ± 11
7.	Methoxychlor	110 ± 13



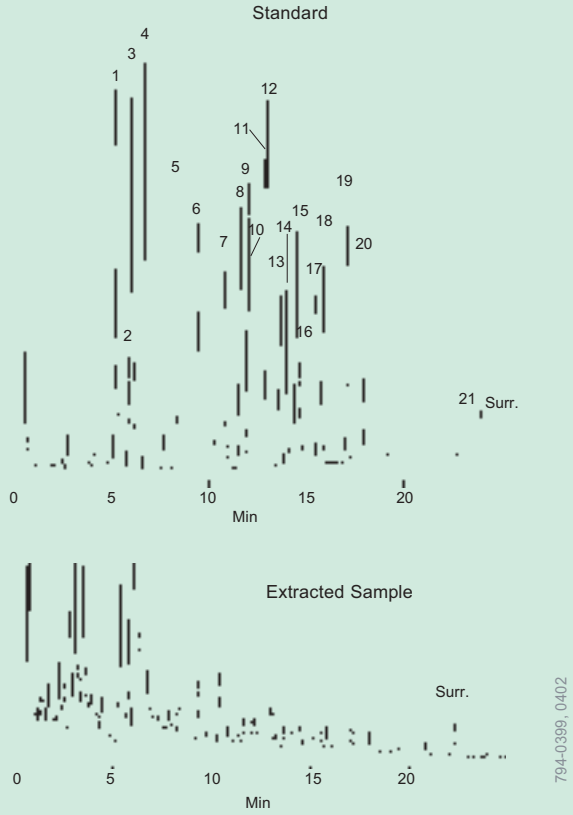
Chlorinated Pesticides (SPE/GC)

Sample: drinking water spiked with pesticides
Extraction Tube: Supelclean ENVI-18, 500mg/6mL
Cat. No.: 57064
Conditioning: 2 x 6mL hexane:ethyl ether (1:1)
6mL methanol
6mL deionized water
Sample Addition: 250mL, 10mL/min
Drying: 10 min
Elution: 2 x 1.5mL hexane:ethyl ether (1:1) Concentrate eluate to 2mL under stream of nitrogen.
Column: PTE-5, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 24135-U
Oven: 150°C (2 min) to 275°C at 10°C/min
Carrier: helium
Det.: ECD, 310°C
Inj.: 1µL

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Sample Preparation Applications
Pesticides, Phenols

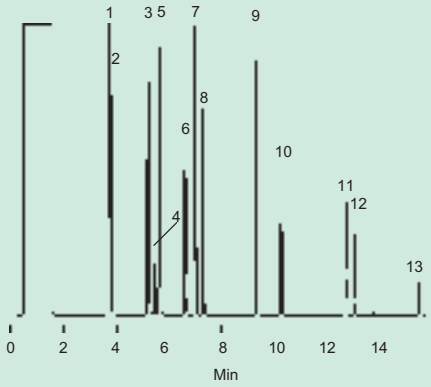
1. α-BHC
2. β-BHC
3. γ-BHC (Lindane)
4. δ-BHC
5. Heptachlor
6. Aldrin
7. Heptachlor epoxide
8. γ-Chlordane
9. Endosulfan I
10. α-Chlordane
11. Dieldrin
12. 4,4'-DDE
13. Endrin
14. Endosulfan II
15. 4,4'-DDD
16. Endrin aldehyde
17. Endosulfan sulfate
18. 4,4'-DDT
19. Endrin ketone
20. Methoxychlor
21. Decachlorobiphenyl (Surr.)



Chlorinated Pesticides in Hazardous Waste (SPE/GC)

Sample:	100mL aqueous hazardous waste, adjust pH to 5-7 if necessary, add 5mL methanol
Extraction Tube:	ENVI-8, glass, 500mg/6mL
Cat. No.:	57107 (0.5g) or 57108 (1g)
Conditioning:	3mL methanol, (do not allow bed to dry out)
	2mL 5% methanol in water
Sample Addition:	adjust vacuum to flow rate of 5mL/min
Dry:	purge tube with nitrogen for 2-3 min (use Visidry attachment)
Extraction:	2 x 4mL hexane:acetone (90:10), allow to soak, elute dropwise
Column:	PTE-5 QTM, 15m x 0.53mm ID, 0.5µm film
Cat. No.:	25355
Oven:	150°C (0.5min) to 275°C (5min)
Carrier:	helium
Det.:	ECD, 300°C
Inj.:	1µL, 200°C, split/splitless (45 sec delay)

Analyte	% Recovery	(± CV)
1. Phenol	101.8	± 3.7
2. 2-Chlorophenol	104.7	± 1.7
3. 2-Methylphenol	107.0	± 1.9
4. 2-Bromophenol (Int. Std.)		—
5. 3-Methylphenol	104.9	± 1.6
6. 2-Nitrophenol	96.3	± 2.8
7. 2,4-Dimethylphenol	105.3	± 2.2
8. 2,4-Dichlorophenol	106.3	± 2.2
9. 4-Chloro-3-methylphenol	104.6	± 2.0
10. 2,4,6-Trichlorophenol	103.9	± 2.1
11. 4-Nitrophenol	99.9	± 4.1
12. 2,3,4,6-Tetrachlorophenol	104.6	± 1.5
13. Pentachlorophenol	97.7	± 4.8



Phenols (SPE/GC)

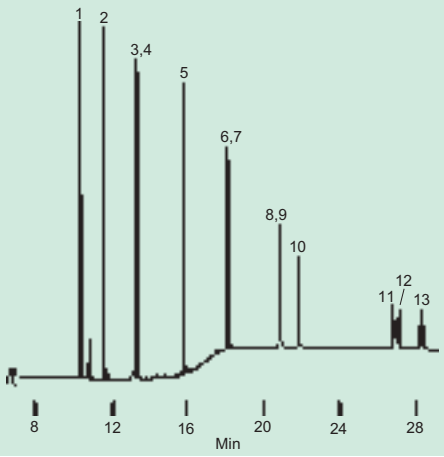
Sample:	water spiked with phenols
Extraction Tube:	Supelclean ENVI-Chrom P, 250mg/6mL
Cat. No.:	57225-U
Conditioning:	6mL methyl t-butyl ether*
	6mL methanol
	6mL deionized water
Sample Addition:	100mL
Drying:	10 min, vacuum suction
Elution:	2mL methyl t-butyl ether,* allow to soak with vacuum off
	2mL methyl t-butyl ether,* elute dropwise
	Additional methyl t-butyl ether until 5mL of eluate is collected.
Column:	PTE-5 QTM, 15m x 0.53mm ID, 0.5µm film
Cat. No.:	25355
Oven:	65°C to 185°C at 10°C/min, hold 1 min, then to 275°C at 20°C/min, hold 5 min
Carrier:	helium
Det.:	FID, 300°C
Inj.:	1µL splitless (45 sec hold)

* Can substitute ethyl acetate.

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Sample Preparation Applications

Polynuclear Aromatic Hydrocarbons, Semivolatiles

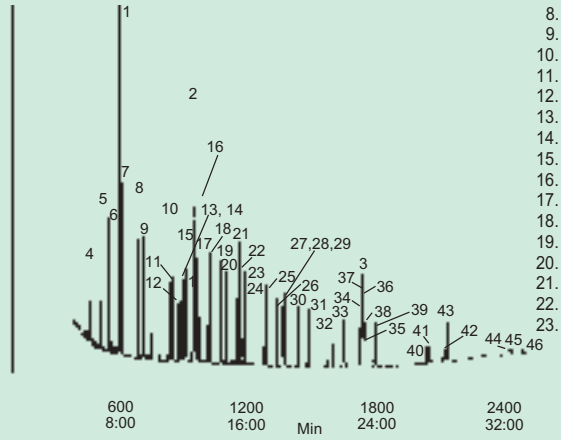


	Analyte	%Recovery(± CV)		
1.	Acenaphthylene	66	±	28
2.	Fluorene	95	±	7.5
3.	Phenanthrene	95	±	8
4.	Anthracene	95	±	11
5.	Pyrene	97	±	7.1
6.	Benzo(a)anthracene	94	±	8.3
7.	Chrysene	101	±	8.8
8.	Benzo(b)fluoranthene	103	±	10
9.	Benzo(k)fluoranthene	103	±	9.4
11.	Indeno(1,2,3-cd)pyrene	102	±	10
10.	Benzo(a)pyrene	94	±	11
12.	Dibenzo(a,h)anthracene	104	±	9.7
13.	Benzo(ghi)perylene	101	±	11

80-207

PAHs in Water (SPE/GC)

Sample: water spiked with PAHs
Extraction Tube: Supelclean ENVI-18, 500mg/6mL
Cat. No.: 57064
Conditioning: 2 x 6mL toluene:methanol (10:1), 6mL methanol, 6mL deionized water
Sample Addition: 250mL, 10mL/min
Drying: 10 min
Elution: 2 x 1mL toluene:methanol (10:1)
Column: PTE-5, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 24135-U
Oven: 70°C (2 min) to 280°C at 8°C/min
Carrier: helium
Det.: FID, 310°C
Inj.: 1µL



		µg/L*			µg/L*
1.	Acenapthene -d_{10}	5.0	24.	Heptachlor epoxide	2.0
2.	Phenanthrene -d_{10}	5.0	25.	2,2',3',4,6-Pentachlorobiphenyl	2.0
3.	Chrysene -d_{12}	5.0	26.	γ-Chlordane	2.0
4.	Hexachlorocyclopentadiene	2.0	27.	Pyrene	2.0
5.	Dimethylphthalate	2.0	28.	α-Chlordane	2.0
6.	Acenaphthylene	2.0	29.	trans-Nonachlor	2.0
7.	2-Chlorobiphenyl	2.0	30.	2,2',4,4',5,6'-Hexachlorobiphenyl	2.0
8.	Diethyphthalate	2.0	31.	Endrin	2.0
9.	Fluorene	2.0	32.	Butylbenzylphthalate	2.0
10.	2,3-Dichlorobiphenyl	2.0	33.	di(2-ethylhexyl)Adipate	2.0
11.	Hexachlorobenzene	2.0	34.	2,2'3,3',4,4',6-Heptachlorobiphenyl	2.0
12.	Simazine	2.0	35.	Methoxychlor	2.0
13.	Atrazine	2.0	36.	2,2'3,3',4,5',6,6'-Octachlorobiphenyl	2.0
14.	Pentachlorophenol	8.0	37.	Benz(a)anthracene	2.0
15.	γ-BHC	2.0	38.	Chrysene	2.0
16.	Phenanthrene	2.0	39.	Di(2-ethylhexyl)phthalate	2.0
17.	Anthracene	2.0	40.	Benzo(b)fluoranthene	2.0
18.	2,4,5-Trichlorobiphenyl	2.0	41.	Benzo(k)fluoranthene	2.0
19.	Alachlor	2.0	42.	Benzo(a)pyrene	2.0
20.	Heptachlor	2.0	43.	Perylene -d_{12}	5.0
21.	di-n-Butylphthalate	2.0	44.	Indeno(1,2,3 -cd)Pyrene	2.0
22.	2,2',4,4'-Tetrachlorobiphenyl	2.0	45.	Dibenz(a,h)anthracene	2.0
23.	Aldrin	2.0	46.	Benzo(ghi)perylene	2.0

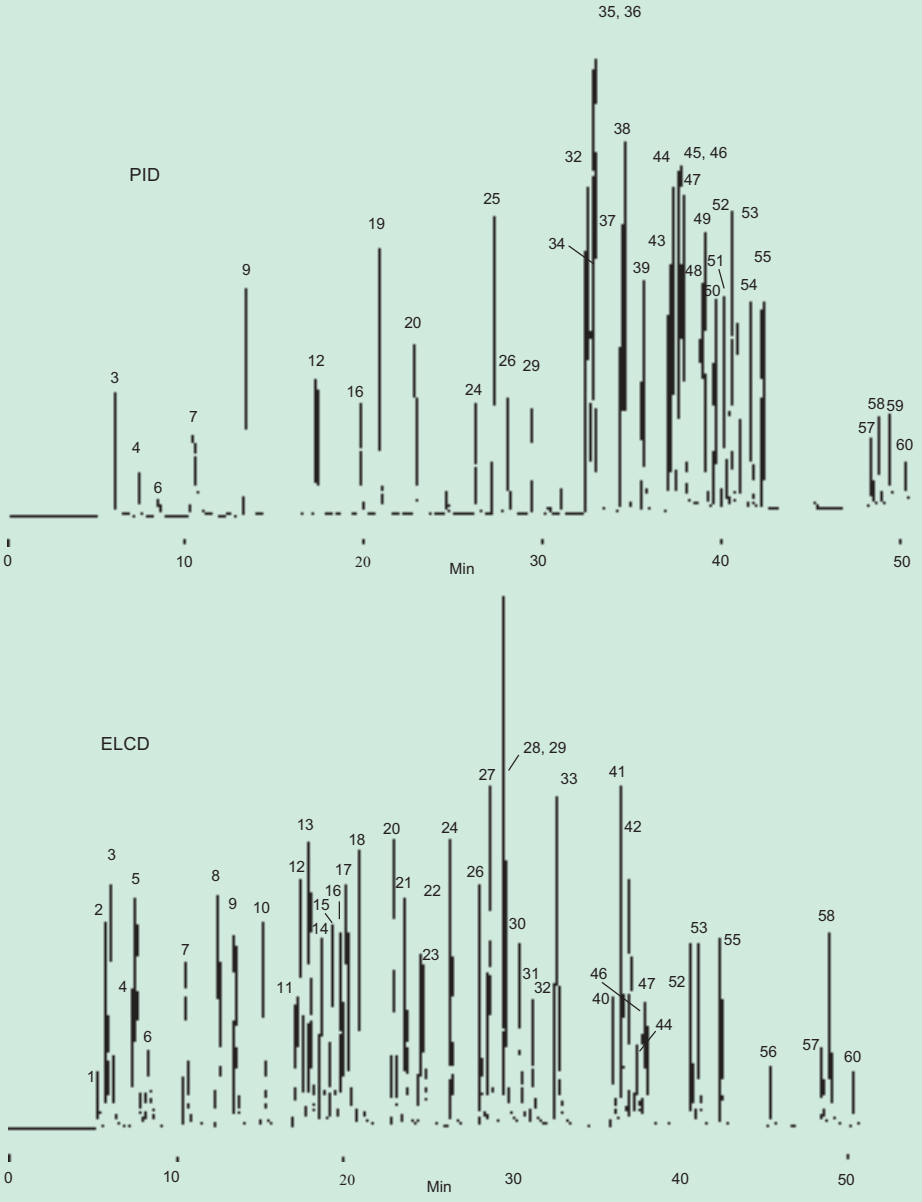
749-0798

Semivolatiles (SPE/GC)

Sample: 1L drinking water, pH to <2 with 6N HCl, add 5mL methanol and mix thoroughly
Extraction Disk: ENVI-18 DSK, 47mm
Cat. No.: 57171
Conditioning: 5mL dichloromethane (pull completely through disk)/5mL methanol (do not allow disk to dry out)/5mL reagent water
Sample Addition: adjust vacuum to flow rate of 100mL/min
Extraction: rinse sample container with 2 x 5mL acetonitrile, extract disk with solution
Column: 5% diphenyl/95% dimethyl silicone capillary, 30m x 0.25mm ID, 0.25µm film
Oven: 40°C to 160°C (3 min), then to 300°C (3 min) at 6°C/min
Supelco Equivalent: Equity-5 (Cat. No. 28089-U)
Carrier: helium, 33cm/sec
Det.: MS, scan range m/z=45-450
Inj.: 1µL, split/splitless, 1min delay

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

1. Dichlorodifluoromethane
2. Chloromethane
3. Vinyl chloride
4. Bromomethane
5. Chloroethane
6. Trichlorofluoromethane
7. 1,1-Dichloroethylene
8. Methylene chloride
9. trans-1,2-Dichloroethylene
10. 1,1-Dichloroethane
11. 2,2-Dichloropropane
12. cis-1,2-Dichloroethylene
13. Chloroform
14. Bromochloromethane
15. 1,1,1-Trichloroethane
16. 1,1-Dichloropropane
17. Carbon tetrachloride
18. 1,2-Dichloroethane
19. Benzene
20. Trichloroethylene
21. 1,2-Dichloropropane
22. Bromodichloromethane
23. Dibromomethane
24. cis-1,3-Dichloropropene
25. Toluene
26. trans-1,3-Dichloropropene
27. 1,1,2-Trichloroethane
28. 1,3-Dichloropropane
29. Tetrachloroethylene
30. Chlorodibromomethane
31. 1,2-Dibromoethane
32. Chlorobenzene
33. 1,1,1,2-Tetrachloroethane
34. Ethylbenzene
35. m-Xylene
36. p-Xylene
37. o-Xylene
38. Styrene
39. Isopropylbenzene
40. Bromoform
41. 1,1,2,2-Tetrachloroethane
42. 1,2,3-Trichloropropane
43. n-Propylbenzene
44. Bromobenzene
45. 1,3,5-Trimethylbenzene
46. 2-Chlorotoluene
47. 4-Chlorotoluene
48. tert-Butylbenzene
49. 1,2,4-Trimethylbenzene
50. sec-Butylbenzene
51. p-Isopropyltoluene
52. 1,3-Dichlorobenzene
53. 1,4-Dichlorobenzene
54. n-Butylbenzene
55. 1,2-Dichlorobenzene
56. 1,2-Dibromo-3-chloropropane
57. 1,2,4-Trichlorobenzene
58. Hexachlorobutadiene
59. Naphthalene
60. 1,2,3-Trichlorobenzene



713-1165, 1166

Chromatograms provided courtesy of O I Analytical, College Station, TX.

Volatile Compounds by US EPA Method 502.2 (PT/GC)

Sample: 5mL water (5ppb each analyte)
Instrument: OI Analytical Model 4560
Trap: VOCARB 3000
Cat. No.: 21131-U
Purge: 11min, at 25°C, 37mL/min
Desorption: 0.5min at 220°C

Column: VOCOL, 105m x 0.53mm ID, 3.0µm film
Cat. No.: 25358
Oven: 35°C (10 min) to 200°C at 4°C/min, hold
Carrier: helium, 8.5mL/min
Det.: ELCD (OI Model 5220)/PID(OI Model 5230) in series

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

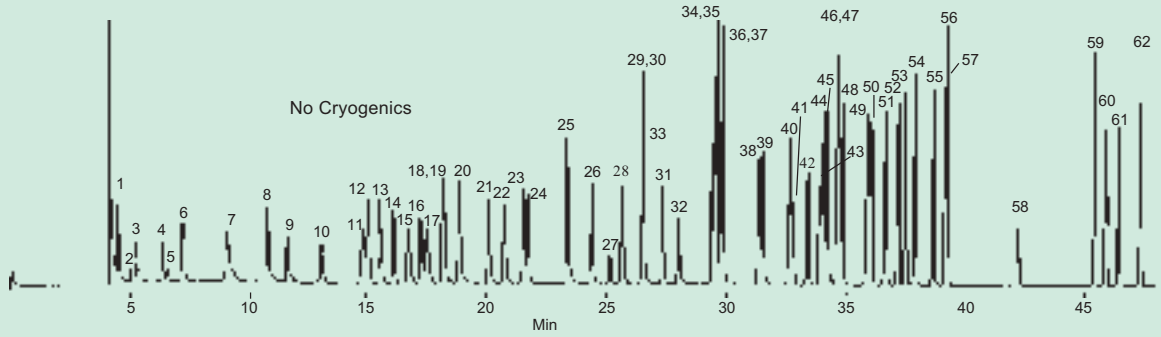
Sample Preparation

SUPELCO

Sample Preparation Applications

Volatiles

1. Dichlorodifluoromethane
2. Chloromethane
3. Vinyl chloride
4. Bromomethane
5. Chloroethane
6. Trichlorofluoromethane
7. 1,1-Dichloroethylene
8. Methylene chloride
9. trans-1,2-Dichloroethylene
10. 1,1,-Dichloroethane
11. 2,2-Dichloropropane
12. cis-1,2-Dichloroethylene
13. Chloroform
14. Bromochloromethane
15. 1,1,1-Trichloroethane
16. 1,1-Dichloropropene
17. Carbon tetrachloride
18. 1,2-Dichloroethane
19. Benzene
20. Fluorobenzene (int std)
21. Trichloroethylene
22. 1,2-Dichloropropane
23. Bromodichloromethane
24. Dibromomethane
25. cis-1,3-Dichloropropene
26. Toluene
27. trans-1,3-Dichloropropene
28. 1,1,2-Trichloroethane
29. 1,3-Dichloropropane
30. Tetrachloroethylene
31. Chlorodibromomethane
32. 1,2-Dibromoethane
33. Chlorobenzene
34. 1,1,1,2-Tetrachloroethane
35. Ethylbenzene
36. m-Xylene
37. p-Xylene
38. o-Xylene
39. Styrene
40. Isopropylbenzene
41. Bromoform
42. 1,1,2,2-Tetrachloroethane
43. 1,2,3-Trichloropropane
44. n-Propylbenzene
45. Bromobenzene
46. 1,3,5-Trimethylbenzene
47. 2-Chlorotoluene
48. 4-Chlorotoluene
49. tert-Butylbenzene
50. 1,2,4-Trimethylbenzene
51. sec-Butylbenzene
52. p-Isopropyltoluene
53. 1,3-Dichlorobenzene
54. 1,4-Dichlorobenzene
55. n-Butylbenzene
56. 1,2-Dichlorobenzene-d_4 (int std)
57. 1,2-Dichlorobenzene
58. 1,2-Dibromo-3-chloropropane
59. 1,2,4-Trichlorobenzene
60. Hexachlorobutadiene
61. Naphthalene
62. 1,2,3-Trichlorobenzene

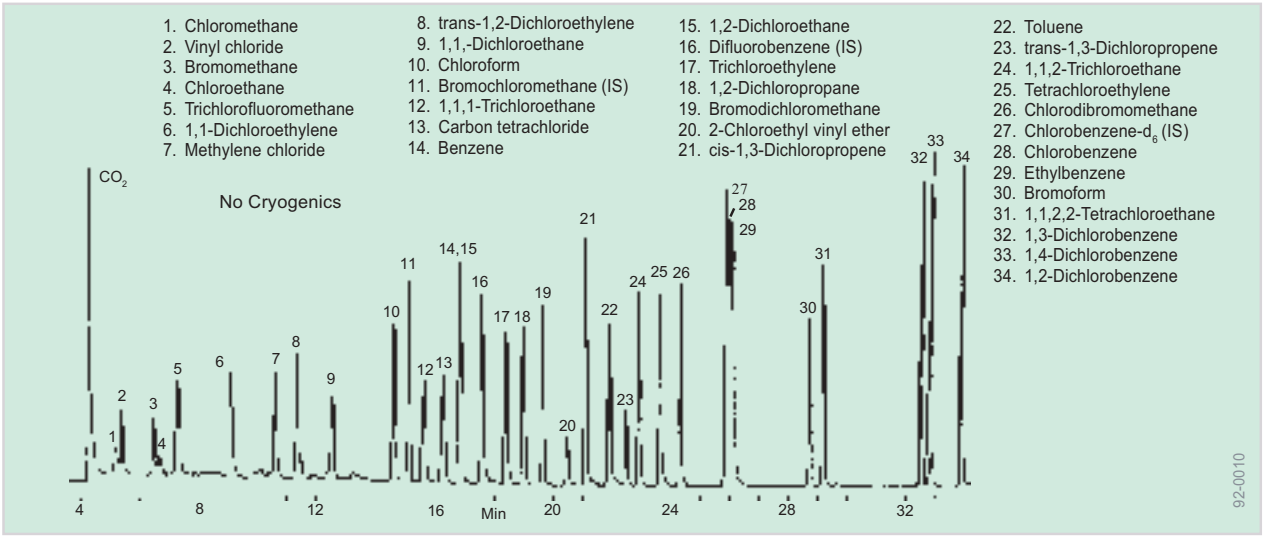


Volatile Compounds by US EPA Method 524.2 (PT/GC)

Sample: 10ppb each component in 5mL water
Trap: VOCARB 3000
Cat. No.: 21066-U
Purge: 11min, 40mL/min
Dry: 3 min
Desorb. Temp: 250°C for 4 min
Bake: 280°C for 10 min

Column: VOCOL, 105m x 0.53mm ID, 3.0µm film
Cat. No.: 25358
Oven: 35°C (10 min) to 200°C at 4°C/min, hold 10 min
Carrier: helium, 10mL/min
Det.: MS, Scan Range m/z = 35-260 at 0.6 sec/scan

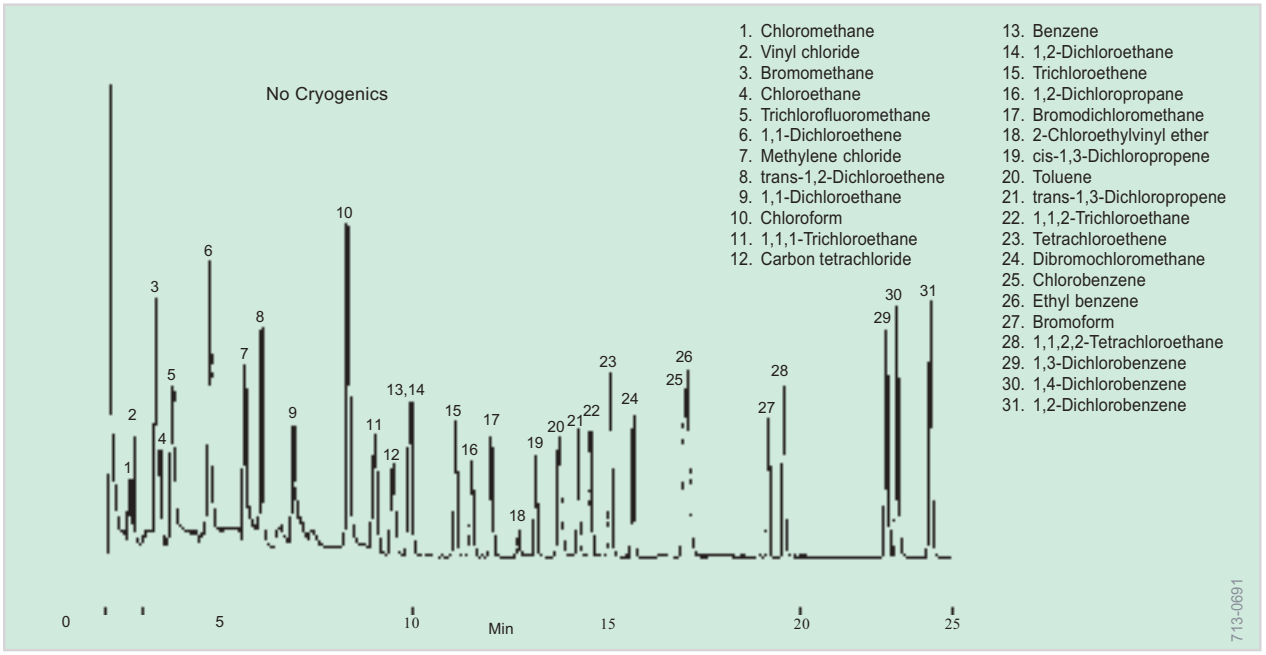
1. Chloromethane
2. Vinyl chloride
3. Bromomethane
4. Chloroethane
5. Trichlorofluoromethane
6. 1,1-Dichloroethylene
7. Methylene chloride
8. trans-1,2-Dichloroethylene
9. 1,1,-Dichloroethane
10. Chloroform
11. Bromochloromethane (IS)
12. 1,1,1-Trichloroethane
13. Carbon tetrachloride
14. Benzene
15. 1,2-Dichloroethane
16. Difluorobenzene (IS)
17. Trichloroethylene
18. 1,2-Dichloropropane
19. Bromodichloromethane
20. 2-Chloroethyl vinyl ether
21. cis-1,3-Dichloropropene
22. Toluene
23. trans-1,3-Dichloropropene
24. 1,1,2-Trichloroethane
25. Tetrachloroethylene
26. Chlorodibromomethane
27. Chlorobenzene-d_6 (IS)
28. Chlorobenzene
29. Ethylbenzene
30. Bromoform
31. 1,1,2,2-Tetrachloroethane
32. 1,3-Dichlorobenzene
33. 1,4-Dichlorobenzene
34. 1,2-Dichlorobenzene



Volatile Compounds by US EPA Method 624 (PT/GC)

Sample: 20ppb each component in 5mL water
Trap: VOCARB 3000
Cat. No.: 21066-U
Purge: 11 min, 35mL/min
Dry Purge: 3 min
Desorb. Temp: 250°C for 4 min
Bake: 60°C for 10 min
Column: VOCOL, 105m x 0.53mm ID, 3.0µm film
Cat. No.: 25358
Oven: 35°C (4 min) to 200°C at 6°C/min
Carrier: helium, 7.5mL/min
Det.: MS, Scan Range m/z = 35-260 at 0.6 sec/scan

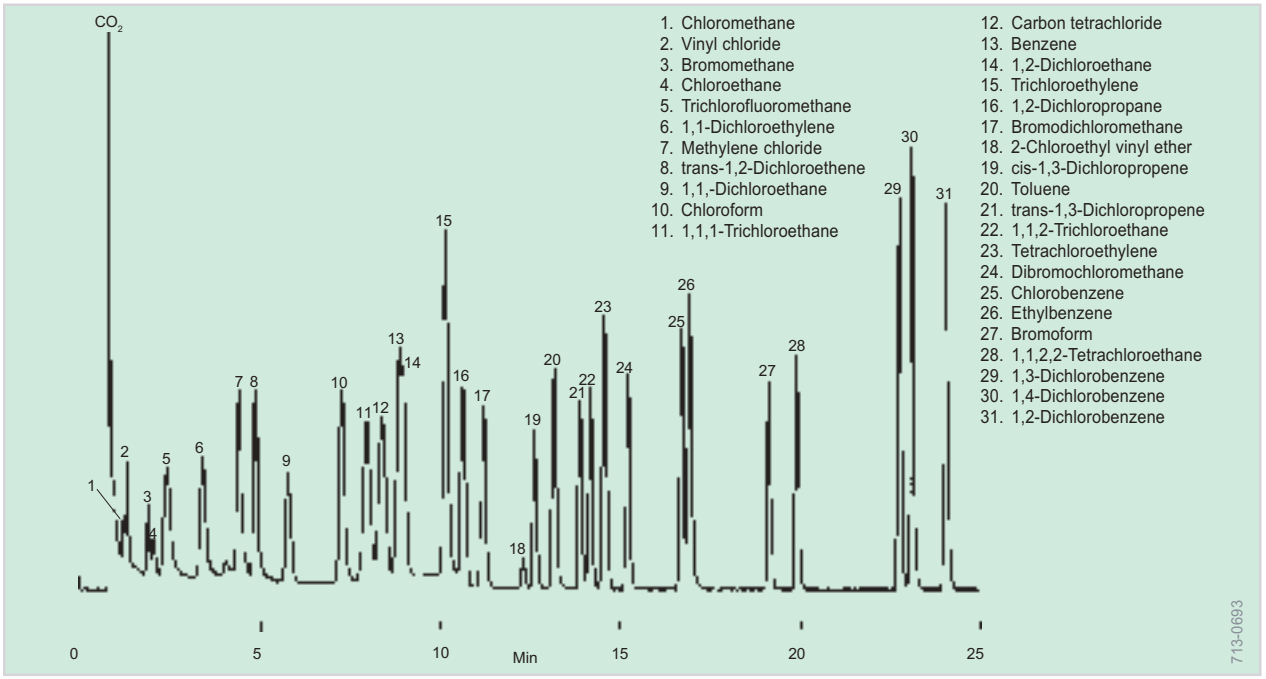
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Volatile Compounds by US EPA Method 624 (PT/GC)

Sample: 20ppb each component in 5mL water
Trap: VOCARB 3000
Cat. No.: 21066-U
Purge: 11min, 35mL/min
Dry Purge: 3 min
Desorb.: 250°C for 4 min
Bake: 260°C for 10 min

Column: VOCOL, 60m x 0.53mm ID,3.0µm film
Cat. No.: 25381
Oven: 35°C (4 min) to 200°C at 6°C/min
Carrier: helium, 7.5mL/min
Det.: MS, Scan Range m/z = 35-260 at 0.6 sec/scan



Volatile Compounds by US EPA Method 624 (PT/GC)

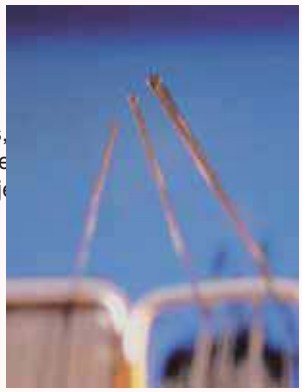
Sample: 20ppb each componentin 5mL water
Trap: VOCARB 3000
Cat. No.: 21066-U
Purge: 11min, 40mL/min
Dry Purge: 3 min
Desorb.: 250°C for 4 min
Bake: 280°C for 10 min

Column: VOCOL, 30m x 0.53mm ID, 3.0µm film
Cat. No.: 25320-U
Oven: 5°C (2 min) to 200°Cat 5°C/min
Carrier: helium, 7.5mL/min
Det.: MS, Scan Range m/z = 35-260 at 0.6 sec/scan

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

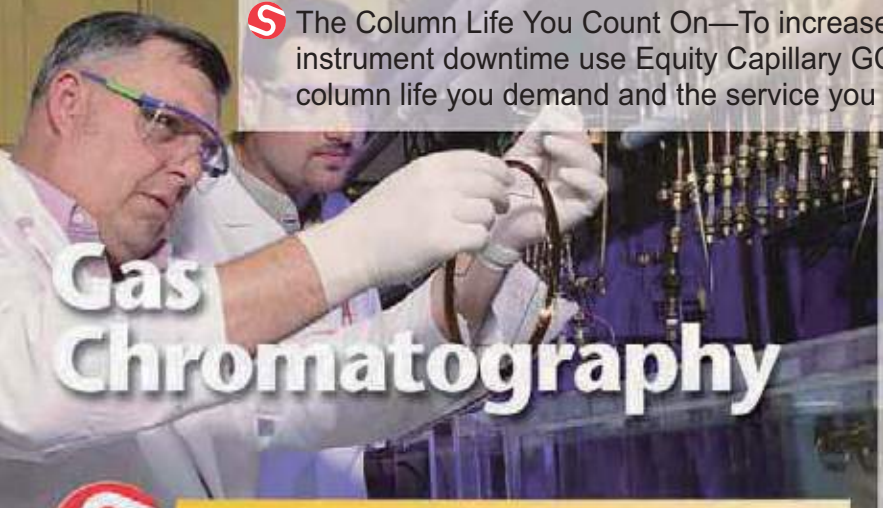
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Equity Capillary GC Columns provide...

- The Resolution You Need—For accurate identification, reliable quantitation, and confidence in your results choose Equity Capillary GC Columns. The consistently high resolution you demand and the service you deserve.
- The Analyte Response You Require—For lower detection limits and less instrument downtime you can depend on Equity Capillary GC Columns. The reproducible analyte response you demand and the service you deserve.
- The Low Bleed You Expect—For great sensitivity, reliable identification, and increased sample throughout rely on Equity Capillary GC Columns. The consistent low bleed performance you demand and the service you deserve.
- The Column Life You Count On—To increase your productivity and reduce your instrument downtime use Equity Capillary GC Columns. The durable, consistent column life you demand and the service you deserve.



Gas Chromatography

Supelco services include...

- Custom Capabilities

If you have special column needs beyond what is listed, please inquire about a custom order.

- Every Column Tested for Quality
- Available When You Need It
- Easy Ordering
- On-Time Delivery
- Superior Support

TechTip

Reduce the risk of chromatographic problems and instrument downtime through regular, proper maintenance of the GC injection port. This will allow you to avoid costly problems associated with dirty liners, overused septa, and improperly installed ferrules.

Be proactive with your maintenance today or be sorry with your results tomorrow.





Gas Chromatography

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Capillary GC
Equity Columns

eQuity
Capillary GC Columns

The performance you demand...
the service you deserve...
from the company you trust.

Supelco's new and improved line of capillary GC columns deliver the capillary GC column performance you demand for your general purpose, special purpose GC/MS, or environmental applications.

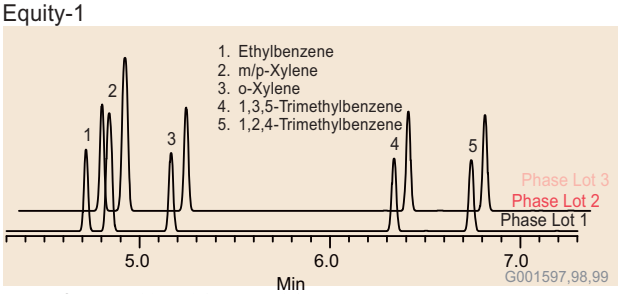
Significant improvements in the polymer chemistry are at the heart of the enhanced performance you will receive with our new Equity Capillary GC Columns. The polymer improvements result in better cross-linking, higher thermal stability, and superior product reproducibility.

The consistent resolution, analyte response, low bleed, and column life from one Equity column to the next will allow you to reliably transfer methods between sites or instruments within the same site. Also, maintain the expected column performance over time with the same instrument when you need to replace your column. The reproducible performance Equity provides will minimize time consuming method adjustments and troubleshooting with column changes which means more tests run with higher confidence.

The Resolution You Need

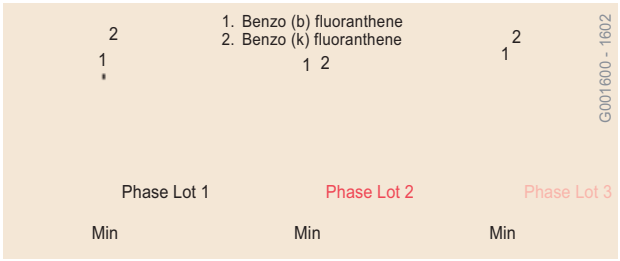
For accurate identification, reliable quantitation, and confidence in your results choose Equity Capillary GC Columns. The consistently high resolution you demand and the service you deserve.

Equity-1



Column: 30m x 0.25mm ID, 0.25µm
Cat. No.: 28046-U
Oven: 50°C to 200°C @ 10°C/min. (5 min.)
Inj.: 200°C
Det.: FID, 250°C
Flow: 30cm/sec. @ 50°C
Injection: 1.0µL, 100:1 split
Sample: UST Modified Gasoline Range Organics (48167)

Equity-5

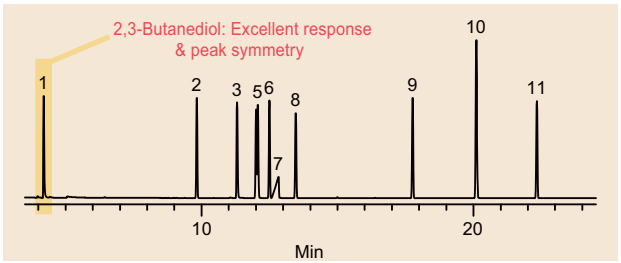


Column: 30m x 0.25mm ID, 0.25µm
Cat. No.: 28089-U
Oven: 40°C (4 min.) to 325°C @ 10°C/min (5 min.)
Inj.: 250°C
MSD Interface: 325°C
Scan Range: 45-450 amu
Flow: 12.5psi constant pressure
Injection: 1.0µL, splitless
Sample: 25ng on-column of a 16 component semivolatile standard

The Analyte Response You Require

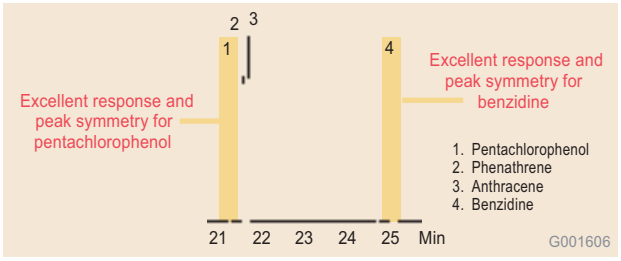
For lower detection limits and less instrument downtime, you can depend on Equity Capillary GC Columns. The reproducible analyte response you demand and the service you deserve.

Equity-1



Column: 30m x 0.25mm ID, 0.25µm
Cat. No.: 28046-U
Oven: 110°C (14 min.) to 325°C (15 min) @ 15°C/min.
Inj.: 250°C
Det.: FID, 360°C
Flow: 30cm/sec. @ 110°C
Injection: 1.0µL, 100:1 split
Sample: Nonpolar Column Test Mix (47300-U)
% Response: Calculated relative to the predicted hydrocarbon response at the same retention time

Equity-5



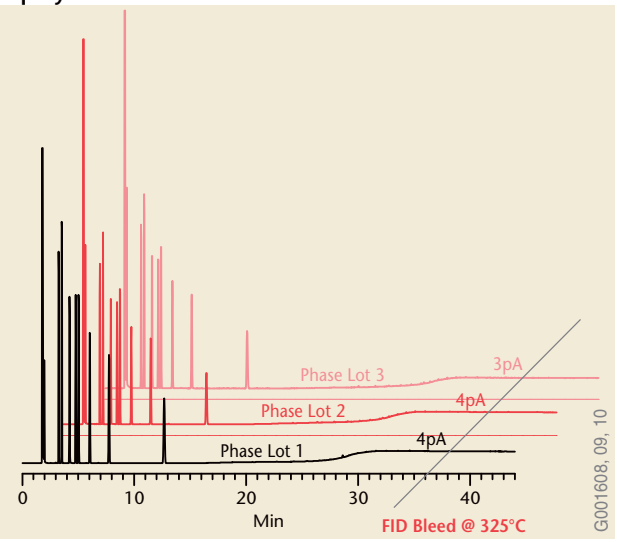
Column: 30m x 0.25mm ID, 0.25µm
Cat. No.: 28089-U
Oven: 40°C (4 min.) to 325°C @ 10°C/min. (5 min.)
Inj.: 250°C
MSD Interface: 325°C
Scan Range: 45-450 amu
Flow: 12.5psi constant pressure
Injection: 1.0µL, splitless
Sample: 25ng on-column of a 16 component semivolatile standard

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

The Low Bleed You Expect

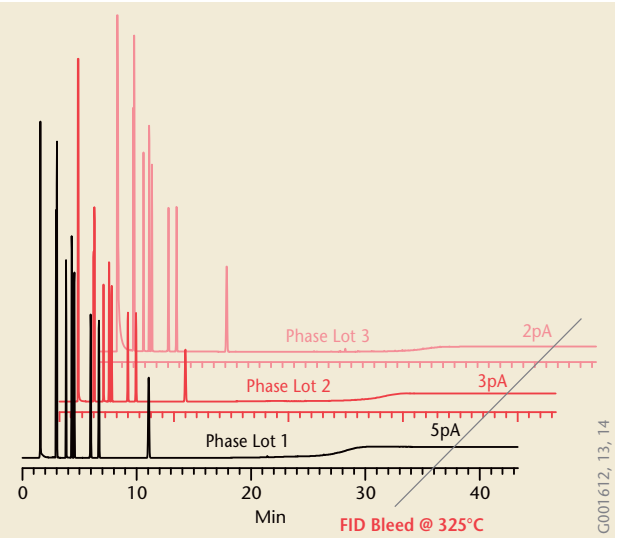
For great sensitivity, reliable identification, and increased sample throughput rely on Equity Capillary GC Columns. The consistent low bleed performance you demand and the service you deserve.

Equity-1



Column: **30m x 0.25mm ID, 0.25µm**
Cat. No.: **28089-U**
Oven: 110°C (14 min.) to 325°C (15 min) @ 15°C/min.
Inj.: 250°C
Det.: FID, 360°C
Flow: 30cm/sec. @ 110°C
Injection: 1.0µL, 100:1 split
Sample: Nonpolar Column Test Mix (47300-U)

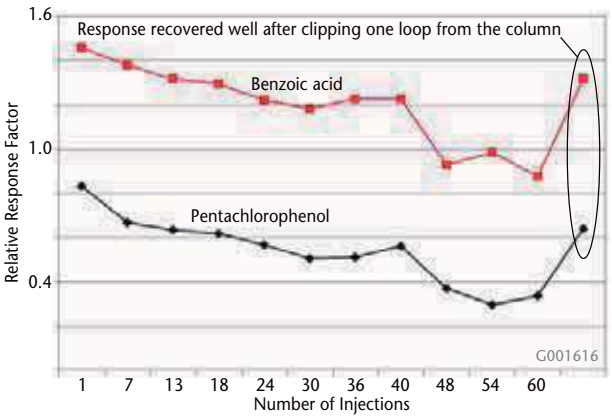
Equity-5



Column: **30m x 0.25mm ID, 0.25µm**
Cat. No.: **28089-U**
Oven: 110°C (14 min.) to 325°C (15 min) @ 15°C/min.
Inj.: 250°C
Det.: FID, 360°C
Flow: 30cm/sec. @ 110°C
Injection: 1.0µL, 100:1 split
Sample: Nonpolar Column Test Mix (47300-U)

The Column Life You Count On

To increase your productivity and reduce your instrument downtime, use Equity Capillary GC Columns. The durable, consistent column life you demand and the service you deserve.



Durability Challenge

Column: **30m x 0.25mm ID, 0.25µm**
Oven: 35°C (4 min.) to 325°C @ 10°C/min. (15 min.)
Inj.: 250°C
Det.: FID, 360°C
Flow: 27psi constant pressure
Injection: 1.0µL, 100:1 split of test mix
Sample: Test Mix – 2.5 to 5ng on-column of a 16 component semivolatile standard; the column challenge mix is a high concentration waste sample.

Response factor is calculated relative to the internal standard 2,2′-Difluorobiphenyl

Durability Test:

The column durability and life was challenged for over 60 injections by alternating injections of the 1µL test mix followed by 5 consecutive 2µL splitless injections of the high concentration waste sample. Column maintenance was performed at the end of the test and a final test mix was injected.

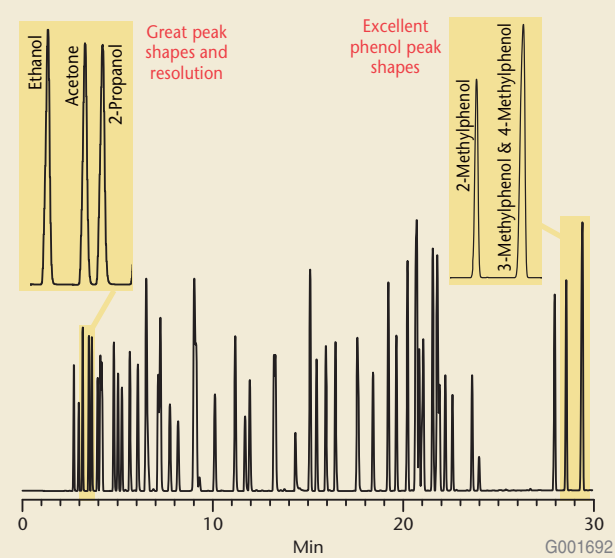
Supelco plans to add more phases and dimensions to the Equity line of capillary GC columns.
Our original nonpolar capillary GC columns are still available and are located on the "Other Columns" pages following the Capillary GC section.

RELATED INFORMATION

For more information on the Equity line of capillary GC columns request T402049.

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

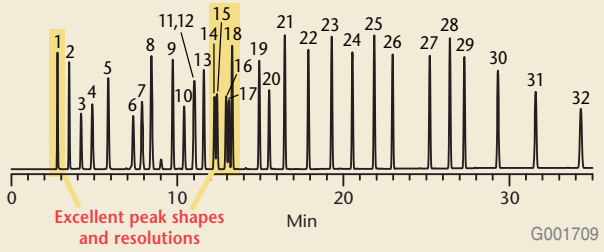
Capillary GC
Equity-1 Columns



Industrial Solvents (GC)

Column: **Equity-1, 30m x 0.32mm ID, 1.0µm**
Cat. No.: **28057-U**
Oven: 35°C (8 min) to 130°C @ 4°C/min. (2 min)
Inj.: 250°C
Det.: FID, 250°C
Flow: Helium, 25cm/sec constant @ 35°C
Inj.: 0.5µL, split (200:1)
Liner: Split, cup design
Sample: 0.5µL of a 59 component neat solvent mixture

1. Methanol
2. Ethanol
3. Isopropanol
4. t-Butanol
5. Propanol
6. 2-Butanol
7. Hexane
8. Isobutanol
9. Butanol
10. 3-Methyl-2-butanol
11. 2-Pentanol
12. 3-Pentanol
13. Heptane
14. 3-Methyl-1-butanol
15. 2-Methyl-1-butanol
16. 3-Methyl-3-pentanol
17. 4-Methyl-2-pentanol
18. Pentanol
19. Octane
20. 4-Methyl-1-pentanol
21. Hexanol
22. Nonane
23. Heptanol
24. Decane
25. Octanol
26. Undecane
27. Dodecane
28. Decanol
29. Tridecane
30. Tetradecane
31. Pentadecane
32. Hexadecane



Hydrocarbons and Alcohols (GC)

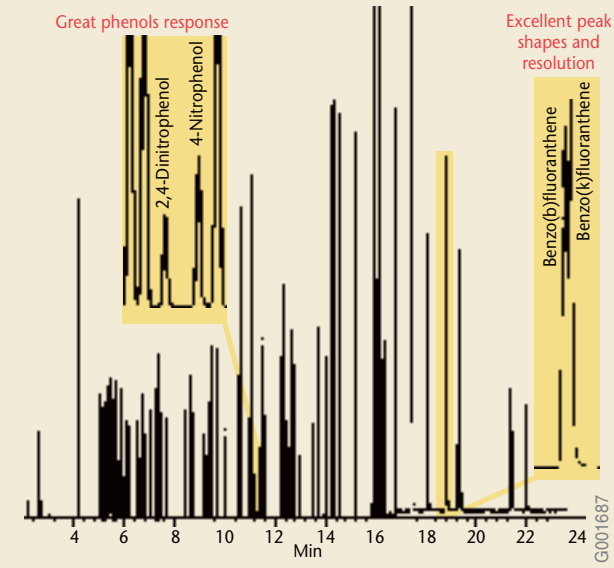
Column: **Equity-1, 30m x 0.53mm ID, 3.0µm**
Cat. No.: **28076-U**
Oven: 40°C (5 min.) to 225°C @ 8°C /min.
Inj.: 250°C
Det.: FID, 275°C
Flow: Helium, 30 cm/sec @ 40°C
Inj.: 0.10µL, split 100:1
Liner: Split, cup design
Sample: 32 component mixed solvent sample, equal by weight

Equity-1 Capillary GC Columns

Phase: bonded; poly(dimethylsiloxane)
Temp. Limits: 0.25 and 0.32mm ID: -60°C to 325/350°C
0.53mm ID: -60°C to 300/320°C (<=1.5µm d_f)
-60°C to 260/280°C (>1.5µm d_f)

LENGTH (m)	D_F (µm)	BETA	CAT. NO.	PRICE
0.10mm ID				
15	0.10	250	**28039-U**	
0.20mm ID				
12	0.33	152	**28041-U**	
25	0.33	152	**28042-U**	
10	1.2	42	**28043-U**	
0.25mm ID				
30	0.10	625	**28044-U**	
15	0.25	250	**28045-U**	
30	0.25	250	**28046-U**	
60	0.25	250	**28047-U**	
15	1.0	63	**28048-U**	
30	1.0	63	**28049-U**	
60	1.0	63	**28050-U**	
100	1.0	63	**28052-U**	
0.32mm ID				
30	0.10	800	**28053-U**	
15	0.25	320	**28054-U**	
30	0.25	320	**28055-U**	
60	0.25	320	**28056-U**	
30	1.0	80	**28057-U**	
60	1.0	80	**28058-U**	
100	1.0	80	**28060-U**	
30	2.0	40	**28061-U**	
30	5.0	16	**28062-U**	
60	5.0	16	**28063-U**	
0.53mm ID				
15	0.10	1325	**28064-U**	
30	0.10	1325	**28065-U**	
15	0.5	265	**28067-U**	
30	0.5	265	**28068-U**	
15	1.0	133	**28069-U**	
30	1.0	133	**28071-U**	
15	1.5	88	**28072-U**	
30	1.5	88	**28073-U**	
60	1.5	88	**28074-U**	
15	3.0	44	**28075-U**	
30	3.0	44	**28076-U**	
60	3.0	44	**28077-U**	
15	5.0	27	**28079-U**	
30	5.0	27	**28081-U**	
60	5.0	27	**28082-U**	

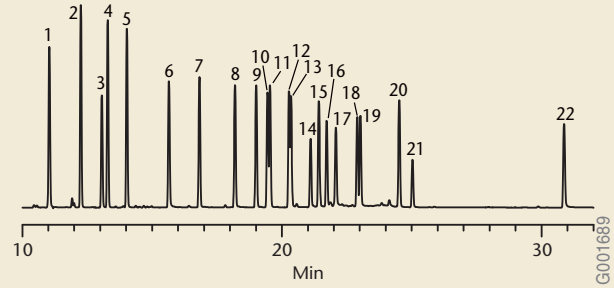
Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



US EPA Method 8270 Semivolatile Compounds (GC/MS)

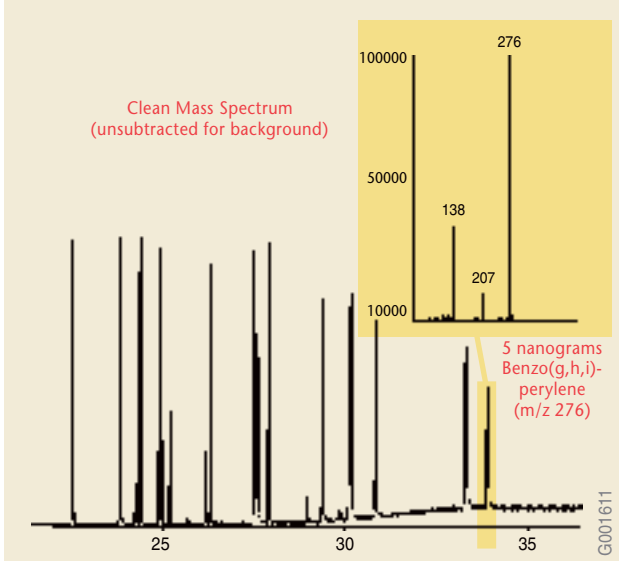
Column: **Equity-5, 30m x 0.25mm ID, 0.5µm**
Cat. No.: **28092-U**
Oven: 40°C (2 min) to 100°C @ 50°C/min to 200°C @ 10°C/min to 325°C @ 30°C/min (7.5 min)
Inj.: 280°C
Det.: 5973 MSD, Scan range 45-450 amu, 325°C transfer line
Flow: Pressure programmed, 20psi (0.0 min.), ramp to 80psi (0.0 min), ramp to 16.5psi (3 min), ramp to 25psi (hold for remainder of run)
Injection: 1.0µL, splitless (0.61 min)
Liner: Single taper, unpacked
Sample: 50ng on-column of a 74 component semivolatile standard, 6 internal standards, and 8 surrogates

1. 2,4,5,6-Tetrachloro-m-xylene (surr.)
2. α-BHC
3. β-BHC
4. γ-BHC
5. δ-BHC
6. Heptachlor
7. Aldrin
8. Heptachlor epoxide
9. γ-Chlordane
10. Endosulfan I
11. α-Chlordane
12. 4,4′-DDE
13. Dieldrin
14. Endrin
15. Endosulfan II
16. 4,4′-DDD
17. Endrin aldehyde
18. Endosulfan Sulfate
19. 4,4′-DDT
20. Endrin ketone
21. Methoxychlor
22. Decachlorobiphenyl (surr.)



US EPA Method 8081 Chlorinated Pesticides (GC)

Column: **Equity-5, 30m x 0.25mm ID, 0.25µm**
Cat. No.: **28089-U**
Oven: 100°C (2 min) to 160°C @ 15°C/min to 300°C @ 5°C/min (10 min)
Inj.: 225°C
Det.: ECD, 310°C
Flow: Helium, 30cm/sec @ 100°C
Injection: 2.0µL, splitless (0.5 min)
Liner: Splitless double taper, unpacked
Sample: 50ppb of a 22 component chlorinated pesticide standard (Cat. No. 46845-U)



Low GC/MS Column Bleed Equity-5 Capillary GC Columns

New!

Phase: bonded; poly(5% diphenyl/95% dimethylsiloxane)
Temp. Limits: 0.25 and 0.32mm ID: -60°C to 325/350°C
0.53mm ID: -60°C to 300/320°C(<=1.5µm d_f)
-60°C to 260/280°C (>1.5µm d_f)

LENGTH (m)	D_f (µm)	BETA	CAT. NO.	PRICE
0.10mm ID				
15	0.10	250	**28083-U**	
0.20mm ID				
15	0.20	250	**28084-U**	
30	0.20	250	**28085-U**	
60	0.20	250	**28086-U**	
12	0.33	152	**28087-U**	
0.25mm ID				
15	0.25	250	**28088-U**	
30	0.25	250	**28089-U**	
60	0.25	250	**28090-U**	
30	0.5	125	**28092-U**	
15	1.0	63	**28093-U**	
30	1.0	63	**28094-U**	
60	1.0	63	**28095-U**	
0.32mm ID				
15	0.25	320	**28096-U**	
30	0.25	320	**28097-U**	
60	0.25	320	**28098-U**	
30	0.32	250	**28099-U**	
30	0.5	160	**28195-U**	
30	1.0	80	**28199-U**	
60	1.0	80	**28251-U**	
0.53mm ID				
15	0.5	265	**28252-U**	
30	0.5	265	**28259-U**	
60	0.5	265	**28263-U**	
30	1.0	133	**28264-U**	
15	1.5	88	**28265-U**	
30	1.5	88	**28267-U**	
30	3.0	44	**28268-U**	
60	3.0	44	**28269-U**	
15	5.0	27	**28278-U**	
30	5.0	27	**28279-U**	
60	5.0	27	**28293-U**	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

SUPELCO

Capillary GC
General Purpose Columns

SPB-Octyl

Polarity approaches that of squalane, and is substantially less than that of the widely used "nonpolar" methyl silicone phase. Because these columns offer unique selectivity compared to the commonly used low and intermediate polarity columns, we recommend SPB-Octyl columns for multidimensional or confirmational analyses of PCB-containing samples.

Operating Conditions: Chemically compatible with water and other injection solvents. Sensitive to strong inorganic acids and bases. Columns can be rinsed.

Phase: bonded; poly(50% n-octyl/ 50% methylsiloxane)
Temp. Limits: -60°C to 280°C (isothermal)
McReynolds Nos.: x′ y′ z′ u′ s′ = 3 14 11 12 11

LENGTH (m)	D_F (µm)	BETA	CAT. NO.	PRICE
0.25mm ID FUSED SILICA				
30	0.25	250	**24218-U**	
60	0.25	250	**24219-U**	
30	1.00	63	**24232**	
60	1.00	63	**24233-U**	
0.53mm ID FUSED SILICA				
60	3.0	44	**25398**	

SPB-20

SPB-20 columns have intermediate polarity as a result of the higher (20%) phenyl content of the stationary phase. The higher polarity produces different elution order for polar compounds, providing confirmational information.

This column meets USP G28 and G32 requirements

Operating Conditions: Chemically compatible with water and other injection solvents. Sensitive to strong inorganic acids and bases. Columns can be rinsed.

Phase: bonded; poly(20% diphenyl/ 80% dimethylsiloxane)
Temp. Limits: -25°C to 300°C
McReynolds Nos.: x′ y′ z′ u′ s′ = 67 116 117 174 131

LENGTH (m)	D_F (µm)	BETA	CAT. NO.	PRICE
0.25mm ID FUSED SILICA				
30	0.2	250	**24086**	
60	0.25	250	**24087-U**	
30	1.0	63	**24196-U**	
0.32mm ID FUSED SILICA				
30	0.25	320	**24088**	
60	1.0	80	**24194-U**	
0.53mm ID FUSED SILICA				
30	0.50	265	**25329-U**	
30	1.0	133	**25333**	

SPB-35

SPB-35 columns have higher polarity than SPB-20 columns as a result of a greater phenyl content (35%). These columns are useful for analyses of polar compounds, because these compounds are retained longer, relative to nonpolar compounds.

This column meets USP G42 requirements.

Operating Conditions: Chemically compatible with water and other injection solvents. Sensitive to strong inorganic acids and bases. Columns can be rinsed.

Phase: bonded; poly(35% diphenyl/ 65% dimethylsiloxane)
Temp. Limits: 0°C to 300°C
McReynolds Nos.: x′ y′ z′ u′ s′ = 101 146 151 219 202

LENGTH (m)	D_F (µm)	BETA	CAT. NO.	PRICE
0.25mm ID FUSED SILICA				
30	0.25	250	**24092**	
0.32mm ID FUSED SILICA				
30	0.25	320	**24094**	
0.53mm ID FUSED SILICA				
30	0.50	265	**25331**	
30	1.0	133	**25335**	

SPB-50

These columns have the highest phenyl content of the common phenyl-containing series of phases, and hence provide the highest polarizability. They are useful for analyses of polar materials and provide useful confirmational information.

This column meets USP G3 requirements.

Operating Conditions: Chemically compatible with water and other injection solvents. Sensitive to strong inorganic acids and bases. Columns can be rinsed.

Phase: bonded; poly(50% diphenyl/ 50% dimethylsiloxane)
Temp. Limits: 30°C to 310°C
McReynolds Nos.: x′ y′ z′ u′ s′ = 125 175 183 268 220

LENGTH (m)	D_F (µm)	BETA	CAT. NO.	PRICE
0.25mm ID FUSED SILICA				
30	0.25	250	**24181**	
0.32mm ID FUSED SILICA				
30	0.25	320	**24187**	
0.53mm ID FUSED SILICA				
30	0.50	265	**25363**	

SP-2250

The nonbonded 50% phenyl polymer that is matched in polarity by the bonded version, SPB-50.

This column meets USP G3 requirements.

Phase: nonbonded; poly(50% phenyl/ 50% methylsiloxane)
Temp. Limits: 0°C to 250°C
McReynolds Nos.: x′ y′ z′ u′ s′ = 119 158 162 243 202

LENGTH (m)	D_F (µm)	BETA	CAT. NO.	PRICE
0.25mm ID FUSED SILICA				
15	0.20	313	**24009**	
30	0.20	313	**24010**	
60	0.20	313	**24011-U**	
0.32mm ID FUSED SILICA				
15	0.20	320	**24147**	
30	0.20	320	**24148**	

SPB-17

This bonded, crosslinked (50%-phenyl)-methylpolysiloxane, intermediate polarity phase is excellent for confirmational analyses.

This column meets USP G3 requirements.

Operating Conditions: Columns can be rinsed.

Phase: bonded; (50% phenyl) methylpolysiloxane
Temp. Limits: 0.25 and 0.32mm ID: 40°C to 280/300°C
0.53mm ID: 40°C to 260/280°C
McReynolds Nos.: x′ y′ z′ u′ s′ = 125 169 174 253 207

LENGTH (m)	D_F (µm)	BETA	CAT. NO.	PRICE
0.25mm ID FUSED SILICA				
15	0.25	250	**24374-U**	
30	0.25	250	**24380-U**	
0.32mm ID FUSED SILICA				
30	0.25	320	**24381**	
30	0.50	160	**24376**	
0.53mm ID FUSED SILICA				
15	1.0	250	**25472**	

SPB-1701

Intermediate polarity SPB-1701 columns have a mixed functionality which provides unique elution order characteristics, relative to the phenyl-containing silicone phases.

This column meets USP G46 requirements.

Phase: bonded; poly(14% cyanopropylphenyl/ 86% dimethylsiloxane)
Temp. Limits: subambient to 280°C
McReynolds Nos.: x′ y′ z′ u′ s′ = 67 170 153 228 171

LENGTH (m)	D_F (µm)	BETA	CAT. NO.	PRICE
0.25mm ID FUSED SILICA				
15	0.25	250	**24112**	
30	0.25	250	**24113**	
60	0.25	250	**24114**	
0.32mm ID FUSED SILICA				
30	0.25	320	**24184**	
60	0.25	320	**24185**	
0.53mm ID FUSED SILICA				
15	0.50	265	**25368**	
30	0.50	265	**25369**	
15	1.0	133	**25366**	
30	1.0	133	**25367**	

PAG

Less polar than polyethylene glycol phases, due to the incorporation of propylene oxide into the polymer backbone. Fills the polarity gap between 50% phenyl columns and Carbowax-type columns (polarity similar to UCON and Pluronics phases).

This column meets USP G18 requirements.

Operating Conditions: Chemically compatible with water and other injection solvents, but solvents such as water and methanol must be vaporized before reaching the column inlet. Avoid these solvents when using on-column injection techniques. Sensitive to strong inorganic acids. Columns can be rinsed.

Phase: bonded; poly(alkylene glycol)
Temp. Limits: 30°C to 220°C
McReynolds Nos.: x′ y′ z′ u′ s′ = 252 499 310 489 416

LENGTH (m)	D_F (µm)	BETA	CAT. NO.	PRICE
0.25mm ID FUSED SILICA				
15	0.25	250	**24222-U**	
30	0.25	250	**24223**	
0.32mm ID FUSED SILICA				
15	0.25	320	**24225-U**	
30	0.25	320	**24226**	
0.53mm ID FUSED SILICA				
15	0.50	265	**25422-U**	
30	0.50	265	**25423-U**	
60	0.50	265	**25424**	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Gas Chromatography

SUPELCO

Capillary GC
General Purpose Columns

SUPELCOWAX 10

The bonded equivalent to the CARBOWAX 20M phase, with much higher thermal stability. Because this phase offers higher polarity than any of the phenylsilicone phases, it is widely used for separation and purity analyses of many polar compounds, including alcohols, aromatics, and other solvents, flavors, fragrances and FAMEs.

This column meets USP G16 requirements.

Operating Conditions: Chemically compatible with water and other injection solvents, but solvents such as water and methanol must be vaporized before reaching the column inlet. Avoid these solvents when using on-column injection techniques. Sensitive to strong inorganic acids. Columns can be rinsed.

Phase: bonded; CARBOWAX 20M poly (ethylene glycol)
Temp. Limits: 35°C to 280°C
McReynolds Nos.: x′ y′ z′ u′ s′ = 305 551 360 562 484

LENGTH (m)	D_F (µm)	BETA	CAT. NO.	PRICE
0.10mm ID FUSED SILICA				
5	0.10	250	**25025-U**	
10	0.10	250	**25026-U**	
15	0.10	250	**24343**	
0.20mm ID FUSED SILICA				
30	0.20	250	**24169**	
60	0.20	250	**24170**	
0.25mm ID FUSED SILICA				
15	0.25	250	**24077**	
30	0.25	250	**24079**	
60	0.25	250	**24081**	
30	0.50	125	**24284**	
0.32mm ID FUSED SILICA				
15	0.25	320	**24078**	
30	0.25	320	**24080-U**	
60	0.25	320	**24082**	
15	0.50	160	**24083**	
30	0.50	160	**24084**	
60	0.50	160	**24085-U**	
30	1.0	80	**24211**	
60	1.0	80	**24212**	
0.53mm ID FUSED SILICA				
15	0.50	265	**25324**	
30	0.50	265	**25325**	
60	0.50	265	**25385**	
15	1.0	133	**25300-U**	
30	1.0	133	**25301-U**	
60	1.0	133	**25391**	
30	2.0	63	**25375-U**	
60	2.0	63	**25376**	

SPB-1000

An improved version of our Nukol phase, SPB-1000 is a bonded, PEG-type phase incorporating acidic functional groups and displaying a polarity closer to the SP-1000 phase than does Nukol. It displays the acidic character necessary for analyses of volatile acidic compounds. It also offers improved performance for analyses of glycols, compared to the Nukol phase. It is the recommended column for ethylene glycol analysis.

This column meets USP G25 and G35 requirements.

Operating Conditions: Columns can be rinsed.

Phase: bonded; modified poly(ethylene glycol)
Temp. Limits: 60°C to 200°C
McReynolds Nos.: x′ y′ z′ u′ s′ = 308 565 368 567 511

LENGTH (m)	D_F (µm)	BETA	CAT. NO.	PRICE
0.25mm ID FUSED SILICA				
30	0.25	250	**24313**	
0.32mm ID FUSED SILICA				
30	0.25	320	**24315**	
0.53mm ID FUSED SILICA				
30	0.50	265	**25445**	

Nukol (Bonded Free Fatty Acid Phase)

This bonded PEG-type phase, incorporating acidic functional groups, displays an acidic character and is useful for analyses of volatile acidic compounds. Even free carboxylic acids can be analyzed with excellent peak shape and minimal adsorption.

This column meets USP G25 and G35 requirements.

Operating Conditions: Sensitive to strong inorganic acids. Columns can be rinsed.

Phase: bonded; modified poly(ethylene glycol)
Temp. Limits: 60°C to 200°C
McReynolds Nos.: x′ y′ z′ u′ s′ = 314 569 372 578 504

LENGTH (m)	D_F (µm)	BETA	CAT. NO.	PRICE
0.25mm ID FUSED SILICA				
15	0.25	250	**24106-U**	
30	0.25	250	**24107**	
60	0.25	250	**24108**	
0.32mm ID FUSED SILICA				
15	0.25	320	**24130**	
30	0.25	320	**24131**	
60	0.25	320	**24132**	
15	1.0	80	**24206-U**	
30	1.0	80	**24207**	
60	1.0	80	**24208**	
0.53mm ID FUSED SILICA				
15	0.50	265	**25326**	
30	0.50	265	**25327**	
60	0.50	265	**25386**	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

SPB-225

This bonded, crosslinked (50% cyanopropylphenyl) methylpolysiloxane, intermediate-high polarity phase is excellent for separations of cis and trans FAMEs.

This column meets USP G7 and G19 requirements.

Operating Conditions: Columns can be rinsed.

Phase: bonded; (50% cyanopropylphenyl) methylpolysiloxane
Temp. Limits: 45°C to 220/240°C

LENGTH (m)	D_f (µm)	BETA	CAT. NO.	PRICE
0.25mm ID FUSED SILICA				
30	0.15	417	**24334**	
30	0.25	250	**24335**	
0.32mm ID FUSED SILICA				
30	0.15	533	**24336**	
30	0.25	320	**24337**	

SP-2330

Substitution of the bis-cyanopropyl and phenyl groups on the polymer backbone provides the phase with both polar and polarizable characteristics. These columns (and all high cyanopropyl-substituted polymers) are useful for both high and low temperature separations of samples such as geometric isomers of fatty acid methyl esters, dioxins, and aromatic compounds.

This column meets USP G8 requirements.

Operating Conditions: More susceptible to damage by oxygen, moisture, and HCl than other silicone phases. Avoid solvents such as water and methanol when using on-column injection techniques. Columns should not be rinsed.

Phase: nonbonded; poly(80% biscyanopropyl/ 20% cyanopropylphenyl siloxane
Temp. Limits: subambient to 250°C
McReynolds Nos.: x′ y′ z′ u′ s′ = 382 610 506 710 591

LENGTH (m)	D_f (µm)	BETA	CAT. NO.	PRICE
0.25mm ID FUSED SILICA				
15	0.20	313	**24018**	
30	0.20	313	**24019**	
60	0.20	313	**24020-U**	
0.32mm ID FUSED SILICA				
15	0.20	320	**24102-U**	
30	0.20	320	**24073**	
60	0.20	320	**24074**	

SP-2380

Between the traditional nonbonded cyanosilicone phases SP-2330 and SP-2340 in polarity. The high polarity of this phase allows the separation of geometric (cis/trans) fatty acid methyl ester isomers as a group. Stabilized phase with a maximum temperature slightly higher than SP-2330 or SP-2340. Significantly more stable than SP-2330.

This column meets USP G48 requirements.

Operating Conditions: More susceptible to damage by oxygen, moisture, and HCl than other silicone phases. Avoid solvents such as water and methanol when using on-column injection techniques. Columns should not be rinsed.

Phase: stabilized poly(90% biscyanopropyl/ 10% cyanopropylphenyl siloxane)
Temp. Limits: subambient to 275°C
McReynolds Nos.: x′ y′ z′ u′ s′ = 402 629 520 744 623

LENGTH (m)	D_f (µm)	BETA	CAT. NO.	PRICE
0.25mm ID FUSED SILICA				
15	0.20	313	**24109**	
30	0.20	313	**24110-U**	
60	0.20	313	**24111**	
0.32mm ID FUSED SILICA				
30	0.20	320	**24116-U**	
60	0.20	320	**24117**	
0.53mm ID FUSED SILICA				
30	0.20	663	**25319**	

SP-2340

The highest polarity of any of the general purpose cyanosilicone phases. As with all cyano phase columns, these columns are useful for both high and low temperature separations of samples such as geometric isomers of fatty acid methyl esters, dioxins, and aromatic compounds.

This column meets USP G5 requirements.

Operating Conditions: More susceptible to damage by oxygen, moisture, and HCl than other silicone phases. Avoid solvents such as water and methanol when using on-column injection techniques. Columns should not be rinsed.

Phase: nonbonded; poly(biscyanopropyl siloxane)
Temp. Limits: subambient to 250°C
McReynolds Nos.: x′ y′ z′ u′ s′ = 419 654 541 758 637

LENGTH (m)	D_f (µm)	BETA	CAT. NO.	PRICE
0.25mm ID FUSED SILICA				
15	0.20	313	**24021**	
30	0.20	313	**24022**	
60	0.20	313	**24023**	
0.32mm ID FUSED SILICA				
15	0.20	320	**24138**	
30	0.20	320	**24075**	
60	0.20	320	**24076**	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Gas Chromatography

SUPELCO

Capillary GC
Special Purpose Columns (Chiral)

α-DEX 120

α-DEX 120 columns provide unique selectivity for enantiomeric separations of small molecules; also recommended for separating positional isomers (phenols, xylenes, etc.).

Phase: nonbonded; 20% permethylated α-cyclodextrin in SPB-35 poly(35% phenyl/65% dimethylsiloxane)

β-DEX 110, β-DEX 120

We recommend β-DEX columns for enantiomeric separations of a wide range of chiral compounds (ketones, esters, alkanes, alkenes, alcohols, acids, ethers, etc.). The 10% (β-DEX 110) and 20% (β-DEX 120) β-cyclodextrin content alters the elution order while maintaining similar enantioselectivity.

Phase: nonbonded; 10% and 20% permethylated β-cyclodextrin in SPB-35 poly(35% diphenyl/ 65% dimethylsiloxane)

γ-DEX 120

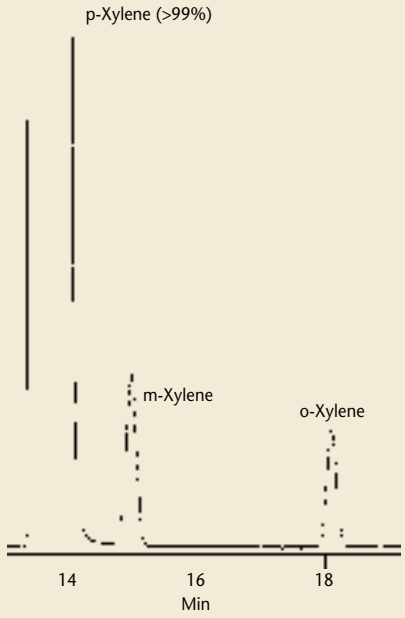
Because the elution order of the members of a chiral pair frequently reverses (enantioreversal) on a γ-DEX column, compared to the elution order on an α-DEX or β-DEX column, we recommend γ-DEX columns as complements to α-DEX and β-DEX columns.

Phase: nonbonded; 20% permethylated γ-cyclodextrin in SPB-35 poly(35% diphenyl/65% dimethylsiloxane)

LENGTH (m)	D_F (µm)	BETA	CAT. NO.	PRICE
α-DEX 120				
0.25mm ID FUSED SILICA				
30	0.25	250	**24310**	
β-DEX 110				
0.25mm ID Fused Silica				
30	0.25	250	**24301**	
60	0.25	250	**24302**	
β-DEX 120				
0.25mm ID Fused Silica				
30	0.25	250	**24304**	
60	0.25	250	**24305-U**	
γ-DEX 120				
0.25mm ID Fused Silica				
30	0.25	250	**24307**	

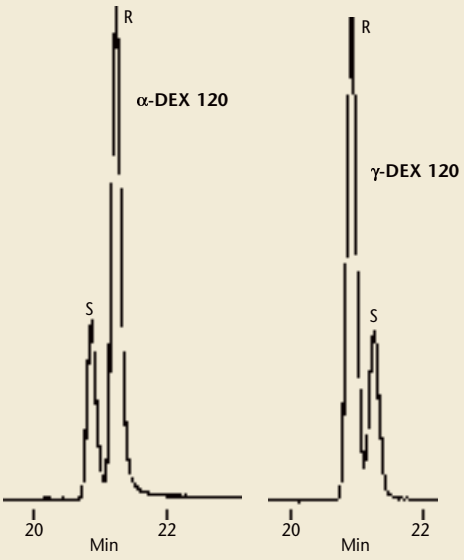
Temperature limits for all DEX columns: 30°C to 230°C.

Resolve positional isomers in highly disproportionate mixtures



Column: **α-DEX 120, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **24310**
Oven: 50°C
Carrier: helium, 30cm/sec
Det.: FID, 300°C
Inj.: 0.6µL each analyte (neat), split (100:1), 80°C

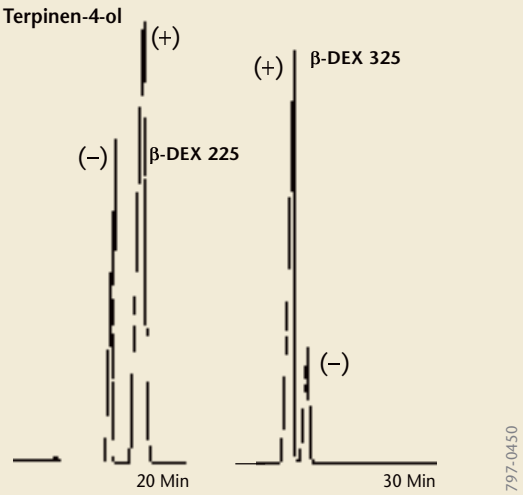
Use γ-DEX to reverse elution order for many compounds (methyl mandelate shown)



Column: **α-DEX 120 and γ-DEX 120, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **24310 (α-DEX 120), 24307 (γ-DEX 120)**
Oven: 130°C
Carrier: helium, 35cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride (1mg/mL each analyte), split (100:1), 250°C

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Selection kits offer the greatest likelihood of providing the separation you want



Column: **β-DEX 225 and β-DEX 325, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **24348** (β-DEX 225), **24308** (β-DEX 325)
Oven: 100°C
Carrier: helium, 25cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride (1mg/mL), split 100:1, 250°C

Cyclodextrin Column Selection Kits

These kits provide the tools you need to perform most chiral separations. Confirm identities of enantiomers by monitoring elution order changes (enantioreversal) from one column to another. In combination, the columns in the two kits span the full range of DEX column enantioselectivity, at substantial savings relative to purchasing individual columns.

Kit I: one 30m x 0.25mm ID, 0.25µm film column of each type: α-DEX 120, β-DEX 120, γ-DEX 120.

Kit II: one 30m x 0.25mm ID, 0.25µm film column of each type: β-DEX 120, β-DEX 225, γ-DEX 225, β-DEX 325.

DESCRIPTION	CAT. NO.	PRICE
Chiral Column Kit I	**24340**	
Chiral Column Kit II	**24328-U**	

RELATED INFORMATION

Request free literature by phone or fax, or see our website.

No.	Subject
T194877	*Chiral applications/selection guide*
T499055	*Using DEX Column Selection Kit II*

DEX-225 and DEX-325 Columns

It is difficult to predict the best phase for a given chiral or positional isomer separation, so we offer a broad range of DEX selectivities. We prepare DEX-225 and DEX-325 columns using dimethyl- and diacetyl-derivatized cyclodextrins. These columns can separate volatile chiral molecules, including alcohols, aldehydes, carboxylic acids, epoxides, esters, and halogenated compounds. We are continually developing specific applications on all our cyclodextrin columns, and suggest that you regularly consult our Web site for the most current chiral applications.

α-DEX 225

Phase: nonbonded; 25% 2,3-di-O-acetyl-6-O-TBDMS-α-cyclodextrin in SPB-20 poly(20% phenyl/80% dimethylsiloxane)

β-DEX 225

These columns provide unique selectivity for enantiomeric separations of small molecules: alcohols, aldehydes (e.g., 2-phenylpropionaldehyde), esters (e.g., methyl malate, methyl lactate), flavor compounds, and ketones.

Phase: nonbonded; 25% 2,3-di-O-acetyl-6-O-TBDMS-β-cyclodextrin in SPB-20 poly(20% phenyl/80% dimethylsiloxane)

γ-DEX 225

Phase: nonbonded; 25% 2,3-di-O-acetyl-6-O-TBDMS-γ-cyclodextrin in SPB-20 poly(20% phenyl/80% dimethylsiloxane)

α-DEX 325

Phase: nonbonded; 25% 2,3-di-O-methyl-6-O-TBDMS-α-cyclodextrin in SPB-20 poly(20% phenyl/80% dimethylsiloxane)

β-DEX 325

Phase: nonbonded; 25% 2,3-di-O-methyl-6-O-TBDMS-β-cyclodextrin in SPB-20 poly(20% phenyl/80% dimethylsiloxane)

γ-DEX 325

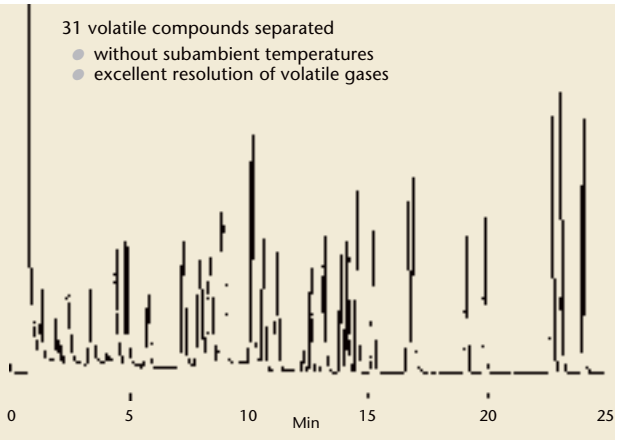
Phase: nonbonded; 25% 2,3-di-O-methyl-6-O-TBDMS-γ-cyclodextrin in SPB-20 poly(20% phenyl/80% dimethylsiloxane)

LENGTH (m)	D_F (µm)	BETA	CAT. NO.	PRICE
α-DEX 225				
30	0.25	250	**24311**	
β-DEX 225				
30	0.25	250	**24348**	
γ-DEX 225				
30	0.25	250	**24312**	
α-DEX 325				
30	0.25	250	**24303**	
β-DEX 325				
30	0.25	250	**24308**	
γ-DEX 325				
30	0.25	250	**24306**	

Fused silica columns, 0.25mm ID

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Capillary GC
Special Purpose Columns (Environmental)



Column: **VOCOL, 30m x 0.53mm ID, 3.0µm film**
Cat. No.: **25320-U**
Oven: 5°C (2 min) to 200°Cat 5°C/min
Carrier: helium, 7.5mL/min
Det.: MS, Scan Range m/z = 35-260 at 0.6 sec/scan
Inj.: 11min, 40mL/min, Dry Purge 3min, Desorb 250°C, 4 min

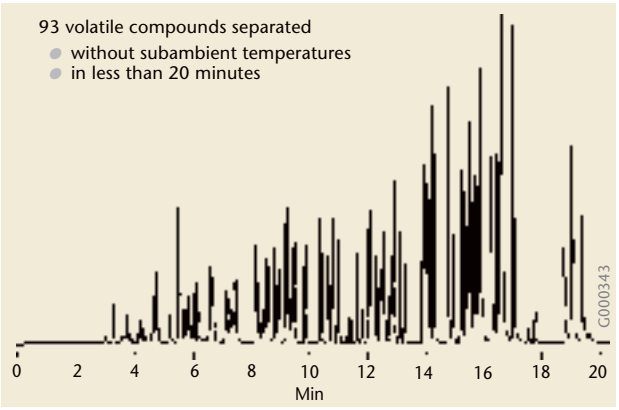
Proprietary bonded phase

Volatiles: VOCOL

These intermediate polarity columns, designed for volatile organic compounds (VOCs) analysis, ensure greater retention and resolution of the more volatile compounds. Use in direct injection ports or coupled to purge-and-trap systems, for US EPA volatiles methods, including 502.2, 524.2, 624, 8240, 8260, and 8021.

Temp. Limits: subambient to 250°C (1.5µm film) or 230°C (3µm film)

LENGTH (m)	D_F (µm)	BETA	CAT. NO.	PRICE
0.20mm ID Fused Silica				
10	1.2	42	**24129-U**	
0.25mm ID Fused Silica				
30	1.5	42	**24205-U**	
60	1.5	42	**24154**	
0.32mm ID Fused Silica				
60	1.8	44	**24217-U**	
60	3.0	27	**24157**	
0.53mm ID Fused Silica				
30	3.0	44	**25320-U**	
60	3.0	44	**25381**	
105	3.0	44	**25358**	



Column: **SPB-624, 75m x 0.53mm ID, 3µm film**
Cat. No.: **25432**
Oven: 40°C (2 min) to 65°C at 5°/min, to 155°C at 12°/min, to 210°C at 25°/min
Carrier: helium, 10mL/min
Det.: MSD, m/z = 35-260
Inj.: Purge 11 min, Dry Purge 3min, Desorb 250°C, 5 min

Proprietary bonded phase

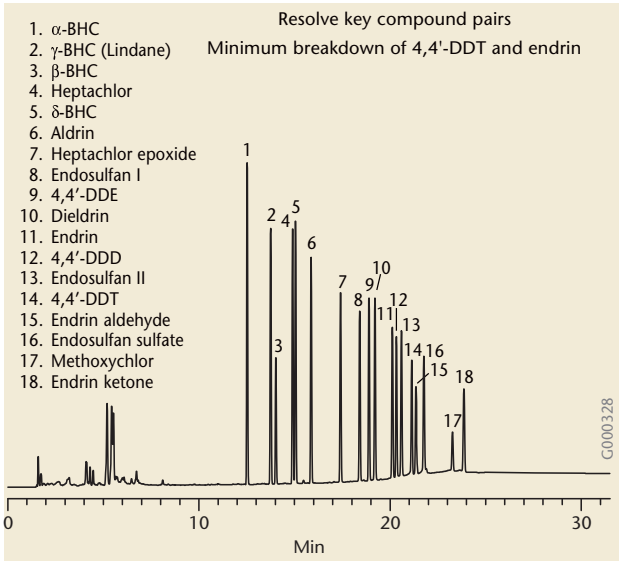
Volatiles: SPB-624

For purge-and-trap analyses of volatile compounds - Specially tested for separation, efficiency, and baseline bleed. Designed for purge-and-trap analyses of volatile halogenated, nonhalogenated and aromatic contaminants from air, drinking and waste water, and soil. SPB-624 columns meet the requirements of various US EPA methods: CLP-VOA, 502.2, 524.2, 601, 602, 624, 1624, TO-1, TO-2, TO-3, TO-14, 5041, 8010, 8015, 8020 and 8260.

Temp. Limits: subambient to 250°C (1.4µm or 1.8µm film) or 230°C (3.0µm film)

LENGTH (m)	D_F (µm)	BETA	CAT. NO.	PRICE
0.25mm ID Fused Silica				
30	1.4	44	**24255**	
60	1.4	44	**24256**	
0.32mm ID Fused Silica				
60	1.8	44	**24251**	
0.53mm ID Fused Silica				
30	3.0	44	**25430**	
75	3.0	44	**25432**	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



Column: **SPB-608, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **24103-U**
Oven: 150°C (4 min) to 290°C at 8°C/min, hold 10 min
Carrier: helium, 38cm/sec, set at 150°C
Det.: ECD, 300°C
Inj.: 1µL (0.4µg/mL each analyte), on-column, 220°C

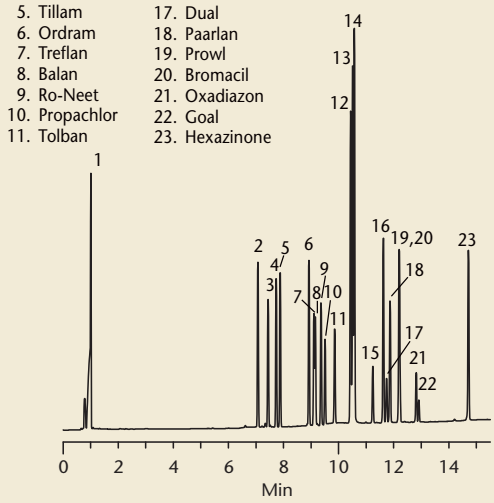
Pesticides/Herbicides: SPB-608

Proprietary bonded phase

For chlorinated pesticides - Specially tested with low concentrations of 18 chlorinated pesticides, with an electron capture detector (ECD). These columns meet the criteria for minimum breakdown of 4,4'-DDT and endrin for US EPA Methods 508, 608, 8080, 8081, and SW-Pesticides.

Temp. Limits: subambient to 300°C

LENGTH (m)	D_f (µm)	BETA	CAT. NO.	PRICE
0.25mm ID Fused Silica				
30	0.25	250	**24103-U**	
0.53mm ID Fused Silica				
15	0.50	265	**25310-U**	
30	0.50	265	**25312**	



Column: **Sup-Herb, 15m x 0.53mm ID, 0.5µm film**
Cat. No.: **25322**
Oven: 60°C (1 min) to 280°C at 16°C/min
Carrier: helium, 5mL/min
Det.: NPD, 300°C
Inj.: 0.5µL 22 Herbicides Mix (5µg/mL each analyte in ethyl acetate), direct, 220°C

Pesticides/Herbicides: Sup-Herb

Specially tested intermediate polarity column for analyses of herbicides, per US EPA Method 507.

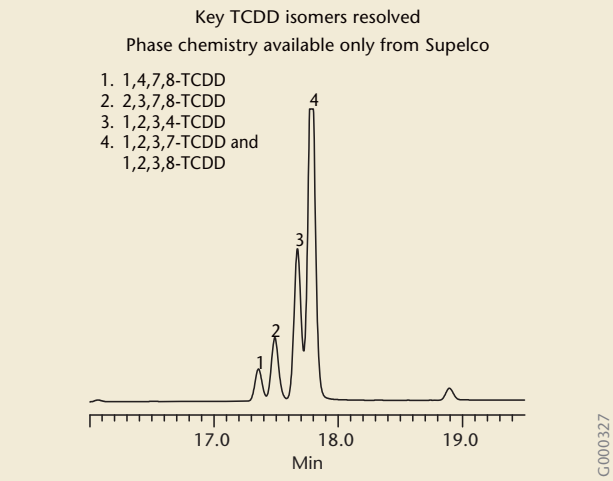
Temp. Limits: subambient to 300°C

LENGTH (m)	D_f (µm)	BETA	CAT. NO.	PRICE
0.53mm ID Fused Silica				
15	0.50	265	**25322**	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco
Gas Chromatography
SUPELCO

Capillary GC

Special Purpose Columns (Environmental, Air Monitoring, High Temperature)



Column: **SP-2331, 60m x 0.32mm ID, 0.2µm film**
Cat. No.: **24105-U**
Oven: 200°C (1 min) to 250°C at 3°C/min, hold 10 min
Carrier: helium, 30cm/sec (set at 200°C)
Det.: ECD, 270°C
Inj.: 1µL TCDD PE Mix (1.5µg/mL each analyte in n-dodecane), on-column, 200°C

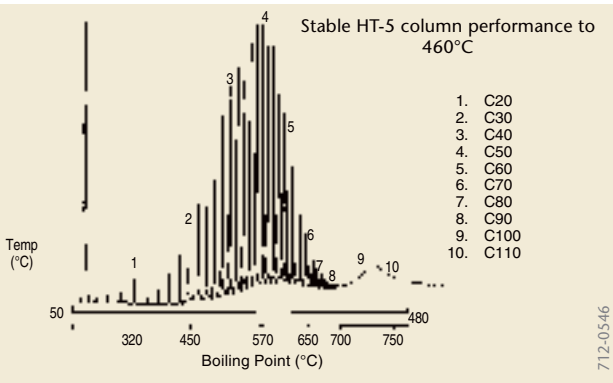
Dioxins: SP-2331

Proprietary stabilized phase

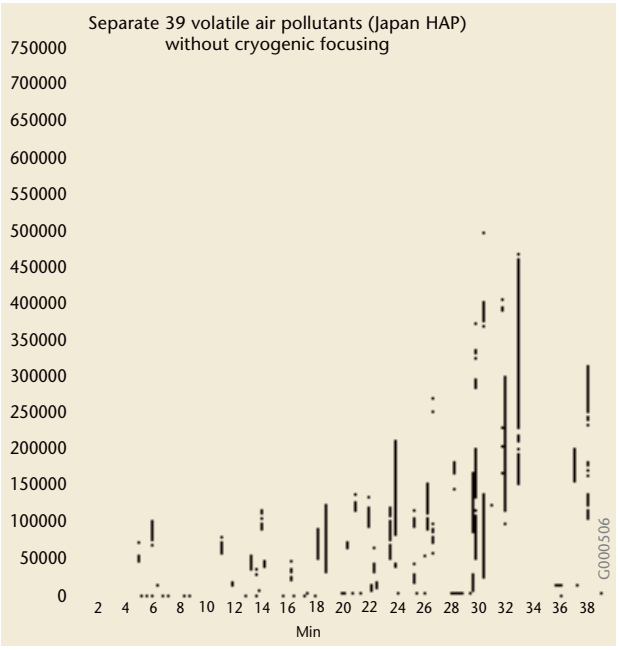
For TCDD (dioxin) isomers - A highly polar cyanosilicone stationary phase, specially tested for analyses of TCDD isomers. The phase is stabilized, providing a maximum temperature slightly higher than nonbonded cyanosilicone phases, such as SP-2330.

Temp. Limits: subambient to 275°C

LENGTH (m)	D_f (µm)	BETA	CAT. NO.	PRICE
0.25mm ID Fused Silica				
30	0.20	313	**24257**	
60	0.20	313	**24104-U**	
0.32mm ID Fused Silica				
60	0.20	400	**24105-U**	



Column: **HT-5, 6m x 0.53mm ID, 0.10µm film**
Cat. No.: **25004**
Oven: 50°C to 480°C at 10°C/min
Inj.: on-column



Column: **SPB-HAP, 60m x 0.32mm ID, 4.0µm film**
Cat. No.: **25020-U**
Oven: 35°C (8 min) to 230°C at 8°C/min, hold 10 min
Carrier: helium, 2.5mL/min
Det.: FID, 250°C
Inj.: thermal desorption

Air Monitoring: SPB-HAP

For hazardous air pollutants - This column was developed to provide the best resolution of very volatile, regulated components. The thick film focuses analyses on the front of the column, without cryogenic focusing.

Phase: bonded poly(dimethylsiloxane)
Temp. Limits: -60°C to 300°C

LENGTH (m)	D_f (µm)	BETA	CAT. NO.	PRICE
0.32mm ID Fused Silica				
60	4.0	20	**25020-U**	

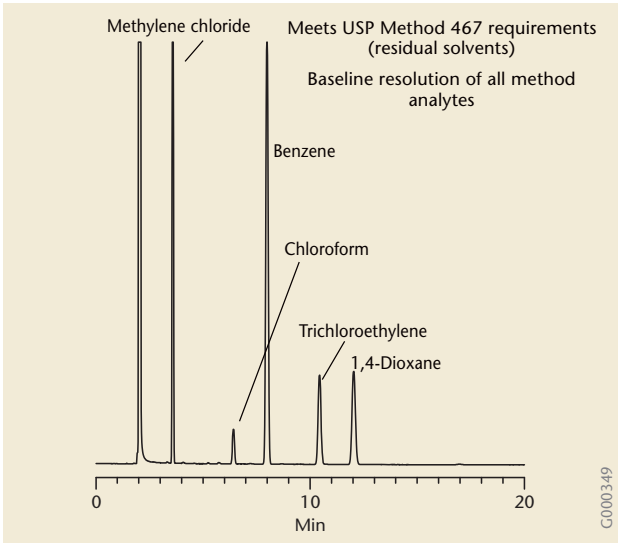
High Temperature: HT-5

For highest-temperature separations - SGE aluminum-clad columns coated with a carborane phase, offering the highest maximum temperature of any commercially available column. They display low bleed for GC/MS and simulated distillation analyses.

Phase: bonded; siloxane-carborane (5% phenyl equivalent)
Temp. Limits: 10°C to 460°C

LENGTH (m)	D_f (µm)	BETA	CAT. NO.	PRICE
0.32mm ID Fused Silica				
12	0.10	800	**25002**	
25	0.10	800	**25003**	
0.53mm ID Fused Silica				
6	0.10	1325	**25004**	
12	0.15	883	**25005-U**	

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Column: **OVI-G43, 30m x 0.53mm ID, 3.0µm film**
Cat. No.: **25396**
Oven: 40°C
Carrier: helium, 35cc/min
Det.: FID, 260°C
Inj.: 1µL, direct, 140°C

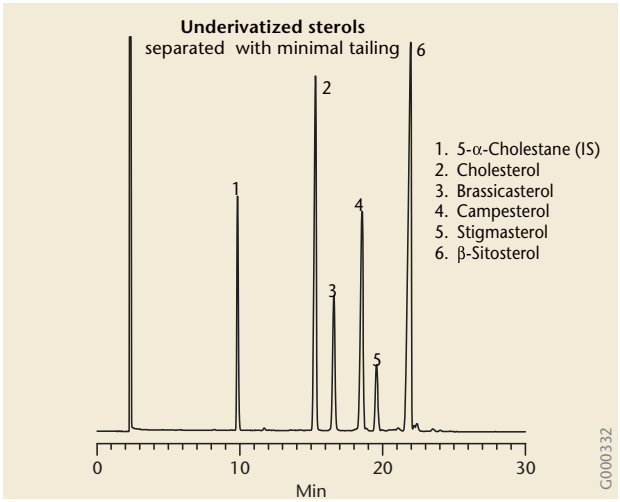
Solvents: OVI-G43

For USP Analysis of organic volatile impurities (OVIs) - This column is specially prepared and tested to meet the requirements of United States Pharmacopoeia (USP) Method 467 and the European Pharmacopoeia general method for determining residual organic solvents in pharmaceutical preparations. Use this column to separate OVIs for research purposes or qualitative analysis. The USP and European Pharmacopoeia methods also specify using a deactivated 5-meter guard column.

This column meets USP G43 requirements.

Phase: bonded; poly(6% cyanopropylphenyl/ 94% dimethylsiloxane)
Temp. Limits: -20°C to 260°C

LENGTH (m)	D_F (µm)	BETA	CAT. NO.	PRICE
0.53mm ID Fused Silica				
30	3.0	44	**25396**	
Deactivated Guard Column for OVI-G43				
5m x 0.53mm ID			**25339**	
Other Columns for Residual Solvents Analysis				
G27 (SPB-5) 30m x 0.53mm ID, 5.0µm			**25347**	
G16 (SUPELCOWAX 10) 30m x 0.53mm ID, 1.0µm			**25301-U**	



Column: **SAC-5, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **24156**
Oven: 285°C
Carrier: helium, 25cm/sec, set at 265°C
Det.: FID, 300°C
Inj.: 1µL Sterol Standard Test Mix (25mg/mL total analytes in methylene chloride), split (100:1), 300°C

Steroids: SAC-5

An SE-54 type phase, developed and tested for reproducible analyses of plant sterols, cholesterol, and other animal sterols.

Phase: bonded; poly(5% diphenyl/ 95% dimethylsiloxane)
Temp. Limits: -60°C to 320°C
McReynolds Nos.: x′ y′ z′ u′ s′ = 19 74 64 93 62

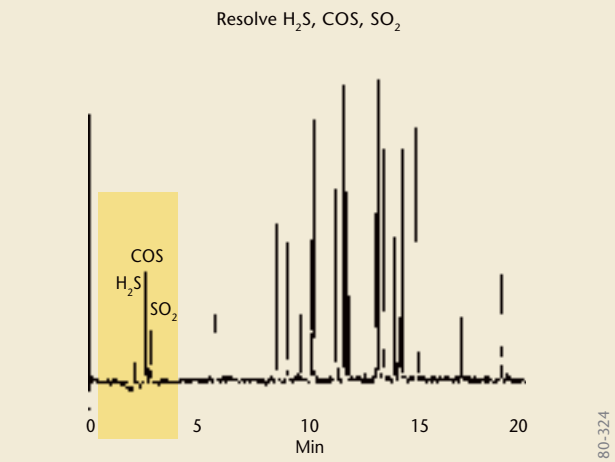
LENGTH (m)	D_F (µm)	BETA	CAT. NO.	PRICE
0.25mm ID Fused Silica				
15	0.25	250	**24151**	
30	0.25	250	**24156**	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

SUPELCO

Capillary GC

Special Purpose Columns (Sulfur Compounds, SCOT Columns)



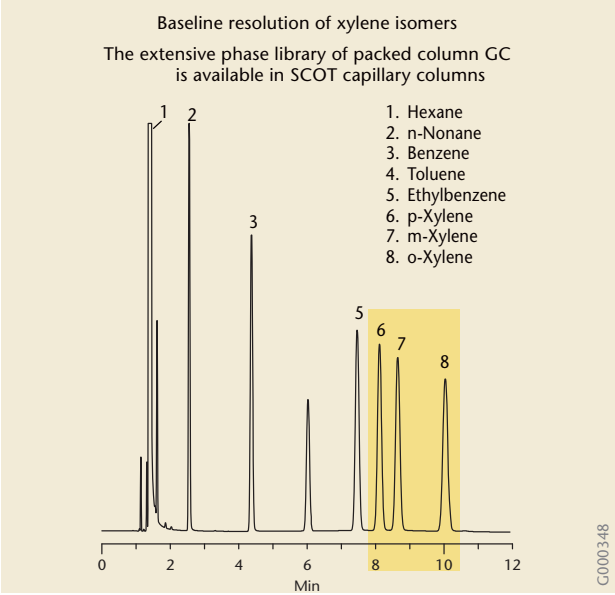
Column: **SPB-1 SULFUR, 30m x 0.32mm ID, 4µm film**
Cat. No.: **24158**
Oven: -10°C (3min) to 300°C at 10°C/min
Carrier: helium, 20cm/sec
Det.: sulfur chemiluminescence
Inj.: 0.1mL sulfur gas standard, split 10:1

Sulfur Compounds (Volatile): SPB-1 SULFUR

A very thick film version of our SPB-1 columns, specially developed for analyses of sulfur gases and other volatile sulfur compounds. The column displays relatively low column bleed, even for the exceptionally thick film (4µm) of stationary phase, which makes it compatible for use with the Sievers Sulfur Chemiluminescence Detector (SCD) and other sulfur-specific detectors.

Phase: bonded; poly(dimethylpolysiloxane)
Temp. Limits: -60°C to 300°C

LENGTH (m)	D_F (µm)	BETA	CAT. NO.	PRICE
0.32mm ID Fused Silica				
30	4.0	20	**24158**	



Column: **Bentone 34/DNDP SCOT, 50′ x 0.02″ ID**
Cat. No.: **25521**
Oven: 90°C
Carrier: helium, 27cm/sec, set at 90°C
Det.: 220°C
Inj.: 220°C

Gases: SCOT Stainless Steel

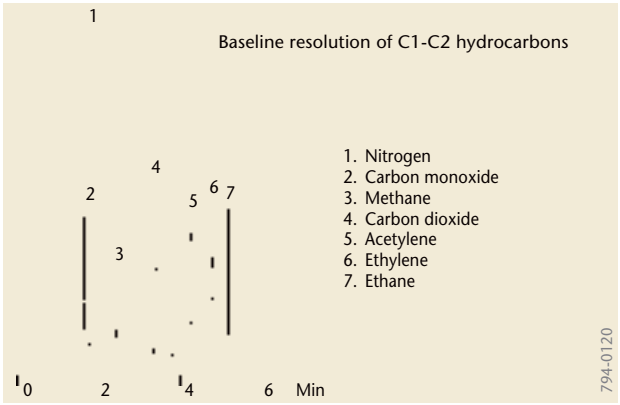
Support-coated open tubular (SCOT) columns are prepared by depositing a layer of liquid phase-coated support particles on the inner wall of the tubing. This technology, developed by PerkinElmer, makes available many phases that cannot be obtained on conventional wall-coated open tubular capillary columns. SCOT columns combine the sensitivity and excellent sample resolution of capillary GC with the extensive stationary phase library of packed column GC.

50' x 1/32'' OD x 0.02'' ID with 1/16'' connections

LIQUID PHASE	MAX. TEMP. (°C)	BETA	CAT. NO.	PRICE
Stainless Steel SCOT Columns				
Bentone 34/DNDP[2]	150	45	**25521**	
BMEA	100	40	**25538**	
Squalane	120	50	**25535**	
TCEP	150	40	**25536**	

[2] Di-n-decylphthalate

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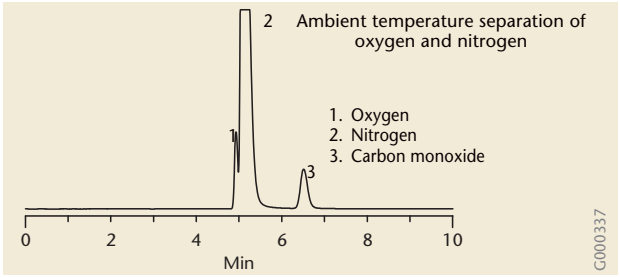


Column: **Carboxen-1006 PLOT, 30m x 0.53mm ID**
Cat. No.: **25461**
Oven: 35°C (5min) to 225°C at 24°C/min

Gases: Carboxen-1006 PLOT[1]

For permanent gases and C1 – C3 light hydrocarbons - The porous carbon molecular sieve (surface area ~ 750m²/gram) in Carboxen-1006 porous layer open tubular (PLOT) columns separates permanent gases and C1, C2, and C3 light hydrocarbons, using above-ambient initial temperatures. The columns also are ideal for resolving formaldehyde/water/methanol (formalin) mixtures and monitoring impurities in ethylene. Use Carboxen-1006 columns with high flow rates and rapid temperature programs, up to 250°C, to ensure excellent, fast separations.

DIMENSIONS (FUSED SILICA)	MAX. TEMP. (°C)	CAT. NO.	PRICE
30m x 0.32mm ID	250	**24241-U**	
30m x 0.53mm ID[2]	250	**25461**	

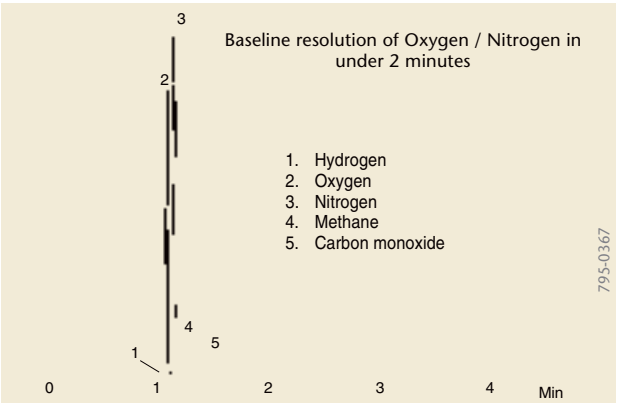


Column: **Carboxen-1010 PLOT, 30m x 0.53mm ID**
Cat. No.: **25467**
Oven: 35°C

Gases: Carboxen-1010 PLOT[1]

For permanent gases, C2 and C3 hydrocarbons - A carbon molecular sieve column for separating hydrogen, nitrogen, carbon monoxide, methane, carbon dioxide, and C2 and C3 hydrocarbons. Oxygen is separated from nitrogen.

DIMENSIONS (FUSED SILICA)	MAX. TEMP. (°C)	CAT. NO.	PRICE
30m x 0.32mm ID	250	**24246**	
30m x 0.53mm ID[2]	250	**25467**	

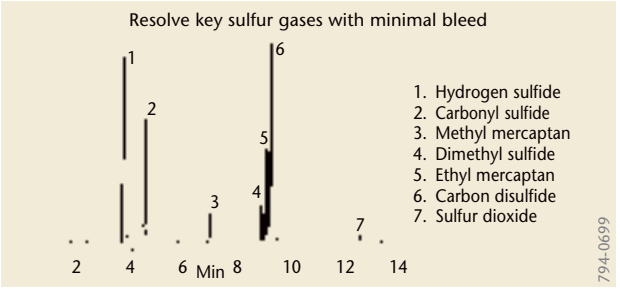


Column: **Mol Sieve 5A PLOT, 30m x 0.53mm ID**
Cat. No.: **25463**
Oven: 65°C, helium, 10mL/min.

Gases: Mol Sieve 5A PLOT[1]

For permanent gases - Oxygen, nitrogen, carbon monoxide and methane can be separated in less than 5 minutes. More difficult separations, such as argon from oxygen, can be achieved by using subambient temperatures (15°C or below).

DIMENSIONS (FUSED SILICA)	MAX. TEMP. (°C)	CAT. NO.	PRICE
30m x 0.32mm ID	300	**24243**	
30m x 0.53mm ID[2]	300	**25463**	



Column: **Supel-Q PLOT, 30m x 0.53mm ID**
Cat. No.: **25462**
Oven: 50°C (min) to 250°C at 10°C/min

Gases: Supel-Q PLOT[1]

For many hydrocarbon and other compounds - Supel-Q PLOT columns contain a porous divinylbenzene polymer that effectively resolves carbon dioxide and C1-C4 hydrocarbons at above ambient temperatures. It also is suitable for analyses of other gases, such as sulfur gases, and alcohols, ketones, aldehydes, and many polar compounds. Gasoline and other petroleum fractions can be analyzed as well. These columns exhibit very little bleed, even at the maximum temperature. Relative to packed columns (e.g., Porapak-Q), Supel-Q PLOT columns offer better resolution in less time.

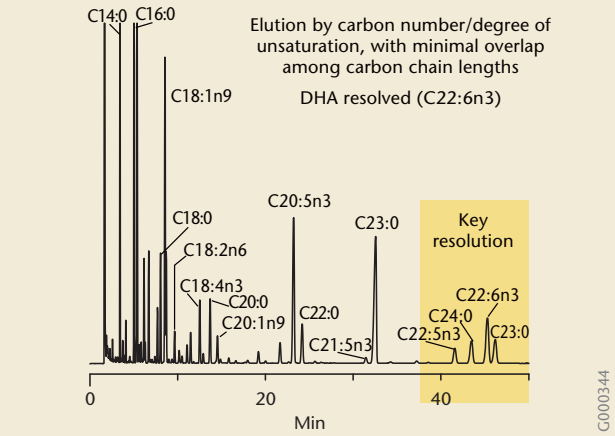
DIMENSIONS (FUSED SILICA)	MAX. TEMP. (°C)	CAT. NO.	PRICE
30m x 0.32mm ID	250	**24242**	
30m x 0.53mm ID[2]	250	**25462**	

[1] A proprietary procedure fixes particles to the fused silica tubing and ensures they will not be dislodged in normal use. Manufactured under US patents 5,599,445; 5,607,580; 5,609,756; 5,620,603; and 5,630,937.

[2] 0.53mm ID column can be used in packed column chromatographs.

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Gas Chromatography
SUPELCO

Capillary GC
Special Purpose Columns (FAMES)



Column: **Omegawax 320, 30m x 0.32mm ID, 0.25µm film**
Cat. No.: **24152**
Oven: 200°C
Carrier: helium, 25cm/sec, set at 200°C(135-140cc/min split vent flow, 30cc/min nitrogen make-up gas)
Det.: FID, 260°C
Inj.: 1µL of Omegawax Test Mix (50mg FAMEs/mL hexane), split 100:1, 250°C

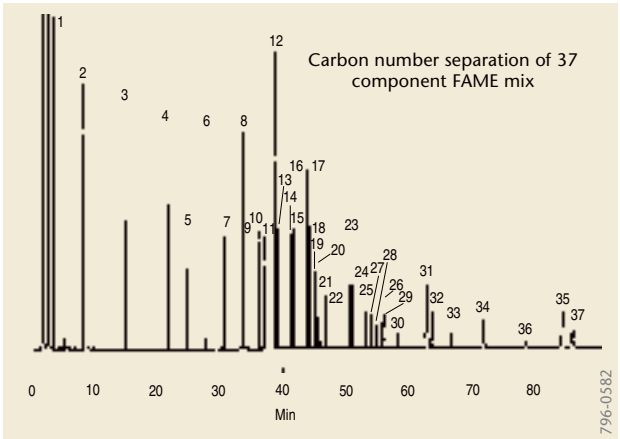
Fatty Acids (FAMEs): Omegawax

For omega 3 and 6 fatty acids - These columns were developed to provide highly reproducible analyses of fatty acid methyl esters, specifically the omega 3 and 6 fatty acids. The columns are checked for reproducibility of FAME equivalent chain length (ECL) values and resolution of key components.

This column meets USP G16 requirements.

Phase: bonded; poly(ethylene glycol)
Temp. Limits: 50°C to 280°C

LENGTH (m)	D_F (µm)	BETA	CAT. NO.	PRICE
OMEGAWAX 250				
0.25mm ID Fused Silica				
30	0.25	250	**24136**	
OMEGAWAX 320				
0.32mm ID Fused Silica				
30	0.25	320	**24152**	
OMEGAWAX 530				
0.53mm ID Fused Silica				
30	0.50	265	**25374**	



Column: **SPB-PUFA, 30m x 0.32mm ID, 0.20µm film**
Cat. No.: **24323**
Oven: 50°C (hold 2 min), 4°C/min to 210°C
Carrier: helium, 25cm/sec, set at isothermal temp.
Det.: FID, (2 x 10-11), 260°C
Inj.: 1µL of 37 Component FAME Mix (Cat. No. 47885-U), split 100:1, 250°C

Fatty Acids (FAMEs): SPB-PUFA

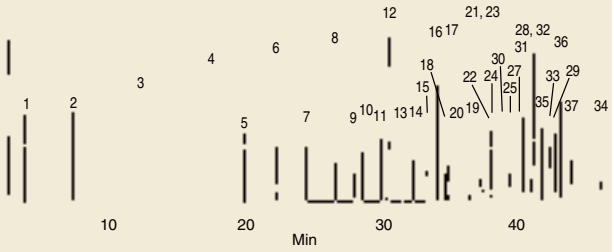
For polyunsaturated fatty acid methyl esters - These columns provide highly reproducible analyses of polyunsaturated fatty acid methyl esters. The lower polarity poly (alkylene glycol) phase features improved "carbon number" separations, compared to poly(ethylene glycol) columns such as Omegawax columns and SUPELCOWAX 10 columns.

Phase: bonded; poly(alkylene glycol)
Temp. Limits: 50°C to 220°C

LENGTH (m)	D_F (µm)	BETA	CAT. NO.	PRICE
0.25mm ID Fused Silica				
30	0.20	313	**24314**	
0.32mm ID Fused Silica				
30	0.20	400	**24323**	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Fast carbon number separation of 37 component FAME mix



Component (acid methyl esters)	Weight %	Component (acid methyl esters)	Weight %
1. C4:0 (Butyric)	4	22. C18:3n3 (α-Linolenic)	2
2. C6:0 (Caproic)	4	23. C20:0 (Arachidic)	4
3. C8:0 (Caprylic)	4	24. C20:1n9 (*cis*-11-Eicosenoic)	2
4. C10:0 (Capric)	4	25. C20:2 (*cis*-11,14-Eicosadienoic)	2
5. C11:0 (Undecanoic)	2	26. C20:3n6 (*cis*-8, 11,14-Eicosatrienoic)	2
6. C12:0 (Lauric)	4	27. C20:3n3 (*cis*-11, 4,17-Eicosatrienoic)	2
7. C13:0 (Tridecanoic)	2	28. C20:4n6 (Arachidonic)	2
8. C14:0 (Myristic)	4	29. C20:5n3 (*cis*-5, 8,11,14,17-Eicosapentaenoic)	2
9. C14:1 (Myristoleic)	2	30. C21:0 (Henicosanoic)	2
10. C15:0 (Pentadecanoic)	2	31. C22:0 (Behenic)	4
11. C15:1 (*cis*-10-Pentadecenoic)	2	32. C22:1n9 (Erucic)	2
12. C16:0 (Palmitic)	6	33. C22:2 (*cis*-13, 16-Docosadienoic)	2
13. C16:1 (Palmitoleic)	2	34. C22:6n3 (*cis*-4,7,10, 13,16,19-Docosahexaenoic)	2
14. C17:0 (Heptadecanoic)	2	35. C23:0 (Tricosanoic)	2
15. C17:1 (*cis*-10-Heptadecenoic)	2	36. C24:0 (Lignoceric)	4
16. C18:0 (Stearic)	4	37. C24:1n9 (Nervonic)	2
17. C18:1n9c (Oleic)	4		
18. C18:1n9t (Elaidic)	2		
19. C18:2n6c (Linoleic)	2		
20. C18:2n6t (Linolelaidic)	2		
21. C18:3n6 (γ-Linolenic)	2		

795-0781

Column: **SP-2380, 30m x 0.25mm ID, 0.20µm film**
Cat. No.: **24110-U**
Oven: 50°C (2 min) to 250°C at 4°C/min, hold 15 min
Carrier: helium, 20cm/sec, 150°C
Det.: FID, 260°C
Inj.: 1µL of Supelco 37 Component FAME Mix (Cat. No. 47885-U, 10mg/mL total), split 100:1, 250°C

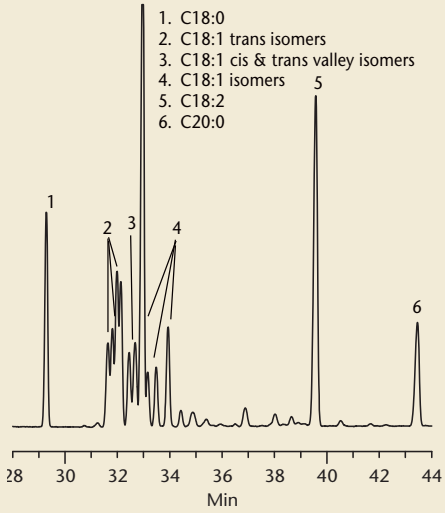
Fatty Acids (FAMEs): SP-2380

For separations by carbon number - This column was developed for high resolution and efficiency, and fast analyses of positional and geometric isomers of fatty acid methyl esters.

Phase: stabilized poly(90% biscyanopropyl/ 10% cyanopropylphenyl siloxane)
Temp. Limits: subambient to 275°C

LENGTH (m)	D_f (µm)	BETA	CAT. NO.	PRICE
0.25mm ID Fused Silica				
100	0.20	313	**24317**	

Positional and geometric isomers separated by very high polarity and long column length



G000345

Column: **SP-2560, 100m x 0.25mm, 0.20µm film**
Cat. No.: **24056**
Oven: 170°C
Carrier: helium, 20cm/sec, set at 170°C
Det.: FID, 200°C
Inj.: 1µL positional cis/trans standard (Cat. No. 45170) (5.0mg/mL FAME isomers in methylene chloride), split 100:1, 200°C

Fatty Acids (FAMEs): SP-2560

For cis/trans positional isomers - Specially prepared and tested columns, designed to separate geometric-positional (cis/trans) isomers of fatty acid methyl esters. Recommended for separating FAMEs in hydrogenated vegetable oil samples.

Phase: nonbonded; biscyanopropyl polysiloxane
Temp. Limits: subambient to 250°C

LENGTH (m)	D_f (µm)	BETA	CAT. NO.	PRICE
0.25mm ID Fused Silica				
100	0.20	313	**24056**	

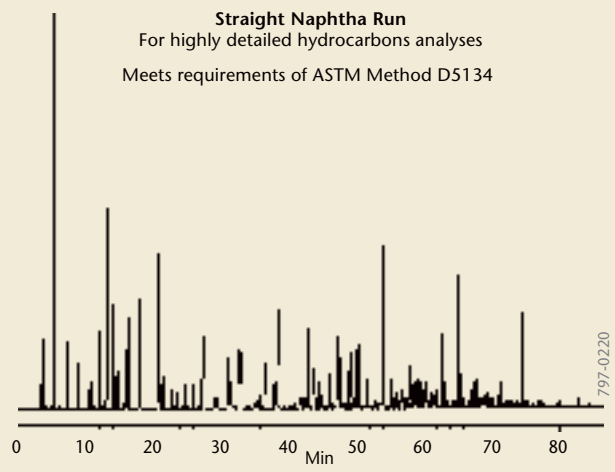
Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Gas Chromatography

SUPELCO

Capillary GC

Special Purpose Columns (Petroleum - Hydrocarbons, MTBE)



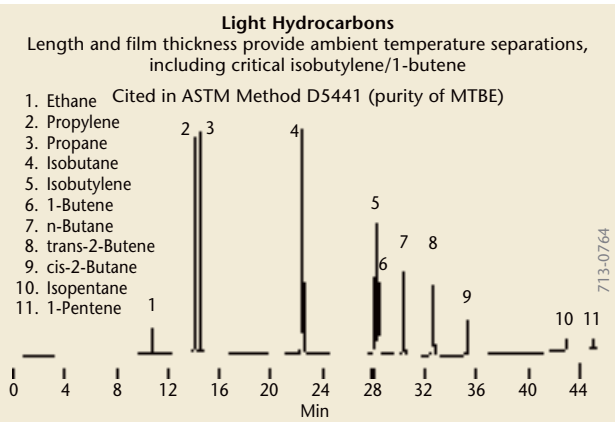
Column: **Petrocol DH 50.2, 50m x 0.20mm ID x 0.50µm film**
Cat. No.: **24133-U**
Oven: 35°C (30min) to 200°C (20min) at 2°C/min

Hydrocarbons: Petrocol DH 50.2

For detailed hydrocarbons analyses - A narrow bore column for detailed hydrocarbon analyses of naphthas, gasolines, and similar samples, according to ASTM Test Method D5134.

Phase: bonded; poly(dimethylsiloxane)
Temp. Limits: -60°C to 320°C

LENGTH (m)	D_f (µm)	BETA	CAT. NO.	PRICE
0.20mm ID Fused Silica				
50	0.50	100	**24133-U**	

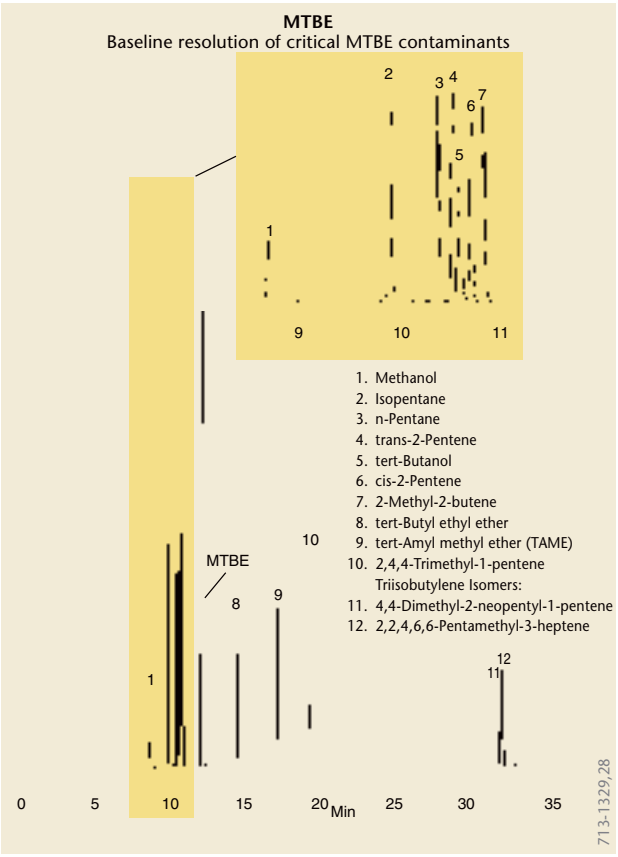


Column: **Petrocol DH 150, 150m x 0.25mm ID, 1.0µm film**
Cat. No.: **24155**
Oven: -20°C (30min) to 75°C at 5°C/min

Hydrocarbons: Petrocol DH 150

For detailed hydrocarbons analyses - The longest capillary column commercially available as a stock item. Columns typically display more than 600,000 theoretical plates. For detailed purity analyses of light hydrocarbon gases and petroleum products (oxygenates, solvents, naphthas, gasolines, etc.).

LENGTH (m)	D_f (µm)	BETA	CAT. NO.	PRICE
0.25mm ID Fused Silica				
150	1.0	63	**24155**	



Column: **Petrocol DH, 100m x 0.25mm ID, 0.50µm film**
Cat. No.: **24160-U**
Oven: 50°C (13 min) to 180°C at 10°C/min
Carrier: helium, 20cm/sec; vent flow 140mL/min (set at 35°C)
Det.: FID (310°C)
Inj.: 1µL MTBE containing 1% each analyte (MTBE Contaminants Mix A, Cat. No. 47942) split (200:1) (250°C)

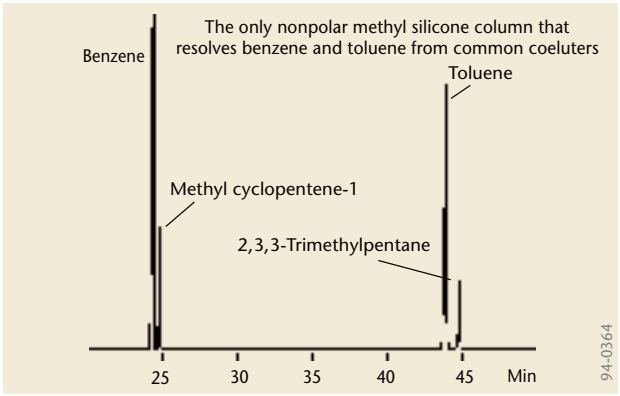
Hydrocarbons: Petrocol DH

For PNA, PONA, PIANO-type analyses - A highly reproducible column displaying more than 400,000 theoretical plates, designed for detailed analyses of petroleum products. Includes an extensive retention index data sheet of 400+ analytes.

Phase: bonded; poly(dimethylsiloxane)
Temp. Limits: -60°C to 320°C

LENGTH (m)	D_f (µm)	BETA	CAT. NO.	PRICE
0.25mm ID Fused Silica				
100	0.50	125	**24160-U**	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



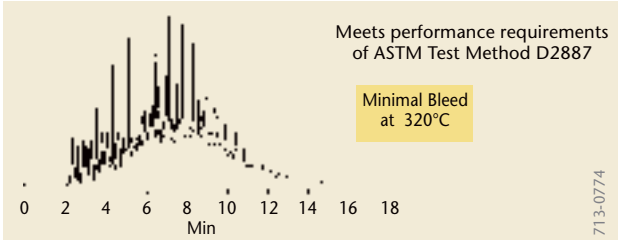
Column: **Petrocol DH Octyl, 100m x 0.25mm ID, 0.5µm film**
Cat. No.: **24282**
Oven: 35°C (15min hold) to 200°C (15min hold)at 1°C/min
Det.: FID, 260°C
Inj.: 1µL, split (215:1), 250°C

Hydrocarbons: Petrocol DH Octyl

For detailed analyses of petroleum products - This highly reproducible column offers unique selectivity not obtainable with poly(dimethylsiloxane) columns, such as baseline separations of benzene/1-methylcyclopentene and toluene/2,3,3-trimethylpentane.

Phase: bonded; poly(50% n-octyl/50% methylsiloxane)
Temp. Limits: -60°C to 220°C

LENGTH (m)	D_f (µm)	BETA	CAT. NO.	PRICE
0.25mm ID Fused Silica				
100	0.50	125	**24282**	



Column: **Petrocol 2887, 5m x 0.53mm ID, 5.0µm film**
Cat. No.: **25323**
Oven: -20°C to 320°C at 20°C/min, hold 5 min
Carrier: nitrogen, 6mL/min
Det.: FID
Inj.: 0.1µL Cat. No. 48873, direct (350°C)

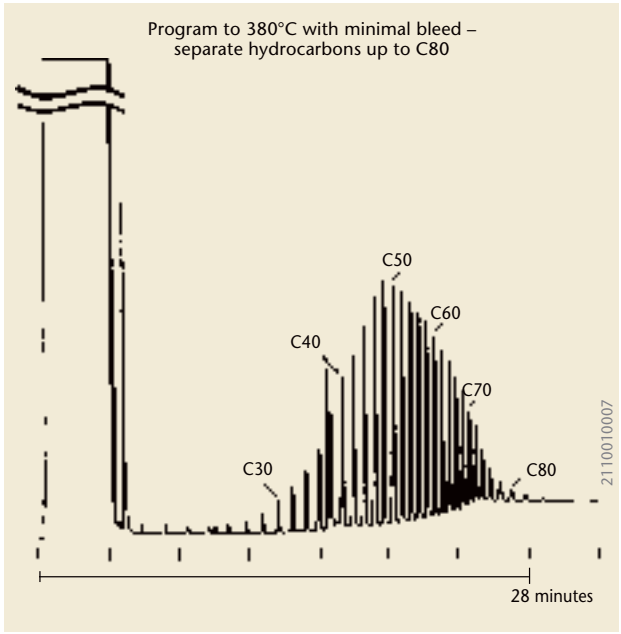
SIMDIS: Petrocol 2887

For ASTM Test Method D2887 - Developed and tested to meet or exceed column performance requirements for simulated distillation of petroleum fractions having boiling points up to 1000°F, according to ASTM Test Method D2887.

Phase: bonded; poly(dimethylsiloxane)
Temp. Limits: subambient to 350°C

LENGTH (m)	D_f (µm)	BETA	CAT. NO.	PRICE
0.53mm ID Fused Silica				
5[1]	0.50	265	**25323**	

[1] 5" cage



Column: **Petrocol EX2887, 5m x 0.53mm ID, 0.10µm film**
Cat. No.: **25337**
Oven: 50°C (3min) to 380°C at 15°C/min
Carrier: helium, 5mL/min
Det.: FID, 400°C
Inj.: 0.2µL (10mg/mL Polywax 655 in p-xylene), cool on-column injection

SIMDIS: Petrocol EX2887

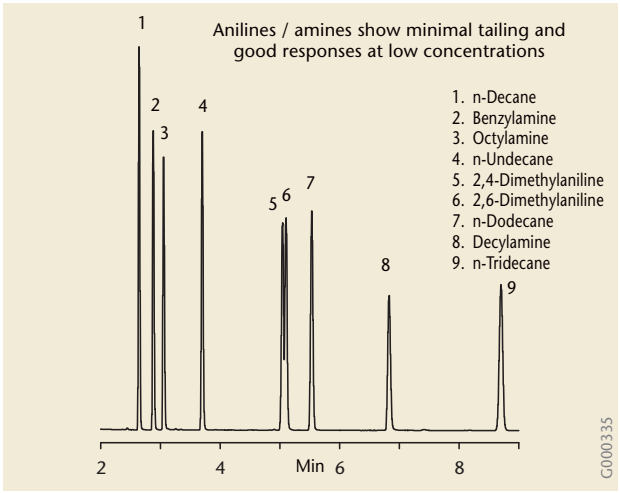
For extended ASTM Test Method D2887 - A thin film version of the Petrocol 2887 column, developed for extended D2887 SIMDIS analysis of samples having final boiling points greater than 1000°F.

Phase: bonded; poly(dimethylsiloxane)
Temp. Limits: subambient to 380°C

LENGTH (m)	D_f (µm)	BETA	CAT. NO.	PRICE
0.53mm ID Fused Silica				
5	0.10	1325	**25337**	

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Gas Chromatography
SUPELCO

Capillary GC
Special Purpose Columns (Amines, Aromatics)



Column: **PTA-5, 30m x 0.25mm ID, 0.5µm film**
Cat. No.: **24277**
Oven: 128°C
Carrier: helium, 40cm/sec
Det.: FID, 220°C
Inj.: 1µL PTA-5 Test Mix (500µg/mL each analyte in methyl tert butyl ether), split (100:1), 220°C

Amines: PTA-5

This column is a specially prepared, base-deactivated poly(5% diphenyl/95% dimethylsiloxane) column designed for analyses of amines and other basic analytes.

Phase: bonded; base-modified poly(5% diphenyl/95% dimethylsiloxane)
Temp. Limits: -60°C to 320°C

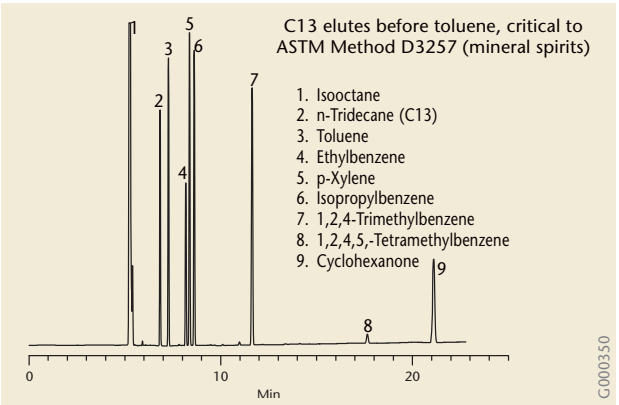
LENGTH (m)	D_F (µm)	BETA	CAT. NO.	PRICE
0.25mm ID Fused Silica				
30	0.50	125	**24277**	
30	1.0	625	**24330**	
0.32mm ID Fused Silica				
30	0.5	160	**24331**	
30	1.0	80	**24332**	
30	1.5	53	**24333**	
0.53mm ID Fused Silica				
30	0.5	265	**25437**	
30	1.5	88	**25438**	
30	3.0	44	**25439**	

Amines: Carbowax Amine

For primary, secondary, and tertiary amines - The Carbowax Amine column is a specially prepared, base-deactivated polyethylene glycol column designed for the analysis of primary, secondary, and tertiary amines and other volatile basic analytes.

Phase: nonbonded; base-modified poly(ethylene glycol)
Temp. Limits: 60°C to 200°C

LENGTH (m)	D_F (µm)	BETA	CAT. NO.	PRICE
0.53mm ID Fused Silica				
15	1.0	133	**25352**	
30	1.0	133	**25353**	
60	1.0	133	**25354**	



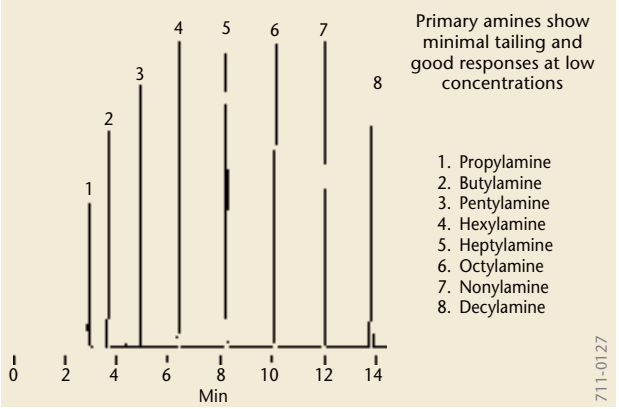
Column: **TCEP, 60m x 0.25mm ID, 0.44µm film**
Cat. No.: **24153**
Oven: 110°C
Carrier: helium, 20cm/sec
Det.: FID, 170°C
Inj.: 1µL TCEP test mix, split (100:1), 170°C

Aromatics: TCEP

This highly polar phase offers unique polarity for certain separations, despite its relatively low temperature limit and the fact that it is not a bonded phase. Because many aromatic compounds have retention indices greater than 1100 on TCEP, it is used for analyses of aromatics in mineral spirits and impurities in individual aromatics and oxygenates.

Phase: nonbonded; 1,2,3-tris-2-cyano-ethoxypropane
Temp. Limits: subambient to 145°C
McReynolds Nos.: x′ y′ z′ u′ s′ = 594 857 759 1031 917

LENGTH (m)	D_F (µm)	BETA	CAT. NO.	PRICE
0.25mm ID Fused Silica				
60	0.44	142	**24153**	
0.32mm ID Fused Silica				
60	0.51	157	**24161**	



Column: **Carbowax Amine, 30m x 0.53mm ID, 1.0µm film**
Cat. No.: **25353**
Oven: 50°C to 200°C at 8°C/min, hold 10 min
Carrier: helium, 20cm/sec (set at 170°C)
Det.: FID, 220°C
Inj.: 0.02µL neat amines mix, split (100:1), 220°C

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SPB-1

Nonpolar methylsilicone columns that separate sample components according to boiling point. This bonded polymer matches the polarity of its nonbonded predecessors, SE-30 and SP-2100. The SPB-1 phase is used in many of our Petrocol specialty columns.

This column meets USP G1, G2 and G9 requirements.

Operating Conditions: Chemically compatible with water and other injection solvents. Sensitive to strong inorganic acids and bases. Columns can be rinsed.

Phase: bonded; poly(dimethylsiloxane)
Temp. Limits: -60°C to 320°C
McReynolds Nos.: x' y' z' u' s' = 4 58 43 56 38

LENGTH (m)	D_f (µm)	BETA	CAT. NO.	PRICE
0.10mm ID FUSED SILICA				
15	0.10	250	24338	
0.20mm ID FUSED SILICA				
15	0.20	250	24162	
30	0.20	250	24163	
12	0.33	152	24229-U	
25	0.33	152	24230-U	
0.25mm ID FUSED SILICA				
30	0.10	625	24261	
15	0.25	250	24026	
30	0.25	250	24028	
60	0.25	250	24030-U	
100	0.25	250	24198	
15	1.0	63	24027	
30	1.0	63	24029	
60	1.0	63	24031	
100	1.0	63	24220-U	
0.32mm ID FUSED SILICA				
30	0.10	800	24290	
15	0.25	320	24099	
30	0.25	320	24044	
60	0.25	320	24046	
100	0.25	320	24228-U	
15	1.0	80	24098-U	
30	1.0	80	24045-U	
60	1.0	80	24047	
100	1.0	80	24213-U	
30	2.0	40	24215-U	
60	2.0	40	24216-U	
30	5.0	16	24296	
60	5.0	16	24297	
0.53mm ID FUSED SILICA				
15	0.10	1325	25360	
30	0.10	1325	25361	
15	0.50	265	25314	
30	0.50	265	25315	
60	0.50	265	25382	
15	1.0	133	25416	
30	1.0	133	25417	
15	1.5	88	25302-U	
30	1.5	88	25303	
60	1.5	88	25388	
15	3.0	44	25340	
30	3.0	44	25341-U	
60	3.0	44	25348	
15	5.0	27	25344	
30	5.0	27	25345-U	
60	5.0	27	25349	

SPB-5

The low phenyl content, 5%, improves thermal stability of the phase, while still providing essentially a boiling point elution order, and a slight increase in selectivity, especially for aromatic compounds.

This column meets USP G27 and G36 requirements.

Operating Conditions: Chemically compatible with water and other injection solvents. Sensitive to strong inorganic acids and bases. Columns can be rinsed.

Phase: bonded; poly(5% diphenyl/ 95% dimethylsiloxane)
Temp. Limits: -60°C to 320°C
McReynolds Nos.: x' y' z' u' s' = 19 74 64 93 62

LENGTH (m)	D_f (µm)	BETA	CAT. NO.	PRICE
0.10mm ID FUSED SILICA				
15	0.10	250	24341	
0.20mm ID FUSED SILICA				
15	0.20	250	24165-U	
30	0.20	250	24166	
60	0.20	250	24167	
12	0.33	152	24234-U	
0.25mm ID FUSED SILICA				
15	0.25	250	24032	
30	0.25	250	24034	
60	0.25	250	24036	
15	1.0	63	24033	
30	1.0	63	24035	
60	1.0	63	24037	
0.32mm ID FUSED SILICA				
15	0.25	320	24101-U	
30	0.25	320	24048	
60	0.25	320	24050	
30	0.50	160	24360	
15	1.0	80	24100-U	
30	1.0	80	24049	
60	1.0	80	24051	
0.53mm ID FUSED SILICA				
15	0.50	265	25316	
30	0.50	265	25317	
60	0.50	265	25383	
30	1.0	133	25420-U	
15	1.5	88	25304	
30	1.5	88	25305-U	
60	1.5	88	25389	
15	3.0	44	25342	
30	3.0	44	25343	
60	3.0	44	25350	
15	5.0	27	25346	
30	5.0	27	25347	
60	5.0	27	25351	

SE-30 and SE-54

The SE-54 column meets USP G36 requirements.

LENGTH (m)	D_f (µm)	BETA	CAT. NO.	PRICE
SE-30, 0.25mm ID FUSED SILICA				
30	0.25	250	24004-U	
SE-54, 0.25mm ID FUSED SILICA				
30	0.25	250	24001	

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Capillary GC
Other Columns

PTE-5/QTM - meets or exceeds performance specifications of US EPA Methods 625, 1625, 8270, and QTM protocols. Low bleed, recommended for use with GC/MS systems.

Phase: bonded; poly(5% diphenyl/95% dimethylsiloxane)
Temp. Limits: -60°C to 320°C
McReynolds Nos.: x' y' z' u' s' = 19 74 64 93 62

LENGTH (m)	D_f (µm)	BETA	CAT. NO.	PRICE
PTE-5				
0.25mm ID Fused Silica				
30	0.25	250	24135-U	
0.32mm ID Fused Silica				
30	0.25	320	24143	
30	0.32	250	24214	
30	1.0	80	24159	
PTE-5 QTM				
0.53mm ID Fused Silica				
15	0.50	265	25355	

MDN-1 - Nonpolar methylsilicone column that separates analytes according to boiling point. The bonded polymer matches the polarity of nonbonded phases SE-30 and SP-2100, and of bonded phase SPB-1.

Phase: bonded; poly(dimethylsiloxane)
Temp. Limits: -60°C to 320°C
Similar Phases: SPB-1, DB-1, ULTRA-1, RTx-1, CP-SIL-5CB

LENGTH (m)	D_f (µm)	BETA	CAT. NO.	PRICE
0.25mm ID Fused Silica				
30	0.25	250	24258	
30	1.0	63	24259	
0.32mm ID Fused Silica				
30	0.25	320	24299	
30	1.0	80	24300-U	

MDN-5 - The low phenyl content (5%) improves the thermal stability of the phase, while still providing essentially a boiling point elution order, and a slight increase in selectivity, especially for aromatic compounds.

Phase: bonded; poly(5% diphenyl/95% dimethylsiloxane)
Temp. Limits: -60°C to 320°C
Similar Phases: DB-5MS, HP-5MS, PTE-5, XTI-5

LENGTH (m)	D_f (µm)	BETA	CAT. NO.	PRICE
0.25mm ID Fused Silica				
30	0.25	250	24096	
0.32mm ID Fused Silica				
30	0.25	320	24097	
30	0.32	250	24203	
30	1.0	80	24204-U	

MDN-5S - These nonpolar columns feature very low bleed, and excellent inertness for active compounds. High sensitivity and integrity due to a better signal-to-noise ratio.

Phase: bonded and crosslinked; (5% phenyl) methylpolysiloxane
Temp. Limits: 0.25 and 0.32mm ID: -60°C to 325/350°C
0.53mm ID: -60°C to 300/320°C
Similar Phases: DB-5MS, HP-5MS, PTE-5, RTx-5MS, ULTRA-2

LENGTH (m)	D_f (µm)	BETA	CAT. NO.	PRICE
0.25mm ID Fused Silica				
30	0.10	625	24378	
15	0.25	250	24377-U	
30	0.25	250	24384	
60	0.25	250	24392	
30	0.50	125	24379	
30	1.0	63	24385-U	
0.32mm ID Fused Silica				
30	0.25	320	24386	
60	0.25	320	24394	
30	0.50	160	24393	
30	1.0	80	24387-U	
0.53mm ID Fused Silica				
30	1.5	88	25474	

MDN-12 - Low polarity and unique selectivity make these columns ideal for confirmational analyses and for separating active compounds, pesticides, herbicides, PCBs, and PAHs.

Phase: bonded and crosslinked; proprietary
Temp. Limits: 30°C to 340/360°C
Similar Phase: DB-XLB

LENGTH (m)	D_f (µm)	BETA	CAT. NO.	PRICE
0.25mm ID Fused Silica				
30	0.25	250	24388	
60	0.25	250	24396	
0.32mm ID Fused Silica				
30	0.25	320	24390-U	
60	0.25	320	24398	
30	1.0	80	24391	

MDN-35 - These low polarity columns have exceptional inertness for active compounds. They are ideal for confirmational analyses.

Phase: bonded and crosslinked; (35% phenyl) methylpolysiloxane
Temp. Limits: 50°C to 340/360°C
Similar Phases: AT-35, DB-35MS, RTx-35, SPB-35

LENGTH (m)	D_f (µm)	BETA	CAT. NO.	PRICE
0.25mm ID Fused Silica				
30	0.25	250	24382-U	
0.32mm ID Fused Silica				
30	0.25	320	24383-U	

Operating Conditions For All Columns On This PageChemically compatible with water and other injection solvents. Sensitive to strong inorganic acids and bases. Columns can be rinsed.

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General Purpose Column Equivalency (Listed in order of increasing Phase Polarity)

	AGILENT / J&W	ALLTECH	CHROMPACK	MACHERY-NAGEL	QUADREX	RESTEK	SGE	PACKED COLUMN EQUIVALENT
SPB-Octyl	—	—	—	—	—	—	—	Squalane
Equity-1 / SPB-1	HP-1 / DB-1	AT-1000	CP-Sil5CB	Optima 1	007-1	RTx-1	BP-1	SE-30, SP-2100
Equity-5 / SPB-5	HP-5, HP-Ultra 2 / DB-5	AT-5	CP-Sil 8CB	Optima 5	007-2	RTx-5	BP-5	SE-54, SE-52, OV-73
SPB-20	—	AT-20	—	—	007-20	RTx-20	—	OV-7
SPB-1701	HP-1701 / DB-1701	AT-1701	CP-Sil19CB	Optima 1701	007-1701	RTx-1701	BP-10	OV-1701
SPB-35	HP-35 / DB-35	AT-35	—	—	007-11	RTx-35	BPX-35	OV-11
SP-2250	HP-50, HP-17 / DB-17	AT-50	CP-Sil 24CB	Optima 17	007-17	RTx-50	—	OV-17
SPB-17	HP-50, HP-17 / DB-17	AT-50	CP-Sil 24CB	Optima 17	007-17	RTx-50	—	OV-17, SP-2250
SPB-50	HP-50 / DB-17	AT-50	CP-Sil 24CB	—	—	RTx-50	—	OV-17, SP-2250
PAG	—	—	—	—	—	—	—	Pluronics F68
SUPELCOWAX 10	HP-Wax, HP-INNOWax / DB-WAX, DB-WAXetr	AT-Wax	CP-Wax 52CB	Permabond CW 20M	007-CW	Stabilwax	BP-20	Carbowax 20M
SPB-1000	HP-FFAP / DB-FFAP	AT-1000	CP-Wax 58CB	Permabond FFAP	007-FFAP	Stabilwax-DA	BP-21	SP-1000, OV-351
Nukol	HP-FFAP / DB-FFAP	— / AT-1000	— / CP-Wax 58CB	— / Permabond FFAP	— / 007-FFAP	— / Stabilwax-DA	— / BP-21	— / SP-1000, OV-351
SPB-225	HP-225 / DB-225	AT-225	CP-Sil 43CB	Optima 225	007-225	RTx-225	BP-225	OV-225
SP-2330	DB-23	AT-Silar	CP-Sil 84	—	007-23	RTx-2330	BPX-70	SP-2330
SP-2380	HP-23 / DB-23	—	CP-Sil 88	—	—	RTx-2330	—	—
SP-2340	—	—	CP-Sil 88	—	—	RTx-2330	—	SP-2340

Specially Tested Column Equivalency

	AGILENT / J&W	ALLTECH	CHROMPACK	MACHERY-NAGEL	QUADREX	RESTEK	SGE
Chiral							
α-DEX	—	—	—	LIPODEX A	—	—	—
ß-DEX	HP Chiral / Cyclodex-B	Chiraldex-B	CP-Chirasil DEX CB	HYDRODEX	—	RT-ßDEX	Cydex B
γ-DEX 120	—	—	—	LIPODEX E	—	RT-γDEX	—
Environmental							
Equity-5 / PTE-5	HP-5MS	AT-5	CP-Sil 8CB	Permabond SE-54-HKW	007-2	XTI-5	BPX-5
SP-2331	DB-Dioxin	—	—	—	—	—	—
SPB-608	HP-608 / DB-608	AT-Pesticides			007-608		BP608
SPB-624	HP-624 / DB-624, DB-VRX	AT-624	CP-Sil 13CB	Optima 624	007-624	RTx-624	BP624
SPB-HAP	—	—	—	—	—	—	—
Sup-Herb	—	—	—	—	—	—	—
VOCOL	HP-VOC / DB-502.2	—	—	—	—	RTx-502.2	—
GC/MS							
Equity-1 / MDN 1	HP-1MS	—	CP-Sil 1CB MS	Optima 1MS	—	—	—
Equity-5 / MDN-5	HP-5MS	—	CP-Sil 8CB MS	Optima 5MS	—	—	BPX5
Equity-5 / MDN-5S	HP-5TA / DB-5MS, DB-625	—	—	—	—	RTx-5Sil MS	—
Food & Beverage / Fatty Acids							
Omegawax	—	—	—	—	—	Famewax	—
SAC-5	—	—	—	—	—	—	—
SP-2380	HP-23 / DB-23	—	CP-Sil 88	—	—	RTx-2330	—
SP-2560	—	—	—	—	—	—	—
SPB-PUFA	—	—	—	—	—	—	—
Petroleum / Industrial Chemical							
Carbowax Amine	HP-BasicWax/ DB-CAM	—	CP-Wax 51	FS-CW 20 M-AM	—	Stabilwax-DB	—
Carboxen-1006 PLOT	—	—	—	—	—	—	—
Carboxen-1010 PLOT	—	—	—	—	—	—	—
Mol Sieve 5A PLOT	HP-PLOT MoleSieve / GS-Molesieve	—	CP-MoleSieve 5A	—	—	RT-MoleSieve 13X	—
Petrocol 2887	DB-2887	—	CP-SimDist CB	—	007-1-10V-1.0F	RTx-2887	—
Petrocol DH	DB-Petro 100	AT-Petro	CP-Sil PONA	Permabond P-100	—	RTx1-PONA	BP-1 PONA
Petrocol DH 150	—	—	—	—	—	—	—
Petrocol DH 50.2	HP-PONA	—	Squalane	—	007-1-50-0.5F	—	BP-1 PONA
Petrocol DH Octyl	—	—	—	—	—	—	—
Petrocol EX2887	DB-2887	—	CP-SimDist CB	—	007-1-10V-1.0F	—	—
PTA-5	—	—	—	Optima-5 Amine	—	RTx-5 Amine	—
SCOT							
SPB-1 Sulfur	—	AT-Sulfur	—	—	—	—	—
Supel-Q PLOT	HP-PLOT Q / GS-Q	—	PoraPLOT Q	—	—	RT-Q PLOT	—
TCEP			TCEP			RTx-TCEP	
Pharmaceutical							
OVI-G43	HP-624 / DB-624	AT-624	—	—	007-624	RTx-624	BP624

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Gas Chromatography

SUPELCO

Capillary GC
Custom Columns

Custom Capillary GC Columns

The information below provides a general overview of the Supelco custom capillary GC capabilities. Supelco manufactures all custom capillary GC columns using our ISO 9001-registered processes to achieve the performance and reproducibility you expect. Custom capillary GC columns are tested for k' and coating efficiency.

To order your custom column, call and provide us with the phase, film thickness, ID, length, and any additional details or special needs.

Custom Fused Silica Capillary Columns

PHASES AVAILABLE*		
Carbowax Amine	SE-30	SPB-35
Equity-1	SE-54	SPB-225
Equity-5	SP-2100	SPB-608
Nukol	SP-2250	SPB-624
Omegawax	SP-2330	SPB-1000
OS-138	SP-2331	SPB-1701
OV-1	SP-2340	SPB-Octyl
OV-1701	SP-2380	SPB-PUFA
OVI-G43	SPB-1	SUPELCOWAX 10
PAG	SPB-1 Sulfur	TCEP
PTA-5	SPB-5	VOCOL
PTE-5	SPB-20	
SAC-5	SPB-50	

DIMENSIONS AVAILABLE

Inside diameter: Available in 0.10mm, 0.20mm, 0.25mm, 0.32mm, 0.53mm, and 0.75mm sizes.
Film thickness: Varies from 0.05µm to 7.0µm. Actual film thickness will depend on the phase and column ID selected.
Column length: Varies from 1m to 100m. Actual lengths will depend on the column ID selected and cage style selected.
Cage: The 0.10mm to 0.25mm ID columns are placed on our standard 6"/15cm cage. All others are placed on our standard 8"/20cm cage. The smaller HP6850 column cage is also available upon request.

Custom PLOT Capillary Columns

PHASES AVAILABLE*		
Carboxen 1006	Alumina KCl	G-45
Carboxen 1010	Alumina Sodium Sulfate	HayeSep N
Mol Sieve 5A	Tenax	HayeSep R
Supel-Q		

DIMENSIONS AVAILABLE

Inside diameter: Available in 0.32mm & 0.53mm sizes.
Column length: Varies from 1m to 60m.

Custom SCOT Capillary Columns

PHASES AVAILABLE*		
Bentone 34	MBMA	TCEP
BMEA	Squalene	UCON LB-550-X
DEGS		

DIMENSIONS AVAILABLE

Inside diameter: Available in .020 inch (.50mm) size.
Column length: Varies from 1 foot to 100 feet.

* Additional phases may be available. Please inquire if you require a phase not listed.

Supelco Capillary Columns for Agilent 6850 (HP6850)

Now, any Supelco capillary GC column can be made compatible with your Agilent/HP 6850 instrument by simply specifying code "PRO100060" when you order.

Until now, transferring your lab method to the Agilent/HP 6850 GC meant specifying different column part numbers because of the different size of the 6850 column cage. This meant risking a method change because you changed the purchasing information. This is no longer necessary.

- No method headaches – your Supelco capillary will fit perfectly in your 6850 instrument.
- No new part numbers to remember – just specify "PRO100060" when you order any Supelco capillary.
- No delay – columns are shipped within 24 hours.

If you are changing a lab method to a 6850, you can continue to use the same Supelco capillary column and ordering information. To order any Supelco capillary column on a 6850 cage, simply ask for order code PRO100060, and then provide the Supelco column ordering information already in your method.

Upon receipt of your order, we will coil the stock or custom Supelco capillary column on an authentic Agilent Technologies 6850 GC cage and ship it within 24 hours. Transferring column ordering information from lab to 6850 methods has never been easier!

DESCRIPTION	CAT. NO.	PRICE
Supelco capillary in an Agilent/HP 6850 column cage	PRO100060	No extra charge!



Fused Silica Tubing

Use as transfer lines, guard columns, or retention gaps, or to make your own columns.

Tubing can be coupled through fused silica or glass GlasSeal connectors. If necessary, use polyimide glue to provide a permanent seal. These products are listed in the index.



TUBING TREATMENT	APPLICATION	MAX. TEMP
Untreated	General purposes, where high inertness is not necessary	360°C
Nonpolar (methyl)	Low polarity solvents (e.g., alkanes, carbon disulfide, ethers)	360°C
Intermediate Polarity (phenyl/methyl)	Intermediate polarity solvents (e.g., acetone, methylene chloride, toluene)	360°C
Polar (PEG)	Polar solvents (e.g., acetonitrile, methanol, water)	260°C

	UNTREATED		DEACTIVATED TUBING NONPOLAR		DEACTIVATED TUBING INTERMEDIATE POLARITY		DEACTIVATED TUBING POLAR	
ID (mm)	CAT. NO.	PRICE	CAT. NO.	PRICE	CAT. NO.	PRICE	CAT. NO.	PRICE
3 x 1-meter lengths								
0.10	25700-U		25704		25705		25710	
0.20	—	—	—	—	25706		—	—
0.25	24024		24025		25707		25712	
0.32	25702		24058		25708		—	—
0.53	25703		25307		25709		25714	
3-meter length								
0.10	25715		25720-U		—	—	—	—
0.20	—	—	—	—	25726		—	—
0.25	25717		25722		25727		—	—
0.32	25718		25723		25728		—	—
0.53	25719		25724		25729		25734	
5-meter length								
0.10	25735		25740-U		25745-U		—	—
0.20	—	—	25741		25746		—	—
0.25	25737		25742		25747		—	—
0.32	25738		25743		25748-U		25752-U	
0.53	25739		25744		25339[1]		25753	
15-meter length								
0.20	—	—	25755		—	—	25763	
0.25	24059		25756		25760-U		—	—
0.32	24062		25757		25761		25765	
0.53	25306		25758		25762		25766	
30-meter length								
0.20	25767		25768-U		25772		—	—
0.25	—	—	25769-U		—	—	25777	
0.32	24063		25770-U		25774		25778	
0.53	25308		25771		25775-U		25779	
60-meter length								
0.20	—	—	—	—	25786		—	—
0.25	24061		25783		25787		—	—
0.32	24064		25784		25788-U		25792	
0.53	25781		25785		25789		—	—

[1] Deactivated according to USP 467.

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Gas Chromatography

SUPELCO



Capillary GC
Test Mixes for Capillary Columns

Column Test Mixes

After you install a column in your system, use a test mix to make sure you haven't also installed some surprises, such as broken fragments in the column, or small leaks. Weekly tests thereafter will keep little problems from growing into big problems. Test mixes are an inexpensive aid to obtaining high quality chromatograms.

Acidity Test Mix

Even a highly efficient column can adsorb acidic or basic compounds. To determine the acid/base affinity of your column, simply inject this mix and compare peak heights (Grob & Grob, Chromatographia 4, 421, 1971). Instructions included. 0.05% each component in methylene chloride.

2,6-Dimethylaniline 2,6-Dimethylphenol

DESCRIPTION	QTY.	CAT. NO.	PRICE
Acidity Test Mix	2mL	48255-U	

Hydrocarbon Test Mix

An ideal mix for checking column installation when you use a capillary column in a modified packed column system. Also used to determine theoretical plates. C12-C17 hydrocarbons, 500-2000µg/mL in chloroform.

DESCRIPTION	QTY.	CAT. NO.	PRICE
Hydrocarbon Test Mix	2mL	48244	

Isothermal Test Mixes

Use these mixes to indicate column efficiency, leaks, dead volume, and sample adsorption. Each mix includes simple, detailed instructions.

Isothermal Test Mix Kit - 2mL each of the three isothermal test mixes described below.

Nonpolar Column Test Mix - For all nonpolar phases. 500µg/mL each component in methylene chloride.

2-Octanone
Decane (C10)
1-Octanol
2,6-Dimethylphenol
Undecane (C11)
2,6-Dimethylaniline
Dodecane (C12)
Tri decane (C13)

Intermediate Polarity Column Test Mix- For SPB-20, SPB-35, and other intermediate polarity phases. 500µg/mL each component in methylene chloride.

Decane (C10)
2-Octanone
Undecane (C11)
1-Octanol
Dodecane (C12)
2,6-Dimethylphenol
Tridecane (C13)
2,6-Dimethylaniline
Tetradecane (C14)

Polar Column Test Mix - For SUPELCOWAX 10, SP-1000, and other polar phases. 500µg/mL each component in methylene chloride.

2-Octanone
Pentadecane (C15)
1-Octanol
Hexadecane (C16)
Heptadecane (C17)
Octadecane (C18)
2,6-Dimethylaniline
2,6-Dimethylphenol
Eicosane (C20)

DESCRIPTION	QTY.	CAT. NO.	PRICE
Isothermal Test Mix Kit	3x3mL	47303	
Nonpolar Column Test Mix	2mL	47300-U	
Intermediate Polarity Column Test Mix	2mL	47301	
Polar Column Test Mix	2mL	47302	

Methane Standard

Use 40µL injections of this dilute methane standard (100ppm in helium) for more accurate flow measurements than with smaller quantities of more concentrated methane. Use with the methane syringe, syringe adapter, and pressure regulator listed. Disposable cylinder.

DESCRIPTION	QTY.	CAT. NO.	PRICE
100ppm in helium	14L	307200	
Accessories for Methane Standard			
Hamilton 1725N Syringe		20705	
Syringe Adapter		609010	
Pressure Regulator		513010	

Programmed Test Mix

This mix is for a sensitive, temperature programmed analysis (Grob, et al.,J. Chromatogr. 156: 1, 1978) that tests a column's affinity for many compounds. Prepared at concentrations convenient for setting split ratios and sample sizes. In use, on-column quantities are those recommended by Grob, et al. Each component at quantity indicated, in methylene chloride.

2,3-Butanediol	530µg/mL
Decane	280µg/mL
1-Octanol	360µg/mL
2,6-Dimethyl phenol	320µg/mL
Nonanal	400µg/mL
Undecane	290µg/mL
2-Ethylhexanoic acid	380µg/mL
2,6-Dimethylan iline	320µg/mL
C10 acid methyl ester	420µg/mL
Dicyclohexylamine	310µg/mL
C11 acid methyl ester	420µg/mL
C12 acid methyl ester	410µg/mL

DESCRIPTION	QTY.	CAT. NO.	PRICE
Programmed Test Mix	2mL	47304	

Test Mixes for Specific Phases

For popular Supelco capillary columns. Each mix contains active components and inactive hydrocarbons.

COLUMN TEST MIX	COMPOSITION	QTY.	CAT. NO.	PRICE
Carbowax Amine	500µg/mL each component in methyl tert-butyl ether. n-Octylamine, n-Nonylamine, n-Pentadecane (C15), n-Decylamine, n-Hexadecane (C16), n-Benzylamine, n-Heptadecane (C17), Tri-n-hexylamine, n-Octadecane (C18), 2,6-Dimethylaniline, 2,4-Dimethylaniline, n-Eicosane (C20)	1mL	48278	
α-DEX 120	500µg/mL each component in methylene chloride Nonane (C9), p-Xylene, m-Xylene, Decane (C10), (+)-1,2-Propanediol[1], (-)-1,2-Propanediol[1], Undecane (C11)	1mL	48013	
β-DEX 120	500µg/mL each component in methylene chloride Nonane (C9), (±)-3,3-Dimethyl-2-butanol, Decane (C10), (±)-3-Methyl-2-heptanone, 1-Hexanol, Undecane (C11)	1mL	48028	
OMEGAWAX TEST MIXES				
Omegawax[2]	Approximately 50mg FAMEs/mL in hexane	1mL	48476	
Menhaden Oil[2]	Approximately 100mg FAMEs/mL in hexane	1mL	48473	
PETROCOL TEST MIXES				
Petrocol DH	Each hydrocarbon (v/v) in cyclohexane n-Hexane, 1%, Benzene, 1%, n-Heptane,1%, Toluene, 1%, n-Octane, 1%, m-Xylene, 4%, p-Xylene, 2%, n-Nonane, 1%	1mL	48872	
Petrocol D2887	1% each component in n-octane n-Hexadecane, n-Octadecane	6 x 1mL	48889	
EQUITY/SPB TEST MIXES				
Equity/SPB Thin Film For 0.10µm film Equity/SPB columns	500µg/mL each component in cyclohexane n-Octadecane (C18), Cetyl alcohol, n-Nonadecane (C19), n-Eicosane (C20)	1mL	48273	
Equity/SPB Thick Film For 3µm and 5µm film Equity/SPB columns	500µg/mL each component in methylene chloride n-Nonane (C9), 2-Octanone, n-Decane (C10), 1-Octanol, 2,6-Dimethylphenol, 2,6-Dimethylaniline, n-Dodecane (C12), n-Tridecane (C13)	1mL	48275-U	
SPB-50	500µg/mL each component in methylene chloride n-Decane (C10), n-Undecane (C11), 2-Octanone, 1-Octanol, n-Dodecane (C12), n-Tridecane (C13), 2,6-Dimethylphenol, 2,6-Dimethylaniline, n-Pentadecane (C15)	1mL	48280-U	
SUP-HERB COLUMN TEST MIXES				
Herbicides Mix 1	100µg/mL each component in ethyl acetate Eptam, Sutan, Tillam (Pebulate), Ordram (Molinate), Ro-Neet (Cycloate), Treflan (Trifluralin), Atrazine, Terbacil, Sencor, Bromacil, Paarlan (Isopropalin), GOAL (Oxyfluorfen), Velpar (Hexazinone)	1mL	49136	
Herbicides Mix 2	100µg/mL each component in ethyl acetate Vernam, Propachlor, Balan, Simazine, Propazine, Tolban (Profluralin), Dual, Prowl, Oxadiazon	1mL	49138-U	

[1] Total concentration 1000µg/mL for the two isomers.

[2] The Omegawax Column Test Mix and the Menhaden Oil standard are based on naturally occurring mixtures of fatty acids –relative p eak sizes may vary from lot to lot.

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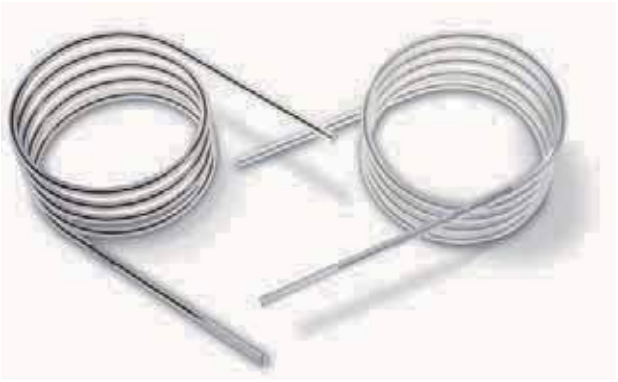


Packed Columns

Agilent Technologies Cross Reference

SUPELCO

Now the Authorized Supplier
of all Packed GC Columns for
Agilent Technologies



Agilent Technologies has made a decision to exit the packed GC column business. In an effort to maintain a continuous supply of product to their customers, Agilent Technologies has named Supelco the authorized supplier of packed GC columns for Agilent Technologies and Agilent Technologies customers.

For your convenience, you may reference an Agilent Technologies part number with your first order. In most cases, your Sigma-Al Supelco representative will provide you with a corresponding Supelco part number for future orders.

- All glass columns will fit Agilent/HP 5880, 5890, 5987 and 6890 GCs of configuration A, on-column injection, all detectors exce TCD.
- All stainless steel columns are general configuration. You can carefully bend to fit most GCs.

AGILENT CROSS	PACKING DESCRIPTION	TYPE	LENGTH	OD	ID	CAT. NO.	PRIC
19001A-101	80/100 Chromosorb 101	SS	6 ft	1/8“	2.1mm	12712	
19001A-102	80/100 Chromosorb 102	SS	6 ft	1/8“	2.1mm	13794	
19001A-103	80/100 Chromosorb 103	SS	6 ft	1/8“	2.1mm	13104-U	
19001A-A01	80/100 HayeSep A	SS	6 ft	1/8“	2.1mm	13105-U	
19001A-A11	10% OV-1 on 80/100 Chromosorb W HP	SS	6 ft	1/8“	2.1mm	13106-U	
19001A-A52	5% OV-1 on 100/120 Chromosorb W HP	SS	6 ft	1/8“	2.1mm	13107-U	
19001A-B11	10% OV-17 on 80/100 Chromosorb W HP	SS	6 ft	1/8“	2.1mm	13109-U	
19001A-B51	5% OV-17 on 80/100 Chromosorb W HP	SS	6 ft	1/8“	2.1mm	13114-U	
19001A-D11	10% OV-101 on 80/100 Chromosorb W HP	SS	6 ft	1/8“	2.1mm	13115-U	
19001A-D12	10% OV-101 on 100/120 Chromosorb W HP	SS	6 ft	1/8“	2.1mm	13116-U	
19001A-F12	10% OV-225 on 100/120 Chromosorb W HP	SS	6 ft	1/8“	2.1mm	13119-U	
19001A-G11	10% Silar 5 CP on 80/100 Chromosorb W HP	SS	6 ft	1/8“	2.1mm	13121-U	
19001A-J11	10% SE-30 on80/100 Chromosorb W HP	SS	6 ft	1/8“	2.1mm	13122-U	
19001A-J51	5% SE-30 on80/100 Chromosorb W HP	SS	6 ft	1/8“	2.1mm	13124-U	
19001A-K11	10% Silar 10 CP on 80/100 Chromosorb W HP	SS	6 ft	1/8”	2.1mm	13125-U	
19001A-M11	10% Carbow ax 20M on 80/100 Chromosorb W HP	SS	6 ft	1/8“	2.1mm	13126-U	
19001A-M12	10% Carbowax 20M on 100/120 Chromosorb W HP	SS	6 ft	1/8“	2.1mm	13127-U	
19001A-M51	5% Carbowax 20M on 80/100 Chromosorb W HP	SS	6 ft	1/8“	2.1mm	13128-U	
19001A-MA1	45/60 M olecular Sieve 5A	SS	6 ft	1/8“	2.1mm	13130-U	
19001A-MA2	60/80 M olecular Sieve 5A	SS	6 ft	1/8“	2.1mm	13133-U	
19001A-MX1	45/60 Molecular Sieve 13X	SS	6 ft	1/8“	2.1mm	13134-U	
19001A-MX2	60/80 Molecular Sieve 13X	SS	6 ft	1/8“	2.1mm	13136-U	
19001A-N00	80/100 Porapak N	SS	6 ft	1/8“	2.1mm	13141-U	
19001A-N01	80/100 HayeSep N	SS	6 ft	1/8“	2.1mm	13144-U	
19001A-P00	80/100 Porapak P	SS	6 ft	1/8“	2.1mm	13146-U	
19001A-Q00	80/100 Porapak Q	SS	6 ft	1/8“	2.1mm	12437	
19001A-Q01	80/100 HayeSep Q	SS	6 ft	1/8“	2.1mm	13801	
19001A-QS0	80/100 Porapak QS	SS	6 ft	1/8“	2.1mm	13787	
19001A-R00	80/100 Porapak R	SS	6 ft	1/8“	2.1mm	13156-U	
19001A-S00	80/100 Porapak S	SS	6 ft	1/8“	2.1mm	13161-U	
19001A-T00	80/100 Porapak T	SS	6 ft	1/8“	2.1mm	13163-U	

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Packed Columns
Agilent Technologies Cross Reference

AGILENT CROSS	PACKING DESCRIPTION	TYPE	LENGTH	OD	ID	CAT. NO.	PRIC
19001C-001	1.95% QF-1 + 1.5% OV-17 on 100/120 Chromosorb W H	Glass	6 ft	1/4"	2mm	13078-U	
19001C-002	1.95% OV-210 + 1.5% OV-17 on 100/120 Chromosorb	Glass	6 ft	1/4"	2mm	13079-U	
19001C-003	10% FFAP + 1% H3P04 on 100/120 W AW	Glass	6 ft	1/4"	2mm	13081-U	
19001C-102	80/100 Chromosorb 102	G lass	6 ft	1/4"	2mm	13082-U	
19001C-A31	3% OV-1 on 80/100 Chromosorb W HP	Glass	6 ft	1/4"	2mm	13083-U	
19001C-B12	10% OV-17 on 100/120 Chromosorb W HP	Glass	6 ft	1/4"	2mm	13084-U	
19001C-B31	3% OV-17 on 80/100 Chromosorb W HP	Glass	6 ft	1/4"	2mm	13085-U	
19001C-D11	10% OV-101 on 80/100 Chromosorb W HP	Glass	6 ft	1/4"	2mm	13086-U	
19001C-D32	3% OV-101 on 100/120 Chromosorb W HP	Glass	6 ft	1/4"	2mm	13087-U	
19001C-M11	10% Carbowax 20M on 80/100 Chromosorb W HP	Glass	6 ft	1/4"	2mm	13088-U	
19001C-M12	10% Carbowax 20M on 100/120 Chromosorb W HP	Glass	6 ft	1/4"	2mm	13089-U	
19001C-M51	5% Carbowax 20M on 80/100 Chromosorb W HP	Glass	6 ft	1/4"	2mm	13090-U	
19001C-M52	5% Carbowax 20M on 100/120 Chromosorb W HP	Glass	6 ft	1/4"	2mm	13091-U	
19001C-P00	80/100 Porapak P	Glass	6 ft	1/4"	2mm	13092-U	
19001C-Q00	80/100 Porapak Q	Glass	6 ft	1/4"	2mm	13093-U	
19001C-QS0	80/100 Porapak QS	Glass	6 ft	1/4"	2mm	13094-U	
19006-60026	10% UCW-982 on 80/100 Chromosorb P AW	SS	18 in	1/4“	5.3mm	13075-U	
19006-60028	10% UCW-982 on 80/100 Chromosorb P AW	SS	20 in	1/8“	2.1mm	13041-U	
19006-80005	35% DC-200 (350 cstks) on 80/100 Chromosorb P AW	SS	5 ft	1/8“	2.1mm	13044-U	
19006-80015	80/100 Porapak Q	SS	6 ft	1/8“	2.1mm	13037-U	
19006-80020	45/60 Molecular Sieve 13X	SS	10 ft	1/8“	2.1mm	13036-U	
19006-80025	80/100 Porapak N	SS	10 ft	1/8“	2.1mm	13052-U	
19006-80030	45/60 Molecular Sieve 13X	SS	3 ft	1/8“	2.1mm	13047-U	
19006-80035	20% Sebaconitrile on 80/100 Chromosorb P AW	SS	2 ft	1/8“	2.1mm	13059-U	
19006-80040	20% Sebaconitrile on 80/100 Chromosorb P AW	SS	30 ft	1/8“	2.1mm	13043-U	
19006-80045	45/60 Molecular Sieve 13X	SS	4 ft	1/8“	2.1mm	13061-U	
19006-80051	20% OV-101 on 80/100 Chromosorb W HP	SS	4 ft	1/8“	2.1mm	13035-U	
19006-80060*	20% TCEP on 80/100 Chromosorb P AW	SS	56 cm	1/16“	0.75mm	12873	
19006-80070	35% DC-200 (350cstks) on 80/100 Chromosorb P AW	SS	10 ft	1/8“	2.1mm	13064-U	
19006-80080	80/100 Porapak N	SS	6 ft	1/8“	2.1mm	13063-U	
19006-80085	80/100 Porapak QS	Teflon	6 ft	1/8“	2.1mm	13071-U	
19006-80095	20% Sebaconitrile +2% H3PO4 on 80/100 Chromosorb	SS	30 ft	1/8“	2.1mm	13066-U	
19006-80100	12% UCW-982 on 80/100 Chromosorb P AW	SS	2 ft	1/8“	2.1mm	13049-U	
19006-80105	25% DC-200 (350 cstks) on 80/100 Chromosorb P AW	SS	15 ft	1/8“	2.1mm	13039-U	
19006-80110	80/100 Hayesep Q	SS	10 ft	1/8“	2.1mm	13038-U	
19006-80115	45/60 Molecular Sieve 13X	SS	2 ft	1/8“	2.1mm	13069-U	
19006-80120	80/100 Hayesep N	SS	8 ft	1/8“	2.1mm	13067-U	
19006-80132	35% DC-200 (350cstks) on 80/100 Chromosorb P AW	SS	30 ft	1/8“	2.1mm	13072-U	
19006-80134	80/100 HayeSep Q	SS	9 ft	1/8“	2.1mm	13073-U	
19006-80136	45/60 M olecular Sieve 5A	SS	9 ft	1/8“	2.1mm	13074-U	
19006-80141	60/80 Chromosorb P AW	SS	3 ft	1/8“	2.1mm	13068-U	
19301-60570	3% OV-101 on 100/120 Chromosorb W HP	SS	20 in	1/4“	5.3mm	13095-U	
4330-0937	Empty	Glass	12 ft	1/8“	1.8mm	13077-U	
4330-0941	Empty	Glass	10 ft	1/4“	2mm	21683	
5080-6759	45/60 Molecular Sieve 5A, 50g					20301	
5080-6761	60/80 Molecular Sieve 5A, 50g					20302	
5080-6763	45/60 Molecular Sieve 13X, 50g					20304	
5180-4194	1% SP-1000 on 60/80 Carbopack B	SS	8 ft	1/8“	2.1mm	12545-U	
5181-1245	1% SP-1000 on 60/80 Carbopack B	SS	6 ft	1/8“	2.1mm	12489	
7157-0206	Empty	SS	6 ft	1/8“	2.1mm	13096-U	
7157-0207	Empty	SS	8 ft	1/8“	2.1mm	13097-U	
7157-0208	Empty	SS	10 ft	1/8“	2.1mm	13098-U	
7157-0209	Empty	SS	12 ft	1/8“	2.1mm	13099-U	
7157-0210	Empty	SS	20 ft	1/8“	2.1mm	13100-U	
8501-0008	60/80 Tenax, 10g					11982	

* Column contains stainless steel screens.



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Packed Columns

Stock Packed Columns

General Configuration	Agilent/HP	Perkin Elmer	Varian
You can carefully bend this column to fit most chromatographs	5880, 5890, 5987, 6890 (Configuration A)	8300, 8400, 8500, 8600, 8700, Auto System (not on-column injection)	3300/3400, 3700, Vista Series (FID)

COLUMN DESCRIPTION	COLUMN TYPE[1]	GENERAL CONFIG.	AGILENT/ HP	PERKIN ELMER	VARIAN	PRICE
CARBOPACK PACKINGS						
1% SP-1000 on 60/80 Carbopack B						
6' x 2.1mm ID	SS	12485-U	12487	—	12489	
8' x 2.1mm ID	SS	12543-U	12548-U	13730-U	12545-U	
2.4m x 2mm ID TightSpec	Glass	—	23084	—	—	
2m x 2mm ID TightSpec	Glass	—	23093	—	—	
0.1% SP-1000 on 80/100 Carbopack C						
6' x 2.1mm ID	SS	12495-U	12500-U	13736-U	—	
2m x 2mm ID TightSpec	Glass	—	26003	—	—	
6' x 2mm ID	Glass	—	26012	26015	—	
3% SP-1500 on 80/120 Carbopack B, 10'	SS	12592	12594	13734-U	12596	
0.2% Carbowax 1500 on 60/80 Carbopack C, 6'	SS	13860-U	—	—	—	
0.2% Carbowax 1500 on 80/100 Carbopack C, 6'	SS	12501-U	12506-U	13738-U	—	
4% Carbowax 20M/0.8% KOH on 60/80 Carbopack B						
2m x 2mm ID TightSpec	Glass	—	26021	26024	26027-U	
6' x 2mm ID	Glass	—	26030-U	26033-U	—	
4% Carbowax 20M on 80/120 Carbopack B-DA [2]						
2m x 2mm ID TightSpec	Glass	—	23110-U	25931-U	—	
6' x 2mm ID	Glass	—	25936	—	25942	
GP[4] 5% Carbowax 20M on 60/80 Carbopack B Guaranteed Performance for Blood Alcohol Analysis						
2m x 2mm ID TightSpec	Glass	—	26039	—	—	
6' x 2mm ID	Glass	—	26048	26051	—	
5% Carbowax 20M on 80/120 Carbopack B-AW						
2m x 2mm ID TightSpec	Glass	—	25945	25947	—	
6' x 2mm ID	Glass	—	25953	—	—	
0.8 % THEED on 80/100 Carbopack C						
1m x 2mm ID TightSpec	Glass	—	26057	—	—	
3' x 2mm ID	Glass	—	—	26069	—	
CARBON MOLECULAR SIEVE PACKINGS						
100/120 Carbosieve S-II, 10'	SS	12577	12581	13821-U	—	
45/60 Carboxen-1000, 2'	SS	12370-U	—	—	—	
45/60 Carboxen-1000, 5'	SS	12380	12382	—	12384	
60/80 Carboxen-1000, 15'	SS	12390-U	12392-U	13744-U	12394	
POROUS POLYMER PACKINGS						
80/100 Chromosorb 101, 6'	SS	12712	13782	—	—	
80/100 Chromosorb 102, 6'	SS	13794	13796	—	—	
80/100 HayeSep Q, 6'	SS	13801	13803-U	—	—	
80/100 Porapak Q, 6'	SS	12437	12792-U	13785	12469	
80/100 Porapak QS, 6'	SS	13787	13789	—	—	
60/80 Tenax TA, 6'	SS	—	12554	—	—	
DIATOMITE PACKINGS						
10% Carbowax 20M on 80/100 Chromosorb W AW, 6'	SS	12212	12785-U	13746-U	12456	
10% Carbowax 20M on 80/100 SUPELCOPORT, 6'	SS	12713	12787-U	13748-U	12768	
3% OV-17 on 80/100 SUPELCOPORT, 6'	SS	12210	—	13750-U	—	
10% SP-1000 on 80/100 SUPELCOPORT, 10'	SS	12537-U	—	—	—	
10% SP-1000 on 80/100 SUPELCOPORT, 20'	SS	12719	12794-U	13755	—	
10% SP-2100 on 80/100 SUPELCOPORT, 6'	SS	12429	12801-U	—	—	
10% SP-2100 on 80/100 SUPELCOPORT, 10'	SS	13766-U	12530-U	—	—	
10% SP-2100 on 100/120 SUPELCOPORT, 6'	SS	—	—	13769	12771	
10% SP-2100 on 100/120 SUPELCOPORT, 10'	SS	12717	12803-U	—	—	
20% SP-2100/0.1% Carbowax 1500 on 100/120 SUPELCOPORT, 10'	SS	—	12804-U	13773	—	
1.5% SP-2250/1.95% SP-2401 on 100/120 SUPELCOPORT						
2m x 4mm ID TightSpec	Glass	—	23077	—	—	
6' x 4mm ID	Glass	—	25965	—	—	
10% SP-2330 on 100/120 Chromosorb W AW, 6'	SS	—	13776	13778	—	
MICROPACKED COLUMNS (2M X 1/16" OD X 0.75MM ID) [3]						
80/100 Carboxen-1004	SS	12854	12846	—	—	
80/100 HayeSep D	SS	12917	12921-U	—	—	
80/100 HayeSep Q	SS	12875	12879	—	—	
80/100 Molecular Sieve 5A	SS	12959-U	12963-U	—	—	

[1] All glass columns are 1/4" OD unless noted otherwise. All stainless steel columns are 1/8" OD x 2.1mm ID unless noted otherwise

[2] Deactivated for acidic compounds.

[3] All micropacked stainless steel columns (1/16" OD) include stainless steel screens.

[4] GP indicates packing is pre tested for a specific analysis.

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Packed Columns
Stock Packed Columns

Specialty 1/16" and 1/8" Columns - All are general configuration columns.

C1-C5 Hydrocarbons - Our durable 23% SP-1700 on Chromosorb P AW column can withstand the punishment of sample valve or valve switching operations. It is ideal for monitoring impurities in any of the C1-C5 hydrocarbons, and can be used with some C6 compounds.

APPLICATION & COLUMN DESCRIPTION (CAT. NO. OF PACKING)	CAT. NO.	PRICE
23% SP-1700 on 80/100 Chromosorb P AW[1], 30' x 1/8" stainless steel	12809-U	

Freons - 5% Fluorcol on 60/80 Carbopack B resolves a wide range of fluorocarbons, including isomers of many compounds. Column performance is distinctly superior to that of other packings. The column is unaffected by large amounts of HF, HCl, or other reactive gases that may be mixed with the fluorocarbons.

APPLICATION & COLUMN DESCRIPTION (CAT. NO. OF PACKING)	CAT. NO.	PRICE
5% Fluorcol on 60/80 Carbopack B, 10' x 1/8" SP Alloy	12425	

Simulated Distillation - Our 10% Petrocol A on 80/100 SUPELCOPORT column meets all criteria of American Society for Testing and Materials (ASTM) Method D3710 for simulated distillation of gasoline fractions having a final boiling point of 500°F (260°C). 3% Petrocol B on 80/100 SUPELCOPORT column meets all criteria of ASTM Method D2887 for simulated distillation of petroleum products and fractions having a final boiling point of 1000°F (538°C). 10% Petrocol C on 80/100 SUPELCOPORT column meets all criteria of ASTM Method D5307 for determining the boiling range distribution of crude petroleum through 1000°F (538°C). We construct these columns with special care to minimize baseline rise or bleed. Each lot of packing is tested to ensure proper resolution, boiling point elution order, boiling point/retention time linearity, and minimal bleed. These columns will fit most GCs, and we include stainless steel nuts and ferrules.

APPLICATION & COLUMN DESCRIPTION (CAT. NO. OF PACKING)	CAT. NO.	PRICE
ASTM D3710 - 10% Petrocol A on 80/100 SUPELCOPORT, 20" x 1/8" stainless steel[3]	12445	
ASTM D2887 - 3% Petrocol B on 80/100 SUPELCOPORT, 20" x 1/8" stainless steel[3]	12449	
ASTM D5307 - 10% Petrocol C on 80/100 SUPELCOPORT, 20" x 1/8" stainless steel[3]	12455	

Sulfur Compounds - 40/60 Carbopack B-HT 100 resolves H_2S, SO_2, COS, and methyl sulfide at ppm or ppb levels. It also will separate a variety of mercaptans, sulfides, and disulfides. Chromosil 310 separates percent or trace concentrations of H_2S, SO_2, COS, and methyl mercaptan. COS elutes before H_2S, which allows determinations of trace concentrations of COS in the presence of H_2S. Chromosil 330 separates ppb concentrations of light sulfur gases, C1-C3 mercaptans, and alkyl sulfides. 12% polyphenyl ether/1.5% H_3PO_4 on 40/60 Chromosorb T columns separate H_2S, SO_2, methyl and ethyl mercaptans, and dimethyl sulfide at ppm and ppb concentrations, for air pollution studies. The Teflon packing (Chromosorb T) ensures maximum inertness toward the sulfur compounds. Supelpak S separates H_2S, SO_2, COS, methanethiol, methyl sulfide, and dimethyl sulfide at low ppm concentrations. This column typically is used in analyzing kraft pulp mill, nylon plant, and petroleum refinery samples.

APPLICATION & COLUMN DESCRIPTION (CAT. NO. OF PACKING)	CAT. NO.	PRICE
40/60 Carbopack B HT[4] 100, 1.4m x 1/8" Teflon (FEP) (2-0272) ASTM D5303	11502-U	
Chromosil 310[2], 8' (6' packed) x 1/8" Teflon (FEP)	11501-U	
Chromosil 330[2], 8' (6' packed) x 1/8" Teflon (FEP)	11496	
12% polyphenyl ether/1.5% H_3PO_4 on 40/60 Chromosorb T[2], 36' x 0.085" Teflon (FEP)	11500	
Supelpak S[5], 30" (18" packed) x 1/8" Teflon (FEP)	12255-U	

Aromatics/Aliphatics - 20% TCEP on 80/100 Chromosorb P AW separates aromatic hydrocarbons in the presence of aliphatic hydrocarbons. Benzene elutes between nC11 and nC12. The 22" column meets the criteria of ASTM D4815 (C1-C4 alcohols and MTBE in gasoline).

APPLICATION & COLUMN DESCRIPTION (CAT. NO. OF PACKING)	CAT. NO.	PRICE
20% TCEP, 22" x 1/16" stainless steel[3]	12873	

[1] Acid-washed support.
[2] Packing available only in columns. Inlet temperature affects packing; 1' left unpacked at both ends.
[3] U-shaped; stainless steel nuts and ferrules included (not attached).
[4] HT - Hydrogen-treated for deactivation.
[5] Column is shipped with stainless steel screens

HELPFUL HINTS

TightSpec metric length columns conform to within ±6mm of their stated lengths. If you are developing a new method, and you might be using several instruments, we recommend TightSpec columns.

Supelco nominal length columns conform to instrument manufacturers' length specifications, in feet or meters, to within 1.5%. We recommend using nominal length columns only when you are trying to duplicate a method on the same model of instrument as was originally used to develop the method.

RELATED INFORMATION

Fluorcol columns: Glajch, Schindel, LC-GC 4: 574, 1986. Reference not available from Supelco.

Request the following free literature by phone or fax, or see our website.

No.	Subject
T397142	C1-C5 hydrocarbons by packed column GC
T100722	sulfur gases by packed column GC
T100743	hydrocarbons by packed column GC
T195890	packed GC column applications

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Packed Columns

Custom Packings / Custom Packed Columns

Ordering Custom Packings and Custom Packed Columns

If you do not find the packing or packed column that you need, we may be able to manufacture the packing or packed column that you require through our custom program. Please follow the steps below and contact either Order Processing or Technical Service.

To order a custom packing, please specify:

1. The percent coating(s) and stationary phase(s).
2. The mesh size and support.
3. Any special treatments required (AW, AW-DMDCS, DA, DB, HT).
4. The amount required (20g, 30g, 50g, 60g, or 100g).

NOTE: Custom packings using Carbopack B or Carbopack C are only available in 15g quantities. Custom packings using Carbopack B HT or Carbopack C HT are only available in 10g quantities.

To order a custom packed column, please specify:

1. If the column catalog number if known, provide it and skip to step7.
2. The column material.
3. The GC make and model.
4. The detector type.
5. The injection configuration; either on-column (see Figure A next page) or not on-column (see Figure B, next page).
6. The column dimensions (length, OD, and ID).
7. The packing required, either by catalog number if a stock packing or by description (see above) if a custom packing.
8. Whether the column inlet is to be packed full. Not on-column configurations are typically packed full. A space of 2 ½ inches is typically left empty with on-column configurations to make room for the syringe needle, unless a gas sampling loop is being used, then the inlet is typically packed full.
9. If the column is to be preconditioned.
10. The number of columns needed.

NOTE: We can also manufacture custom empty columns (follow steps 2-6).

Things you should know about metal columns

- We make all stainless steel columns from our premium grade stainless steel tubing.
- We normally attach brass Swagelok nuts and ferrules to packed metal columns. If you want stainless steel fittings, or if you don't want fittings attached to your column, please specify this.
- If you would like stainless steel screen ends on either or both ends of a 1/8" OD metal column, please specify.
- All 1/16" OD stainless steel columns include stainless steel screens.

Things you should know about glass columns

- We include brass nuts and Supeltex M-2A front ferrules with packed glass columns (Supeltex M-4 ferrules with Dexsil phases).
- Glass columns up to 10' (3.05m) long have one-piece construction – no butt seams.
- Most 2mm ID glass columns have chamfered inlets, to prevent bent needles.
- For an inert glass frit in the exit end of a glass column (prevents column debris from plugging a chromatograph-mass spectrometer interface), please specify.

Stationary Phase and Support

Phases which have been synthesized specifically for GC use typically are purer, of narrower molecular weight range, and without trace catalysts or metal impurities. Often they offer a wider minimum/maximum temperature range. Consult our stationary phase listings to determine if a GC-grade phase is available for your application. Descriptions of most of the GC-grade phases we offer begin with the letters DC, SP, or OV.

Be sure to request a coating percentage compatible with the support. Table A indicates examples of how much phase can be added to various types of supports. Excess phase will bleed from the column as it is conditioned, and will prolong the conditioning time (to days).

Many of the supports we offer are available in multiple particle size (mesh) ranges, deactivation, etc. Carefully read our support section to understand the differences in the many types of supports.

Table B indicates the amount of various supports required to pack tubing of different dimensions. This information is useful for customers who pack their own columns.

Table A. General Guidelines for Phase Coating Percentages

SUPPORT	PHASE COATING %
Carbopack B	1-6% nonsilicone phase
Carbopack C	0.1-1% nonsilicone phase
Carbopack F	0.1-1% nonsilicone phase
Chromosorb G	20% (15% gum)
Chromosorb P	30% (25% gum)
Chromosorb T	15% (7% gum)
Chromosorb W	20%
HayeSep Polymers	15% (5% gum)
Porapak Polymers	15% (5% gum)
SUPELCOPORT	20%
Tenax TA	15% (5% gum)

Table B. Column Packing Requirements

	AVERAGE WEIGHT PER FOOT (0.3m) OF TUBING			
	STAINLESS STEEL		GLASS	
SUPPORT	1/8" OD	1/4" OD	2mm ID	4mm ID
Carbopack B	0.5g	2.8g	0.4g	1.5g
Carbopack C	1.0g	5.5g	1.0g	3.5g
Chromosil	0.4g	2.6g	0.4g	1.4g
Chromosorb G	0.8g	3.8g	0.7g	2.3g
Chromosorb P	0.5g	3.3g	0.4g	2.4g
Chromosorb W	0.3g	2.2g	0.3g	1.2g
Chromosorb 101-108	0.3g	2.2g	0.4g	1.2g
Porapak Polymers	0.4g	3.0g	0.5g	1.7g
SUPELCOPORT	0.3g	2.2g	0.3g	1.2g
Tenax TA	0.2g	1.2g	0.2g	0.8g

All weights approximate. Tubing ID, changes in support specifications, etc. affect values.

HELPFUL HINTS

Save time when reordering custom columns. We retain sales order numbers for empty custom columns, custom packings, and packed columns for 3 years. Simply give us the number for your previous custom order.

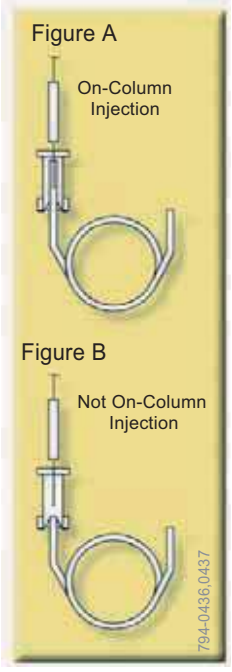
Metal and Teflon Columns

Tubing Composition and Specifications: Various tubing materials have been used for GC. It is best that you use the material specified in your method. All metal tubing is specified by outside diameter, but the inside diameters of the different metals (stainless steel, copper, nickel) differ greatly. This affects the total amount of packing in the column, and a change from one metal to another can noticeably affect your separations.

Column Configuration: Most analysts prefer to have metal columns formed specifically to fit their instruments. However, you can make small modifications to the shape of a general conformation metal column, without damaging the packing, if you bend the tubing carefully (e.g., around a large gas cylinder).

Silane Treated Glass Columns

Our glass shop has been fabricating glass columns for gas chromatography for more than 30 years. We have glass column specifications for more than 500 GC models. We can manufacture glass columns for any GC that we have a drawing for.



Inlet Design: In addition to the make and model of instrument, we will need to know the injector configuration. If the column extends to the septum in the inlet, injections are made "on-column" (Figure A). If the column extends just into the fitting in the oven, injections are "not on- column" (Figure B). This information will tell us how much of the column inlet should be left unpacked. Unless requested otherwise, we prepare all columns for on-column injection, with 2½ inches (63mm) empty at the inlet, to allow for the needle entering the column. If the column is to be used with not on-column injection, you don't need to allow space for the needle, and you probably will want the column completely filled.

TightSpec versus Nominal Dimensions: Variations in column length and ID affect the reproducibility of your retention times. You can be assured of highly consistent dimensions when you use either TightSpec or Supelco nominal length columns, but there is a difference between the two. TightSpec metric length columns conform to within ±6mm of their stated lengths. This means no matter which make or model of instrument you use, your column will have the same length, and you will have the best chance of repeating your results from one instrument to another. Supelco nominal length columns conform to instrument manufacturers' length specifications, in feet or meters, to within ±1.5%. When you compare actual lengths of these columns among instruments, you will find large differences – as much as 1 foot from the stated length (thus the term nominal length). Obviously, these differences will cause problems when you try to reproduce retention times among different instruments. We recommend using nominal length columns only when you are trying to duplicate a method on the same model of instrument as was originally used to develop the method.

Special Column Designs and Considerations: Consider the type of end plugs (typically glass or Teflon wool), the type of deactivation the tubing and plugs should have, and whether you want special end closures such as glass frits. The tubing and plugs should be deactivated in a manner that conforms to the characteristics of your sample. For most applications silanized wool plugs are suitable, but for analyses of ppm levels of acids the glass wool plugs should be treated with H_3PO_4, and analyses of sulfur compounds typically require Teflon wool plugs. We routinely treat glass columns with a silanizing agent, and can rinse them with other chemicals to produce special surface treatment, such as with NaOH for basic compounds.

Analysts using mass spectrometers often request glass frits in their columns, to insure that no particles get into and obstruct the jet separator. If you are using valving in your system, we can install stainless steel frits in the ends of your stainless steel column, to prevent packing particles from entering the valves and scratching their inner surfaces. We will be happy to discuss all of these options with you, and will custom manufacture your column to provide the best possible analytical environment for your samples.

Fittings: We include brass fittings and appropriate ferrules with most packed columns. You can request special fittings (stainless steel) or ferrules for your particular application. Simply tell us what you need when placing your order.

PureCol Column Inlet Liners

When nonvolatiles accumulate in the column inlet, you must replace several inches of packing – or the entire column. A silanized glass PureCol liner, inserted in the column inlet, solves this problem simply and inexpensively. When column performance begins to deteriorate, you can quickly and conveniently replace the insert – often without removing the column from the instrument. Replacement time is comparable to replacing a septum. Replace the PureCol liner when you change the septum, or when you analyze a new type of sample.

PureCol liners are available in two sizes. The smaller size fits 2mm ID glass columns with chamfered ends and 7cm of straight, unpacked inlet. The larger size fits any 4mm ID glass column that has 7cm of straight, unpacked inlet. Use PureCol liners with a 2" (5cm) 21-gauge or finer needle.

DESCRIPTION	QTY.	CAT. NO.	PRICE
FOR 2mm ID COLUMNS (CHAMFERED INLET ONLY)			
	10	20534	
	50	20536	
FOR 4mm ID COLUMNS			
	10	20540-U	
	50	20543	

Order your glass column with a PureCol liner already in place – at no extra cost. Just specify "glass column with PureCol liner" on your order.

Order: 1.800.325.3010 Technical Service: 1.800.325.3041 Web: www.sigma-aldrich.com/supelco



Packed Columns

Empty Glass Columns

Silane Treated Empty Glass Columns (no fittings, all 1/4" OD)

COLUMN DIMENSIONS LENGTH	ID (mm)	CAT. NO.	PRICE
Agilent/HP 5880, 5890, 5987, 6890 Configuration A 9" span all detectors except TCD		X 11.02" 280mm Y 9.05" 230mm S 9" 229mm	
2'/0.61m	2	21638	
3'/0.91m	2	21838	
1.0m TS	2	21203-U	
4'/1.22m	2	21776	
6'/1.83m	2	21641	
2.0m TS	2	21814	
2.4m TS	2	21816	
10'/3.05m	2	21683	
4'/1.22m	4	21839	
6'/1.83m	4	21681	
2.0m TS	4	21815	
Agilent/HP 5880, 5890, 5987, 6890 Configuration B TCD only		X 11.02" 280mm Y 7.09" 180mm S 9" 229mm	
6'/1.83m	2	20613	
10'/3.05m	2	21642	
6'/1.83m	4	20500-U	
Perkin Elmer 1, 2, 3, 115, 300, 900, 910, 990, F30, 2000, 2100, 3920, Sigma Series (not on-column injection)		X 8 5/8" 219mm Y 8 5/8" 219mm S 8 3/4" 222mm	
4'/1.22m	2	21842	
6'/1.83m	2	20487	
2.0m TS	2	21817	
10'/3.05m	2	20822	
6'/1.83m	4	21654	
Perkin Elmer 1, 2, 3, 300, 910, Sigma Series (heated on-column injection)		X 12 5/8" 321mm Y 7 1/8" 181mm S 8 3/4" 222mm	
1.0m TS	2	21214	
2.0m TS	2	21823	
Perkin Elmer 8300, 8400, 8700 Series (not on-column injection)		X 6 13/16" 173mm Y 6 13/16" 173mm S 6 1/2" 165mm	
3'/0.91m	2	21802	
1.0m TS	2	21206	
6'/1.83m	2	21804	
2.0m TS	2	21179-U	
2.4m TS	2	21197-U	
6'/1.83m	4	21806	
2.0m TS	4	21189-U	
Perkin Elmer 8300, 8400, 8500, 8600, 8700 Series (on-column injection)		X 12" 305mm Y 6 13/16" 173mm S 6 1/2" 165mm	
3'/0.91m	2	21739	
6'/1.83m	2	21799	
6'/1.83m	4	21801	

x = length of injector arm
y = length of detector arm
s = span (injector to detector)
TS = TightSpec column

Silane Treated Empty Glass Columns (no fittings, all 1/4" OD)

COLUMN DIMENSIONS LENGTH	OD	ID (mm)	CAT. NO.	PRICE
Shimadzu GC-4BM, 4CM, 4MG, GC-6A, 6AM, GC-7AG, 7A, 9A			X 13" 355mm Y 11" 282mm S 1.57" 40mm	
1.7m	5mm	3	20821-U	
2.5m	5mm	3	21687	
Shimadzu GC RIA, GC-8A8IF			X 9" 229mm Y 9" 229mm S 6" 152mm	
1.5m	5mm	3	21632	
2.0m	5mm	3	21633	
Shimadzu 14A, 15A, 16A			X 13" 335mm Y 11" 282mm S 1.57" 40mm	
1.0m TS	5mm	2.6	21190-U	
1.7m	5mm	2.6	21879-U	
1.7m TS	5mm	2.6	21191-U	
2.4m TS	5mm	2.6	21193-U	
2.5m	5mm	2.6	21880-U	
1.7m	5mm	3	21538	
1.7m TS	5mm	3.0	21192-U	
Shimadzu Mini-GC			X 7.48" 190mm Y 5.59" 142mm S 4.72" 120mm	
6'/1.83m	5mm	3.0	20609	

Fittings

Ferrules: four graphite ferrules for Shimadzu columns, with metal spacers.

Nut Assembly: stainless steel nut, spring, stainless steel front ferrule, metal back spacer.

DESCRIPTION	CAT. NO.	PRICE
Ferrules	23311	
Nut Assembly	23312	

(2 assemblies needed per Shimadzu column)

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Silane Treated Empty Glass Columns (no fittings, all 1/4" OD)

COLUMN DIMENSIONS LENGTH	ID (mm)	CAT. NO.	PRICE
Tremetrics (Tracor) 560, 565, 570, 585		X 8" 203.2mm Y 8" 203.2mm S 6" 152.4mm	
6'/1.83m	2	21588	
10'/3.05m	2	21780-U	
Varian Universal 3000, 3300, 3400, 3600, 3700, 4400, 4600, 6000, Vista Series		X 9 1/4" 235mm Y 5 7/8" 149mm with adapter S 9" Union FID* X 9 1/4" 235mm Y 7 7/8" 200mm S 2 5/8"	
6'/1.83m	2	20845	
2m	2	21882-U	
6'/1.83m	4	20847	
Union: A special bored-through union is required to join the two-piece column. This union is not supplied with columns - order separately. We furnish graphite ferrules with the union.		21495-U	
Varian 3300/3400 FID (injector A to detector A)		X 9 5/16" 236.5mm Y 8" 203.2mm S 5 1/2" 139.7mm	
3'/0.91m	2	21720-U	
1.0m TS	2	21207	
6'/1.83m	2	21721	
2.0m TS	2	21181-U	
2.4m TS	2	21199-U	
6'/1.83m	4	21722	
2.0m TS	4	21194-U	
Varian 3300/3400 FID (Injector B to detector B)		X 9 5/16" 236.5mm Y 8" 203.2mm S 6.82" 173.2mm	
3'/0.91m	2	20840-U	
6'/1.83m	2	20841	
6'/1.83m	4	20843	

Silane Treated Empty Glass Columns (no fittings, all 1/4" OD)

COLUMN DIMENSIONS LENGTH	ID (mm)	CAT. NO.	PRICE
Varian 3600, 3700, 4400, 4600, 6000, Vista series FID ECD TSD FPD		X 9 5/16" 236.5mm Y 8" 203.2mm S 5 1/2" 139.7mm	
2'/0.61m	2	21784	
1.0m TS	2	21208	
3'/0.91m	2	21720-U	
4'/1.22m	2	21847	
6'/1.83m	2	21721	
2m	2	21853-U	
2.0m TS	2	21829	
8'/2.44m	2	21765	
2.4m TS	2	21831	
10'/3.05m	2	23738	
12'/3.66m	2	21849	
1m	4	21852-U	
6'/1.83m	4	21722	

HELPFUL HINTS

TightSpec metric length columns conform to within ±6mm of their stated lengths.If you are developing a new method, and you might be using several instruments, we recommend TightSpec columns.

Supelco nominal length columns conform to instrument manufacturers' length specifications, in feet or meters, to within 1.5%. We recommend using nominal length columns only when you are trying to duplicate a method on the same model of instrument as was originally used to develop the method.

* One long adapter and one short adapter supplied with each column.
x = length of injector arm
y = length of detector arm
s = span (injector to detector)
TS = TightSpec column

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Packed Columns
Stationary Phases

Your Analyses Deserve the Best Column You Can Make

Our exclusive SP phases are silicone, ester, and other materials specifically manufactured or purified for use as chromatograph stationary phases. They ensure consistent analyses and much less bleed than generic substitutes. Many of the analyses shown on Applications pages of this catalog were performed on columns incorporating these phases.

DESCRIPTION [USP CODE], QTY. (SOLVENT)	TEMP. (°C) MIN/MAX	CAT. NO.	PRICE
Apiezon L, 25g (C,T)	50/300	21006	
BC-120 (C)	0/125	●	
Bentone 34, 50g (T)	0/180	21013-U	
Bis(2-ethoxyethyl)adipate, 50g (A)	0/150	21146	
Bis(2-ethylhexyl)phthalate [G22], 50g (M)	/150	21010-U	
Bis(2-methoxyethyl)adipate (A)	20/100	●	
n,n'-Bis(p-methoxylbenzylidene)-α,α'-bi-p-toluidine (BMBT) (C)	189/225	●	
Butanediol succinate, purified (C)	50/225	●	
Carbowax 20M [G16], 50g (C)	60/225	21032	
Carbowax 20M-terephthalic acid [G25], 50g (C)	60/225	11033-U	
Carbowax 400 [G20], 50g (C)	10/100	21023-U	
Carbowax 600, 50g (C)	30/125	21025-U	
Carbowax 1000 [G14], 50g (C)	40/150	21027	
Carbowax 1540, 50g (C)	50/175	21028	
Carbowax 4000 [G15], 50g (C)	60/120	21029	
Cyclohexanedimethanol succinate (CHDMS)[t] (C)	100/250	●	
DC-11 (C,T) (suggested substitute: SP-2100)	0/300	●	
DC-200 (500 cstks) (C,T) (suggested substitute: SP-2100)	0/200	●	
DC-200 (12,500 cstks) (C,T) (suggested substitute: SP-2100)	0/250	21095	
DC-550 [G28] (A,T) (suggested substitute: OV-7)	20/250	21096	
DC-710 (A) (suggested substitute: OV-11)	5/250	●	
DC QF-1 (FS 1265) (A) (suggested substitute: SP-2401)	0/250	21098-U	
DEGS-PS (A)	20/200	●	
Dexsil 300 carborane/methyl silicone, 5g (T)	50/450	21258	
Dexsil 400 carborane/methyl phenyl silicone (T)	50/400	●	
Dexsil 410 carborane/methyl cyanoethyl silicone (T)	50/375	●	
Dibutyl maleate, 50g (A)	0/50	21040-U	
Di-n-decyl phthalate (high purity), 25g (A)	10/175	21042-U	
Di(2-ethylhexyl)sebacate [G11], 50g (A)	0/125	21046-U	
Diethylene glycol adipate (DEGA) (A)	0/200	●	
Diethylene glycol succinate (DEGS)[G4], 25g (A)	20/200	11045	
Diglycerol, 10g (C,M)	20/100	21047-U	
Diisodecyl phthalate [G24] (A)	0/175	●	
2,4-Dimethylsulfolane, 10g (C)	0/50	21050-U	
Dinonyl phthalate, 50g (A)	20/150	21052-U	
Dioctyl sebacate, 50g (A)	0/125	21054-U	
EPON 1001 (A◆,C)	50/225	●	
Ethyl n,n-dimethyloxamate (EDO-1)	/40	●	
Ethylene glycol adipate (EGA)[G23], 25g (A)	100/225	11060	
Ethylene glycol phthalate (C)	100/200	●	
Ethylene glycol succinate (C)	100/200	●	
Ethylene glycol tetrachlophthalate (C)	120/200	●	
Fluorad FC-431, 50% solution in ethyl acetate, 50g (E)	40/200	21102-U	
Free Fatty AcidPhase (FFAP)[G25], 10g (C)	50/250	21063-U	
Hallcomid M-18-OL, 50g (C, M)	8/150	21068-U	
Halocarbon 10-25 (C)	20/100	●	
Halocarbon K-352 (F)	0/250	●	
Halocarbon wax (A)	50/150	●	
1,2,3,4,5,6-Hexakis (2 cyanoethoxycyclohexane) (C, T)	125/150	●	
Igepal CO-880 (Nonoxynol) [G31], 50g (A)	100/200	21072	
Igepal CO-990, 50g (A)	100/200	21073	
N-n-Lauryl-N-L-valine-t-butylamide (SP-300) (C)	60/140	●	
Neopentyl glycol adipate (C)	50/225	●	
Neopentyl glycol sebacate (C)	50/225	●	
Neopentyl glycol succinate [G21] (C)	50/225	●	
Nonoxynol (Igepal CO-880) [G31], 50g (A)	100/200	21072	
OV-1 (vinyl) [G9] (C, T) (suggested substitute: SP-2100)	100/350	●	
OV-1 (dimethyl, gum) [G2] 10g (C, T)	100/350	21104	
OV-3 (phenyl methyl dimethyl, 10% phenyl) (C,T)	0/350	●	
OV-7 (phenyl methyl dimethyl, 20% phenyl) [G32] (C, T)	0/350	●	
OV-11 (phenyl methyl dimethyl, 35% phenyl) (C, T)	0/350	●	
OV-17 (phenyl methyl, 50% phenyl) [G3], 25g (C, T) (suggested substitute: SP-2250)	0/375	21105	
OV-22 (phenyl methyl diphenyl, 65% phenyl) (C)	0/350	●	
OV-25 (phenyl methyl diphenyl, 75% phenyl) [G17], 10g (C)	0/350	21234	
OV-61 (diphenyl, 33% phenyl) (C ,T)	0/350	●	
OV-73 (5.5% diphenyl) (T)	0/325	●	
OV-101 (dimethyl, fluid) [G1], 20g (C) (suggested substitute: SP-2100)	0/350	21228	
OV-105 (cyanopropylmethyl) (A)	0/275	●	
OV-202 (trifluoropropyl, fluid) (C)	0/275	●	
OV-210 (trifluoropropyl, fluid) [G6], 25g (A) (suggested substitute: SP-2401)	0/275	21240-U	
OV-215 (trifluoropropyl, gum) (E)	0/275	●	
OV-225 (cyanopropylmethyl-phenylmethyl) [G19], 5g (A,C)	0/265	21241	

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Packed Columns
Stationary Phases

DESCRIPTION [USP CODE], QTY. (SOLVENT)	TEMP. (°C) MIN/MAX	CAT. NO.	PRICE
OV-275 (dicyanoallyl), 5g (A)	25/250	21278-U	
OV-330 silicone - Carbowax (A, T)	0/250	●	
OV-351 (C)(suggested substitute: SP-1000)	50/270	●	
OV-1701 (vinyl), 3g	0/250	21281-U	
β,β-Oxydipropionitrile, 50g (M)	0/75	21086	
Phenyldiethanolamine succinate [G12], 25g (C)	0/230	21087	
Polyethylene glycol adipate (EGA)[G23], 25g (A)	0/225	11060	
Polyethyleneimine, 50g (A)	0/175	21195-U	
Polyphenyl ether (5 rings) OS-124, 25g (A)	0/200	21089	
Polyphenyl ether (6 rings) OS-138, 25g (A)	0/225	21088	
Polypropylene glycol, 50g (M)	0/150	21090-U	
Polypropyleneimine (C)	0/200	●	
PPE-20 (poly-M-phenoxylene) (C)	125/375	●	
PPE-21 (C)	125/375	●	
Propylene carbonate (C)	0/50	●	
Quadrol, 50g (C)	0/150	21092	
SE-30 (methyl silicone, GC grade)[G2], 10g (C) (suggested substitute: SP-2100)	50/300	21099-U	
SE-52 (methyl silicone)[G27], 50g (C, T) (suggested substitute: OV-73)	50/300	21100-U	
SE-54 (methyl silicone: 5% phenyl, 1% vinyl silicone) [G36], 50g (C, T)	50/300	21106	
SF-96 (methyl silicone), 50g (C, T) (suggested substitute: SP-2100)	0/250	21101-U	
Silar 5 CP (C, A) (suggested substitute: SP-2300)	0/250	●	
Silar 10 CP[G5] (C, A) (suggested substitute: SP-2340)	0/250	●	
Sorbitol [G13] (M)	/150	●	
SP-216-PS (A)	25/200	●	
SP-300 (N-n-Lauroyl-N-L-valine-T-butylamide) (C)	60/140	●	
SP-301 (C)	260/290	●	
SP-400, chlorophenyl methyl silicone	0/350	●	
SP-1000[G25], (C)	50/250	●	
SP-1200, 10g (C)	25/200	21263	
SP-1220 (C)	50/200	●	
SP-1500 (C)	50/230	●	
SP-1510 (C)	50/230	●	
SP-1700 (A)	0/110	●	
SP-2100 (methyl silicone) [G1], 10g (C)	0/350	21284-U	
SP-2250 (methyl phenyl silicone, 50% phenyl) [G3], (C, T)	0/375	●	
SP-2300 (poly(cyanopropylphenyl siloxane))[G7], 5g (C, A)	20/275	21889	
SP-2310 (poly(50% biscyanopropyl / 50% cyanopropylphenyl siloxane)) (A)	25/275	●	
SP-2330(poly(80% biscyanopropyl / 20% cyanopropylphenyl siloxane)) [G8], 5g (A)	25/275	21287-U	
SP-2340 (poly(biscyanopropyl siloxane)) [G5], 5g (A)	25/275	21288	
SP-2380 (poly(90% biscyanopropyl / 10% cyanopropylphenyl siloxane)) (A)	25/275	●	
SP-2401 (methyl silicone, trifluoropropyl) [G6], (A)	0/275	●	
SP-2510 (C)	50/250	●	
Squalane, 50g (C, T)	20/100	21109	
Squalene, (C, T)	0/100	●	
Sucrose acetate isobutyrate (SAIB) (C)	0/200	●	
Tetracyanoethylated pentaerythritol (C, T)	30/175	●	
Tetraethylene glycol dimethyl ether [G30] (M)	/80	●	
1,2,3,4-Tetrakis (2-cyanoethoxy)butane (C)	110/200	●	
Tetraethylenepentamine (M)	0/125	●	
Tetrahydroxyethylethylenediamine (THEED) (C)	0/125	●	
β,β'-Thiodipropionitrile (TDPN) [G29] (C)	/100	●	
Tricresyl phosphate (C,M)	20/125	●	
Tris (2-cyanoethyl) nitromethane (TCENM) (C)	20/140	●	
1,2,3-Tris (2-cyanoethoxy)propane (TCEP), 50g (M,C)	0/175	21217	
Triton X-100, 50g (A)	0/200	21123	
Triton X-305 (A)	0/200	●	
UC W982 (methyl silicone) [G9], 50g (C,T) (suggested substitute: SP-2100)	0/300	21272-U	
UCON 50-HB-280-X (C,M)	0/200	●	
UCON 50-HB-2000 (C,M)	0/200	●	
UCON 50-HB-5100 (C,M)	0/200	●	
UCON LB-550-X [G18] (C,M)	0/200	●	
UCON LB-1800-X (M)	/200	●	
Versamid 900 (M)	190/275	●	

[1] US Patent No. 3,239,997.

● Available in packed columns or as a coated packing only.

SOLVENTS	
A – acetone	C – chloroform
E – ethyl acetate	F – Freon
M – methanol	P – pyridine
T – toluene	◆ – hot solvent

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Packed Columns
Supports

Graphitized Carbon Blacks (GCB)

Nonporous, nonspecific, highly inert graphitic carbon adsorbents/solid supports which separate compounds according to the size and shape of the molecule (e.g., polarizability). Addition of a liquid phase allows unique separations, based on analyte interactions with both the carbon surface and the liquid phase (i.e., gas-liquid-solid chromatography, or GLSC).

Carbopack B -USP code [S12]. Surface area: ~100m²/g.

Carbopack C -USP code [S7]. Surface area: ~ 10m²/g. Separation mechanism equivalent to that of Carbopack B, but a larger molecular size range typically is chosen.

Carbopack F -Surface area: ~ 5m²/g. Can reduce separation times by 50%, compared to Carbopack C.

Carbopack X -A unique graphitized carbon black with porosity (absent in most GCBs). The 240m²/g surface area provides greater adsorption strength, relative to other GCBs, making Carbopack X a unique bridge between GCBs and carbon molecular sieves. Density: 0.41g/mL.

Carbopack Y -Surface area: 24m²/g; density: 0.42g/mL. A bridge between Carbopack B and Carbopack C.

Carbotrap -Surface area: 100m²/g; available in 20/40 mesh. Traps many airborne C4-C8 compounds.

Carbotrap C -Surface area: 10m²/g; available in 20/40 mesh. Traps many airborne C8 and heavier compounds.

Carbon Molecular Sieves

Carbosieve S-III[1] - Primarily for purge and trap of C2 and smaller molecules. A large surface area, 820m²/g, and 15/40Å pores, excellent for trapping airborne molecules.

Carboxen-563 – Carboxen-564 – Carboxen-569 -Our versions of Ambersorb XE-347 and Ambersorb XE-340 adsorbents, Carboxen-563 and Carboxen-564[2] carbon molecular sieves provide higher capacity for many volatile organics. Carboxen-569 is an exclusive material with no close equivalents. Carboxen-563 is for analyses of water or airborne compounds. Its range for airborne compounds is similar to that of Carboxen-564, but with a somewhat lower capacity. Carboxen-564 traps many C2-C5 volatile organic compounds. Carboxen-569 has the highest capacity for organic molecules and the lowest capacity for water.

Carboxen-1000 -Large surface area (>1200 m²/g) for excellent kinetics and thermodynamics, designed for analyses of permanent gases and light hydrocarbons. Carboxen-1000 GSC columns are direct replacements for Carbosieve S-II columns.

Carboxen-1001 -Surface area: 560 m²/g; packing density: 0.47g/mL; available in 60/80 mesh. Traps C1 and C2 hydrocarbons. Available only in ORBO tubes or purge traps.

Carboxen-1003 -Large surface area (~ 1000m²/g); a combination of efficient adsorption/desorption and hydrophobic surface characteristics. Density: 0.46g/mL; porosity: macropores – 0.28cc/g, mesopores – 0.26c micropores – 0.38cc/g.

Carboxen-1004 -Improved sieving characteristics for analyses of permanent gases and light hydrocarbons. Available in 80/100 mesh size for micropacked columns.

Supelcarb -A high-capacity sieve, capable of trapping a broad range of organic compounds. Specifically prepared for split vent trap and carrier gas purification applications. Trapping capacity is much higher than that of activated charcoal – by a factor of two for lighter hydrocarbons. Allows less gas channeling in a packed bed than activated charcoal particles.

[1] Patented. See Legally Speaking in the index.
[2] Supelco US Patent No. 4,839,331.

Polymers

Chromosorb 101 -USP code [S2]. Surface area: <50m²/g; packing density: 0.30g/mL. For free fatty acids, glycols, alcohols, alkanes, esters, ketones, hydrocarbons, ethers.

Chromosorb 102 -USP code [S6]. Surface area: 350m²/g; packing density: 0.29g/mL. For alcohols, light and permanent gases, oxygenated compounds, or as an adsorbent to trap organics in air or water.

Chromosorb 103 -Surface area: 350m²/g; packing density: 0.32g/mL. For basic compounds such as alcohols, amides, amines, arsines, hydrazines, ketones, NH_3, phosphines, or as an adsorbent to trap acidic compounds in air.

Chromosorb 104 -Surface area: 100-200m²/g; packing density: 0.32g/mL. For polar compounds.

Chromosorb 105 -Surface area: 600-700m²/g; packing density: 0.34g/mL. For formaldehyde, various classes of organic compounds (boiling point approx. 200°C), to separate acetylene from other small hydrocarbons, or as an adsorbent for trapping organics in air or water.

Chromosorb 106 -Surface area: 700-800m²/g; packing density: 0.28g/mL. For gases, C2-C5 alcohols, low boiling compounds; an adsorbent for organics in air or water.

Chromosorb 107 – Chromosorb 108 -Supply limited; available in columns only until supply runs out.

HayeSep A -Separates permanent gases at ambient temperatures. Use at higher temperatures to analyze C2 hydrocarbons, hydrogen sulfide, and water.

HayeSep B -Separates C1 and C2 amines and trace levels of ammonia and water.

HayeSep C -USP code [S10]. For analyses of polar molecules. Separation characteristics similar to Chromosorb 104.

HayeSep D and DB -Superior separation characteristics for light gases, carbon monoxide, carbon dioxide, and acetylene (elutes before other C2 hydrocarbons). Use D for analyses of water and hydrogen sulfide.

HayeSep Q -USP code [S3].

HayeSep R -USP code [S4].

HayeSep S -USP code [S8].

HayeSep N-P-T -Also available.

Tenax TA - Use for analyses of high boiling alcohols, polyethylene glycols, diols, phenols, mono- and diamines, ethanolamines, aldehydes, ketones, chlorinated aromatics. Widely mentioned in US EPA and NIOSH methods. A replacement for Tenax GC. Tenax GR (30% graphitzed carbon in Tenax) is still available – please inquire.

Porapak

Polarity increases from Porapak P through Porapak T.

Porapak Packing	Surface Area (m^2/g)	Packing Density (g/mL)
P	100-200	0.27
PS[3]	100-200	0.27
Q	500-600	0.34
QS[4]	500-600	0.34
R	450-600	0.30
S	300-450	0.35
N	225-350	0.38
T	250-350	0.43

[3] Silanized version of Porapak P.
[4] Silanized version of Porapak Q.

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Chromosorb T (Teflon) - USP code [S5]. Popular for analyses of small polar molecules such as water, acids, amines, alcohols, and corrosives such as HF, HCl, and chlorosilanes. Difficult to pack. Upper temperature limit: 250°C.

Silica

Chromosil 310 and Chromosil 330 packings are specially tested for specific sulfur applications (e.g. COS, SH_2, CS_2 and SO_2), and are available only in prepared columns. For more information about these columns, request Bulletin 722.

Davison Silica Grade 12 - Surface area: 750 m^2/g; pore volume: 0.45cc/g; pore diameter: 22Å. Used for collecting or separating light volatile compounds; often used for analyses of CO_2. High affinity for water.

Diatomites

Chromosorb G - For analyses of polar compounds. Maximum phase loading: ~ 5% by weight (equivalent to a Chromosorb W loading of ~ 12.5% because of higher density). Available only as a custom product.

Chromosorb P - USP code [S1C]. Particularly well suited for nonpolar compounds, must be deactivated for use with polar compounds. Can support high phase loadings, up to 35% by weight in some cases.

Chromosorb W - USP code [S1A]. Suitable for use with polar compounds, due to its low surface area and high inertness. Frag

Chromosorb 750 - Developed for pesticide and biological applications. Available only as a custom product.

SUPELCOPORT - USP code [S1A]. The most inert diatomite support available. Acid washed to remove mineral impurities, then DMDCS treated. Density and particle size distribution are tightly controlled to assure batch-to-batch reproducibility. Each lot is tested to conform to US EPA Method 608 for organochlorine pesticides and PCBs.

Activated Alumina F-1

Extremely wide pore diameter range, 0-100,000Å, very useful for separating saturated light (C1-C5) hydrocarbons from unsaturates. Also very useful for air monitoring. Often used as a drying medium. Available only as a custom product.

Zeolite Molecular Sieves

Molecular Sieve 5A and Molecular Sieve 13X are commonly used for separations of H_2, O_2, N_2, CH_4, and CO, argon, neon, and other rare gases. Also used as trapping materials, in particular, for removing water vapor from gas streams. When three-foot columns of the molecular sieves are compared, elution of O_2, N_2, and CH_4, is approximately equal, but elution of CO takes twice as long on Molecular Sieve 5A.

Support Treatments

AW	acid washed
AW-DMDCS	silane treated, acid washed
BW	base washed (only available on SUPELCOPORT)
DA	deactivated for acidic compounds
DB	deactivated for basic compounds
HT	hydrogen-treated
NAW	nonacid washed

Diatomite Supports

DESCRIPTION [USP CODE] MESH SIZE	SURFACE AREA (m^2/g)	PACKING DENSITY (g/mL)	CAT. NO.	PRICE
CHROMOSORB P NAW, 100g				
60/80	4-6	0.32-0.38	20193	
80/100			20194-U	
100/120			20103	
CHROMOSORB P AW [S1C], 100g				
60/80	4-6	0.32-0.38	20198-U	
80/100			20203-U	
100/120			20110	
CHROMOSORB P AW-DMDCS [S1C] 100g				
60/80	4-6	0.32-0.38	20206	
80/100			20207	
100/120			20117	
CHROMOSORB W HP [S1A], 100g				
60/80	0.6-1.3	0.23	20152	
80/100			20153	
100/120			20159-U	
CHROMOSORB W AW, 100g				
60/80	1.0-3.5	0.21-0.27	20123	
80/100			20124	
100/120			20126	

Available Mesh Sizes

SUPPORT	MESH SIZE
Carbopack B	60/80, 80/100, 80/120
Carbopack B HT	40/60, 60/80
Carbopack C	60/80, 80/100
Carbopack C HT	60/80, 80/100
Alumina F-1	60/80, 80/100, 100/120
Anachrom	80/100, 100/120
Celite 545 (AW)	filter aid, fine mesh
Chromosorb 101-108 [1]	60/80, 80/100, 100/120
Chromosorb 750	60/80, 80/100, 100/120
Chromosorb W HP	60/80, 80/100, 100/120
Chromosorb G HP	80/100, 100/120
Chromosorb G, P, or W (AW or NAW)	45/60, 60/80, 80/100, 100/120
Chromosorb G, P, or W (AW-DMDCS)	60/80, 80/100, 100/120
Chromosorb T [2]	30/60, 40/60
Glass beads	60/80
HayeSep	60/80, 80/100, 100/120
Mol Sieve 5A	60/80, 80/100, 100/120
Mol Sieve 13X	60/80, 80/100, 100/120
Porapak	50/80, 80/100, 100/120
Silica gel	60/80, 80/100, 100/120
SUPELCOPORT	60/80, 80/100, 100/120
SUPELCOPORT BW	60/80, 80/100, 100/120

[1] Chromosorb 104 is not available in 80/100 mesh.

[2] Suggested substitute: Haloport F

HELPFUL HINTS

Catalog numbers for supports can be found in the Stock Packings section of this catalog.

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Gas Chromatography

SUPELCO

Packed Columns
Stock Packings

Stock Packings for GC Columns

PACKING DESCRIPTION		USE	MIN./MAX. TEMP. (°C)	QTY.	CAT. NO.	PRIC
APIEZON						
10% Apiezon L/2% KOH on 80/100 Chromosorb W AW		amines	50/225	20g	11893	
CARBOPACK B						
Carbopack B, 60/80		light hydrocarbons	>500	10g	20273	
Carbopack B HT[1], 60/80			/225	10g	20274	
4% CARBOWAX 20M/0.8% KOH/60/80 Carbopack B		amines	/220	15g	11887	
5% CARBOWAX 20M/GP 60/80 Carbopack B		blood alcohols	/225	15g	11766	
4% CARBOWAX 20M /80/120 Carbopack B-DA[2]		C2-C5 acids	/200	15g	11889	
5% CARBOWAX 20M/80/120 Carbopack B AW		alcoholic beverages	/225	15g	11812-U	
6.6% CARBOWAX 20M/80/120 Carbopack B AW		alcoholic beverages	/225	15g	11814	
2.5% Oronite NIW/60/80 Carbopack B		alcohols, esters, ketones, general	/200	15g	11800-U	
1% SP-1000/60/80 Carbopack B		halogenated organics	/225	15g	11815	
3% SP-1500/80/120 Carbopack B		industrial solvents	/230	15g	11813-U	
1% SP-1510/60/80 Carbopack B		industrial solvents	/230	15g	11809	
CARBOPACK C						
Carbopack C	60/80	light hydrocarbons	>500	10g	10257	
	80/100	light hydrocarbons	>500	10g	10258	
0.2% CARBOWAX 1500/60/80 Carbopack C		alcohols, esters, ketones, general	/175	15g	11826	
0.2% CARBOWAX 1500/80/100 Carbopack C		alcohols, esters, ketones, general	/175	15g	11827	
0.3% CARBOWAX 20M/0.1% H_3PO_4/60/80 Carbopack C		C2-C5 acids	/200	15g	11825-U	
0.1% SP-1000/80/100 Carbopack C		phenols	/225	15g	11820	
0.8% THEED/80/100 Carbopack C		ethylene oxide (EtO) residues, glycols	/115	15g	11880-U	
CARBOPACK X						
Carbopack X	40/60	light hydrocarbons	>500	10g	10436	
	60/80			10g	10437-U	
	120/400			50g	10439-U	
CARBOPACK Y						
Carbopack Y	40/60	light hydrocarbons	>500	10g	10461-U	
	60/80			10g	10462	
	120/400			50g	10464-U	
CARBOSIEVE						
Carbosieve[3] G	45/60	permanent gases,	/200	5g	10197	
	60/80	C2-C3		5g	10198	
	80/100	hydrocarbons		5g	10199	
Carbosieve S-II	60/80	permanent gases,		10g	10189	
	80/100	C2-C3 hydrocarbons,		10g	10190-U	
Carbosieve S-III	60/80			10g	10184	
CARBOTRAP						
Carbotrap	20/40	air monitoring	/350	10g	20287	
Carbotrap C	20/40			10g	20309	
Carbotrap X	20/40			10g	10435-U	
Carbotrap Y	20/40			10g	10460-U	
CARBOXEN						
Carboxen-563	20/45	permanent gases		10g	10263	
Carboxen-564	20/45	permanent gases		10g	10264	
Carboxen-569	20/45	permanent gases		10g	10269	
Carboxen-1000	45/60	permanent gases,	/225	50g	10477-U	
	60/80	C2-C3 hydrocarbons		10g	10478-U	
Carboxen-1003	40/60	permanent gases	/225	10g	10471	
CARBOWAX 20M						
3% CARBOWAX 20M on 100/120 SUPELCOPORT		general	60/225	20g	11792	
3% CARBOWAX 20M on 80/100 Chromosorb 101		ethylene oxide (EtO) & residues	60/220	20g	11780-U	
5% CARBOWAX 20M on 40/60 Chromosorb T		general	60/225	50g	11993	
5% CARBOWAX 20M on 100/120 SUPELCOPORT		general	60/225	20g	11793-U	
10% CARBOWAX 400 on 80/100 SUPELCOPORT		general	10/100	20g	11808	

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PACKING DESCRIPTION		USE	MIN./MAX. TEMP. (°C)	QTY.	CAT. NO.	PRICE
CARBOWAX 20M (CONT'D)						
10% CARBOWAX 20M on 80/100 Chromosorb W AW		general	60/225	20g	11994	
10% CARBOWAX 20M/2% KOH on 80/100 Chromosorb W AW		amines	60/225	20g	11805	
10% CARBOWAX 20M/TPA on 80/100 Chromosorb W AW		acids	60/225	20g	11874	
10% CARBOWAX 20M on 80/100 SUPELCOPORT		general	60/225	20g	11810	
10% CARBOWAX 20M on 100/120 SUPELCOPORT		general	60/225	20g	11794-U	
15% CARBOWAX 20M on 80/100 SUPELCOPORT		general	60/225	20g	11796	
20% CARBOWAX 20M on 80/100 SUPELCOPORT		sulfur gases, light hydrocarbons	60/225	20g	11795-U	
DC PHASES						
10% DC-200 on 100/120 SUPELCOPORT		pesticides	0/250	20g	11964	
DEGS						
5% DEGS-PS on 100/120 SUPELCOPORT		C14-C20 fatty acids	20/200	20g	11870-U	
10% DEGS on 80/100 Chromosorb W AW		fatty acid esters	20/200	20g	11903	
GP 10% DEGS-PS on 80/100 SUPELCOPORT		fatty acid esters	20/200	20g	11999	
15% DEGS on 80/100 Chromosorb W AW		fatty acid esters	20/200	20g	11904	
DEXSIL						
3% Dexsil 300 on 80/100 Chromosorb W AW		general	50/450	20g	11995	
3% Dexsil 300 on 100/120 SUPELCOPORT		general	50/450	20g	11973	
MOLECULAR SIEVE						
Molecular Sieve 5A	30/40	permanent gases	/400	50g	20300	
	45/60			50g	20301	
	60/80			50g	20302	
Molecular Sieve 13X	45/60	permanent gases	/400	50g	20304	
	60/80			50g	20305	
	100/120			50g	20307	
OV PHASES						
3% OV-1 on 80/100 SUPELCOPORT		general	100/350	20g	11951	
3% OV-1 on 100/120 SUPELCOPORT		general	100/350	20g	11750-U	
3% OV-7 on 100/120 SUPELCOPORT		general	0/350	20g	11788-U	
3% OV-17 on 80/100 SUPELCOPORT		general	0/350	20g	11953	
3% OV-17 on 100/120 SUPELCOPORT			0/350	20g	11754	
3% OV-17 on 80/100 Chromosorb W HP			0/350	20g	12099	
3% OV-101 on 80/100 SUPELCOPORT			0/350	20g	11752	
10% OV-101 on 80/100 SUPELCOPORT			0/350	20g	11753	
3% OV-210 on 80/100 SUPELCOPORT		general	0/275	20g	11956	
3% OV-225 on 80/100 SUPELCOPORT		general	0/265	20g	11957-U	
3% OV-225 on 100/120 SUPELCOPORT		general	0/265	20g	11992	
15% OV-275 on 100/120 Chromosorb P AW-DMDCS		cis/trans FAMEs	0/250	20g	11844-U	
POROUS POLYMERS: CHROMOSORB CENTURY SERIES						
Chromosorb 101	60/80	general	/250	50g	20213	
	80/100				20214	
	100/120				20215	
Chromosorb 102	60/80	general	/250	50g	20200-U	
	80/100				20201	
	100/120				20202	
Chromosorb 103	60/80	polar compounds	/250	50g	20216	
	80/100				20217	
	100/120				20218	
Chromosorb 105	60/80	formaldehyde, acetylene	/250	50g	20222	
	80/100				20223	

GP Indicates packing has been tested for a specified analysis.

[1] HT – Hydrogen-treated for deactivation.

[2] DA – Deactivated for acidic compounds.

[3] Trademark, patented.

[4] DB – Deactivated for basic compounds.

[5] Porapak PS and QS are silanized versions of Porapak P and Q, treated to reduce surface adsoprtion.

HELPFUL HINT

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Packed Columns

Stock Packings

PACKING DESCRIPTION		USE	MIN./MAX. TEMP. (°C)	QTY.	CAT. NO.	PRICE
POROUS POLYMERS: CHROMOSORB CENTURY SERIES (CONT'D)						
Chromosorb 106	60/80	C2-C3 gases, alcohols	/250	50g	20225	
	80/100				20226	
	100/120				20227	
Chromosorb 107	80/100		/250	50g	20233	
Chromosorb 108	60/80		/250	50g	20131	
	80/100				20132	
	100/120				20133	
POROUS POLYMERS: HAYESEP SERIES						
HayeSep A	60/80	permanent gases	/165	75cc	10282	
	80/100				10283	
	100/120				10284	
HayeSep B	60/80	C1-C2 amines,	/190	75cc	10285	
	80/100	ammonia in water			10286	
HayeSep C	60/80	polar compounds	/250	75cc	10288	
	80/100				10289	
	100/120				10290	
HayeSep D	60/80	light gases,	/290	75cc	10291	
	80/100	CO, CO_2			10292	
	100/120				10293	
HayeSep DB[3]	80/100	light gases, CO, CO_2	/290	75cc	10280-U	
	100/120				10281-U	
HayeSep N	60/80	acetylene,	/165	75cc	10294	
	80/100	ethylene			10295	
	100/120				10296	
HayeSep P	60/80	ammonia,	/250	75cc	10297	
	80/100	alcohols in water			10298	
HayeSep Q	60/80	hydrocarbons,	/275	75cc	10300-U	
	80/100	sulfur gases,			10301-U	
	100/120	general			10302-U	
HayeSep R	60/80	light hydrocarbons,	/250	75cc	10303	
	80/100	chlorinated			10304	
	100/120	compounds			10305-U	
HayeSep S	60/80	C2-C3 hydrocarbons	/250	75cc	10306	
	80/100	polar compounds			10307	
HayeSep T	60/80	light hydrocarbons	/165	75cc	10309	
	80/100	formaldhyde			10310	
	100/120				10311	
POROUS POLYMERS: PORAPAK SERIES						
Porapak N	50/80	ammonia,	/190	75cc	20324	
	80/100	acetylene,			20325	
	100/120	C2 hydrocarbons			20326	
Porapak P	50/80	carbonyl compounds	/250	75cc	20327	
	80/100				20328	
	100/120				20329	
Porapak PS[3]	50/80		/250	75cc	20345	
	80/100				20346	
	100/120				20347	
Porapak Q	50/80	aliphatic	/250	75cc	20330-U	
	80/100	hydrocarbons,			20331	
	100/120	general			20332	
Porapak QS[3]	50/80	organic acids,	/250	75cc	20342	
	80/100	other polar			20343	
	100/120	compounds			20344	
Porapak R	50/80	moderately	/250	75cc	20333	
	80/100	polar ethers			20334	
	100/120				20335	
Porapak S	50/80	alcohols	/250	75cc	20336	
	80/100	(normal & branched)			20337	
	100/120				20338	
Porapak T	50/80	formaldehyde, other	/190	75cc	20339	
	80/100	polar compounds			20340	

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Packed Columns
Stock Packings

PACKING DESCRIPTION	USE	MIN./MAX. TEMP. (°C)	QTY.	CAT. NO.	PRICE
SE-30					
3% SE-30 on 80/100 Chromosorb W HP	general	50/300	20g	12097-U	
GP 4% SE-30/6% SP-2401 on 100/120 SUPELCOPORT	pesticides	100/250	20g	11948	
5% SE-30 on 80/100 SUPELCOPORT	general	50/300	20g	11784	
10% SE-30 on 80/100 SUPELCOPORT	general	50/300	20g	11785-U	
SILICA GEL					
Silica Gel (Davison Grade 12), 60/80	hydrocarbons, CO, CO_2, sulfur gases		100g	20290-U	
SP PHASES					
10% SP-1000 on 80/100 SUPELCOPORT	general	50/250	20g	11872	
10% SP-1000/1% H_3PO_4 on 100/120 Chromosorb W AW	anaerobic fermentation	/200	20g	11841	
5% SP-1200/1.75% Bentone 34 on 100/120 SUPELCOPORT	xylenes	25/175	20g	12134	
10% SP-1200/1% H_3PO_4 on 80/100 Chromosorb W AW	C2-C5 volatile fatty acids	25/200	20g	11965	
15% SP-1220/1% H_3PO_4 on 100/120 Chromosorb W AW	volatile fatty acids	/200	20g	12144	
1% SP-1240-DA[2] on 100/120 SUPELCOPORT	phenols	70/180	20g	11832	
23% SP-1700 on 80/100 Chromosorb P AW	C1-C6 hydrocarbons	0/110	25g	11865	
3% SP-2100 on 80/100 SUPELCOPORT	steroids	0/350	20g	11987	
3% SP-2100 on 100/120 SUPELCOPORT	steroids	0/350	20g	12138	
5% SP-2100 on 100/120 SUPELCOPORT	general	0/350	20g	11782-U	
10% SP-2100 on 80/100 SUPELCOPORT	hydrocarbons	0/350	20g	12140	
GP 10% SP-2100 on100/120 SUPELCOPORT	phenols	0/350	20g	11989	
GP 20% SP-2100/0.1% Carbowax 1500 on 100/120 SUPELCOPORT	solvents	0/175	20g	11821	
3% SP-2250 on 80/100 SUPELCOPORT	general	0/350	20g	11980	
3% SP-2250 on 100/120 SUPELCOPORT	bile acid methyl esters	0/350	20g	11878	
10% SP-2250 on 100/120 SUPELCOPORT	general	0/350	20g	12132	
GP 1.5% SP-2250/1.95% SP-2401 on 100/120 SUPELCOPORT	pesticides	0/250	20g	11947	
GP 3% SP-2310/2% SP-2300 on 100/120 Chromosorb W AW	rapeseed FAMEs	25/275	20g	11833	
10% SP-2330 on 100/120 SUPELCOPORT	general	0/275	20g	11858	
GP10% SP-2330 on 100/120 Chromosorb W AW	fatty acid esters	0/275	20g	11851	
3% SP-2340 on 100/120 SUPELCOPORT	carbohydrates	0/275	20g	11863	
10% SP-2340 on 100/120 Chromosorb W AW	general	0/275	20g	11852	
3% SP-2401 on 100/120 SUPELCOPORT	steroids	0/275	20g	11978	
TENAX					
Tenax TA, 60/80	high boiling compounds	/350	10g	11982	
80/100	amines, alcohols	/350	10g	21009-U	
TCEP					
GP 10% 1,2,3-Tris(2-cyanoethoxy)propane (TCEP) on 80/100 Chromosorb P AW	oxygenates, hydrocarbons, aromatics	0/175	20g	12122	
20% 1,2,3-Tris(2-cyanoethoxy)propane (TCEP) on 80/100 Chromosorb P AW	aromatics, oxygenates in gasoline	0/175	20g	11779	

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GC Accessories
Agilent Technologies Instruments

Supeltex Capillary Column Ferrules (Short)

24803-U



Use with original Agilent/HP nut or Supelco replacement nut (P/N 24833-U).

We offer the short style ferrules for Agilent/HP GC's. This design will fit the standard Agilent/HP capillary nut. They are offered in M-2A (85% polyamide/15% graphite), M-4 (100% graphite), and CapSeal (graphite/aluminum) versions.

FERRULE TYPE	TEMP. LIMIT	QTY.	CAT. NO.	PRIC
0.20-0.25mm COLUMN ID x 0.4mm FERRULE ID				
M-2A New!	400°C	10	24803-U	
		50	24807-U	
M-4 New!	450°C	10	24811-U	
		50	24819-U	
CapSeal Bullet	450°C	10	23864	
		50	23867	
0.32mm COLUMN ID x 0.5mm FERRULE ID				
M-2A New!	400°C	10	24802-U	
		50	24806-U	
M-4 New!	450°C	10	24809-U	
		50	24813-U	
CapSeal Bullet	450°C	10	23865	
		50	23868	
0.53mm COLUMN ID x 0.8mm FERRULE ID				
M-2A New!	400°C	10	24801-U	
		50	24804-U	
M-4 New!	450°C	10	24808-U	
		50	24812-U	
CapSeal Bullet	450°C	10	23866	
		50	23869	

Column Nuts for Agilent/HP

New!



24833-U

Use with short Supeltex ferrules (see above).

These column nuts are replacements for damaged or misplaced original Agilent/HP nuts. They are to be used with the shorter design ferrules for Agilent/HP GC's.

DESCRIPTION	CAT. NO.	PRICE
Column Nuts (pk. of 2)	24833-U	

Accessory Case for Agilent/HP GC Capillary Products

New!

We offer a clear plastic storage case with a foam insert. The foam easily stores your capillary accessories. The foam has been cut out to hold your Pk/5 inlet liners, Pk/50 septa, Pk/50 ferrules, Pk/25 Therm-O-Rings, Column nuts, and Pk/10 Inlet Seals.

DESCRIPTION	CAT. NO.	PRICE
GC Accessory Case for Agilent Technologies	28035-U	

Supeltex Capillary Column Ferrules (General Purpose)

503258



Use with Supelco Ferrule Nut Adapter (P/N 22470-U or 22509).

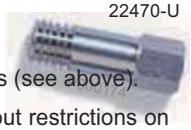
These are the original Supeltex ferrules. Use these ferrules if you have replaced the original Agilent/HP nut with Supelco's Ferrule Nut Adapter. They are offered in M-1 (ceramic-filled Teflon), M-2A (85% polyamide/15% graphite), M-2B (75% polyamide/25% graphite), M-4 (100% graphite), and CapSeal (graphite/aluminum) versions.

FERRULE TYPE	TEMP. LIMIT	QTY.	CAT. NO.	PRIC
0.20-0.25mm COLUMN ID x 0.4mm FERRULE ID				
M-2A	400°C	10	503258	
		50	22474	
M-2A 2-hole	400°C	5	22467	
M-2A Indented Blank[1]	400°C	10	22488	
M-2B	350°C	10	22510-U	
M-4	450°C	10	22498	
		50	22480-U	
CapSeal Bullet	450°C	12	23480-U	
		48	23485	
0.32mm COLUMN ID x 0.5mm FERRULE ID				
M-2A	400°C	10	22461	
M-2A 2-hole	400°C	5	22463	
M-2A Indented Blank[1]	400°C	10	22488	
M-2B	350°C	10	22511	
M-4	450°C	10	22462	
		50	22412	
CapSeal Bullet	450°C	12	23481	
		48	23486	
0.53mm COLUMN ID x 0.8mm FERRULE ID				
M-1	250°C	10	22499	
M-2A	400°C	10	22489	
		50	22473	
M-2A Indented Blank[1]	400°C	10	22488	
M-2B	350°C	10	22512	
M-4	450°C	10	20628	
		50	22479	
CapSeal Bullet	450°C	12	23482	
		48	23487	
0.75mm COLUMN ID x 1.0mm FERRULE ID				
M-2A Indented Blank[1]	400°C	10	22488	
M-4	450°C	10	22494	
0.50-0.75mm COLUMN ID x 1.2mm FERRULE ID				
M-2A	400°C	10	22459	
M-2A Indented Blank[1]	400°C	10	22488	
M-4	450°C	10	22460	

[1] Drill to fit your column.

Supelco Ferrule Nut Adapters

22470-U



Use with general purpose Supeltex ferrules (see above).

Install fused silica capillary columns without restrictions on ferrule choice. These adapters enable you to use general purpose Supeltex and other 1/16" compression capillary ferrules in your Agilent/HP 5710, 5790, 5840, 5880, 5890, or 6890 system.

DESCRIPTION	CAT. NO.	PRICE
Adapters (pk. of 2)	22470-U	
Adapters, Knurled (pk. of 2)	22509	

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Supeltex Capillary Ferrules (Long)



Use with original Agilent/HP MSD Source Nut, SSNE Style Nut (P/N 28034-U), or Supelco MSD Source Nut (P/N 22517).

We offer a preconditioned ferrule for Agilent/HP GC/MS applications in M-2A material (85% polyamide/15% graphite).

DESCRIPTION	QTY.	CAT. NO.	PRICE
0.20-0.25mm column ID	10	24826-U	
x 0.4mm ferrule ID	50	28022-U	
0.32mm column ID	10	24824-U	
x 0.5mm ferrule ID	50	28023-U	
0.53mm column ID	10	24823-U	
x 0.8mm ferrule ID	50	28024-U	

Column Nut for Agilent/HP MSD



Use with long Supeltex ferrules.

These column nuts are replacements for damaged or misplaced original Agilent/HP MSD nuts. They are to be used with the longer design ferrules for Agilent/HP GC's.

DESCRIPTION	QTY	CAT. NO.	PRICE
SSNE style columns nut	5	28034-U	

MSD Source Nut for GC/MS Interface

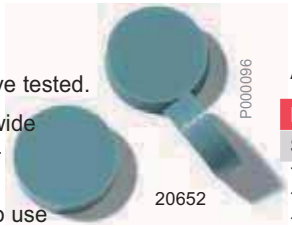


Use with long Supeltex ferrules or general purpose Supeltex ferrules.

These column nuts can be used to replace damaged or misplaced original Agilent/HP source nuts. The nuts are made of brass to prevent damage to MSD source threads. An enlarged knurled end allows easy finger tightening for a leak tight seal.

DESCRIPTION	CAT. NO.	PRICE
MSD Source Nut	22517	

Thermogreen LB-2 Septa



Lowest bleed of any septum we have tested.

- Extremely low bleed over a wide range of inlet temperatures – 100°C to 350°C
- Already conditioned, ready to use
- Easier needle penetration and high puncture tolerance – ideal for autosamplers
- Rubber formulation exclusive to Supelco

(Pk. of 50).

DESCRIPTION	DIAMETER	CAT. NO.	PRICE
5880A, 5890	11mm (7/16")	20654	
5700 Series, 5880	9.5mm (3/8")	20652	
5880/90, 6890, OCI Ports	5mm (3/16")	20638	

Inlet Seals



The inlet seal on an Agilent/HP GC must be regularly changed to prevent sample adsorption due to accumulation of sample residue and/or septum fragments. We manufacture replacment seals of high quality stainless steel for analyses of non-reactive compounds, and stainless steel seals plated with pure gold for applications requiring more inertness. No brighteners are used in the plating process. Stainless steel washers are included with each type of seal.

DESCRIPTION	CAT. NO.	PRICE
Stainless Steel Inlet Seals (pk. of 2)	23316-U	
Stainless Steel Inlet Seals (pk. of 10)	23317-U	
Stainless Steel Inlet Seals, 100 Seals w/50 washers	23363-U	
Gold Plated Inlet Seals (pk. of 2)	23318-U	
Gold Plated Inlet Seals (pk. of 10)	23319-U	

Therm-O-Ring Seals for Capillary Inlet Liners



Exclusive from Supelco. New high temperature O-ring seals can be used with inlet temperatures up to 375°C without sticking or fragmenting. Fit both 6.3mm OD (split) and 6.5mm OD (splitless) Agilent/HP capillary liners, and any 1/4" OD capillary liner that uses an O-ring seal. Superior replacement for Viton O-rings.

DESCRIPTION	CAT. NO.	PRICE
Therm-O-Ring Seals (pk. of 10)	21003-U	
Therm-O-Ring Seals (pk. of 25)	21004-U	

Deactivated Glass Inlet Liners

Our liners feature:

- High temperature silanization, to ensure inertness
- Consistent dimensions, tolerances and quality
- In-house manufacturing that meets or exceeds instrument manufacturer's specifications

All Models, 4890, 5880, 5890, 6890. (pk/5).

DESCRIPTION	CAT. NO.	PRICE
SPLIT INJECTION		
78.5 x 6.3mm, 4mm ID, wool packed	2048605	
78.5 x 6.3mm, cup design	2051005	
78.5 x 6.3mm, cup design, wool packed	2048205	
SPLITLESS		
78.5 x 6.5mm, tapered	2046605	
78.5 x 6.5mm, tapered, wool packed	2047805	
78.5 x 6.5mm, 2mm ID	2051305	
78.5 x 6.5mm, dual tapered	2048505	
DIRECT/WIRE-BORE		
78.5 x 6.5mm, 1.5mm ID	2051705	
78.5 x 6.3mm, 0.75mm ID, SPME	2637505	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

GC Accessories
PerkinElmer Instruments



Supeltex Capillary Column Ferrules

Use with original PerkinElmer 1/16" or SSNE Style Nuts (p/n 28034-U).

FERRULE TYPE	TEMP. LIMIT	QTY.	CAT. NO.	PRIC
0.20-0.25mm COLUMN ID x 0.4mm FERRULE ID				
M-2A	400°C	10	24826-U	
		50	28022-U	
M-4	450°C	10	28025-U	
		50	28028-U	
CapSeal Bullet	450°C	12	23488	
		48	23493	
0.32mm COLUMN ID x 0.5mm FERRULE ID				
M-2A	400°C	10	24824-U	
		50	28023-U	
M-4	450°C	10	28026-U	
		50	28031-U	
CapSeal Bullet	450°C	12	23489	
		48	23494-U	
0.53mm COLUMN ID x 0.8mm FERRULE ID				
M-2A	400°C	10	24823-U	
		50	28024-U	
M-4	450°C	10	28027-U	
		50	28032-U	
CapSeal Bullet	450°C	12	23490	
		48	23495	
0.50-0.75mm COLUMN ID x 1.0mm FERRULE ID				
CapSeal Bullet	450°C	12	23491-U	

SSNE Style Column Nut

DESCRIPTION	QTY	CAT. NO.	PRICE
SSNE Style Column Nut	5	28034-U	

Therm-O-Ring Seals

Exclusive from Supelco. New high temperature O-ring seals can be used with inlet temperatures up to 375°C without sticking or fragmenting. They fit 1/4" capillary liners.

DESCRIPTION	QTY	CAT. NO.	PRICE
Therm-O-Ring Seals	25	21004-U	

Thermogreen LB-2 Septa

Lowest bleed of any septum we have tested.

- Extremely low bleed over a wide range of inlet temperatures – 100°C to 350°C
- Already conditioned, ready to use
- Easier needle penetration and high puncture tolerance – ideal for autosamplers
- Rubber formulation exclusive to Supelco

Sigma series, 900 & 990, 8000 Auto Sampler

DESCRIPTION	QTY	CAT. NO.	PRICE
11.0mm	50	20654	



Supeltex Capillary Column Ferrules (General Purpose)

Use with 1/16" compression nuts.

FERRULE TYPE	TEMP. LIMIT	QTY.	CAT. NO.	PRIC
0.20-0.25mm COLUMN ID x 0.4mm FERRULE ID				
M-2A	400°C	10	503258	
		50	22474	
M-4	450°C	10	22498	
		50	22480-U	
0.32mm COLUMN ID x 0.5mm FERRULE ID				
M-2A	400°C	10	22461	
M-4	450°C	10	22462	
		50	22412	
0.53mm COLUMN ID x 0.8mm FERRULE ID				
M-2A	400°C	10	22489	
		50	22473	
M-4	450°C	10	20628	
		50	22479	

Swagelok™ 1/16" Compression Nut

These nuts permit use of general purpose Supeltex and other 1/16" compression capillary ferrules.

DESCRIPTION	QTY	CAT. NO.	PRICE
Swagelok 1/16" brass nut	10	22021	

Inlet Liners

Our liners feature:

- High temperature silanization, to ensure inertness
- In-house manufacturing that meets or exceeds instrument manufacturer's specifications

(Pk/5)

DESCRIPTION	CAT. NO.	PRICE
AUTO SYSTEM 9000 SPLIT/SPLITLESS CAPILLARY INJECTOR		
Split Injection		
92mm x 0.25",4mm ID	2630905	
92mm x 0.25", 4mm ID	2631005	
Splitless		
92mm x 0.25", 2mm ID	2631105	
92mm x 0.25", 0.75mm ID, SPME	2631205	
PPS (PROGRAMMED SPLIT/SPLITLESS)		
Split Injection		
86mm x 4mm, 2mm ID	2631305	
Splitless		
86mm x 4mm, 1mm ID	2631405	
Direct/On-Column/Other		
86mm x 4mm, On-Column	2631505	

Accessory Cases for PerkinElmer GC Capillary Products

We offer a clear plastic storage case with a foam insert. The foam easily stores your capillary accessories. The foam has been cut out to hold your Pk/5 inlet liners, Pk/50 septa, Pk/50 ferrules, Pk/25 Therm-O-Rings, and Column nuts.

DESCRIPTION	CAT. NO.	PRICE
GC Accessory Case for Perkin-Elmer	28037-U	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

24826-U



P000776

Supeltex Capillary Column Ferrules

Use with Varian Nut (p/n 28033-U).

FERRULE TYPE	TEMP. LIMIT	QTY.	CAT. NO.	PRIC
0.20-0.25mm COLUMN ID x 0.4mm FERRULE ID				
M-2A	400°C	10	24826-U	
		50	28022-U	
M-4	450°C	10	28025-U	
		50	28028-U	
CapSeal Bullet	450°C	12	23488	
		48	23493	
0.32mm COLUMN ID x 0.5mm FERRULE ID				
M-2A	400°C	10	24824-U	
		50	28023-U	
M-4	450°C	10	28026-U	
		50	28031-U	
CapSeal Bullet	450°C	12	23489	
		48	23494-U	
0.53mm COLUMN ID x 0.8mm FERRULE ID				
M-2A	400°C	10	24823-U	
		50	28024-U	
M-4	450°C	10	28027-U	
		50	28032-U	
CapSeal Bullet	450°C	12	23490	
		48	23495	
0.50-0.75mm COLUMN ID x 1.0mm FERRULE ID				
CapSeal Bullet	450°C	12	23491-U	

Column Nuts

DESCRIPTION	CAT. NO.	PRICE
Column Nut for Varian GC (pk. of 5)	28033-U	

Thermogreen LB-2 Septa

Lowest bleed of any septum we have tested.

- Extremely low bleed over a wide range of inlet temperatures – 100°C to 350°C
- Already conditioned, ready to use

DESCRIPTION	DIAMETER	CAT. NO.	PRICE
1177 Injectors	9mm	28021-U	
Packed column injectors	9.5mm	20652	
SPI	11mm	20654	
Capillary Injectors	11mm	20654	
	11.5mm	23154	
Saturn GC/MS	11.5mm	23154	

Accessory Case for Varian GC Capillary Products

We offer a clear plastic storage case with a foam insert. The foam easily stores your capillary accessories. The foam has been cut out to hold your Pk/5 inlet liners, Pk/50 septa, Pk/50 ferrules, and Column nuts.

DESCRIPTION	CAT. NO.	PRICE
GC Accessory Case for Varian	28036-U	

Deactivated Glass Inlet Liners

Our liners feature:

- High temperature silanization, to ensure inertness
- Consistent dimensions, tolerances and quality
- In-house manufacturing that meets or exceeds instrument manufacturer's specifications

(Pk/5)

DESCRIPTION	CAT. NO.	PRICE
MODEL 1177 CP INJECTOR		
Split Injection		
78.5 x 6.3mm, 4mm ID, wool packed	2048605	
78.5 x 6.3mm, cup design	2051005	
78.5 x 6.3mm, cup design, wool packed	2048205	
78.5 x 6.3mm, cup design, 10% OV-1 on Chromosorb packed	2055105	
Splitless		
78.5 x 6.5mm, tapered	2046605	
78.5 x 6.5mm, tapered, wool packed	2047805	
78.5 x 6.5mm, 2mm ID	2051305	
78.5 x 6.5mm, dual taper	2048505	
Direct/On-Column		
78.5 x 6.5mm, 1.5mm ID	2051705	
SPME		
78.5 x 6.3mm, 0.75mm ID	2637505	
MODEL 1075/1077 INJECTOR		
Split Injection		
72 x 6.3mm, with frit	2050505	
72 x 6.3mm, Packed with 10% OV-1 on Chromosorb packed	2055505	
72 x 6.3, unpacked	2636105	
72 x 6.3mm, with baffle	2050105	
72 x 6.3mm, wool packed	2636005	
72 x 6.3mm, w/cup unpacked	2049805	
Splitless		
74 x 6.3mm, straight	2050205	
74 x 6.35mm, SPME, 0.75mm ID	2635805	
Direct/On-Column		
72 x 6.3mm, fused silica	2636205	
73 x 0.25", universal flash, 0.53mm ID columns	2636805	
MODEL 1093-94 SPI		
Direct/On-Column		
54 x 4.6mm, direct injection,	2636305	
54 x 5mm, 3.4mm ID, frit	2636405	
54 x 4.6mm, wool packed	2636505	
MODEL 1078 INJECTOR		
Split Injection		
54 x 5mm, 3.4mm ID, unpacked	2637105	
54 x 5mm, 3.4mm ID, frit	2637205	
54 x 5mm, 3.4mm ID, packed	2637305	
54 x 5mm, 2mm ID, split/splitless, wool packed	2637705	
Splitless		
54 x 5mm, 2mm ID, unpacked	2637405	
54 x 5mm, 0.8mm ID, unpacked	2637805	
54 x 5mm, 0.5mm ID, temp ramp mode	2637605	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



GC Accessories
Ferrules and Accessories

Select the best ferrule for your application:

Supeltex ferrules form leaktight seals without sticking to your column. And they don't require back ferrules.

We highly recommend:

- Supeltex M-4 and CapSeal Bullet ferrules for fused silica capillary columns
- Supeltex M-4 and Supeltex M-2A ferrules for glass columns
- Supeltex M-2A and Supeltex M-2 ferrules for metal columns

FERRULE SPECIFICATIONS

Supeltex M-1
Max. Temp.: 250°C
Composition: ceramic-filled Teflon
Characteristics: Ideal for connections to mass spectrometers. High reusability. Isothermal use only.

Supeltex M-2
Max. Temp.: 350°C
Composition: DuPont VESPEL SP-1 (100% polyimide)
Characteristics: High reusability.

Supeltex M-2A
Max. Temp.: 400°C
Composition: DuPont VESPEL SP-21 (85% polyimide/15% graphite)
Characteristics: Seals at 1/4 turn past fingertight. High reusability. Won't stick to metal or glass.

Supeltex M-2B
Max. Temp.: 350°C
Composition: DuPont VESPEL SP-211 (75% polyimide/25% graphite)
Characteristics: Conforms easily to capillary column, ensuring an effective seal and less chance of breakage.

Supeltex M-4
Max. Temp.: 450°C
Composition: flexible graphite
Characteristics: Seals at 1/4 turn past fingertight. Maximum sealing surface contact, reduced risk of column contamination at installation.
An improved design . Supelco has refined the design of graphite ferrules so that we can offer you the finest quality ferrule available. Compare these ferrules to the graphite ferrules you are now using – Supeltex M-4 ferrules offer a clean, sharp profile with minimal flash.

CapSeal Bullet
Max. Temp.: 450°C
Composition: graphite in an aluminum base
Characteristics: Seals at 1/8-turn past fingertight. Reusable. A special end taper reduces graphite extrusion into fitting.
Will not adhere to fittings. Reusable CapSeal Bullet ferrules consist of a graphite material captured in an aluminum base. This unique design keeps the ferrule from adhering to the fitting, making it easy to remove. Eliminate the headache of digging out a stuck ferrule and risking damage to your fitting.

O-Ring
Max. Temp.: 200°C
Composition: silicone
Characteristics: Seals column having OD over or under specifications.

Therm-O-Ring
Max. Temp.: 375°C
Characteristics: Won't stick to metal or glass. Superior replacement for Viton O-rings.

Supeltex Packed Column Ferrules

FERRULE TYPE	TEMP. LIMIT	QTY.	CAT. NO.	PRIC
1/4" COLUMN OD x 1/4" FERRULE ID				
M-1	250°C	10	22086-U	
		100	22087-U	
M-2	350°C	10	22320-U	
		50	22475	
M-2A	400°C	10	22481	
		50	22471	
M-4	450°C	10	22492	
		50	22478	
O-Rings	200°C	100	20407	
6mm COLUMN OD x 6mm FERRULE ID				
M-1	250°C	10	22089-U	
M-2A	400°C	10	22393	
M-4	450°C	10	22493	
1/8" COLUMN OD x 1/8" FERRULE ID				
M-1	250°C	10	22496	
		100	22309	
M-2	350°C	10	22321	
		50	22476	
M-2A	400°C	10	22483-U	
		50	22472	
M-4	450°C	10	22491	
Teflon Front[2]	300°C	10	22058	
Teflon Back[2]	300°C	10	22059	
1/16" COLUMN OD x 1/16" FERRULE ID				
M-1	250°C	10	22386	
M-2	350°C	10	20644-U	
M-2A	400°C	10	22487-U	
M-2A Indented Blank[1]	400°C	10	22488	
M-4	450°C	10	22495-U	

[1] Drill to fit your column.
[2] For Purge Traps.

Supeltex Reducing Ferrules

DIMENSIONS	QTY.	PRICE	CAT. NO.
SUPELTEX M-1			
1/8" to 1/16"	10		22387
SUPELTEX M-2			
1/4" to 1/16"	10		22384
1/4" to 1/8"	10		22314
SUPELTEX M-2A			
1/8" to 1/16"	10		22484-U
1/4" to 1/16"	10		22486
1/4" to 1/8"	10		22485-U
SUPELTEX M-4			
1/8" to 0.50mm	2		22458
1/4" to 0.50mm	2		22457









Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Supeltex Capillary Column Ferrules (General Purpose)

FERRULE TYPE	TEMP. LIMIT	QTY.	CAT. NO.	PRIC
0.20-0.25mm COLUMN ID x 0.4mm FERRULE ID				
M-2A	400°C	10	503258	
		50	22474	
M-2A 2-hole	400°C	5	22467	
M-2A Indented Blank[1]	400°C	10	22488	
M-2B	350°C	10	22510-U	
M-4	450°C	10	22498	
		50	22480-U	
CapSeal Bullet	450°C	12	23480-U	
		48	23485	
0.32mm COLUMN ID x 0.5mm FERRULE ID				
M-2A	400°C	10	22461	
M-2A 2-hole	400°C	5	22463	
M-2A Indented Blank[1]	400°C	10	22488	
M-2B	350°C	10	22511	
M-4	450°C	10	22462	
		50	22412	
CapSeal Bullet	450°C	12	23481	
		48	23486	
0.53mm COLUMN ID x 0.8mm FERRULE ID				
M-1	250°C	10	22499	
M-2A	400°C	10	22489	
		50	22473	
M-2A Indented Blank[1]	400°C	10	22488	
M-2B	350°C	10	22512	
M-4	450°C	10	20628	
		50	22479	
CapSeal Bullet	450°C	12	23482	
		48	23487	
0.75mm COLUMN ID x 1.0mm FERRULE ID				
M-2A Indented Blank[1]	400°C	10	22488	
M-4	450°C	10	22494	
0.50-0.75mm COLUMN ID x 1.2mm FERRULE ID				
M-2A	400°C	10	22459	
M-2A Indented Blank[1]	400°C	10	22488	
M-4	450°C	10	22460	

[1] Drill to fit your column.

Ferrules for 5mm Shimadzu Columns and Inlet Liners

Ferrules with metal spacers for 5mm OD Shimadzu columns and inlet liners. Replace Shimadzu part number 221-15563-91.

DESCRIPTION	CAT. NO.	PRICE
Ferrules for Shimadzu Columns (pk. of 4)	23311	











CapSeal Bullet Ferrules



Ferrule Kits

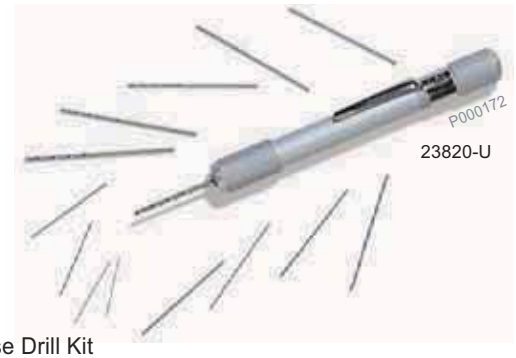
Finding the right ferrule can be difficult. Simplify this chore with one of our ferrule starter kits. Each kit contains several types of Supeltex ferrules – you can determine which type is best for your applications. Kits include instructions for installing each ferrule.

Kit for Fused Silica Capillary Columns (0.40mm to 0.51mm OD): 4 drilled Supeltex M-2A, 4 indented blank Supeltex M-2A, 4 Supeltex M-4 ferrules, plus pin vise drill kit (Cat. No. 23820-U) and instructions.

Kit for Wide Bore Fused Silica Capillary Columns (0.8mm to 1.19mm OD):4 Supeltex M-1, 4 Supeltex M-2A, 4 Supeltex M-4 ferrules, plus pin vise drill kit (Cat. No. 23820-U) and instructions.

Ferrule Kit for Glass Packed Columns (1/4" OD): 4 Supeltex M-1, 4 Supeltex M-2A, 4 Supeltex M-4 ferrules, a 6"/15cm x 1/4" practice piece of glass tubing, and instructions.

DESCRIPTION	CAT. NO.	PRICE
For Fused Silica Capillary Columns	22469	
For Wide Bore Fused Silica Capillary Columns	22468	
For Glass Packed Columns	20648	
Pin Vise Drill Kit	23820-U	



Pin Vise Drill Kit

Drill the exact bore you need in hard or soft ferrules. Includes pin vise and 14 drill bits:

0.33mm/0.0135"	0.77mm/0.031"	1.06mm/0.042"
0.40mm/0.016"	0.83mm/0.033"	1.17mm/0.046"
0.56mm/0.022"	0.91mm/0.036"	1.40mm/0.055"
0.63mm/0.025"	0.97mm/0.038"	1.61mm/0.061"
0.72mm/0.028"	1.02mm/0.040"	

The vise handle holds all bits to keep them at your fingertips. The vise also is handy for gripping fine wire when cleaning FID jets, syringe needles, or any other small orifice.

DESCRIPTION	CAT. NO.	PRICE
Pin Vise Drill Kit	23820-U	
DRILL BITS		
0.35mm	23811-U	
0.40mm	23810	
0.51mm	23809	

RELATED INFORMATION

For Leak Free Connections, a guide to ferrule selection, connection techniques, and accessories, request the following free literature by phone or fax, or see our website.

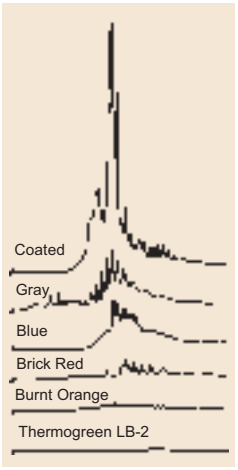
No.	Subject
T100741	ferrule selection and installation

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

GC Accessories
Septa and Accessories

We test every lot of Thermogreen LB-2 and Thermogreen LB-1 silicone septa, to ensure low bleed and high puncture tolerance. We also condition these septa – they are ready to use, right from the container.





93-0132

Bleed after 25 punctures
Temperature: 40°C to 250°C
Injector Set Point: 350°C

P000183

Thermogreen LB-2 Septa

Lowest bleed of any septum we have tested.

- Extremely low bleed over a wide range of inlet temperatures – 100°C to 350°C
- Already conditioned, ready to use
- Easier needle penetration and high puncture tolerance – ideal for autosamplers
- Rubber formulation exclusive to Supelco

DISC DIAMETER mm	INCH	QTY.	CAT. NO.	PRICE
5.0	3/16	50	20638	
6.0	1/4	50	20651	
9.0	11/32	50	28021-U	
9.5[1]	3/8	50	20652	
9.5[1]	3/8	250	20666	
9.5[1]	3/8	1000	20677	
10.0	13/32	50	20653-U	
10.0	13/32	250	23156	
10.0	13/32	1000	23157	
11.0	7/16	50	20654	
11.0	7/16	250	23163	
11.0	7/16	1000	23164	
11.5	11/24	50	23154	
12.5	1/2	50	20660-U	
12.5	1/2	250	20678	
14.0	9/16	50	20662-U	
16.0	5/8	50	20663	
17.0	21/32	50	23159	
CYLINDRICAL, FOR SHIMADZU INSTRUMENTS				
Plug Type		10	20608	
Plug Type		50	20633	
DRILLED, FOR SOLID PHASE MICROEXTRACTION				
9.5[1]	3/8	25	23161	
9.5[1]	3/8	50	23162-U	
11.0	7/16	25	23167	
11.0	7/16	50	23168	

[1] We recommend a 9.5mm (3/8") septum to those who previously used the 9mm size.

Thermogreen LB-1 Septa

For overall dependability.

- Inlet temperature: 50°C to 300°C

DISC DIAMETER mm	INCH	QTY.	CAT. NO.	PRICE
9.5	3/8	50	20659-U	
10.0	13/32	50	20657-U	
11.0	7/16	50	20658	
12.5	1/2	50	20661	
CYLINDRICAL, APPROX. 6mm DIAMETER x 9mm				
Thru-Hole Type		100	20667	
Half-Hole Type		100	20668	



P000331

With Thermogreen LB-2 Septa

Ask for your free mug when you order any package of Thermogreen LB-2 septa.

DESCRIPTION	CAT. NO.
Free Mug	1714-U

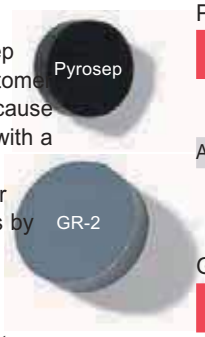
RELATED INFORMATION:

For Low Bleed, High Temperature Septa useful application note describing criteria for selecting a septum, request the following free literature by phone or fax, or see our website.

No.	Subject
T395082	Low Bleed, High Temperature GC Septa Improve Baseline Stability

Pyrosep S-1 Septa

Inlet Temperature: 300°C to 400°C – Pyrosep S-1 septa are made from a Teflon-type elastomer conditioned at 300°C to minimize bleed. Because they are relatively hard, they must be used with a needle guide (to prevent the needle from buckling) and only at high temperatures. Our metal adapter rings offer substantial savings by enabling you to use smaller septa.



GR-2 Septa

Inlet Temperature: 50°C to 200°C – Low cost gray silicone rubber septa for routine, isothermal use.

Hamilton Red Disc Septa

Inlet Temperature: to 200°C – A soft inner layer of silicone rubber sandwiched between hard outside layers.

P000185

Teflon-Faced Septa

Inlet Temperature: 200°C to 300°C – After the Teflon face is ruptured during injection, some bleeding will occur. Since this bleed increases as more rubber is exposed, we recommend using a needle guide to reduce the size of the punctured area.

SS-138 123 mil off-white silicone rubber / 2 mil ivory Teflon.

SS-174 123 mil off-white silicone rubber / 2 mil yellow Teflon. Improved version of the SS-138 with less bleed.

Septum Sizes for Various Chromatographs

MANUFACTURER	GC MODEL	DISC DIAMETER mm	DISC DIAMETER INCH
Agilent/HP	5880A, 5890	11	7/16
	5700 series, 5880	9.5	3/8
	5880/90, 6890, OCI ports	5	3/16
Antek	all	9.5	3/8
Finnigan	9600	9.5	3/8
Finnigan/Tremetics	9000, 9500	12.5	1/2
GOW-MAC	all	9.5	3/8
HNU	portable GC	9.5	3/8
Perkin-Elmer	Sigma series, 900 & 990, 8000, Auto Sampler	11	7/16
Shimadzu	14, 15A, 16, 17A	plug	
Thermoquest	8000 series	17	21/32
Tracor	220, 222, 540	12.5	1/2
	550, 560	9.5	3/8
Varian	packed column injectors	9.5	3/8
	SPI	11	7/16
	3700/Vista, capillary injectors	11/11.5	7/16/11/24
	Saturn GC/MS	11.5	11/24
	1177	9.0	11/32

Pyrosep S-1 Septa

DISC DIAMETER mm	DISC DIAMETER INCH	QTY.	CAT. NO.	PRICE
6	1/4	10	22369	
9.5	3/8	10	22370-U	
ADAPTER RINGS(PK. OF 2)				
9.5mm OD x 6mm ID [1]			22338	

[1] Use with 6mm septa, to replace 9.5mm septa.

GR-2 Septa

DISC DIAMETER mm	DISC DIAMETER INCH	QTY.	CAT. NO.	PRICE
5.0	3/16	100	20712	
6.0	1/4	100	20442-U	
9.5	3/8	100	20405	
9.5	3/8	250	20625	
9.5	3/8	1000	20627	
10.0	13/32	100	20441	
11.0	7/16	100	20421	
12.5	1/2	100	20413	
GR-2 RUBBER SHEET STOCK				
290 x 290 x 3mm			20420-U	

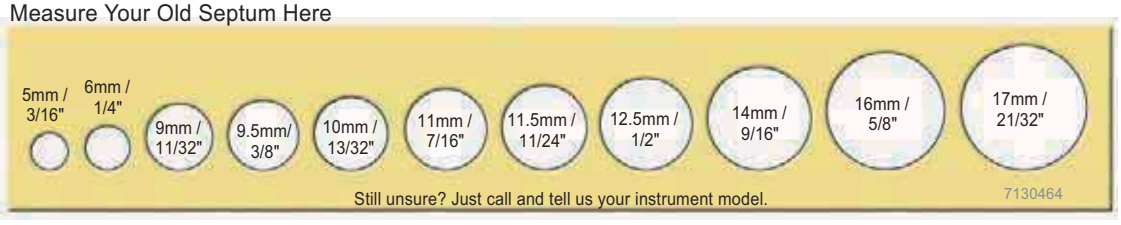
Hamilton Red Disc Septa

DISC DIAMETER mm	DISC DIAMETER INCH	QTY.	CAT. NO.	PRICE
9.0	11/32	12	20416	
10.0	13/32	12	20417	
12.5	1/2	12	20418	

Teflon-Faced Septa

DISC DIAMETER mm	DISC DIAMETER INCH	QTY.	CAT. NO.	PRICE
SS-138				
6.0	1/4	100	22652	
9.5	3/8	100	20459	
9.5	3/8	250	22622	
10.0	13/32	100	20465	
11.0	7/16	100	22730	
12.5	1/2	100	20460-U	
SS-174				
6.0	1/4	100	22654	
9.5	3/8	100	22656	
9.5	3/8	250	22618	
9.5	3/8	1000	22619	
10.0	13/32	100	22647	
11.0	7/16	100	22731	
12.5	1/2	100	22657	
14.0	9/16	50	22732	

Measure Your Old Septum Here



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GC Accessories
Septa and Accessories



Septum Nuts

Consistent septum tightness, fewer bent needles, easy leak detection. The needle guide in Supelco septum nuts ensures that the needle consistently penetrates the septum in the same place, prolonging septum life. The guide also prevents the needle from striking the edge of the column or bending during insertion. The 9/16" hexagonal nut head accommodates our torque wrench for consistent, optimum tightening. Each nut is supplied with easily interchanged 1/2" and 1" guides. Use 9.5mm septa with each nut.

The stainless steel nuts hold up under heavy use (e.g., when septa are replaced daily). We also recommend using them for reactive samples, such as chlorinated pesticides. Aluminum nuts offer economy in light use or when samples are nonreactive (i.e., when metal columns are used).

Nut N-1 fits PE-3920, 900, Sigma series, Agilent/HP-5700, other ports accepting 1/4" Swagelok nut, 7/16" threads, 20/inch.

Nut N-2 fits Varian 3700, other ports accepting 1/4" nut, 7/16" threads, 24/inch.

Use with packed columns only. Also see torque wrench.

DESCRIPTION	CAT. NO.	PRICE
SEPTUM NUT N-1		
Stainless Steel[1]	22399	
All Aluminum	22497	
SEPTUM NUT N-2		
All Aluminum	22402	

[1] Aluminum needle guide.



Torque Wrench

Take the guesswork out of tightening a septum nut. The handle of the Supelco septum nut torque wrench slips when preset torque (8 inch-lbs.) is reached. Helps prevent leaking septa, excess bleed, and difficult septum penetration. Deepwell socket (9/16") fits over the Supelco septum nut even with a needle guide attached.

DESCRIPTION	CAT. NO.	PRICE
Torque Wrench	22661	

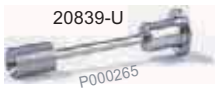


Injection Port Rethreader

Die, enclosed in a knurled brass jacket, restores worn injection port threads, ensuring a good septum nut seal.

DESCRIPTION	CAT. NO.	PRICE
For ports accepting		
1/4" Swagelok nuts[1]	20855	
1/8" Swagelok nuts[2]	20856	
In Varian instruments[3]	20854	

[1] 7/16", 20 threads/inch
[2] 5/16", 20 threads/inch
[3] 7/16", 24 threads/inch



Needle Guide

Prolongs septum and needle life. Use with the septum holder already in your instrument. Requires a 3/16" diameter hole in the holder. If hole in your septum holder is too small, simply drill to 3/16" to insert guide.

DESCRIPTION	CAT. NO.	PRICE
Needle Guide	20839-U	



Septum Pullers

Our hook septum puller is great for removing soft silicone septa and graphite ferrules from 1/4" Swagelok nuts. Has dozens of other uses around the lab.

The screw septum puller is perfect for removing soft silicone septa and harder high temperature septa such as the Pyrosep S-1.

DESCRIPTION	CAT. NO.	PRICE
Hook Septum Puller	20352	
Screw Septum Puller	20353	



Septum Inserter

No burned fingers – no contaminated septa. Use the Supelco Septum Inserter to install a septum in any GC injection port that uses 9.5mm - 11mm septa. Eliminates the potential for burned fingers; prevents septum contamination from finger oils or dropping on the floor.

DESCRIPTION	CAT. NO.	PRICE
Septum Inserter	21385-U	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Deactivated Glass Liners for Packed Column Injection Ports

We can prepare liners to your specifications. Just call our Ordering and Customer Service Departments for a quote.

These deactivated glass liners prevent reaction between active sample components and the injection port's metal surfaces.

INSTRUMENT MANUFACTURER & MODEL	LINER DESCRIPTION	MFR. PART NO.	QTY.	CAT. NO.	PRICE
AGILENT/HP 5700, 5830/40A, 5880A, 5890A					
	Glass liner	5080-8732	5	20508	
91.5mm x 3mm OD	1.8mm ID		25	20511	
PERKIN-ELMER 3920					
	Glass liner (small bore)	0009-1614	1	26301	
143mm x 4.6mm OD	1.5mm ID				
PERKIN-ELMER 8000, SIGMA 2000/2100, SIGMA 1B-4B & 300 MANUFACTURED 1978 OR LATER					
	Glass liner	0330-2221	1	26300-U	
101mm x 4.6mm OD	2.75mm ID		5	26409	
PERKIN-ELMER AUTO SYSTEM, MODEL 9000					
Unpacked	Packed column	N610-1048	1	2631601	
	3mm ID		5	2631605	
112mm x 6mm OD			25	2631625	
Packed (deactivated glass wool)					
	For dirty samples		5	2631705	
112mm x 6mm OD	3mm ID		25	2631725	
VARIAN UNIVERSAL FLASH INJECTORS 1060-60, 3300, 3400, 3500-3600, OLDER 3700/VISTA					
	Glass injector insert (wool packed)	37-000813-00	1	26369	
			5	26426	
72mm x 6.3mm OD			25	26481	
VARIAN MODULINE AND OTHER OLDER MODELS					
	Glass insert	6-000107-01	10	26370-U	
5½"/14cm x 1/8" OD	1.8mm ID				

Deactivated Glass Liners for Capillary Injection Ports

A regular schedule of inlet liner replacement will help prevent adsorption problems that can otherwise drastically affect analysis.

We also can prepare replacement liners for other instruments or unique liners from your own design. Just call for a quote.

Our liners feature:

- High temperature silanization, to ensure inertness
- Consistent dimensions, tolerances and quality
- In-house manufacturing that meets or exceeds instrument manufacturer's specifications

	INSTRUMENT MANUFACTURER & MODEL	APPLICATION	MFR. PART NO.	QTY.	CAT. NO.	PRICE
	ATAS OPTIC 2 HIGH VOLUME INJECTOR					
	Unpacked with single frit			1	2632601	
				5	2632605	
				25	2632625	
	80mm x 5mm OD x 3mm ID					
	CARLO ERBA/FISONS MODEL 6000 SERIES					
Splitless	HS glass (2mm ID)	Trace analytes	45300300	1	2632001	
				5	2632005	
				25	2632025	
	79.5mm x 5.5mm OD					
Splitless	HS glass (4mm ID)	Trace analytes	45300400	5	2632105	
				25	2632125	
	79.5mm x 5.5mm OD					
Splitless	4mm ID (with slot)	High & low MW analytes	45320010	1	2632301	
				5	2632305	
	99mm x 5.5mm OD					
Splitless	1.8mm ID (with slot)	Trace analytes	45320020	1	2632401	
				5	2632405	
	99mm x 5.5mm OD					

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Gas Chromatography

SUPELCO

GC Accessories
Inlet Liners

	INSTRUMENT MANUFACTURER & MODEL	APPLICATION	MFR. PART NO.	QTY.	CAT. NO.	PRICE
AGILENT/HP MODELS 4890, 5880, 5890, 6890						
Split	Cup (unpacked)  78.5mm x 6.3mm OD	High & low MW analytes	18740-80190	5 25	2051005 2051025	
Split	Cup (wool packed)  78.5mm x 6.3mm OD	Dirty samples	18740-80190 [1]	1 5 25	2048201 2048205 2048225	
Split	Cup (packed w/ 10% OV-1 on Chromosorb-W HP)  78.5mm x 6.3mm OD	Dirty samples Traps non-volatiles Reduces discrimination	18740-60840	1 5 25	2055101 2055105 2055125	
Split	Split/splitless (4mm ID, wool packed)  78.5mm x 6.3mm OD	General For 7673 autosampler	19251-60540	1 5 25	2048601 2048605 2048625	
Splitless	2mm ID  78.5mm x 6.5mm OD	Trace analytes Samples <2µL	18740-80220 [2] 5181-8818	1 5 25	2051301 2051305 2051325	
Splitless	Dual-tapered  78.5mm x 6.5mm OD	Active analytes in trace quantities	5181-3315	1 5 25	2048501 2048505 2048525	
Splitless	Tapered (unpacked)  78.5mm x 6.5mm OD	Active analytes in trace quantities	5181-3316	1 5 25	2046601 2046605 2046625	
Splitless	Tapered (wool packed)  78.5mm x 6.5mm OD	General For 7673 autosampler	5062-3587	1 5 25	2047801 2047805 2047825	
Direct	0.75mm ID  78.5mm x 6.3mm OD	SPME [3] Small volume	no equivalent	1 5 25	2637501 2637505 2637525	
Direct	1.5mm ID  78.5mm x 6.5mm OD	Headspace & purge/trap devices	18740-80200	1 5 25	2051701 2051705 2051725	
FINNIGAN MODELS 9001, GCQ						
Split	Cup (unpacked)  78.5mm x 6.3mm OD	High & low MW analytes	18740-80190	5 25	2051005 2051025	
Split	Cup (wool packed)  78.5mm x 6.3mm OD	Dirty samples	18740-80190 [1]	1 5 25	2048201 2048205 2048225	
Split	Cup (packed w/ 10% OV-1 on Chromosorb-W HP)  78.5mm x 6.3mm OD	Dirty samples Traps non-volatiles Reduces discrimination	18740-60840	1 5 25	2055101 2055105 2055125	
Split	Split/splitless (4mm ID, wool packed)  78.5mm x 6.3mm OD	General For 7673 autosampler	19251-60540	1 5 25	2048601 2048605 2048625	
Splitless	2mm ID  78.5mm x 6.5mm OD	Trace analytes Samples <2µL	18740-80220 [2] 5181-8818	1 5 25	2051301 2051305 2051325	

[1] Supelco version has been modified to enhance performance.
[2] Instrument manufacturer's nondeactivated liner
[3] Solid Phase Microextraction

Gas Chromatography
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GC Accessories
Inlet Liners

	INSTRUMENT MANUFACTURER & MODEL	APPLICATION	MFR. PART NO.	QTY.	CAT. NO.	PRICE
FINNIGAN MODELS 9001, GCQ (CONT'D)						
Splitless	Dual-tapered  78.5mm x 6.5mm OD	Active analytes in trace quantities	5181-3315	1 5 25	2048501 2048505 2048525	
Splitless	Tapered (unpacked)  78.5mm x 6.5mm OD	Active analytes in trace quantities	5181-3316	1 5 25	2046601 2046605 2046625	
Splitless	Tapered (wool packed)  78.5mm x 6.5mm OD	General For 7673 autosampler	5062-3587	1 5 25	2047801 2047805 2047825	
Direct	0.75mm ID  78.5mm x 6.3mm OD	SPME[3] Small volume	no equivalent	1 5 25	2637501 2637505 2637525	
Direct	1.5mm ID  78.5mm x 6.5mm OD	Headspace & purge/trap devices	18740-80200	1 5 25	2051701 2051705 2051725	
PERKIN-ELMER MODELS 2000, 8000						
Split	Wide bore, 4mm ID  100mm x 5mm OD	General purpose Dirty samples	0330-5181	1 5 25	2630301 2630305 2630325	
Splitless	narrow bore, 2mm ID  100mm x 5mm OD	Trace analytes	0330-5180	1 5 25	2630401 2630405 2630425	
Splitless	Glass (unpacked) 88mm x 2mm	For high linearity	N600-2017	1 25	2630601 2630625	
PERKIN-ELMER AUTO SYSTEM, MODEL 9000 SPLIT/SPLITLESS CAPILLARY INJECTOR						
Split	 92mm x 0.25" OD x 4mm ID	General purpose	N610-1052 N612-1001[4]	1 5 25	2630901 2630905 2630925	
Split	Packed (deactivated glass wool)  92mm x 0.25" OD x 4mm ID	General purpose Dirty samples		5 25	2631005 2631025	
Splitless	 92mm x 0.25" OD x 2mm ID	Trace analytes	N612-1002[4]	5 25	2631105 2631125	
SPME	 92mm x 0.25" OD x 0.75mm ID	SPME[3]		5	2631205	
PERKIN-ELMER PROGRAMMED SPLIT/SPLITLESS INJECTION (PSS)						
Split	 86mm x 4mm OD x 2mm ID		N612-1004[4]	1 5 25	2631301 2631305 2631325	
Splitless	 86mm x 4mm OD x 1mm ID	Trace analytes	N612-1006[4]	5	2631405	
On-Column	 86mm x 4mm OD	Thermolabile Trace analytes	N610-1539	5	2631505	

[3] Solid Phase Microextraction.

[4] Instrument manufacturer's quartz liner.

G000425-435

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GC Accessories

Inlet Liners

	INSTRUMENT MANUFACTURER & MODEL	APPLICATION	MFR. PART NO.	QTY.	CAT. NO.	PRICE
SHIMADZU MODELS 9A/AM/15A/16 WITH SPL-G9/15 INJECTORS						
Split	127mm x 5mm OD	High & low MW analytes	221-25822-01	1 5 25	2633001 2633005 2633025	
Splitless	 127mm x 5mm OD	Trace analytes	221-25440-03	1 5	2633101 2633105	
	 127mm x 0.75mm ID x 5mm OD	SPME[3]		1 5 25	2632901 2632905 2632925	
SHIMADZU MODELS 14/15A/16 WITH SPL-14 INJECTORS						
Split	 99mm x 5mm OD	General purpose	221-32544-01	1 5 25	2633301 2633305 2633325	
Splitless/SPME	 99mm x 5mm OD	Trace analytes	221-32544-00	1 5 25	2633401 2633405 2633425	
	 99mm x 5mm OD x 0.75mm ID	SPME[3]		1 5 25	2633501 2633505 2633525	
SHIMADZU MODEL 17A WITH SPL-17 INJECTORS						
Split	 95mm x 5mm OD	General purpose	221-41444-00	1 5 25	2633601 2633605 2633625	
	 Packed (deactivated glass wool)	Dirty samples		5 25	2632705 2632725	
Splitless/SPME	 95mm x 5mm OD	Trace analytes	221-41544-00	5 25	2633705 2633725	
	 95mm x 5mm OD x 0.75mm ID	SPME[3]		1 5 25	2633901 2633905 2633925	
Wide Bore	Internal taper  95mm x 5mm OD	Wide bore capillary columns	221-41599	1 5 25	2633801 2633805 2633825	
VARIAN 1075/1077 INJECTORS						
Split	Unpacked  72mm x 6.3mm OD	High & low MW analytes	16-000830-00 [2]	1 5 25	2636101 2636105 2636125	
	with frit  72mm x 6.3mm OD	Dirty samples	16-000830-01 [2] 01-900109-03	1 5 25	2050501 2050505 2050525	
	Wool packed  72mm x 6.3mm OD	Dirty samples	01-900109-01	1 5 25	2636001 2636005 2636025	
	Packed w/ 10% OV-101 on Chromosorb W HP 80/100  72mm x 6.3mm OD	Complete vaporization Aids thermal transfer	03-949809-00 [2]	1 5	2055501 2055505	

[2] Instrument manufacturer's nondeactivated liner.

[3] Solid Phase Microextraction.

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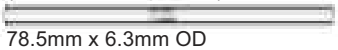
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	INSTRUMENT MANUFACTURER & MODEL	APPLICATION	MFR. PART NO.	QTY.	CAT. NO.	PRICE
VARIAN 1075/1077 INJECTORS (CONT'D)						
Split	with baffle  72mm x 6.3mm OD	Analytes with close boiling points	16-000829-00 [2] 01-900109-04	1 5 25	2050101 2050105 2050125	
Split	Cup (unpacked)  72mm x 6.3mm OD	High & low MW analytes	01-900109-02	1 5 25	2049801 2049805 2049825	
Splitless/SPME	Straight  74mm x 6.3mm OD	Trace analytes	03-949437-90 [2] 01-900109-05	1 5 25	2050201 2050205 2050225	
Splitless/SPME	0.75mm ID  74mm x 6.35mm OD	SPME [3] Small volume	no equivalent	1 5 25	2635801 2635805 2635825	
Direct	Fused silica  72mm x 6.3mm OD	High linearity (0.25/0.32mm ID columns)	03-908725-00	1 5	2636201 2636205	
Universal Flash	Glass flash inserts (0.53mm ID columns)  73mm x 0.25" OD		03-918339-00	1 5 25	2636801 2636805 2636825	
VARIAN 1093-94 SPI INJECTOR						
Direct/SPME	Glass insert (high performance)  54mm x 4.6mm OD	High linearity (0.25 & 0.32mm ID columns)	03-918332-01 [2] 01-900109-06 01-900066-18	1 5 25	2636301 2636305 2636325	
Direct/SPME	Flash & on-column insert (0.53mm ID column)  54mm x 4.6mm OD	High linearity (0.53mm ID columns) SPME	03-918332-02 [2] 01-900109-07 01-900066-19	1 5 25	2636401 2636405 2636425	
Direct/SPME	Glass insert (wool packed)  54mm x 4.6mm OD	Dirty samples	01-900109-08	5 25	2636505 2636525	
VARIAN 1078/1079 INJECTOR						
Split	Frit  54mm x 5mm OD x 3.4mm ID	Instantaneous sample vaporization	03-918464-01	1 5 25	2637201 2637205 2637225	
Split	Unpacked  54mm x 5mm OD x 3.4mm ID		03-918464-00	1 5 25	2637101 2637105 2637125	
Split	Packed  54mm x 5mm OD x 3.4mm ID		03-918956-00	1 5 25	2637301 2637305 2637325	
Splitless/SPME	Unpacked  54mm x 5mm OD x 2mm ID	Minimizes dead volume	03-918466-00	1 5 25	2637401 2637405 2637425	
Splitless/SPME	 54mm x 5mm OD x 0.8mm ID	SPME [3]	03-925330-00	1 5	2637801 2637805	

[2] Instrument manufacturer's nondeactivated liner.
[3] Solid Phase Microextraction.

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G000454-466

GC Accessories
Inlet Liners

	INSTRUMENT MANUFACTURER & MODEL	APPLICATION	MFR. PART NO.	QTY.	CAT. NO.	PRICE
VARIAN 1078/1079 INJECTOR (CONT'D)						
Split/Splitless	 54mm x 5mm OD x 0.5mm ID	Trace analytes Thermolabile and polar compounds	03-925331-00	1 5 25	2637601 2637605 2637625	
Split/Splitless	Packed (deactivated glass wool) 	Nonpolar compounds	03-925350-00	1 5 25	2637701 2637705 2637725	
VARIAN MODEL CP-1177 INJECTOR						
Direct	Cup (unpacked)  78.5mm x 6.3mm OD	High & low MW analytes	18740-80190	5 25	2051005 2051025	
Direct	Cup (wool packed)  78.5mm x 6.3mm OD	Dirty samples	18740-80190 [1]	1 5 25	2048201 2048205 2048225	
Direct	Cup (packed w/ 10% OV-1 on Chromosorb-W HP)  78.5mm x 6.3mm OD	Dirty samples Traps non-volatiles Reduces discrimination	18740-60840	1 5 25	2055101 2055105 2055125	
Direct	Split/splitless (4mm ID, wool packed)  78.5mm x 6.3mm OD	General For 7673 autosampler	19251-60540	1 5 25	2048601 2048605 2048625	
Splitless	2mm ID  78.5mm x 6.5mm OD	Trace analytes Samples <2µL	18740-80220 [2] 5181-8818	1 5 25	2051301 2051305 2051325	
Splitless	Dual-tapered  78.5mm x 6.5mm OD	Active analytes in trace quantities	5181-3315	1 5 25	2048501 2048505 2048525	
Splitless	Tapered (unpacked)  78.5mm x 6.5mm OD	Active analytes in trace quantities	5181-3316	1 5 25	2046601 2046605 2046625	
Splitless	Tapered (wool packed)  78.5mm x 6.5mm OD	General For 7673 autosampler	5062-3587	1 5 25	2047801 2047805 2047825	
SPME	0.75mm ID  78.5mm x 6.3mm OD	SPME [3] Small volume	no equivalent	1 5 25	2637501 2637505 2637525	
SPME	1.5mm ID  78.5mm x 6.5mm OD 54mm x 5mm OD x 2mm ID	Headspace & purge/trap devices	18740-80200	1 5 25	2051701 2051705 2051725	

[1] Supelco version has been modified to enhance performance
[2] Instrument manufacturer's nondeactivated liner.
[3] Solid Phase Microextraction.

Ferrules/Metal Spacers for 5mm Shimadzu Inlet Liners and Columns

Replace Shimadzu part number 221-15563-91.

DESCRIPTION	CAT. NO.	PRICE
Ferrules for Shimadzu Liners (pk. of 4)	23311	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

G000467-480



A syringe with a 6"/15.24cm needle is required to deposit samples properly within the sleeve.

Cool On-Column Injection Sleeve Kit

Minimize splitter discrimination - Splitter discrimination among sample components that have different boiling points causes inaccurate quantification among components. Using our 6.25"/16cm x 1/4" Cool On-Column Injection Sleeve (Cat. No. 20476) in conjunction with a 0.53mm ID SPB-1 Thin Film capillary column, we found splitter discrimination was negligible for paraffins up to C44.

The sleeve was designed for use with a 0.53mm ID fused silica column. Use the hardware supplied in the injection sleeve kit (Cat. No. 23630) to install the sleeve in a 1/4" packed column injection system (on-column injection only).

DESCRIPTION	CAT. NO.	PRICE
Cool On-Column Injection Sleeve Kit (Injection sleeve plus 1/4" connecting hardware)	23630	
Cool On-Column Injection Sleeve	20476	
Reducing Union	23633	
Male Nuts, 1/16" (pk. of 4)	23805	
Knurled Male Nuts, 1/16" (pk. of 2)	23812	
Hamilton 701N Syringe (10µL), 6"/15.24cm fixed needle	21574	



Injection Tee Kit

Simultaneous analyses on two wide bore columns - This kit enables you to characterize samples on two wide bore columns of different polarity. The tee is deactivated and the inlet chamfered for use with automatic samplers. Use in 1/4" injection ports.

Kit includes deactivated glass tee, two 1/4" x 1/16" stainless steel reducing unions, ferrules for 0.53mm and 0.75mm ID columns, and instructions.

DESCRIPTION	CAT. NO.	PRICE
Injection Tee Kit #1 (6"/15cm tee)	23664	
Injection Tee Kit #2 (8"/20cm tee)	23665	
Tee, 6"/15cm	23666	
Tee, 8"/20cm	23667	
Reducing Union	23633	
Male Nuts, 1/16" (pk. of 4)	23805	
Knurled Male Nuts, 1/16" (pk. of 2)	23812	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

GC Accessories
Capillary GC

SGE ms-NoVent System

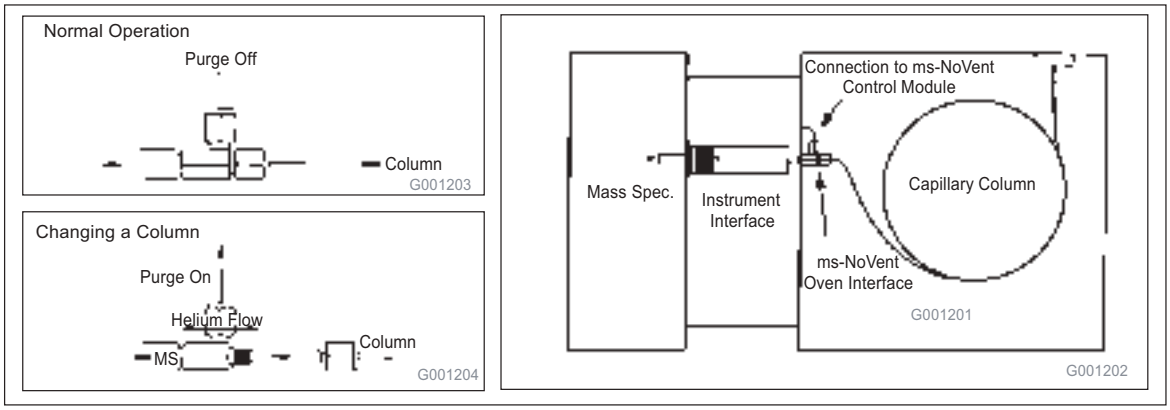


A new, time-saving accessory for GC/MS systems. Typically, much GC/MS operating time is wasted when the capillary GC column must be disconnected at the detector end. Disconnecting a column means shutting down the ion source, cooling the mass spectrometer, and venting the MS to air. After the column is replaced or reconnected, the system must be evacuated and allowed to stabilize for hours before useful data can be obtained. The time involved can vary from 3-4 hours, at best, to several days, but these precautions are necessary to avoid damaging the ion source by exposure to oxygen or diffusion oil.

In contrast, the ms-NoVent* system allows you to use the MS almost immediately after replacing a column, producing results in minutes, rather than after many hours. Installing a new column simply involves turning on a helium purge gas, then replacing the column. There is no time limit to how long the MS system can be left open. If you wish to condition the new column before connecting it to the MS, simply leave the helium purge on until the column has been conditioned, cool the system down, and connect the column.

The system consists of an external control module (80mm x 50mm x 150mm) and an interface that connects to the inlet in the mass spectrometer. A fused silica transfer line (restrictor), specific in length for each MS instrument, fits inside the interface. The transfer line restricts the gas flow that can be pulled into the ion source, allowing a low pressure to be maintained in the MS. Controlled by the control module, the helium purge, on the MS side of the fused silica restrictor, ensures that there is flow in only one direction, preventing air from being drawn into the mass spectrometer. As a result, only pure helium can enter the MS while the system is open.

The ms-NoVent system can be installed in approximately 30 minutes. The system is compatible with Hewlett-Packard (5970, 5971/5972, 5973), Varian (Saturn), and Shimadzu (5000/5050) GC/MS instruments. Order the fused silica restrictor appropriate for your instrument.



DESCRIPTION	CAT. NO.	PRICE
ms-NoVent System	26191-U	
RESTRICTORS FOR MS-NOVENT SYSTEM		
Restrictor for HP5970	26192-U	
Restrictor for HP 5971/5972	26193-U	
Restrictor for HP 5973	26194-U	
Restrictor for Varian Saturn	26195-U	
Restrictor for Shimadzu 5000/5050	26196-U	

[1] Restrictor not included with ms-NoVent system. Order separately according to the model of your GC/MS system.

* Patent pending.


P000911

Capillary Starter Kit

If you're a new capillary chromatographer or an experienced chromatographer tired of improvising with packed column tools, you can have everything you need right at hand. As a bonus, we gave the kit a special price.

Here's what you get:

- Tweezers
- Pin vise drill kit
- Pocket mirror
- Dispoz-a-lamp
- Capillary Cleaving Tool
- Screw-type septum puller
- 1/4" x 5/16" open end wrench
- 6" (15cm) stainless steel ruler
- 6"/15cm pipe cleaners (6)

DESCRIPTION	CAT. NO.	PRICE
Capillary Starter Kit	23639	

Pin Vise Drill Kit

Drill the exact bore you need in hard or soft ferrules. Includes pin vise and 14 drill bits:

0.33mm/0.0135"	0.77mm/0.031"	1.06mm/0.042"
0.40mm/0.016"	0.83mm/0.033"	1.17mm/0.046"
0.56mm/0.022"	0.91mm/0.036"	1.40mm/0.055"
0.63mm/0.025"	0.97mm/0.038"	1.61mm/0.061"
0.72mm/0.028"	1.02mm/0.040"	

The vise handle holds all bits to keep them at your fingertips. The vise also is handy for gripping fine wire when cleaning FID jets, syringe needles, or any other small orifice.

DESCRIPTION	CAT. NO.	PRICE
Pin Vise Drill Kit	23820-U	
DRILL BITS (PKS. OF 6)		
0.35mm	23811-U	
0.40mm	23810	
0.51mm	23809	


P000912

Needle Files

Four-inch slim taper files to enlarge ferrule ID. Also handy for removing ferrules stuck in fittings.

DESCRIPTION	CAT. NO.	PRICE
Needle Files (pk. of 2)	23783	


P000913

Capillary Cleaving Tool

Makes scalpel-like cuts in both polyimide and fused silica, leaving no jagged edges to create problems. Industrial sapphire cutting edges remain sharp indefinitely. The spring-loaded retractable blade version reduces the chance of breakage if the tool is dropped.

DESCRIPTION	CAT. NO.	PRICE
Cleaving Tool		
with Retractable Blade	23814	
with Fixed Blade	23740-U	
REPLACEMENT PARTS		
Replacement Blade for 23814	23815	


P000914

Shortix Fused Silica Tubing Cutter

A rotating diamond cutting blade ensures precision cuts in fused silica capillary tubing. Even an inexperienced user can make the clean, 90° cuts required for high quality capillary gas chromatography. Cuts any diameter of fused silica tubing from 0.10mm ID through 0.53mm ID.

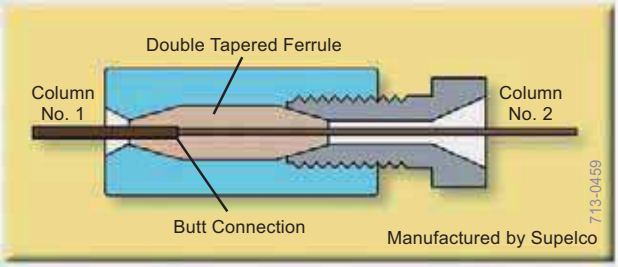
DESCRIPTION	CAT. NO.	PRICE
Shortix Fused Silica Tubing Cutter	21386-U	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

GC Accessories
Capillary GC

Capillary Column Butt Connector

This patented[1] device consists of a double-tapered ferrule and a stainless steel compression housing with a threaded cap. Small and light (2.3cm x 0.6cm, 4.4g with ferrule), it provides a gastight seal. You will find no change in column efficiency or inertness.



DESCRIPTION	CAT. NO.	PRICE
Butt Connector		
with 0.4mm ID Supeltex M-2 ferrule	23796	
body only (Select ferrules from table)	23804	
Replacement Nuts (pk. of 4)	23805	
Knurled Nuts (pk. of 2)	23812	

Supeltex Ferrules for Capillary Column Butt Connectors

FERRULE ID (mm)	CONNECTION (FUSED SILICA COLUMNS)	CAT. NO.	PRICE (PK. 2)
SUPELTEX M-2 FERRULES			
0.25	0.1mm ID to like diameter	22585	
0.4	0.20-0.25mm ID to like diameter	23797	
0.5	0.32mm ID to like diameter	22464	
0.8	0.53mm ID to like diameter	22590-U	
0.4/0.8	0.20-0.25mm ID to 0.53mm ID	22465	
0.5/0.8	0.32mm ID to 0.53mm ID	22596	
0.5/1.2	0.32mm ID silica to 0.75mm ID glass	22466	
SUPELTEX M-2B FERRULES			
0.4	0.20-0.25mm ID to like diameter	22453	
0.5	0.32mm ID to like diameter	22454	
0.8	0.53mm ID to like diameter	22591	
0.4/0.8	0.20-0.25mm ID to 0.53mm ID	22455-U	
0.5/0.8	0.32mm ID to 0.53mm ID	22586	
0.5/1.2	0.32mm ID silica to 0.75mm ID glass	22456	

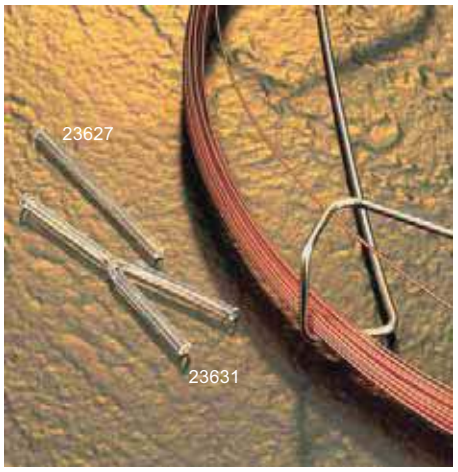
TFE Teflon Heat Shrink Tubing

Quickly repair or connect glass columns. Teflon heat shrink tubing fits over glass tubing up to 1.4mm OD, shrinks to 0.81mm.

DESCRIPTION	CAT. NO.	PRICE
TFE Teflon Heat Shrink Tubing (three 8"/20cm pieces)	23785	



[1]Supelco, US Patent No. 4,529,230



GlasSeal Capillary Column Connectors

GlasSeal connectors quickly connect fused silica tubing of the same or different diameter – no tools, no leaks. Use them to connect a guard column or transfer line, repair a broken column, or connect two columns (same or different phases). A "Y" connector splits a sample to two columns or a column effluent to two detectors. Silanized for an inert inside surface. Choose borosilicate glass or fused silica. Use with our 0.25mm-0.53mm ID tubing.

DESCRIPTION	CAT. NO.	PRICE
GLASSEAL CAPILLARY COLUMN CONNECTORS		
Borosilicate Glass (pk. of 12)	20479	
Fused Silica (pk. of 5)	23627	
Fused Silica (pk. of 25)	23628	
"Y" GLASSEAL CONNECTORS		
Borosilicate Glass (each)	20480	
Fused Silica (each)	23631	
Fused Silica (pk. of 3)	23632	

Polyimide Sealing Resin

A GlasSeal connector will form a perfect seal between two glass or fused silica columns; a small drop of this resin makes the connection extremely durable. Also an excellent high temperature glue. Cure at 200°C; maximum temperature 350°C. 5g bottle with handy applicator cap.

DESCRIPTION	CAT. NO.	PRICE
Polyimide Sealing Resin (5g)	23817	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



Supelcarb Split Vent Trap

Adsorb toxic compounds longer than with conventional traps.

Typical split vent flow rates of 10-100mL/min carry most of the injected sample into the laboratory atmosphere. Many GC manufacturers recommend venting the split injection systems into a fume hood, but this is often impossible due to space constrictions. Another approach is to connect an adsorbent trap to the split vent outlet.

A Supelcarb Split Vent Trap traps a broad range of organic compounds. The high-capacity carbonaceous adsorbent has been specifically prepared for split vent applications – a narrow particle size distribution and spherical shape allow tight packing and less gas channeling than the irregular shape of activated charcoal particles.

Data show that breakthrough on the Supelcarb trap occurs after approximately 2 weeks at 65mL/min. Breakthrough on other traps often occurs before the manufacturer's recommended replacement time. We recommend using Supelcarb traps for longer effective trapping, and replacing the trap every two weeks.

BREAKTHROUGH ON SPLIT VENT TRAPS				
	TYPE A	TYPE B	TYPE C	SUPELCARB
Breakthrough Time (Hours)	22.5	49.5	249.0	374.0
Breakthrough Volume (Liters)	88	193	971	1458
No. of Injections Before Breakthrough	45	99	498	748
Manufacturer's Recommended Replacement Time	168 hr	300 inj.	720 hr	336 hr

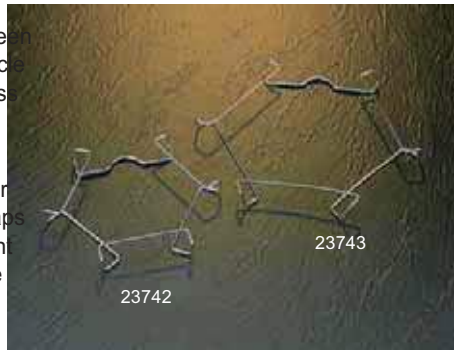
DESCRIPTION	CAT. NO.	PRICE
SUPELCARB SPLIT VENT TRAP STARTER KIT		
(one trap and an attachment kit)	22536	
REPLACEMENT SUPELCARB TRAPS		
Two Traps	2253502	
Five Traps	2253505	



Solvent Rinse Kit

Ideal for coating or washing capillary columns. Insert one end of the capillary column into the reservoir fitting and seal with a graphite ferrule. Gas pressure applied through a side arm forces the solution from the reservoir through the column.

DESCRIPTION	CAT. NO.	PRICE
Solvent Rinse Kit	23626	
Supeltex M-4 Ferrules, 0.8mm ID (pk. of 10)[1]	20628	



Cages for Fused Silica Columns

Unique design with minimal metal-to-column contact reduces the possibility of damaging your column's protective coating. Makes column hanging easier.

DESCRIPTION	CAT. NO.	PRICE
For 0.25mm ID Columns, 6"/15cm (pk. of 3)	23742	
For 0.32mm and 0.53mm ID Columns, 8"/20cm (pk. of 3)	23743	



Capillary Column Tags

Permanently label your capillary column. Keep loops secure during storage.

- Soft enough to imprint with a ball-point pen
- Big enough for all necessary information
- Lightweight — won't damage your column

DESCRIPTION	CAT. NO.	PRICE
Capillary GC Column Tags (pk. of 100)	23779	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

GC Accessories
Packed Column GC



Glasrench Wrench

Joint slips when fitting is tight. Can pay for itself by saving just one column.

Connecting glass columns to a chromatograph often results in leaks because fittings are not tight enough, or in a broken column because the fittings are tightened too much. Our Glasrench lets you consistently apply just the correct force needed to tighten the ferrule – the wrench slips when too much force is applied. You know when to stop tightening and you don't damage your column. Because different ferrules require different amounts of tightening force, we offer two color-coded models.

DESCRIPTION	CAT. NO.	PRICE
Model A, Red (for Supeltex M-1, Supeltex M-2 ferrules)	22901	
Model C, Black (for Supeltex M-2A, Supeltex M-4 ferrules)	22903	



Ratchet Wrench

Jaws open to slip around the nut, then close. Convenient to use in a small chromatograph oven or other confined places.

DESCRIPTION	CAT. NO.	PRICE
7/16" (for 1/8" fittings)	20447	
9/16" (for 1/4" fittings)	20448	



Torque Wrench

Take the guesswork out of tightening a septum nut.

The handle of the Supelco septum nut torque wrench slips when preset torque (8 inch-lbs.) is reached. Helps prevent leaking septa, excess bleed, and difficult septum penetration. Deepwell socket (9/16") fits over the Supelco septum nut even with a needle guide attached.

DESCRIPTION	CAT. NO.	PRICE
Torque Wrench	22661	

Sylon-CT

To be sure the glass tubing you use for columns is inert, treat it with Sylon-CT solution (5% dimethyldichlorosilane in toluene). It deactivates the tubing for use up to 350°C to 400°C, far exceeding the capabilities of other deactivating agents used at room temperature. Sylon-CT also deactivates transfer lines and glass or glass-lined injection port liners. Instructions included.

DESCRIPTION	CAT. NO.	PRICE
Sylon-CT, pint	33065-U	

Rejuv-8

For packed columns only.

How can you improve deteriorating chromatographic results, salvage a tired column, or minimize peak tailing and sample loss when working with submicrogram samples? Simply inject 10-50µL of Rejuv-8 silylating agent directly onto your column. Contains no chlorosilanes.

DESCRIPTION	CAT. NO.	PRICE
Rejuv-8, 25mL	33059-U	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



Column Tags

For a permanent record of important chromatographic data. Easily marked with a Burgess Vibrograver or other scribing tool. Choose engraved (just fill in the blank) or plain (engrave with any information you want to record).

DESCRIPTION	CAT. NO.	PRICE
Engraved, 2 straps (pk. of 50)	20396	
Plain, 1 strap (pk. of 100)	20401	



Restrictor

Prevents back diffusion of oxygen into the column during conditioning. Stainless steel Swagelok union with 1"/2.5cm capillary tube.

DESCRIPTION	CAT. NO.	PRICE
Restrictor For 1/8" columns	20669	

Leak Tester Kit

Detect septum leaks without contaminating your column.

Eliminates placing leak detection fluid, a potential contaminant, directly onto the septum. Dip one end of the leak tester tube into Snoop and place the other end into the septum nut or needle guide. Bubbles indicate a leak. Kit includes 10 leak tester tubes and 8 ounces of Snoop.

DESCRIPTION	CAT. NO.	PRICE
Leak Tester Kit	22660-U	
Snoop, 8oz. bottle	20434	



Plastic Column Caps

Easily slip over the end of the tubing, to protect your columns during storage. Pack of 100.

DESCRIPTION	CAT. NO.	PRICE
For 1/16" OD columns	20436	
For 1/8" OD columns	20437-U	
For 3/16" OD columns	20438-U	
For 1/4" OD columns	20439	



Leak-Tec Leak Detector

Use at temperatures up to 210°C – Leak-Tec leak detector will not bubble on a heated part unless there is a leak. 283g pressurized can.

DESCRIPTION	CAT. NO.	PRICE
Leak-Tec Leak Detector, 283g	20566	

RELATED INFORMATION

Bulletin 890 is a detailed guide to nearly 200 packed column applications. Request a free copy by phone or fax, or see our website.

No.	Subject
T195890	packed column applications

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

GC Accessories
Packed Column GC



Burgess Vibrograver

Eliminate gaps when packing your columns. The Burgess Vibrograver is ideal for vibrating columns or marking tags.
110VAC models: 9 watts, 0.08 amp, 60Hz;
220VAC model: 12 watts, 0.05 amp, 50Hz.

DESCRIPTION	CAT. NO.	PRICE
110VAC	20402	
110VAC self-grounding (three wires)	20391	
220VAC[1]	20398-U	

[1] Does not have a CE mark.

Stainless Steel Screening

Keep packing debris out of your detector. Use this 2" x 2" (5 x 5cm) stainless steel screening with 10µm openings to make your own end screens. Note: End screens cannot be used in aluminum columns.

DESCRIPTION	CAT. NO.	PRICE
Stainless Steel Screening	22327	



Puller/Inserter Tool

Insert or remove wool plugs the easy way. The fork on one end feeds the plug into the column, then leaves it cleanly. The hook on the other end won't disrupt the packing when you remove the plug. Reduces contamination caused by handling glass wool with your fingers. Use with 1mm-4mm ID glass or 1/8", 1/4", 5mm OD metal columns.

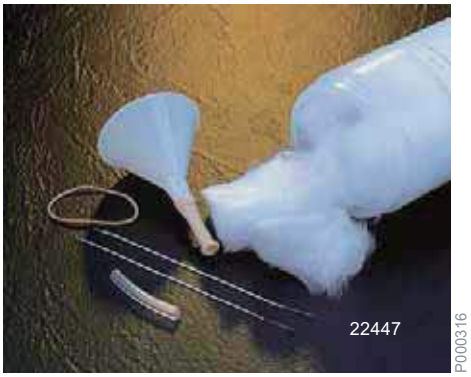
Also removes injector liners from columns, or wool or foam plugs from adsorption tubes. Pays for itself the first time you use it!

DESCRIPTION	CAT. NO.	PRICE
Puller/Inserter Tool (pk. of 2)	22406	

Funnel and Tubing

Fill your packed columns with this convenient plastic funnel. Tygon tubing connects funnel to column. Simple, yet does the job.

DESCRIPTION	CAT. NO.	PRICE
Funnel and Tubing	20390-U	



Column Filling Kits

All you need to quickly and efficiently pack your columns. Includes two puller/inserter tools (Cat. No. 22406), plastic funnel, rubber column connector, and 50g glass wool for plugs. Saves you money when compared to individually priced items.

DESCRIPTION	CAT. NO.	PRICE
Kit A (silane-treated glass wool)	22447	

Glass Wool

Choose silane treated (for general use), phosphoric acid treated (for acidic compounds such as barbiturates, free fatty acids, etc.), pesticide grade, or untreated (for special applications and do-it-yourself).

DESCRIPTION	CAT. NO.	PRICE
Silane Treated, 50g	20411	
Silane Treated, 250g	20410	
Phosphoric Acid Treated, 50g	20383	
Pesticide Grade, 10g	20409	
Untreated, 50g	20384	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Ultrasonic Cleaner

SPECIFICATIONS	
Tank Size:	5½ x 6 x 4 in. (14 x 15 x 10cm)
Overall Size:	7½ x 8 ½ x 9 in. (19 x 22 x 23cm)
Weight:	7 lbs. (3.2kg)



Ultrasonic cleaning is fast, effective and safe. The Branson ultrasonic cleaner has more power than most comparable models. It ensures faster, more thorough cleaning of dirt, protein residue, and other debris from your glassware, fittings, syringes, needles, and other apparatus. It also is useful for ultrasonic digestion of environmental samples.

Bransonic cleaners are used routinely to clean electronics components, contact lenses, and gemstones – you can be sure they'll safely clean your glassware and system components. Recessed cleaning tank is enclosed in durable, solvent and impact resistant plastic. ½ gallon (1.8 liter) capacity.

DESCRIPTION	CAT. NO.	PRICE
BRANSONIC ULTRASONIC CLEANER		
110VAC	22326	
220VAC[1]	22336	
CLEANING SOLUTION		
900mL	22335	

[1] CE approved.

Immersion Cleaner

An aqueous and nontoxic surfactant solution that removes heavy deposits of silica from a detector. Recommended for dirty detectors not effectively cleaned by our in-place detector cleaner (Cat. No. 33000-U). Mix concentrate 1:10 with water.

DESCRIPTION	CAT. NO.	PRICE
Immersion Cleaner, 100mL	22662	

In-Place Detector Cleaner

A halocarbon liquid that cleans the detector in place. Just inject microliter quantities into an empty glass column while it is connected to a lighted flame detector. HF, produced by combustion of the cleaner, removes silica deposits from detector electrodes. Also useful for removing greases and oils from glassware, syringes, etc.

DESCRIPTION	CAT. NO.	PRICE
In-Place Detector Cleaner	33000-U	



Jet and Needle Cleaning Kit

Ten wires in each of five sizes (0.00350, 0.00497, 0.00659, 0.00815, and 0.01207" OD), plus a bottle of syringe cleaning solution. Perfect for cleaning small orifices such as FID jets and syringe needles.

Packaged in a reusable box that prevents wires from being damaged during storage.

DESCRIPTION	CAT. NO.	PRICE
Jet and Needle Cleaning Kit	21578	



Wire Brush Detector Cleaning Kit

A collection of wire brushes specially tailored to clean FIDs and injection ports that accept 1/4" columns. Brass brushes prevent scratching and marring of expensive FID components and save downtime by allowing the detector to be cleaned while hot.

Each kit includes two detector brushes, one injection port tube brush, a brass toothbrush (for cleaning jets and other odd surfaces), and a piece of fine emery cloth to clean electrical contacts.

Just measure your collector assembly ID and choose the closest kit. Instructions are included.

DESCRIPTION	CAT. NO.	PRICE
Collector Assembly ID		
0.145" (e.g., HP 5700, 5830)	22403	
0.235" (e.g., Varian 3700, 1400, 2700)	22404	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

GC Accessories
Packed Column GC

PID Lamps

These lamps are manufactured by Scientific Services Co., internationally known as the pioneers of the PID lamp. Both lamps have an MgF_2 window and are filled with krypton.

Model 103C is the original PID lamp manufactured by Scientific Services Co. It is used for applications requiring the 10.0, 10.2, and 10.6eV lines. The 1.375" (3.49 cm) base diameter is compatible with HNU and SRI detectors.



Model 108-10.0/10.6 replaces Model 108-10.6. The designation denotes the 10.0-10.6eV potential of the lamp. Model 108-10.0/10.6 is the most commonly used PID lamp. The 0.781" (1.98 cm) base diameter is compatible with Tracor, OIC Model 4430, and Baseline photoionization detectors.

The lamp cleaning kit includes aluminum oxide cleaning compound, swabs, and instructions.

DESCRIPTION	CAT. NO.	PRICE
PID Lamp, Model 103C	22631	
PID Lamp, Model 108-10.0/10.6	22626	
PID Lamp Cleaning Kit	22627	



GC/MS Inlet Jet Separator

Allows accurate, reproducible control of jet sizes, alignment, and spacing. All-glass, single-stage construction eliminates the peak broadening or tailing effects encountered with other separators that use glass frits or membranes. Can be cycled to 450°C, depending on the type of connections used. Manufactured by SGE for use with HP 5985 GC/MS.

DESCRIPTION	CAT. NO.	PRICE
GC/MS Inlet Jet Separator	22600-U	



Merlin Microseal Septum and Nut for Agilent/HP GCs

Unique design features two sequential seals for longer life.

Patented[1] long-life replacements for the standard septum and septum nut on the capillary inlet system or purged packed column inlet system of a Agilent/HP GC. The Microseal system incorporates two sequential seals to provide a much longer septum life.

- Sustains many injections without leaks or septum fragments
- For Agilent/HP Models 5700, 5800, 5900 series, 6890
- Ideal for Agilent/HP 7673 autosampler or other systems accepting a blunt-tipped 0.63mm OD (0.026"/23 gauge) needle

DESCRIPTION	CAT. NO.	PRICE
Nut	22582	
Septum[2]	22583	
Nut and 1 Septum[2]	22584	
Nut and 2 Septa[2]	22581-U	

High Pressure Merlin Microseal Septum for HP and Varian GCs

Higher pressure rating: 100psi vs. 30psi

In addition to offering a system with a higher pressure rating, Merlin now offers a Microseal Septum in a configuration for Varian GCs.

DESCRIPTION	CAT. NO.	PRICE
FOR HP MODELS 5800, 5900 SERIES, 6890		
1 Nut and 2 Septa[2]	24814-U	
1 Nut and 1 Septum[2]	24815-U	
1 Septum[2]	24816-U	
FOR VARIAN MODELS 3400, 3800[3]		
1 Nut for Varian Inlet, 1 Septum, 1 Inlet Adapter and O-Ring[2]	24817-U	
1 Septum[2]	24818-U	

[1] Merlin Instrument Co., US Pat. No. 4,954,149.

[2] The Microseal septum can be used only with a syringe that has a 23 gauge "blunt tipped" needle or with an SPME device with a 23 gauge needle.

[3] The Microseal nut supplied by Merlin for the Varian GC is almost identical to the OEM Varian nut. However, the Merlin nut does not have the septum-cutting ridge incorporated in the Varian-manufactured nut. Use of the Varian-manufactured nut will damage the Merlin septum, and the manufacturer will not replace the septum.

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

GC Accessories
Packed Column / Capillary Conversion Kits

Have your packed column system ready for capillary analyses in half an hour or less. Reconvert for packed column use in minutes.

Use our Direct Injection Conversion Kit to connect a 0.53mm or 0.75mm ID capillary column to the injection port in your packed column GC (on-column injection system). You can use the capillary column with standard size syringes and septum systems. Dead volume is minimal.

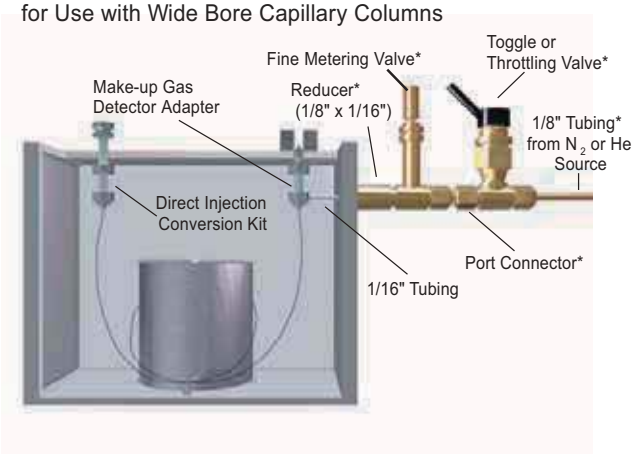
With our Make-up Gas Detector Adapter Kit you can use the capillary column at optimum flow rates (2-10mL/minute), even if your detector is designed for higher flows. You can connect the column and a make-up gas line (to prevent column effluent from spreading in the detector) to the detector without modifying your detector gas line. Regulate the make-up gas through external control (see diagram) or, in a two-column instrument, connect the make-up gas line to the second injection port and regulate flow with the flow controller (requires a Swagelok reducer – Cat. No. 22017-U for a 1/8" fitting, Cat. No. 22701 for a 1/4" fitting – and nut; order separately).

How to Determine Which Conversion Kits Fit Your Instrument

Use these kits with an on-column injection system. Remove all fittings and liners, then insert a piece of tubing as far as possible into the injector. Add 1" (2.5cm) to this measurement to obtain the minimum sleeve length for the Injection Conversion Kit. Repeat at the detector port to obtain the minimum sleeve length for the Make-up Gas Detector Adapter Kit.

Each kit consists of a sleeve, a special union, ferrules for 0.53mm ID and 0.75mm ID columns, and complete instructions.

Packed Column Chromatograph Converted for Use with Wide Bore Capillary Columns



Direct Injection Conversion Kits

DESCRIPTION	CAT. NO.	PRICE
1/4" PORT		
Kit #1 (5"/13cm sleeve)	23799	
Replacement Parts		
5"/13cm Sleeve	23794	
7"/18cm Sleeve	23795	
Reducing Union	23633	
1/8" PORT		
Kit #2 (7"/18cm sleeve)	23643	
Replacement Parts		
5"/13cm Sleeve	23645	
10"/25cm Sleeve	23647	
5mm PORT		
Kit #4 (13cm sleeve)	23640-U	
Replacement Parts		
13cm Sleeve	23635	
13cm Sleeve with expansion chamber	20483	
Reducing Union	23633	

Make-up Gas Detector Adapter Kits

DESCRIPTION	CAT. NO.	PRICE
1/8" PORT		
Kit #1 (2"/5cm sleeve)	23654	
Kit #3 (6"/15cm sleeve)	23656	
Replacement Parts		
2"/5cm Sleeve	23657	
6"/15cm Sleeve	23659	
REPLACEMENT NUTS FOR ALL ADAPTER KITS		
Male Nut, 1/16'' (pk. of 4)	23805	
Knurled Male Nuts, 1/16" (pk. of 2)	23812	

Swagelok Accessories for Make-up Gas System

DESCRIPTION	CAT. NO.	PRICE
Reducers, 1/8" to 1/16", brass (pk. of 2)	22017-U	
Reducers, 1/4" to 1/16", brass (pk. of 2)	22701	
Fine Metering Valve, 1/8" straight, brass	22116	
Port Connectors, 1/8" stainless steel (pk. of 2)	22689	
Toggle Valve, 1/8" straight, brass	22699	
On/Off Throttling Valve, 1/8"	22138-U	
Replacement Male Nuts, 1/16" (pk. of 4)	23805	
Knurled Male Nuts, 1/16" (pk. of 2)	23812	

Compact Adapter

Use as a 1/4" to 1/16" Swagelok reducer, or as a 1/4" to 1/16" capillary ID reducing ferrule. Also fits Varian capillary injection ports. Stainless steel body and 1/4" M-2A ferrule. Purchase appropriate capillary ferrules separately.


713-0457

DESCRIPTION	CAT. NO.	PRICE
Compact Adapter	22063	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Gas Delivery
Hydrogen Generators

domnick hunter Nitrox UHP Hydrogen Generators

domnick hunter hydrogen generators are a safe and economic alternative to high pressure gas cylinders. These generators deliver a continuous stream of 99.99999% pure hydrogen, suitable for use with any laboratory instrument requiring a supply of ultra high purity hydrogen, and ideal for carrier gas and fuel gas applications. domnick hunter hydrogen generators use a proprietary ion exchange membrane to produce ultra-high-purity hydrogen from laboratory grade deionized water, totally eliminating the need for caustic solution.

These generators are designed for total safety and highly reliable operation. Hydrogen is generated only on demand, at low pressure, and minimal volume is stored within the unit. A unique digital display gives system status and diagnostic capabilities not available on any other competitive hydrogen generator.

Two year parts and labor warranty from domnick hunter.



27750-U

DESCRIPTION	CAT. NO.	PRICE
Nitrox UHP Model 20 [1]	27748-U	
Nitrox UHP Model 40 [1]	27749-U	
Nitrox UHP Model 60 [1]	27750-U	
Replacement Parts		
Deionizer Bags (pk. of 2)	27768-U	
Desiccant Cartridge	27769-U	

[1] CE approved.

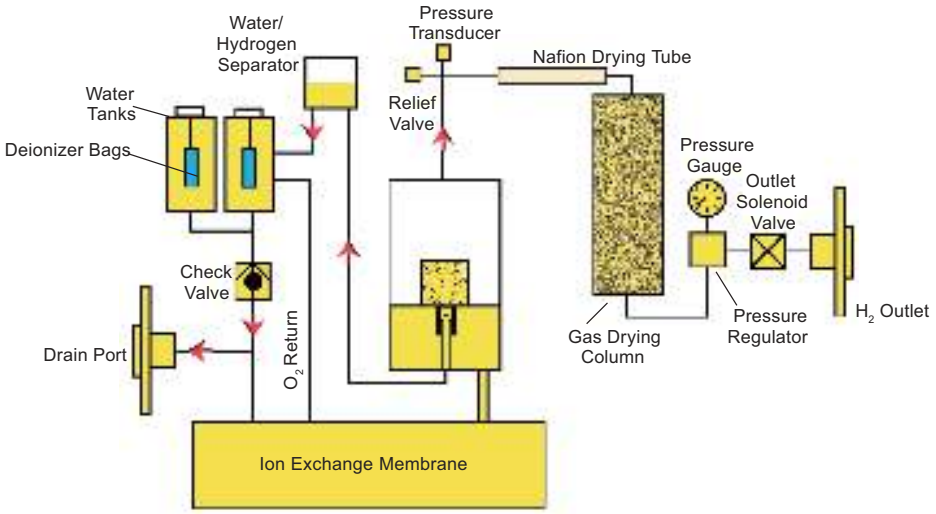
FEATURES

- 99.99999% pure hydrogen
- Remote start/stop and remote alarm
- Automatic leak detection
- Low water detection (audible alarm)
- Poor water quality detection (audible alarm)
- Integrated microprocessor control
- Meet CE, CSA, UL requirements

SPECIFICATIONS

Product Purity:	99.99999% pure hydrogen gas
Input Water Quantity:	deionized, >1 megohm per cm
Reservoir Capacity:	4 liters
Output Flow (cc/min):	Model 20: 160
	Model 40: 250
	Model 60: 500
Delivery Pressure:	0.1-90 psig
Outlet:	1/8" Swagelok
Power Requirements:	90-264VAC, 47-63 Hz (self-switching)
Dimensions:	27 x 14 x 14" (69 x 36 x 36cm)
Weight Dry:	78 lbs/35kg

Hydrogen Generation Process



Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Gas Delivery
Hydrogen Generators



Indicating Drying Cartridge for Parker ChromGas Hydrogen Generators (1 1/2" OD x 8"/38mm x 20.3cm)



SPECIFICATIONS

Product Purity:	99.9999+% pure [3] hydrogen gas
Reservoir Capacity:	4 liters
Flow Range: (cc/min, STP)	Model 9090: 0-90 Model 9150: 0-160 Model 9200: 0-250 Model 9400: 0-500 Model 9800: 0-1200
Delivery Pressure:	0-90 psig; 0-100 psig for Model 9800
Outlet:	1/8" Compression Fitting
Power Requirements:	110VAC or 220VAC
Dimensions:	15 x 13 x 17" (H x W x D) [4] (37 x 33 x 44cm)
Weight Dry:	40lbs/18.1kg

MAINTENANCE REQUIREMENTS

Water Reservoir:	Refill as needed with deionized water (500,000 ohm/cm minimum)
Deionizer Bag:	Replace every 6 months, or whenever Change Water indicator is on
Desiccant Cartridge:	Recharge (dry) or replace when cartridge turns pink

One-Year Parts and Labor Warranty from Parker ChromGas

Parker ChromGas's in-house service specialists and worldwide service organization are equipped to handle any situation a ChromGas Series 9000 user might encounter.

Parker ChromGas 9000-Series Hydrogen Generators

Generate high-purity hydrogen, reliably and with complete safety.

Regulated low pressure (2-100psig) No caustic solutions

Minimal maintenance— Long-life solid polymer electrolyte

- CE approved
- UL listed
- CSA listed
- IEC 1010 certified
- Satisfies OSHA and NFPA requirements

Parker ChromGas hydrogen generators eliminate the hazards of high pressure cylinders and the dangers of alkaline electrolyte solutions.

Exclusive SPE Electrolyzer

The heart of every Parker ChromGas hydrogen generator is a proprietary SPE Electrolyzer cell. SPE Electrolyzers use a solid polymer electrolyte in the electrolyzing process, rather than a liquid electrolyte, eliminating the need for toxic liquids. The SPE technology has been refined to generate 99.9999+% pure hydrogen, using only deionized water. Contaminants are traces of nitrogen and methane.

Proven in more than 15,000 GC systems worldwide, SPE Electrolyzers also are extensively used in US Navy submarines and NASA supplemental fuel systems. This reliable, high quality hydrogen generation technology is being evaluated for fueling the Ultra Low Emission Vehicles and Zero Emission Vehicles (ULEV/ZEV) of the future.

Most important, these are the ONLY hydrogen generators certified for laboratory use by CSA, UL, and IEC 1010.

DESCRIPTION	CAT. NO.	PRICE
Model 9090 [1], 110V [5]	27773-U	
Model 9150 [1], 110V [5]	27620-U	
Model 9200 [1], 110V [5]	22751	
Model 9400 [1], 110V [5]	22801	
Model 9800 [1], 110V [5]	22835	
Replacement Parts		
Indicating Drying Cartridge [2]	22837	
Deionizer Pack (box of 2)	22963	

[1] CE approved.

[2] Replaces desiccant cartridge discontinued by manufacturer.

[3] 99.99997% pure for Model 9800.

[4] 14.75 x 13 x 14" (37 x 33 x 36cm) for Model 9000.

[5] When ordering, request 220V to receive 220V adapter with unit..

Order: 1.800.325.3010 Technical Service: 800.359.3041 Web: www.sigma-aldrich.com/supelco

Gas Delivery
Pure Air Generators

domnick hunter Pure Air Generators

In Nitrox Pure Air Generators, a high performance desiccant removes moisture from compressed air. Two desiccant beds alternate between purification and regeneration modes, ensuring continuous operation to specified purity levels. High efficiency pre-desiccant and post-desiccant filtration ensures total air quality.



27752-U

SPECIFICATIONS	
Air Input Required:	Model 070: 85L/min Model 140: 171L/min Model 300: 366L/min
Min/Max Inlet Pressure:	4bar/60psig / 10.5bar/152psig
Air Output : (7bar/100psig inlet pressure)	Model 070: 70L/min Model 140: 140L/min Model 300: 300L/min
Output Air Quality	ISO 8573.1 Class 1.2.1 Dirt, Water, Oil
Dewpoint at 7bar:	-40°C (-40°F)
Non-Methane Hydrocarbons:	<0.01ppm
Connections:	1/4" BSP
Power Requirements:	110VAC, 50-60 Hz
Dimensions:	Model 070: 15 x 12 x 4" (38 x 31 x 10cm) Model 140: 18 x 12 x 4" (46 x 31 x 10cm) Model 300: 28 x 12 x 4" (71 x 31 x 10cm) (L x W x D)
Weight :	Model 070: 18lbs/8kg Model 140: 22lbs/10kg Model 300: 27lbs/12kg

DESCRIPTION	CAT. NO.	PRICE
Model 070 [1], 110 volt	27751-U	
Model 140 [1], 110 volt	27752-U	
Model 300 [1], 110 volt	27753-U	
Model 070 [1], 220 volt	28351-U	
Model 140 [1], 220 volt	28352-U	
Model 300 [1], 220 volt	28353-U	
8000 Hour Service Kit (all models)	27771-U	

[1] CE approved.

Important Note: These units do not remove methane. Methane-free air requires a zero air generator.

Two year parts and labor warranty from domnick hunter.

domnick hunter CO_2-Removing Pure Air Generators

In Nitrox CO_2-removing purifiers, activated alumina removes both moisture and carbon dioxide. Two adsorbent beds alternate between purification and regeneration modes, ensuring continuous operation to specified purity levels. High efficiency pre-desiccant and post-desiccant filtration ensures total air quality. Model 015 CO_2 Removal Purifier can be used for TOC applications, Models 140, 280, and 850 are suitable for FTIR.

SPECIFICATIONS

Air Input Required:	Model 015: 4.0L/min
	Model 140: 26L/min
	Model 280: 51L/min
	Model 850: 155L/min
Min/Max Inlet Pressure:	4bar/60psig / 10.5bar/152psig
Air Output:	Model 015: 1.5L/min
(7bar/100psig inlet pressure)	Model 140: 14L/min
	Model 280: 28L/min
	Model 850: 85L/min
Output CO_2:	<1ppm
Non-Methane Hydrocarbons:	<0.003ppm
Particles:	<0.01µm
Dewpoint at 7bar:	-70°C (-100°F)
Connections:	1/4" BSP
Power Requirements:	110VAC, 50-60 Hz
Dimensions:	Model 015: 15 x 12 x 4" (38 x 31 x 10cm)
	Model 140: 18 x 12 x 4" (46 x 31 x 10cm)
	Model 280: 28 x 12 x 4" (71 x 31 x 10cm)
	Model 850: 40 x 17 x 6" (102 x 42 x 15cm)
	(L x W x D)
Weight:	Model 015: 18lbs/8kg
	Model 140: 22lbs/10kg
	Model 280: 27lbs/12kg
	Model 850: 80lbs/36kg

DESCRIPTION	CAT. NO.	PRICE
Model 015 [1], 110 volt	27754-U	
Model 140 [1], 110 volt	27755-U	
Model 280 [1], 110 volt	27756-U	
Model 850 [1], 110 volt	27757-U	
Model 015 [1], 220 volt	28354-U	
Model 140 [1], 220 volt	28355-U	
Model 280 [1], 220 volt	28356-U	
Model 850 [1], 220 volt	28357-U	
8000 Hour Service Kit for Models 015, 140, 280	27772-U	
8000 Hour Service Kit for Model 850	27771-U	

[1] CE approved.

Important Note: These units do not remove methane. Methane-free air requires a zero air generator.

Two year parts and labor warranty from domnick hunter.



27754-U

APPLICATIONS

- FTIR purge
- NMR
- Laser purging
- Rheometer supply

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Gas Delivery
Zero Air Generators

27759-U



domnick hunter
Zero Air Generators

- Low power usage
- Easy to wall mount

Nitrox Zero Air Generators employ a catalytic oxidation system to produce a continuous supply of air that is virtually free of hydrocarbons, including methane. After incoming compressed air is filtered to remove oil, water, and particles, it is passed over a heated platinum catalyst that converts methane and oxygen in the air to carbon dioxide and water. If the hydrocarbon content of the input air is less than 10ppm (as methane), the residual hydrocarbon concentration (as methane) is less than 0.1ppm. A high efficiency 0.01 micron filter downstream of the catalyst ensures further removal of particles from the product stream.

SPECIFICATIONS	
Min/Max Inlet Pressure:	1.5bar/20psig / 8.5bar/125psig
Max Input Hydrocarbons:	10ppm (as methane)
Air Output:	Model 10: 1000cc/min Model 35: 3500cc/min
Output Hydrocarbons:	<0.1ppm (as methane)
Particles:	<0.01µm
Connections:	1/4" Swagelok
Power Requirements:	110VAC, 50-60 Hz, 100W
Dimensions:	12 x 9 x 17" (H x W x D) (31 x 23 x 43cm)
Weight:	19lbs/8.5kg

DESCRIPTION	CAT. NO.	PRICE
Model 10 [1], 110 volt	27758-U	
Model 35 [1], 110 volt	27759-U	
Model 10 [1], 220 volt	28358-U	
Model 35 [1], 220 volt	28359-U	
Filter Element, Inlet (8000 hours)	27774-U	
Filter Element, Outlet (8000 hours)	27775-U	

[1] CE approved.

Two year parts and labor warranty from domnick hunter.

22445-U



Supelpure-HC Trap

If halocarbons or sulfur-containing compounds might be present in the source air, we recommend using a Supelpure-HC trap to avoid contaminating the catalyst in your zero air generator. Supelpure-HC traps contain activated charcoal (120cc) that adsorbs hydrocarbons and other contaminants from air, carrier gases, and hydrogen. The trap operates efficiently for approximately six months when total hydrocarbons in the incoming gas average 10ppm. Dimensions: 1 3/8" OD x 11 1/8" long, with fittings (35mm x 28.2cm).

DESCRIPTION	CAT. NO.	PRICE
1/8" fittings	22445-U	
1/4" fittings	22446	
Replacement charcoal, 400cc	22451	

Gas Delivery
Zero Air Generators



SPECIFICATIONS

Product Purity:	< 0.1ppm total hydrocarbons (as methane)
Inlet Air Pressure:	2-125psig
Delivery Pressure:	125psig
Outlet:	1/8" Compression Fitting
Pressure Drop at Max. Flow Rate:	5psig
Flow Rate Pressure Stabilization Time:	<2 minutes
Max. Air Flow Rate:	Models 1000, 1001 1000cc/min (serves 2-3 FIDs) Models 3500, 3501 3500cc/min (serves 10-12 FIDs)
Dimensions:	Models 1000, 1001 9.75 x 5.75 x 12" (25 x 14.7 x 30.8cm) (H x W x D) Models 3500, 3501 12 x 6.75 x 15" (29.2 x 17.8 x 39.4cm)
Weight:	Models 1000, 1001 11lbs (5kg) Models 3500, 3501 20lbs/9.1kg

ELECTRICAL REQUIREMENTS

Models 1000, 3500 (110 VAC)
100-125VAC, 60Hz, 100W, 1.0A (1.5A fuse)
Models 1001, 3500 (220VAC)
200-250VAC, 50 Hz, 100W, 0.5A (0.8A fuse)

Parker ChromGas Zero Air Generators

A hazard-free alternative to pressurized gas cylinders. Require only house compressed air and a standard electrical outlet to produce ultra-high purity air. Reduce total hydrocarbons to less than 0.1ppm, stabilizing baselines and improving detection. Eliminate the need for cumbersome gas cylinders and expensive safety cabinets.

- CE approved
- UL listed
- CSA listed
- IEC 1010 certified

We recommend using a zero air generator with flame ionization detectors. The resulting noise reduction and improved baseline stability allow lower detection limits, increasing the sensitivity of your analyses.

These Parker ChromGas zero air generators produce ultra-high purity (UHP) air from a standard compressed air supply – at continuous flow rates up to 3500cc/min, at pressures up to 125psig, with less than 0.1ppm total hydrocarbons.

The Parker ChromGas system consists of three stages: a 0.5µm coalescing inlet filter removes particles, oil, and water; a heated catalyst removes hydrocarbons; and a 0.01µm cellulose fiber outlet filter removes residual particulate material from the product air stream. Maintenance is minimal – just clean the inlet and outlet filters every 6 months and change them every 2 years.

DESCRIPTION	CAT. NO.	PRICE
Model 1000 (110VAC)[1]	22824	
Model 3500 (110VAC)[1]	27625-U	
Model 1001 (220VAC)[1]	22830-U	
Model 3501 (220VAC)[1]	27626-U	
Replacement Filters		
Models 1000, 1001[2] inlet and outlet	22817	
Models 1000, 1001[2] inlet and outlet	27629-U	
Models 2500, 2501[2] outlet	22817	
Models 2500, 2501[2], 3500, 3501 inlet	27627-U	
outlet	27629-U	

[1] CE approved.
[2] Serial no. up to 407840.

One-Year Parts and Labor Warranty from Parker ChromGas.

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Gas Delivery
Nitrogen Generators

domnick hunter High-Purity Nitrogen Generators

These Nitrox nitrogen generators employ pressure swing adsorption technology to produce a continuous supply of high-purity nitrogen. An integral oil-free air compressor delivers filtered compressed air (7bar/101psig) to a bed of carbon molecular sieve, which selectively removes oxygen, water vapor, carbon dioxide, and hydrocarbons. The adsorbent bed alternates between purification and regeneration modes, ensuring product nitrogen meets specified purity levels. A storage reservoir ensures a continuous supply of nitrogen. For units without an air compressor, please inquire.

SPECIFICATIONS

Nitrogen Output:	Model 0751: 750cc/min Model 1501: 1500cc/min Model 3001: 3000cc/min
Output Pressure:	5bar/73psig
Output Oxygen:	<10ppm
Connections:	1/4" Swagelok or 1/8" Swagelok (Model 0751)
Power Requirements:	110VAC, 50-60 Hz, 250W (Model 0751) or 300W
Dimensions:	Model 0751: 33 x 14 x 14 1/4" (84 x 36 x 36cm) Model 1501: 33 x 14 x 26" (84 x 36 x 66cm) Model 3001: 33 x 14 x 26" (84 x 36 x 66cm) (H x W x D)
Weight:	Model 0751: 79lbs/36kg Model 1501: 176lbs/80kg Model 3001: 176lbs/80kg

DESCRIPTION	CAT. NO.	PRICE
Model 0751 [1], 110 volt	27760-U	
Model 1501 [1], 110 volt	27761-U	
Model 3001 [1], 110 volt	27762-U	
Model 0751 [1], 220 volt	28360-U	
Model 1501 [1], 220 volt	28361-U	
Model 3001 [1], 220 volt	28362-U	
4000 Hour Filter Kit (all units)	27778-U	

[1] CE approved.

Two year parts and labor warranty from domnick hunter.

domnick hunter Hydrocarbon-Free Nitrogen Generator

This Nitrox nitrogen generator employs pressure swing adsorption technology to produce a continuous supply of hydrocarbon-free nitrogen. An integral oil-free air compressor delivers filtered compressed air (7bar/101psig) to a bed of carbon molecular sieve, which selectively removes oxygen, water vapor, carbon dioxide, and hydrocarbons. A heated catalyst then reduces the hydrocarbons in the nitrogen stream to less than 0.1ppm (as methane). Two adsorbent beds alternate between purification and regeneration modes, ensuring a continuous supply of nitrogen at specified purity levels.

SPECIFICATIONS

Nitrogen Output:	1000cc/min
Typical Output Pressure:	5bar/73psig
Output Oxygen:	<10ppm
Output Hydrocarbons:	<0.1ppm (as methane)
Connections:	1/4" NPT
Power Requirements:	110VAC, 50-60 Hz, 350W
Dimensions:	33 x 14 x 18" (H x W x D) (84 x 36 x 46cm)
Weight:	101lbs/46kg

DESCRIPTION	CAT. NO.	PRICE
Model 1001 [1]	27765-U	
Model 1001 [1], 220 volt	28366-U	
4000 Hour Filter Kit	27778-U	

[1] CE approved.

Two year parts and labor warranty from domnick hunter.



27760-U

Gas Delivery
Nitrogen Generators

domnick hunter LC/MS Nitrogen Generators

Compatible with APCI and ESI Interfaces.

Nitrox LCMS Nitrogen Generators are specially designed to meet the gas flow, purity, and pressure requirements of LC/MS. By providing a continuous supply of clean, dry, 99.5% pure nitrogen, they eliminate the need for expensive, hazardous, cumbersome, labor-intensive gas cylinders. Both models are compatible with atmospheric pressure chemical ionization (APCI) and electrospray ionization (ESI) interfaces.

These generators employ pressure swing adsorption technology to produce a continuous supply of high-purity nitrogen. An oil-free air compressor is integral to Model 12; use Model 18 with your current supply of oil-free compressed air. Either model delivers filtered compressed air (8.5bar/125psig) to a bed of carbon molecular sieve, which selectively removes oxygen and other contaminants. Two adsorbent beds alternate between purification and regeneration modes, ensuring a continuous supply of nitrogen at specified purity levels.

SPECIFICATIONS

Input Air Pressure:	Model 12: integral compressor Model 18: 8.5bar/125psig
Nitrogen Output:	Model 12: 12L/min Model 18: 18L/min
Output Pressure:	7bar/100psig
Output Oxygen:	<0.5%
Connections:	1/4" Swagelok
Power Requirements:	110VAC, 50-60 Hz, 550W (Model 12) or 50W (Model 18)
Dimensions:	Model 12: 33 x 14 x 27" (84 x 36 x 69cm) Model 18: 33 x 14 x 18" (84 x 36 x 46cm)
Weight:	Model 12: 190lbs/86kg Model 18: 165lbs/75kg

DESCRIPTION	CAT. NO.	PRICE
Model 12 [1], 110 volts	27766-U	
Model 18 [1], 110 volts	27767-U	
Model 12 [1], 220 volts	28367-U	
Model 18 [1], 220 volts	28368-U	
4000 Hour Filter Kit (both units)	27781-U	

[1]CE approved.

Two year parts and labor warranty from domnick hunter.

domnick hunter Air/Nitrogen Generators

Ideal for a Crowded Laboratory!

Nitrox Air/Nitrogen Generators provide a continuous supply of clean, dry, high-purity nitrogen and clean, high-purity air.

These generators employ pressure swing adsorption technology to produce a continuous supply of high-purity gas. An oil-free air compressor delivers filtered compressed air (7bar/1015psig) to a bed of carbon molecular sieve, which selectively removes oxygen, water vapor, and other contaminants. The adsorbent bed alternates between purification and regeneration modes, ensuring product nitrogen meets specified purity levels. A storage reservoir ensures a continuous supply of nitrogen. Additionally, the compressed air is delivered to a bed of activated alumina, to remove water vapor and other contaminants. The adsorbent bed alternates between purification and regeneration modes, and a storage reservoir ensures a continuous supply of pure gas.

With integral Oil-Free Air Compressor

SPECIFICATIONS

Nitrogen Output:	Model 0601: 600cc/min Model 3001: 3000cc/min
Oxygen Content:	<10ppm
Pure Air Output:	Model 0601: 1500cc/min Model 3001: 3000cc/min
Output Air Quality	ISO 8573.1 Class 1.2.1 Dirt, Water, Oil
Output Pressure:	5bar/73psig
Connections:	1/8" Swagelok (Model 0601) or 1/4" Swagelok (Model 3001)
Power Requirements:	110VAC, 50-60 Hz, 250W (Model 0601) or 300W (Model 3001)
Dimensions:	Model 0601: 33 x 14 x 18" (84 x 36 x 46cm) Model 3001: 33 x 14 x 26" (84 x 36 x 66cm)
Weight:	Model 0601: 79lbs/36kg Model 3001: 187lbs/85kg

DESCRIPTION	CAT. NO.	PRICE
Model 0601 [1], 110 volts	27763-U	
Model 3001 [1], 110 volts	27764-U	
Model 0601 [1], 220 volts	28363-U	
Model 3001 [1], 220 volts	28364-U	
4000 Hour Filter Kit (both units)	27778-U	

[1] CE approved.

Two year parts and labor warranty from domnick hunter.



Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Gas Delivery
Air Compressors

Jun-Air Oilless Air Compressors

Oilless, dry, clean – no potential source of contamination; quiet and vibrationless

- CE approved
- UL listed
- CSA listed
- IEC 1010 certified

More than 30 years of experience and product development keep Jun-Air the leader in compressor technology. These quiet, reliable compressors produce GC-quality compressed air. Highl efficient cooling enables you to run the compressor continuously. Models 2000-40MD and 600-25MD are housed in sound-reducing cabinets and incorporate an effluent filter/dryer to reduce water vapor.

OUTPUT OF JUN-AIR COMPRESSORS

(Values Approximate)

	Output (Liters/Min) at 0-8 bar								
Model	0	1	2	3	4	5	6	7	8 bar
2000-40MD [1]	175	132	120	112	105	99	94	90	86
600-25MD [2]	42	42	39	39	36	34	31	28	27
200-1.5B[3]	24	19	17	15	13	12	11	10	10

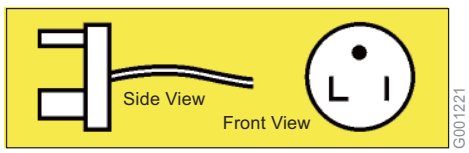
[1]220VAC unit with dryer.
[2]110VAC unit with dryer.
[3]110VAC unit.

DESCRIPTION	CAT. NO.	PRICE
MODEL 2000-40MD (100L/min at 4 bar) [1,2]		
110VAC	27675-U	
220VAC	22825	
MODEL 600-25MD (42L/min at 4 bar) [1,2]		
110VAC	503762	
MODEL 200-1.5B (14/24L/min at 4 bar) [1,2]		
110VAC	503746	
220VAC	503754	
INTAKE REPLACEMENT FILTER[3]		
for Model 2000-40MD	23153	
for Model 600-25MD	503797	

[1] CE approved.
[2] Two-week delivery.
[3] Compressors require two filters.

HELPFUL HINTS

Note: 110 VAC Jun-Air compressors are fitted with a NEMA 20 Electrical plug.



27675-U



All models have a two-year warranty from Jun-Air.

SPECIFICATIONS FOR MODEL 2000-40MD

Displacement (0 bar): 150 L/min (5.3ft ³/min)
(4 bar): 100 L/min (3.5ft ³/min)
Maximum Pressure: 8 bar (120psi)
Flow Rate (4 bar): 100L/minute
Noise: 53 dB at 8 bar
Dimensions:
(H x W x D) 31 x 25 x 22 1/2" (79 x 63 x 57cm)
Weight: 254lbs/115kg
Electrical: 110VAC, 60Hz or 220VAC, 50Hz

503762



Oil-free, low maintenance

SPECIFICATIONS FOR MODEL 600-25MD

Maximum Pressure: 8 bar (120psi)
Flow Rate (4 bar): 42L/minute
Noise: 48 dB at 8 bar
Dimensions
(H x W x D): 30.9 x 17.3 x 22.5" (78.5 x 44 x 57cm)
Weight: 191lbs/86.5kg
Electrical: 110VAC, 60Hz or 220VAC, 50Hz

503746



Compatible with Balston/Whatman & Packard Zero Air Generators, up to 24L/min; maintenance-free

SPECIFICATIONS FOR MODEL 200-1.5B

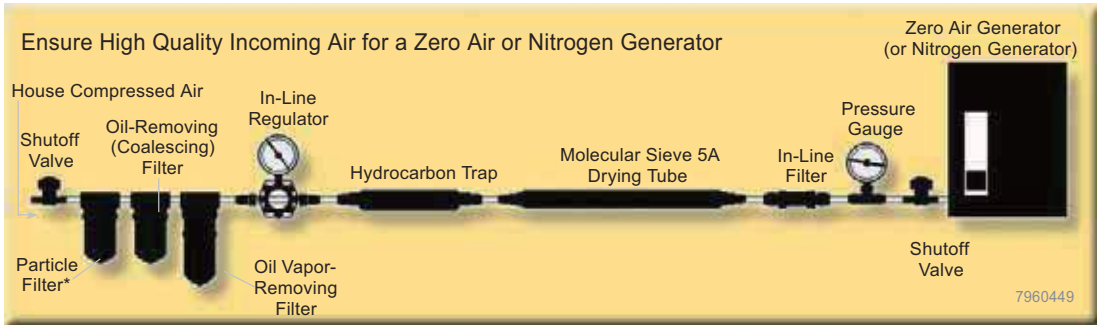
Maximum Pressure: 8 bar (120psi)
Flow Rate (4 bar): 110VAC – 14L/minute, 220VAC – 24L/minute
Noise: 60dB at 8 bar
Dimensions
(H x W x D):12 x 15.4 x 12" (30.5 x 39 x 30.5cm)
Weight: 33lbs/14.8kg
Electrical: 110VAC, 60Hz or 220VAC, 50Hz

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Norgen Particle, Oil-Removing, and Oil Vapor-Removing Filters

Eliminate compressor oil vapors and droplets from air lines. Airborne contaminants – dust, moisture, and organic pollutants – are drawn into an air system at the compressor intake. To these, the compressor can add oil vapors and aerosol droplets, plus sludge and other matter. These contaminants can significantly shorten the lifetimes of filtering devices in zero air generators, nitro generators, and other downstream instruments, and could affect the performance of the instruments themselves. The particle-, oil- and oil vapor-removing filters described here will eliminate these contaminants from compressed air.

Norgren Particle Filters remove liquids and solid particles as small as 5 microns in diameter. One of these filters should be the initial filtering device downstream from the air compressor (see figure). Norgren Oil-Removing (Coalescing) Filters remove submicron solid particles and oil aerosols, down to 0.01 micron. At 21°C, from an inlet concentration of 8ppm, a maximum of 0.01ppm oil will remain in the filter. Norgren Oil Vapor-Removing Filters remove oil vapors. At 21°C, only 0.003ppm oil will remain in air leaving the filter, when it is used properly (the oil vapor-removing filter must be protected by an oil-removing filter). We recommend incorporating this three filter system in any compressed line serving sensitive, high-performance gas chromatography or other laboratory instruments.



* Note: If your compressed air system has no additional protection, Norgren suggests using a 40µm and a 5µm particle filter, to ensure maximum life from the filter elements in the oil filters.

DESCRIPTION	CAT. NO.	PRICE
Particle Filter, 40µm Element, 1/4" Female NPT	24990-U	
Particle Filter, 5µm Element, 1/4" Female NPT	24992	
Oil-Removing Filter, 1/4" Female NPT	24994	
Oil Vapor-Removing Filter, 3/8" Female NPT	24996	
Replacement Elements		
Filter Element/Repair Kit for 24990-U	24991	
Filter Element/Repair Kit for 24994	24995	
Replacement Element for 24996	24997	



HELPFUL HINTS

Although most of the plumbing in a gas chromatography system should be secured to a bench or wall, there should be some flexibility at the point of connection to the GC (and to gas generators, if you are using them). Roll about 3 feet/1 meter of the gas line into a coil 4-6 inches/10-15cm in diameter. This will allow some lateral and front-to-back movement of the unit when it is being serviced.

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Gas Delivery
Gas Cylinder Accessories

27642-U



Bench Mounted Bracket

Cat. No. 27642-U (one cylinder) and Cat. No. 27644-U (two cylinders) bench or table mount brackets firmly attach to tables or benches from 1/4" (0.6cm) to 1 7/8" (4.7cm) thick.

DESCRIPTION	CAT. NO.	PRICE
1 cylinder (3.5" to 14")	27642-U	
2 cylinders (3.5" to 14")	27644-U	

27643-U



27640-U



27641-U



Wall Mounted Brackets

Cat. No. 27641-U mounts to any permanent vertical surface (fasteners not included), bracket adjusts to fit cylinders from 3.5" (8.9cm) to 14" (35.6cm) in diameter. 1.5" polypropylene strap with steel cinch buckle.

Cat. No. 27640-U will support up to 14" (35.6cm) diameter cylinder; Cat. No. 27643-U and Cat No. 27645-U), respectively, will support two or three cylinders up to 12 3/8" (31.4cm). 1.5" polypropylene strap with steel cinch buckle. All units comply with Occupational Safety and Health Administration, National Fire Protection Agency, and Uniform Fire Code (UFC) standards. Assembly required.

DESCRIPTION	CAT. NO.	PRICE
1 cylinder (up to 14"/35.6cm)	27640-U	
1 cylinder (3.5"/8.9cm to 14"/35.6cm)	27641-U	
2 cylinders (up to 12 3/8"/31.4cm)	27643-U	
3 cylinders (up to 12 3/8"/31.4cm)	27645-U	

Portable Rack/Cart

Designed for safe transport and storage of gas cylinders, Cat. No. 27647-U has 3' swivel casters and will hold four 12" (30.4cm) diameter cylinders. 1.5" polypropylene straps with steel cinch buckles. Assembly required.

DESCRIPTION	CAT. NO.	PRICE
4 cylinders (up to 12"/30.4cm)	27647-U	

27652-U



Stationary Racks

Cat. No. 27646-U supports four 12 3/8" (31.4cm) diameter cylinders, and has 1.5" polypropylene straps with steel cinch buckles. Cat. No. 27652-U holds two 12" (30.4cm) cylinders, mounts to a wall or to the floor (mounting fasteners not included). Cat. No. 27651-U floor stand holds a 3.5" (8.9cm) to 10" (25.4cm) cylinder through a combination of strap/cinch buckle and sliding support wedge. Assembly required.

DESCRIPTION	CAT. NO.	PRICE
1 cylinder (3.5"/8.9cm to 10"/25.4cm)	27651-U	
2 cylinders (up to 12"/30.4cm)	27652-U	
4 cylinders (up to 12 3/8"/31.4cm)	27646-U	

Cylinder Valve and Cap Wrench

This tool makes it easy to open a cylinder valve that is fitted with a hand wheel. It also is the proper, safe tool for removing cylinder caps.

DESCRIPTION	CAT. NO.	PRICE
Cylinder Valve and Cap Wrench	Z261866-1EA	

27650-U

27653-U



Hand Trucks

These industrial quality trucks make moving cylinders up to 12 inches in diameter safe, easy, and convenient. The one-cylinder models have 8" semi-pneumatic tires; the two-cylinder model has 10.5" fully pneumatic tires. Heavy-duty construction, rugged polypropylene straps with steel cinch buckles. All units are 47"/119cm tall. Assembled and ready to use.

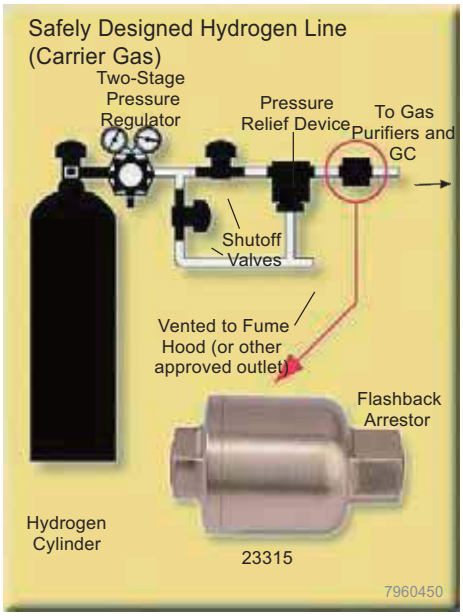
DESCRIPTION	CAT. NO.	PRICE
One-Cylinder Hand Truck	27653-U	
One-Cylinder Hand Truck*	27649-U	
Two-Cylinder Hand Truck*	27650-U	

* With Drop-Down Casters

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Hydrogen Flash Arrestor

Install a flash arrestor in the line between a hydrogen cylinder and chromatograph (see figure), or use with a hydrogen genera In event of a flashback, the flash arrestor diverts the flame into three feet (1m) of tubing, where the flame is extinguished and the heat is absorbed. The shock wave preceding the flashback closes and locks the arrestor's shutoff valve, eliminating gas feed. 1/4" female NPT connections; use to 50psig (3.5kg/cm^2). Meets Occupational Safety and Health Administration (OSHA) and National Fire Protection Agency (NFPA) codes; Factory Mutual approved.



DESCRIPTION	CAT. NO.	PRICE
Brass	23315	
Stainless Steel	Z261858-1EA	

Connectors, Swagelok (Tube) to 1/4" NPT

SWAGELOK NO.	SIZE	CAT. NO.	PRICE
BRASS (PK. 2)			
200-1-4	1/8" tube	22066	
400-1-4	1/4" tube	21519	
810-1-4	1/2" tube	25818	
STAINLESS STEEL (EACH)			
200-1-4	1/8" tube	22067	
400-1-4	1/4" tube	22700-U	
810-1-4	1/2" tube	25830	

Check Valves

Attach a check valve to the outlet side of a regulator to prevent backflow of gas into the regulator and cylinder. 1/4" female NPT fittings. Maximum pressure: 3000psig.

CONSTRUCTION	O-RING[1]	CAT. NO.	PRICE
Brass	Viton	Z146846-1EA	
Stainless Steel	EPR	Z146854-1EA	
Stainless Steel	neoprene	Z146862-1EA	
Stainless Steel	Viton	Z146870-1EA	

[1] Operating temperature range: Viton: -20°F to 400°F; EPR: -65°F to 300°F; neoprene: 80°F to 300°F.



Flexible Stainless Steel Hose

This infinitely flexible 30" (76cm) x 1/4" 316 stainless steel hose solves many routing problems. It enables you to change the direction of a line as needed, and as often as necessary. Tested to 3000psig (211kg/cm^2) with helium. Connections are 1/8" Swagelok.

DESCRIPTION	CAT. NO.	PRICE
Flexible Stainless Steel Hose	22060-U	

Order: 1.800.325.3010 Technical Service 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Gas Delivery
Gas Cylinder Accessories



High-Purity, Automatic Changeover Panels

- Automatically switch from empty cylinder to full
- Stainless steel diaphragm suitable for GC carrier gas
- Wall-mount panel
- Diaphragm packless purge valves
- Hand-tight connectors

These Air Products automatic changeover panels provide a continuous, uninterrupted gas supply on installations where reserve cylinders are needed. The unit consists of two identical regulators, but one is set to deliver gas at a slightly higher pressure than the other. When the service cylinder is empty, the unit will automatically draw gas from the reserve cylinder, eliminating the need to shut down the system to replace the empty cylinder. The pressure gauges indicate which cylinder is in use and which cylinder is empty.

High-purity construction makes this system ideal for chromatography and laboratory gas applications. The system includes purge valves, allowing the purging of air trapped in the lines during cylinder change-out. All systems are shipped complete, with mounting panel, flexible pigtails, isolation valves, and outlet shut-off valves.

Note: These units are not intended to allow the user to adjust outlet pressure. For final pressure control, use with an in-line regulator.

DESCRIPTION	CAT. NO.	PRICE
ACR 2 Cylinder, Brass Regulators with Purge		
CGA350 for H_2, Ar/CH_4	503576	
CGA580 for He, N_2, Ar	503584	



Regulator Wall Brackets –
Single-Station and Two-Station Manifolds

These manifolds are designed to provide a safe, reliable method to wall-mount a single-cylinder regulator, thus eliminating the need to handle the regulator during cylinder changes. The horizontal brackets are fabricated from type 304 stainless steel for long life, and are suitable for mounting to our single- or two-stage regulators (not provided). Complete with 30" stainless steel bellows, flexible pigtails, and hand-tight CGA connectors – no need for a cylinder wrench.

DESCRIPTION	CAT. NO.	PRICE
SINGLE-STATION MANIFOLDS		
One pigtail on bracket with CGA connector		
CGA350 for H_2, Ar/CH_4	503657	
CGA580 for He, N_2, Ar	503665	
CGA590 for Purified Air	503673	
TWO-STATION MANIFOLDS		
Two pigtails on brackets with CGA connectors		
CGA350 for H_2, Ar/CH_4	503703	
CGA580 for He, N_2, Ar	503711	
CGA590 for Purified Air	503738	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Pressure Regulation

Select a regulator based on your application and the type of gas you intend to use. Analysts often waste considerable time and money by choosing the wrong regulator for a project.

Our high-purity and ultra-high purity regulators are ultrasonically cleaned to remove contaminants, and their internal parts are protected by 20µm sintered bronze filters. A preset safety relief valve is incorporated into every single-stage and two-stage regulator we offer.

Pressure Regulator Types

In-line regulators

Adjust pressure at the point of use and are intended to be installed downstream of a cylinder regulator. The input pressure should not exceed 400psig for our in-line regulators; the output pressure varies with each regulator.

Single-stage regulators

Reduce cylinder pressure to line pressure in a single step. If a single-stage regulator is not used with a downstream in-line regulator, some pressure change can occur downstream as the cylinder pressure drops. The gauges show cylinder and output line pressure.

Two-stage regulators

Reduce cylinder pressure to line pressure in two steps. This enables the regulator to uniformly control the output pressure despite the decreasing input pressure from the cylinder. Consequently, an in-line regulator usually is not needed.

Application Considerations

General purpose regulators

For non-chromatographic applications, where simple pressure control is needed. Typical uses are non-corrosive plant, pilot plant, and maintenance shop applications. Our general purpose regulators feature nylon-reinforced, neoprene diaphragms for excellent performance and long life. These materials are not a barrier to oxygen and other gases, however, and we do not recommend these regulators for chromatographic applications.

High purity regulators

For chromatography and chemical applications. Our high purity regulators feature stainless steel diaphragms with captive Teflon gaskets and brass bar (nickel-plated) stock bodies, and are sealed to a helium leak rate of less than 2 x 10^{-9} cc/second.

Ultra-high purity regulators

For high sensitivity chromatography and analytical lab applications. Our ultra-high purity regulators feature stainless steel diaphragms with metal-to-metal seals and brass bar (nickel-plated) stock bodies, and are sealed to a helium leak rate of less than 2 x 10^{-8} cc/second.

Cross-Purge Assembly with Diaphragm Valves

These assemblies incorporate a cross tee and two diaphragm valves attached to the regulator, to allow purging of air trapped in the line during cylinder installation.We recommend them for all applications requiring a high purity or ultra-high purity regulator. For more information, request publication 41101, Regulator Design and Operation.

Cylinder Connections

All our single-stage and two-stage regulators include cylinder connector fittings – Compressed Gas Association (CGA) fittings for regulators ordered in the US, or DIN fittings for regulators ordered in Europe and elsewhere. CGA fittings have a nut, a gland, and, if specified, a washer; DIN fittings have a gasket, a nut, and a gland. Gauges on regulators equipped with CGA fittings are calibrated in psi; gauges on regulators equipped with DIN fittings are calibrated in bar units. Other outlet connections from these regulators, and all fittings on general purpose single-stage and two-stage regulators, are 1/4" male NPT. All single-stage and two-stage regulators have outlet shut-off valves.

All in-line regulators we offer include 1/8" Swagelok inlet and outlet fittings; some include mounting brackets.

CGA Connection 320 (for CO_2)



0.825" – 14NGO RH EXT. (Flat Nipple)

CGA-320

CGA Connection 346 (for compound air)



0.825" – 14NGO RH EXT. (Large Round Nipple)

713-1104

CGA Connection 350 (for H_2)



0.825" – 14NGO LH EXT. (Round Nipple)

713-1108

CGA Connection 580 (for He, N_2, Ar)



0.965" – 14NGO RH EXT.

713-1107

CGA Connection 590 (for purified air)



0.965" – 14NGO LH EXT.

713-1109

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Gas Delivery
Pressure Regulators

High Purity and Ultra-High Purity Pressure Regulators

- Specially cleaned to eliminate halocarbon and hydrocarbon residues
- Filters in fitting and regulator body protect regulator from particles and pressure surges
- Easy-to-read 2 1/2"/6.3cm gauges (0-200psi or 0-14 bar)
- Leak tested[2], ready to use





SPECIFICATIONS

High Purity Regulators (in-line, single-stage, two-stage)

Body:	nickel-plated brass or brass
Diaphragm:	316 stainless steel
Diaphragm Seal:	captive Teflon gasket
Maximum Inlet Pressure (psig/bar):	In-Line: 400/27
	Single-Stage: 3000/204
	Two-Stage: 3000/204
Delivery Pressure (psig/bar):	0-100/0-7

Ultra-High Purity Regulators (in-line, single-stage, two-stage)

Body:	nickel-plated brass or brass
Diaphragm:	316 stainless steel
Diaphragm Seal:	metal-to-metal
Maximum Inlet Pressure (psig/bar):	In-Line: 400/27
	Single-Stage: 3000/204
	Two-Stage: 3000/204
Delivery Pressure (psig/bar):	0-100/0-7

APPLICATION/TYPE	FITTING	SINGLE-STAGE CAT. NO.	SINGLE-STAGE PRICE	TWO-STAGE CAT. NO.	TWO-STAGE PRICE
FOR He, N_2, Ar					
General Purpose					
endfitting = 1/4" male NPT	CGA 580	503436		503479	
High Purity					
no purge valves, endfitting = 1/4" male NPT	CGA 580	503355		503398	
purge valves, endfitting = 1/8" Swagelok	CGA 580	23876		23879	
purge valves, endfitting = 1/8" Swagelok	DIN 6	—	—	24972	
Ultra-High Purity					
no purge valves, endfitting = 1/4" compression, unplated brass	CGA 580	503312		503339	
purge valves, endfitting = 1/8" Swagelok	CGA 580	23870		23872	
FOR CO_2					
General Purpose					
endfitting = 1/4" male NPT	CGA 320	503460		503509	
FOR H_2, CH_4, AR/CH_4					
General Purpose					
endfitting = 1/4" male NPT	CGA 350	503444		503487	
High Purity					
no purge valves, endfitting = 1/4" male NPT	CGA 350	503363		503401	
purge valves, endfitting = 1/8" Swagelok	CGA 350	23877		23880-U	
purge valves, endfitting = 1/8" Swagelok	DIN 1	—	—	24974	
Ultra-High Purity					
no purge valves, endfitting = 1/4" compression, unplated brass	CGA 350	503320		503347	
purge valves, endfitting = 1/8" Swagelok	CGA 350	23871		23873	
FOR PURIFIED AIR[3]					
General Purpose					
endfitting = 1/4" male NPT	CGA 590	503452		503495	
High Purity					
no purge valves, endfitting = 1/4" male NPT	CGA 590	503371		503428	
purge valves, endfitting = 1/8" Swagelok	CGA 590	23878		23881	
purge valves, endfitting = 1/8" Swagelok	DIN 13	—	—	24973	
FOR COMPOUND AIR[4]					
High Purity					
purge valves, endfitting = 1/8" Swagelok	CGA 346	—	—	23899	

[1] Gauges calibrated in psi on regulators with CGA fittings, in bar on regulators with DIN fittings.
[2] High purity regulators leak tested to 2 x 10^{-5} cc/second (helium); ultra-high purity regulators leak tested to 2 x 10^{-8} cc/second (helium).
[3] Air purified to meet specifications for contaminants; no control of oxygen and nitrogen levels.
[4] Pure oxygen and pure nitrogen blended to specific levels.

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



In-Line Regulators

Include 1/8" Swagelok fittings. Maximum inlet pressure of 400psi.

REGULATOR	CAT. NO.	PRICE
Economy, 0-60 psi (gauge and panel mount, brass fittings)	23831-U	
Economy, 0-60 psi (no gauge or panel mount, brass fittings)	23832-U	
Gauge for 23832-U, (0-60psi, 1/8" male NPT fitting)	23833-U	
Bracket and nut for 23832-U,	23834-U	
General Purpose, 0-50 psi (Air, H_2, N_2, Ar) (brass fittings)	23883	
High Purity (Air, H_2, N_2, Ar, He), 0-100 psi (stainless steel fittings)	23882	
Ultra High Purity (Air, H_2, N_2, Ar, He), 0-100 psi (stainless steel fittings)	23884	



Diaphragm Shutoff Valves

- Multiple metal diaphragms provide a permanent seal, prevent diffusion of air and water vapor into the gas flow
- Brass body, KEL-F seat

Grease-free, high integrity valves, leak tested to 10^{-10} cc/sec (helium). Maximum operating pressure: 2000psig (350kg/cm^2), operating temperature range: -40°C to 93°C.

DESCRIPTION	CAT. NO.	PRICE
1/4" Male NPT x 1/4" Female NPT	23896	
1/4" Male NPT x 1/4" Male NPT	23897	



Pressure Gauges

2"/5cm, steel and copper alloy.

DESCRIPTION	CAT. NO.	PRICE
GAUGE WITH 1/8" TEE		
0-30psi	20469	
0-60psi	20470	
0-100psi	22423	
GAUGE WITH 1/8" NPT FITTING		
0-30psi	20393	
0-60psi	20394	



Complete Pressure Gauge Kit

2"/5cm gauge (0-100psi), NPT to Swagelok adapter, 18"/1/2m of 1/8" copper line, 1/8" tee, assembly and installation instructions.

DESCRIPTION	CAT. NO.	PRICE
Pressure Gauge Kit	20392	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Gas Delivery
Flow Control

Backpressure Regulation

Backpressure regulation is used in almost all modern gas chromatographs, to control column inlet pressure rather than outlet pr
By updating your instrument with backpressure regulation, you can:

- Conserve carrier gas
- Set linear velocity more accurately
- Use hydrogen carrier gas more safely

The pressure regulators on this page are made by Porter Instrument Company, and are specifically designed for gas chromatograph
They are suitable for panel mounting, and can be used to 160°F. All backpressure regulators on this page have 1/8" brass Swagelok
connectors and provide bubble-tight shutoff to 250psi (helium).

22811-U



Porter Backpressure Regulator

Use of this regulator requires a low flow controller (Cat. No. 22834, below) with a 0-535cc/min flow element (Cat. No. 22839).

SPECIFICATIONS (MODEL 9000)

Flow Capacity:	0-1000cc/min
Regulation Range:	0-100psig (0-7.0kg/cm^2)
Construction:	aluminum body & bonnet, Fairprene 5029A diaphragm, Viton valve seat

DESCRIPTION	CAT. NO.	PRICE
Model 9000 Backpressure Regulator	22811-U	

22834



Porter Variable Constant Low Flow Controller

Use the VCD 1000 Variable Constant Low Flow Controller to maintain the flow of carrier gas, make-up gas, etc. to within ±0.3% of any rate from 0-110cc/min, regardless of pressure changes downstream. Optional flow elements maintain flow rates over lower (0-10cc/min) or wider (0-535cc/min) flow ranges.

SPECIFICATIONS (VCD 1000)

Max. Operating Pressure:	250psig/17.6kg/cm^2
Pressure Drop Required:	≥15psi/1kg/cm^2
Control Accuracy:	±0.3% of instantaneous flow rate
Construction:	aluminum body & filter, Fairprene 5029A diaphragm, Buna-N O-rings, Viton valve seat

DESCRIPTION	CAT. NO.	PRICE
with 0-110cc/min Flow Element (Green)	22834	
Optional additional flow elements		
0-10cc/min element only (Blue)	22836	
0-535cc/min element only (Black)	22839	

22813-U



Porter Model 4000 Miniature Pressure Regulator

Provides the same control and stability at lower pressures as the larger low flow regulator (Cat. No. 22816), but requires much less space – the 1 1/8 inch/2.9cm OD body fits into the smallest of instruments. Recommended for flows of 0-500cc/min. A 10psi pressure change will not change the outlet pressure by more than 0.05psi; from 2cc/min to 250cc/min, the outlet pressure will not change by more than 0.2psi.

SPECIFICATIONS (MINIATURE)

Max. Operating Pressure:	250psig/17.6kg/cm^2
Flow Capacity:	0-15 liters/min (60psig helium supply, 15psig outlet)
Regulation Range:	0-60psig (0-4.2kg/cm^2)
Pressure Drop Required:	≥10psi/0.7kg/cm^2
Construction:	aluminum body & bonnet, stainless steel diaphragm

DESCRIPTION	CAT. NO.	PRICE
Miniature Pressure Regulator	22813-U	

22816



Porter Low Flow Pressure Regulator

Precise pressure regulation at very low flows – particularly useful with 0.53mm ID capillary columns. Outlet pressure will not decrease more than 0.3psi over entire flow range. Regulation range: 0-100psig (0-7.0kg/cm^2).

SPECIFICATIONS (LOW FLOW)

Max. Operating Pressure:	250psig/17.6kg/cm^2
Pressure Drop Required:	≥10psi/0.7kg/cm^2
Control Accuracy:	less than 0.3psi decrease over total flow range
Construction:	aluminum body & bonnet, stainless steel diaphragm & filter, Buna-N O-rings, Viton valve seat

DESCRIPTION	CAT. NO.	PRICE
Model 8311 Low Flow Pressure Regulator	22816	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



Supelco Rotameters

Designed for accurate metering, these rotameters are excellent for chromatographic purposes. Each rotameter consists of a flow tu and four interchangeable floats. Standard flow tables (mL/min at STP) are included. The rotameter is easy to mount on any chromatograph, or you can install it on the optional tripod assembly. Available with or without needle valves.

FLOW RANGE (ML/MIN)	ROTAMETER LENGTH (MM)	FLOAT CAPACITY (ML/MIN AIR, STP) G	S	ST	C
0-33	65	6	8	17	33
0-110	150	19	30	61	110
0-246	150	49	73	137	246
0-454	150	92	140	264	454

[1] G = glass, S = sapphire, St = stainless steel, C = Carboloy

SPECIFICATIONS

Accuracy: ±2% full scale
Repeatability: ±0.25%
Max. Operating Pressure: 200psig (13.8 bar) / 14kg/cm [2]
Max. Operating Temp.: 250°F/121°C
Useful Flow Range: 10:1 minimum (one float)

Order Swagelok connectors separately.

FLOW RANGE	CAT. NO.	PRICE
WITH NEEDLE VALVE		
0-33mL/min	23324	
0-110mL/min	23325	
0-246mL/min	23320-U	
0-454mL/min	23326	
WITHOUT NEEDLE VALVE		
0-33mL/min	503843	
0-110mL/min	503851	
0-454mL/min	503886	

Tripod Assembly

Cat. No. 23322 is for Supelco rotameters, Cat. No. 23320-U, 23324, 23325, 23326. Has leveling screws and a built-in level.

Cat. No. 22548 is for modular rotameters, Cat. No. 22549 and 22550-U.

DESCRIPTION	CAT. NO.	PRICE
for Supelco rotameters	23322	
for modular rotameters	22548	



Swagelok Connectors

Swagelok (A) to 1/8" NPT (B). Required for connecting all rotameters on this page to gas supply. Also available with 7µm frits – please inquire.

SWAGELOK NO.	SIZE	CAT. NO.	PRICE
BRASS (PK. 2)			
200-1-2	1/8" tube	22082	
400-1-2	1/4" tube	22083	
STAINLESS STEEL (EACH)			
200-1-2	1/8" tube	22084-U	
400-1-2	1/4" tube	22085-U	



Modular Rotameters

Low Flow Modular Rotameter Kit
Module 1: glass float (6-60mL/min)
stainless steel float (15-150mL/min)
Module 2: sapphire float (11-110mL/min)
Carboloy float (30-300mL/min)

High Flow Modular Rotameter Kit
Module 1: glass float (38-380mL/min)
stainless steel float (84-840mL/min)
Module 2: sapphire float (54-540mL/min)
Carboloy float (125-1250mL/min)

For rapid float changes.Modular assembly enables you to quickly change floats to monitor different flow rates. You never touch the float – simply interchange the entire tube/float module. Each kit contains two modules, with two floats to each module.

Readings are accurate to within ±2%. Conversion charts for air, Ar, CO_2, He, H_2, N_2, and O_2 are included. Order the tripod assembly (Cat. No. 22548) and Swagelok connectors separately.

DESCRIPTION	CAT. NO.	PRICE
Low Flow Rotameter Kit (6-300mL/min)	22549	
High Flow Rotameter Kit (38-1250mL/min)	22550-U	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Gas Delivery
Flow Measurement

Aalborg Low-Cost Mass Flowmeters

- ±1.5% accuracy, full scale, over ranges from 0-50mL/min to 0-10L/min
- Aluminum body for noncorrosive gases
- Tiltable display
- AC or rechargeable battery operation
- EN 55011 Class I, Class B; EN50082-1



AC Power Supply
(not shown)

Use these economical instruments to read gas mass flow rate for common GC gases –$_2$H-He, N_2, CO_2, air, and argon/methane mixtures – at inlet pressures up to 500psig. Each unit features a tiltable (more than 90°), LCD digital readout built into the top of the transducer. The readout module can easily be removed for remote readings.

The units can be powered with rechargeable batteries or with 110VAC or 220VAC current – choose the option you need.

Principal of Operation - The stream of metered gas is split proportionally. A small part of the flow is shunted through a straight capillary sensor tube, the balance of the gas flows through a laminar flow conduit. Heat flux is introduced at two sections of the capillary sensor tube by means of precision wound coils. As it flows, the gas carries heat from the coils upstream to the coils downstream. The resultant temperature differential is proporti8onal to the change in resistance of the coils. Wheat-stone bridges are used to monitor the instantaneous temperature of each of the coils. The closed loop control circuit detects and amplifies the temperature gradient and restores the temperature balance of the coils. The current required at any given time to maintain dynamic equilibrium is a function of the amount of heat carried by the gasses. An output signal of 0-5VDC or 4-20mA is generated, which indicates the mass molecular-based flow rate of the metered gas. Flow rates are unaffected by temperature or pressure variations within stated limits.

SPECIFICATIONS

Accuracy:	±1.5%, full scale
Repeatability:	±0.5%, full scale
Max. Pressure Drop:	up to 10 std. L/min
Gas Pressures:	500psig (34.5 bar) maximum
	20psig (1.4 bar) optimum
Gas & Ambient Temp.:	32°F to 122°F (0 to 50°C)
Helium Leak Rate:	1 x 10^{-7} SCCS
Transducer Input:	+12VDC; 200mA
Fittings:	1/4" NPT (other fittings available on request)

RELATED INFORMATION

Note: These flowmeters can be used with all common GC gases, but they are calibrated for helium. Refer to the manual for conversion factors for other gases. For calibration for other gases, please inquire. (Price will be the same.)

DESCRIPTION	CAT. NO.	PRICE
0-50mL/min	503894	
0-100mL/min	503908	
0-200mL/min	503916	
0-500mL/min	503924	
0-1L/min	503932	
0-5L/min	503940	
0-10L/min	503959	
Power Sources (one needed for each unit)		
Battery Kit with Charger, 110VAC	503266	
Battery Kit with Charger, 220VAC	503274	
Power Supply, 110VAC, 12VDC	503282	
Power Supply, 220VAC, 12VDC	503290	

[1] CE approved.

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco





Bubble Flowmeters

Use these bubble flowmeters to check splitter or detector flow, or to calibrate personal pumps for accurate air sampling. Bubble meters are graduated in these increments: 10mL by 1mL; 25mL by 5mL; 50mL by 10mL; 100mL by 20mL; 500mL by 50mL; and the 1000mL by 100mL. The 500mL and 1000mL meters can be used to measure positive or negative flow.

Bubble meter kits include a squeeze bulb, 30" (3/4m) of 5/16" Tygon tubing, a collapsible stand, and a bottle of liquid soap solution.

DESCRIPTION	CAT. NO.	PRICE
BUBBLE METER KITS		
500mL Bubble Meter Kit	20414	
1000mL Bubble Meter Kit	20415	
BUBBLE METERS AND ACCESSORIES		
10mL Bubble Meter[1]	20562	
25mL Bubble Meter[1]	20431	
50mL Bubble Meter[1]	20432	
100mL Bubble Meter[1]	20433-U	
Replacement Magnetic Clamps for 10mL, 25mL, 50mL units (pk. of 6)	20595	
Replacement Squeeze Bulbs (pk. of 10)	23166	
500mL Bubble Meter	20427-U	
1000mL Bubble Meter	20428-U	
Snoop, 8 oz/475mL bottle	20434	

[1] Includes 2 magnetic clamps.

Capillary Column Bubble Meter

Accurately measure capillary column gas flow rate. This 0.5mL volume bubble meter will allow you to calculate true split ratio by measuring actual flow rate – even as small as 0.01mL/min. Graduated in 0.01mL increments.

Choice of easy installation setups: magnetic clamps or stand.

DESCRIPTION	CAT. NO.	PRICE
with stand	23771	
with magnetic clamps	23762-U	



Humonics Veri-Flow 500 Electronic Flowmeter

- Calibrated for nitrogen, helium, hydrogen, air, 5% argon/methane (certificate supplied)
- Range of 5-500mL/min; accurate to within ±2% of reading or 0.25mL (whichever value is larger)
- Continuous readings in volume, linear velocity, or split ratio
- EPC compatible
- 9-pin RS 232 communication port for recording data
- Includes power adapter jack and recharger
- Only 4 x 5 x 3" (10 x 12.5 x 7.5cm)

The leaders in GC flow measurement technology have developed an outstanding instrument for analysts who want a simple, continuous-reading flowmeter for general GC applications.

The Veri-Flow 500 Electronic Flowmeter is multiple-point calibrated to NIST-certified volumetric standards for nitrogen, helium, hydrogen, air, and 5% argon/methane, for superior accuracy and to help you comply with ISO 9000, GLP, and other stringent quality control protocols. The display indicates flow in volume (mL/minute) or linear velocity (cm/second), or split ratio. Operation is pulse-free, unaffected by temperature or pressure changes, and the unit is fully compatible with electronic pressure control systems. Operates on internal rechargeable batteries. Very low power consumption and automatic shut-off.

DESCRIPTION	CAT. NO.	PRICE
110VAC[1]	23143	
110-220VAC, 50/60Hz[2]	23142	

[1] CE approved

[2] Includes 110VAC USA, 220VAC European power cords and a universal charger



Digital Timers

LCD Digital Stopwatch–Performs many functions: time of day, 1/100 second timing, split (lap) times, day, date and month, time in/time out, two finishing times, night light, 0.003% accuracy. Includes battery.

Digital Timer/Clock–Countdown timer and stopwatch functions counts up or down from one second to 24 hours. Alarm sounds for 60 seconds and shuts off automatically. Unit clips onto your pocket. Includes a 1.5V battery.

DESCRIPTION	CAT. NO.	PRICE
LCD Digital Stopwatch	23011	
Digital Timer/Clock	22754-U	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Gas Delivery
Flow Measurement, Leak Detectors





Humonics Optiflow Flowmeters

- Four flow ranges available; accurate to within ±2 or ±3% of any reading
- Portable – includes standard 9-volt battery
- Automatic power-off for extended battery life
- Field replaceable tubes
- Compatible with electronic pressure control

SPECIFICATIONS
Optiflow 420 Digital Flowmeter Flow Range: 0.5-50mL/min Accuracy: ±3% of any reading Display: mL/min or linear velocity
Optiflow 570 Digital Flowmeter Flow Range: 0.5-700mL/min Accuracy: ±2% of any reading Display: mL/min or split ratio
Optiflow 650 Digital Flowmeter Flow Range: 5-5000mL/min Accuracy: ±2% of any reading Display: mL/min or split ratio

These high-precision instruments combine the simplicity and versatility of a bubble meter with the speed and accuracy of a microprocessor, providing you with a reliable means of measuring gas flow. Optiflow Digital Flowmeters automate the performance-proven bubble flowmeter "positive displacement" technique that works independent of the type, mass, or mixture of gases. They retain the key advantages of the bubble meter – simplicity and reliability – while improving accuracy and reproducibility, and providing certified performance.

The versatile units can be used with all gases. And they feature an easy-to-read, accurate digital display, eliminating the need for tedious bubble watching, timing, and flow rate/time conversions. The bubble is visible for your observation.

Optiflow Digital Flowmeters help you comply with the quality protocols of the American Society for Quality Control, ISO 9000, and Good Laboratory Practice. Each unit is individually calibrated to the registered standards of the National Institute of Standards and Technology and comes with a certificate of calibration. A recalibration service is available.

DESCRIPTION	CAT. NO.	PRICE
Optiflow 420 Digital Flow Meter	22806	
Replacement Flow Tube	22779-U	
Optiflow 570 Digital Flow Meter	22741-U	
Replacement Flow Tube	22777	
Optiflow 650 Digital Flow Meter	22912	
Replacement Flow Tube	22778	



Humonics Liquid Flowmeters

- Easy set-up operation
- NIST traceable

Humonics digital liquid flowmeters replace the tedious and time-consuming glass burette and stopwatch traditionally used to measure flow rates – a microcomputer and infrared optics are used to track a rising volume of liquid within a tube of precision-bore glass. Absolute accuracy is established by comparing the performance of the instrument to an NIST-registered burette.

MODEL	FLOW RANGE (mL/min)	RESOLUTION	CALIBRATION POINTS
1000	0.100 - 1.999	0.001	1.5, 3, 5mL/min
	2.00 - 9.99	0.001	
	10.0 - 30.0	0.1	

DESCRIPTION	CAT. NO.	PRICE
Model 1000 Liquid Flowmeter, 110VAC	55090-U	
Model 1000 Liquid Flowmeter, 220VAC [1]	55093	

[1] CE approved



Snoop Liquid Leak Detector

Also useful in bubble meters.

DESCRIPTION	CAT. NO.	PRICE
Snoop, 8 oz./475mL bottle	20434	
Snoop, 1 gallon/3.8L bottle	20640-U	

Leak-Tec Leak Detector

Will not bubble on a heated part unless there is a leak. Use at temperatures up to 210°C.

DESCRIPTION	CAT. NO.	PRICE
Leak-Tec Leak Detector, 283g pressurized can	20566	

NOTE: We do not recommend using liquid leak detectors with capillary GC systems.

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

GOW-MAC Gas Leak Detectors

Help you find leaks quickly – without risk of contaminating your GC system. Using liquids to detect gas leaks can be poor economy, especially in a capillary GC system. Even a small amount of liquid leak detector that seeps into a fitting, or through the septum, can damage your column or create baseline noise. GOW-MAC gas leak detectors easily and quickly pinpoint gas leaks too small to detect with soap solution.

GOW-MAC gas leak detectors operate on the same principle as a thermal conductivity detector – they respond to any gas mixture that has a thermal conductivity value different from that of air. With an intrinsically high signal-to-noise ratio, amplification provides maximum usable sensitivity: helium leaks of 1.0×10^{-5} cc/sec and refrigerant leaks of 1.0×10^{-4} cc/sec are easily detected.

Easy to Operate - GOW-MAC gas leak detectors can be operated with little or no training. Turn on, adjust the zero and probe for leaks. The probe is designed to reach difficult and confined locations. A HIGH/LOW switch permits you to control sensitivity for very small leaks.

Deluxe and miniature models are available. Both models include rechargeable batteries and two sensitivity ranges.

Deluxe Detector: Model 21-250 -The Deluxe Model is a sturdy addition to your lab. Free your hands to work the probe and still have easy reference to the control panel by shifting the carrying handle to a stand position. An audible tone alerts you when the probe passes over a gas leak.

Miniature Detector: Model 21-050

The Mini Model is the smallest detector of its kind, offering all of the accuracy of the larger GOW-MAC model in a convenient, lightweight instrument. Visual LED bar graph shows you when the probe passes over a leak.

Both models have a 1-year warranty from GOW-MAC.

DESCRIPTION	CAT. NO.	PRICE
GOW-MAC Gas Leak Detectors		
Deluxe Model 21-250 [1]	22409	
Mini Detector: Model 21-050		
with 110VAC/60Hz recharger	22807	
with 220VAC/50Hz recharger [2]	22808	
Carrying Case for Mini Detector	22809	

[1] Does not have a CE mark.

[2] CE approved.

NOTE: These GOW-MAC gas leak detectors are not intended for determining leaks of combustible gases. They are intended for nonspecific applications, to determine low level leaks of gases with thermal conductivity different from that of air. We recommend a combustible gas detector for monitoring combustible gases in possibly hazardous situations.



P000330

SPECIFICATIONS: DELUXE DETECTOR

Output: Audio. Frequency changes with concentration; adjustable threshold and speaker volume.
Range: High: x1; Low: x100
Dimensions: 10 3/4 x 8 1/4 x 3 5/8" (27 x 21 x 9cm) (excluding handle)
Weight: 9lb/4.1kg (shipping wt. : 12lb/5.4kg)
Power: Rechargeable lead/acid gel battery, 8V, selectable 110/220VAC, 50/60 Hz

SPECIFICATIONS: MINIATURE DETECTOR

Output: Visual LED bar graph alerts you to leaks
Range: High: x1; Low: x100
Dimensions: 3 1/4 x 1 13/16 x 5 1/4" (8 x 4.5 x 13cm)
Weight: 465g without charger
Line Voltage: Rechargeable Ni-Cd battery, 7.2V/800mAmp/hr; recharger included: 110VAC/60Hz or 220VAC/50Hz

SENSITIVITY OF GOW-MAC LEAK DETECTORS

Gas	cc/sec	feet^3/year
Argon	1.0×10^{-4}	0.110
CO_2	1.1×10^{-4}	0.123
Fluorocarbons	1.1×10^{-4}	0.123
Helium	1.0×10^{-5}	0.012
H_2/He (40:60)	1.0×10^{-5}	0.012
Refrigerants	1.0×10^{-4}	0.123

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Gas Delivery
Gas Purifiers

How to Select Purifiers

Why use gas purifiers? Hydrocarbons in the carrier gas can lead to noisy baselines and irreproducible results. Moisture and oxygen can strip phase, creating excessive bleed, damaging the GC column and shortening lifetime. Purifiers help ensure the reliable and efficient performance of the GC instrument.

Our recommendation is to use individual purifiers to handle each of the typical contaminants. These contaminants (hydrocarbons, moisture and oxygen) are present in different impurity levels in the gases. Seldom do you find a purifier that has the quantities of each adsorbent to match the contaminants in your gases. It is better to use separate purifiers for each contaminant and change on a need base.

Indicating Purifiers - These purifiers allow a continuous monitoring of the actual gas quality that reaches the GC instrument. They give an indication of a needed purifier change before an analytical problem is caused by insufficient gas purity. We strongly recommend these indicators to ensure a reliable delivery of pure carrier gas.

Moisture indicators (blue beads) - Most moisture purifiers that contain blue beads will show a color change at moisture levels above 50ppm. They can be regenerated under certain conditions.

Oxygen indicators - Purifiers such as the OMI line of purifiers indicate the presence of oxygen in your carrier gas. Oxygen indicators are designed for use primarily as an indicator. They are not designed for use as the main oxygen trap when purifying gas of low purity.

Special Purpose Purifiers - These purifiers are designed for specific applications.

GC/MS Purifiers Purifiers such as the Supelco helium purifier and the UOP mat/sen are designed to produce high purity Helium carrier gas for use with GC/MS instruments. This results in greater sensitivity of the MS.

Carbon Dioxide Purifier - This purifier is used with techniques involving FTIR, IR, Total Organic Carbon (TOC) and other detectors sensitive to Carbon Dioxide (CO_2). We offer a purifier that removes CO_2 and shows a color change. The reaction of CO_2 with the absorbent forms moisture. We recommend the use of a moisture-removing purifier downstream of the CO_2 purifying purifier.

More information is available in Supelco Bulletin 918 (T197918) on Selecting Purifiers for Gas Chromatography.

Gas Purifier Recommendations

	HYDROCARBONS	MOISTURE	OXYGEN
CARRIER GAS (HELIUM, HYDROGEN OR NITROGEN)			
Single GC, Part time usage and low gas flows			
	Supelcarb-HC 120 cc	Molecular Sieve 5A 200 cc	Supelpure-O 120 cc
GC usage and normal gas flows, up to 4 units			
Option 1:	Supelcarb-HC 120 cc	High Capacity Gas Purifier[2] & OMI-2 [1,4]	High Capacity Gas Purifier[2] & OMI-2 [1,4]
Option 2:	Supelpure-HC 120 cc	Molecular Sieve 5A 200 cc	Supelpure-O 120 cc
Multiple GC usage, 5 and more units			
Option 1:	Supelcarb-HC 750 cc	High Capacity Gas Purifier[2] & OMI-2 [1,4]	High Capacity Gas Purifier[2] & OMI-2 [1,4]
Option 2:	Supelcarb-HC 750 cc	Molecular Sieve 5A 750 cc	Supelpure-O 750 cc
GC/MS Usage			
Option 1:	Supelco Helium Purifier[3]	Supelco Helium Purifier[3]	Supelco Helium Purifier[3]
Option 2:	UOP mat/sen[3]	UOP mat/sen[3]	UOP mat/sen[3]
AIR			
Single GC usage, up to 4 units			
	Supelcarb-HC 120 cc	Molecular Sieve 5A 200 cc	
Multiple GC usage, 5 and more units			
	Supelcarb-HC 750 cc	Molecular Sieve 5A 750 cc	
HYDROGEN (AS A FUEL GAS)			
GC usage and normal gas flows, up to 4 units			
	Supelcarb-HC 120 cc		
Multiple GC Usage, 5 and more units			
	Supelcarb-HC 750 cc		

[1] One needed per GC
[2] Do not use with hydrogen
[3] Use with helium only
[4] Requires 4 ft. tubing between high-capacity gas purifier and OMI-2

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Gas Purifiers for Hydrocarbon Removal

NAME OF PURIFER	CARRIER GASES PURIFED	CONTAMINANTS REMOVED	PRODUCT DESCRIPTION[2]	MAXIMUM FLOW & INLET PRESSURE (CC/MIN)	(PSIG/BAR)	CAPACITY (GRAMS HC X 75%) [3]	STATED LIFE (CYLINDERS)[1]
Supelcarb HC	He, H_2, N_2, Ar/CH_4, air	C3 and higher hydrocarbons	120cc tube 1/8" 24448 1/4" 24449	2000	250/17.2	18	16.5
			750cc tucbe 1/4" 24564 1/2" 24565	10,000	250/17.2	120	110
Supelpure HC	He, H_2, N_2, Ar/CH_4, air	C4 and higher hydrocarbons	120cc tube 1/8" 22445-U 1/4" 22446	2000	250/17.2	9	8.0
			750cc tube 1/4" 24518 1/2" 24519	10,000	250/17.2	60	55.0
UOP Inert Gas Purifier	He	O_2, H_2O, CO_2, CO halocarbons, hydrocarbons, sulfurs	364cc tube 1/8" 22680-U 1/4" 22681	500	250/17.2	7.5	6.9

Gas Purifiers for Moisture Removal

NAME OF PURIFER	CARRIER GASES PURIFED	CONTAMINANTS REMOVED	PRODUCT DESCRIPTION[2]	MAXIMUM FLOW & INLET PRESSURE (CC/MIN)	(PSIG/BAR)	CAPACITY (GRAMS H_2O X 75%)	STATED LIFE (CYLINDERS)[1]
Molecular Sieve 5A Trap	He, H_2, N_2, many others	H_2O	1/8" 20619 1/4" 20618	2000	250/17.2	15.6	68
			750cc tube 1/4" 23991 1/2" 23992	10,000	250/17.2	58.5 [6]	253
High Capacity Heated Purifier	He, N_2, Ar/CH_4 not compatible with air, O_2, H_2	O_2, H_2O, CO_2, CO	32cc tube[4] 1/8" 22396 1/4" 22398	1100	150/10.3	16.9	73
OMI	He, H_2, N_2, Ar/CH_4 not compatible with air or O_2	O_2, H_2O, CO_2, CO, NH_3, alkynes, halocarbons, halogens, hydrogen halides	OMI-2, 15cc tube[5] 1/8" 23906	1000	150/10.3	0.2	0.8
			OMI-4, 90cc tube[5] 1/8" 23909	1000	150/10.3	1.3	5.8
GateKeeper	He, H_2, Ni_2, Ar not compatible with air or O_2	O_2, H_2O, H_2, CO_2, CO, (removes H_2 as a contaminant, also can purify H_2 carrier gas)	35cc cartridge 24970	1000	200/13.8	0.1	0.5
			500cc cartridge 24971	60,000	200/13.8	1.4	6.0
Supelpure-O	He, H_2, N_2, Ar/CH_4 not compatible with air or O_2	O_2, H_2O, CO_2, CO, NH_3, alcohols, alkanes, alkenes, amines, aromatics, diethylether, halogens, sulfurs	120cc tube 1/8" 22449 1/4" 22450-U	250	100/6.9	1.5	6.5
			750cc tube 1/4" 503088 1/2" 503096	10,000	250/17.2	10.2[6]	44.3
UOP Inert Gas Purifier	He	O_2, H_2O, CO_2, CO, halocarbons, hydrocarbons, sulfurs	364cc tube 1/8" 22680-U 1/4" 22681	500	250/17.2	26.3	114

[1] Based on 9" X 51" cylinders (218 cubic feet) of carrier gas containing 50ppm of contaminants supplying 1 chromatograph with 2 c apillary columns. Ask our supplier for specifications for the cylinders you use. To correct for other volumes of gas per cylinder, multiply Stated Life (cylinders) by the number of cubic feet in your cylinders, then divide by 218.

[2] Quantity of adsorbent material – dimensions of fitting – catalog number.

[3] Expressed as medium weight (C8 – C20) hydrocarbons.

[4] Heat required (tube must be installed in a specially designed heater).

[5] Holder required.

[6] At a flow rate of 1000cc/min.

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Gas Delivery
Gas Purifiers

Gas Purifiers for Oxygen Removal

NAME OF PURIFER	CARRIER GASES PURIFED	CONTAMINANTS REMOVED	PRODUCT DESCRIPTION	MAXIMUM FLOW & INLET PRESSURE (CC/MIN)	(PSIG/BAR)	CAPACITY (O_2) (GRAMS X 75%)	STATED LIFE (CYLINDERS) [1]
OMI	He, H_2, N_2, Ar/CH_4 not compatible	O_2, H_2O, CO_2, CO, NH_3, alkynes,	OMI-2, 15cc tube [3] 1/8" 23906	1000	150/10.3	0.16	0.4
	with air or O_2	halocarbons, halogens, hydrogen halides	OMI-4, 90cc tube [3] 1/8" 23909	1000	150/10.3	1.19	2.9
High Capacity Heated Purifier	He, N_2, Ar/CH_4 not compatible with air, O_2, H_2	O_2, H_2O, CO_2, CO	32cc tube [4] 1/8" 22396 1/4" 22398	1100	150/10.3	15.0	36.5
Supelpure-O	He, H_2, N_2, Ar/CH_4 not compatible	O_2, H_2O, CO_2, CO, NH_3, alcohols,	120cc tube 1/8" 22449 1/4" 22450-U	250	100/6.9	0.45	1.1
	with air or O_2	alkanes, alkenes, amines, aromatics, diethylether, halogens, sulfurs	750cc tube 1/4" 503088 1/2" 503096	10,000	250/17.2	2.4 [6]	5.8
GateKeeper	He, H_2, N_2, Ar not compatible	O_2, H_2O, H_2, CO_2, CO	35cc cartridge 24970	1000	200/13.8	0.77	1.9
	with air or O_2	(removes H_2 as a contaminant, also can purify H_2 carrier gas)	500cc cartridge 24971	60,000	200/13.8	9.56	23.3
Oxisorb	He, H_2, N_2, Ar/CH_4	O_2, H_2O, CO_2, CO	52cc cartridge [3] 20631	5000	90/6.2	NA [5]	1.0 [5]
Oxiclear	He, H_2, N_2, Ar/CH_4	O_2, H_2O, CO_2, CO	180cc cartridge 1/8" 22992 1/4" 22993	3000	250/17.2	NA [5]	3.5 [5]
UOP Inert Gas Purifier	He	O_2, H_2O, CO_2, CO, halocarbons, hydrocarbons, sulfurs	364cc tube 1/8" 22680-U 1/4" 22681	500	250/17.2	2.14	5.2

[1] Based on 9" X 51" cylinders (218 cubic feet) of carrier gas containing 50ppm of contaminants supplying 1 chromatograph with 2 c apillary columns. Ask your supplier for specifications for the cylinders you use. To correct for other volumes of gas per cylinder, multiply Stated Life (cylinders) by the number of cubic feet in your cylinders, then divide by 218.

[2] Quantity of adsorbent material - dimensions of fitting - catalog number.

[3] Holder required.

[4] Heat required (tube must be installed in a specially designed heater).

[5] Data for determining oxygen capacity was not available from the manufacturer. Stated life in cylinders in the manufacturer's r ecommendation.

[6] At a flow rate of 1000cc/min.

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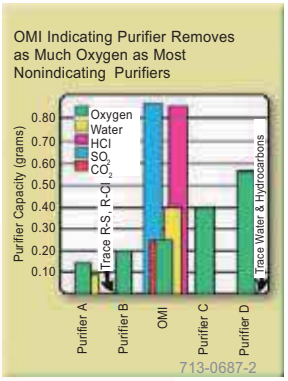
OMI Indicating Purifiers

- Simultaneously remove O_2, water vapor, CO, CO_2, most sulfur compounds, most halogen compounds, alcohols, phenols to less than 10ppb
- Purify helium, hydrogen, nitrogen, argon-methane
- Color change indicates purifier exhaustion
- Glass body does not diffuse air or off-gas
- Ideal for Hall, ECD, GC/MS detection systems
- OMI-4 purifier protects multiple instruments (three times the capacity of OMI-2 tubes)

Irreversibly remove contaminants from carrier gas. Install an OMI purifier downstream from your primary gas purifying device, and tell at a glance whether or not oxygen and water vapor are being effectively eliminated from your system. The OMI purifier will provide point-of-use gas polishing and final visual assurance of gas quality before the gas enters the GC. OMI purifier tubes contain Nanochem resin, developed for the demanding gas purity needs of the semiconductor manufacturing industry. As little as 1ppm of oxygen or water will change the indicating resin from black to brown.

Spent tubes are easily replaced. Simply unscrew the end assembly from the tube holder and replace the tube. The design prevents air from entering the new tube during installation.

Note: For optimum performance, we do not recommend storing OMI tubes for longer than 6 months.





Protect Your Column from Many Carrier Gas Contaminants

CONTAMINANT	OMI PURIFIER	INDICATING DEVICES	NON-INDICATING OXYGEN TRAPS
Oxygen	Yes	Yes[1]	Yes[1]
Water	Yes	No	Maybe
Carbon monoxide	Yes	No	Maybe
Carbon dioxide	Yes	No	No
Alcohols/Phenols	Yes	No	No
Sulfur-containing compounds	Yes	No	No[2]
Halogen-containing compounds	Yes	No	No[2]

[1] If incoming oxygen level does not exceed 10ppm.
[2] Corrosive compounds may poison some of these devices.

DESCRIPTION	CAT. NO.	PRICE
OMI-2 Purifier Tube[3]	23906	
OMI-2 Tube Holder, 1/8" fittings [3]	23921	
Seal Kit for OMI-2 Tube Holder (includes 2 Teflon seals and tool)	23917	
OMI-4 Purifier Tube[3]	23909	
OMI-4 Tube Holder, 1/8" fittings [3]	23926	
OMI-1 Replacement Tube[4] (includes 2 ferrules)	23900-U	
3/8" Ferrules (pk. of 10)	22311	
1/4" to 1/8" Swagelok SS Reducer	21517	

[3] First time users must order both purifier tube and corresponding holder. Holder is reusable.

[4] Will not fit OMI-2 tube holder – use with OMI-1 installation kit only (kit no longer available).

DIMENSIONS OF OMI PURIFIERS

OMI-2
Tube: 6"/15.2cm x 5/8"/1.6cm OD
Tube Holder: 10"/25.4cm x 1 1/2"/3.8cm OD
Endfittings: 2 1/2"/6.4cm
OMI-4
Tube: 12"/30.5cm x 1"/2.5cm OD
Tube Holder: 16"/40.6cm x 1 1/2"/3.8cm OD
Endfittings: 2 1/2"/6.4cm

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Gas Delivery
Gas Purifiers

High Capacity Gas Purifier

No other purifier removesboth oxygen and water in such large quantities. To reliably protect your GC columns and detectors from oxygen and water vapor damage, you should use a gas purifier specifically designed to ensure maximum gas purity. The Supelco High Capacity Gas Purifier tube is heated inside an oven, and oxygen and water react with the gettering material in the tube. Unlike purifiers which remove contaminants by adsorption, chemical reaction with the gettering material prevents these contaminants from returning to the gas stream — even when the temperature changes or as the material approac saturation. The High Capacity Gas Purifier also removes carbon monoxide and carbon dioxide.

A single, replaceable High Capacity Gas Purifier tube can remov 14 liters of oxygen or 35 liters of water vapor (STP). It removes oxygen and water from at least 60 tanks of heavily contaminated gas — gas containing 100ppm of oxygen and/or water. It efficiently removes oxygen and water at gas flow rates up to 1100mL/minute,and you can use it with any common carrier gas except hydrogen.

The stainless steel converter tube is 10" x 1/2" OD. The split-sided heater is 10" long. An integral mounting bracket allows you to bolt the unit to a bench top or wall. The 90 watt power consumption makes the unit as economical to operate as a light bulb. Mount horizontally only.

2-year guarantee; elements guaranteed for 90 days.



SPECIFICATIONS	
Oven with 1/4" or 1/8" Tube	
Height:	5 1/4"/13.3cm
Width (with shields):	14 1/2"/36.8cm
Depth:	6"/15.2cm
Tube (1/8" or 1/4")	
Diameter:	1/2"/12.7mm
Length:	10"/25.4cm
Max. Inlet Pressure:	150psi
Max. Flow Rate:	1100mL/min.
Operating Temp.:	580°C

DESCRIPTION	CAT. NO.	PRICE
HIGH CAPACITY GAS PURIFIER		
110VAC, 1/8" Fittings[1]	23800-U	
110VAC, 1/4" Fittings[1]	23802	
220VAC, 1/8" Fittings[1]	23801	
220VAC, 1/4" Fittings[1]	23803	
REPLACEMENT PURIFIER TUBES		
1/8" Fittings	22396	
1/4" Fittings	22398	
REPLACEMENT ELEMENTS[2]		
Element for 110VAC Unit (2 required)	24975	
Top element for 220VAC Unit	24976	
Bottom element for 220VAC Unit	24977	

[1] CE approved.
[2] Modifications may be required on older purifiers.

Complete Pressure Gauge Kit

Use with our high capacity gas purifier, to indicate when the purifier tube should be replaced. Change purifier tube when pressure drop exceeds 10psi. 2"/5cm gauge (0-100psi), NPT to Swagelok adapter, 18"/1/2m of 1/8" copper line, 1/8" tee, installation instructions.

DESCRIPTION	CAT. NO.	PRICE
Pressure Gauge Kit	20392	



Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



Supelcarb HC Hydrocarbon Traps

Remove organics from carrier gases, air, and hydrogen. We manufacture these traps in our own facilities, to ensure the cleanest material available and the best trapping ability per gram – Supelcarb HC adsorbent has twice the trapping ability of activated charcoal.

DESCRIPTION	CAT. NO.	PRICE
120cc, 1/8" Fittings	24448	
120cc, 1/4" Fittings	24449	
750cc, 1/4" Fittings	24564	
750cc, 1/2" Fittings	24565	
S-Trap, 1/8" Fittings	503134	
Supelcarb Refill, 300cc	24566	
Mounting Clip for 120cc Traps	23993	
Mounting Clip for 750cc Traps	24983	

Supelpure-HC Hydrocarbon Traps

Activated charcoal adsorbs hydrocarbons and other contaminants from carrier gases, air, and hydrogen. Operates efficiently for approximately six months when total hydrocarbons in the incoming gas average 10ppm.

DESCRIPTION	CAT. NO.	PRICE
120cc, 1/8" Fittings	22445-U	
120cc, 1/4" Fittings	22446	
750cc, 1/4" Fittings	24518	
750cc, 1/2" Fittings	24519	
S-Trap, 1/8" Fittings	503142	
Charcoal Refill for 400cc	22451	
Mounting Clip for 120cc Traps	23993	
Mounting Clip for 750cc Traps	24983	



Molecular Sieve 5A Water Vapor Traps

Remove water vapor and pump oils. Molecular Sieve 5A efficiently removes water and heavy hydrocarbons from compressed air, electrolytically produced hydrogen, house nitrogen, or other gases with high moisture or hydrocarbon content. 200cc traps are 26 1/4" x 1" (67 x 2.5cm), 750cc traps are 18 x 2 3/8" (45.7 x 6cm), S-trap is 1/2"/13mm OD x 5 9/16"/14.1cm wide x 7 1/2"/19cm long (total bed length: 19 3/4"/50.2cm) – the extended bed length ensures prolonged contact between the gas and the adsorbent and provides greater working capacity. Use the smaller traps with up to 5 GCs, the larger traps with 6-20 instruments.

DESCRIPTION	CAT. NO.	PRICE
200cc, 1/8" Fittings	20619	
200cc, 1/4" Fittings	20618	
750cc, 1/4" Fittings	23991	
750cc, 1/2" Fittings	23992	
S-Trap, 1/8" Fittings	503118	
Molecular Sieve 5A Refill, 1/2lb./0.22kg	20298	
Mounting Clip for 200cc Traps	503231	
Mounting Clip for 750cc Traps	24983	



Economy Water Vapor Traps

For air and actuator gases. These clear polycarbonate polymer tubes contain a mixture of Molecular Sieve 13X and Molecular Sieve 4A with indicating capability. Because some oxygen and water vapor will permeate through the polymer shell, these traps should not be used with carrier gases, but they are an excellent value for cleaning air and actuator gases to suitable purity. Dimensions: 2"/51mm OD x 17 1/2"/44.4cm long.

DESCRIPTION	CAT. NO.	PRICE
400cc, 1/8" Fittings	23987	
400cc, 1/4" Fittings	23988	
Molecular Sieve 13X/4A Refill, ~475cc	23989	
Mounting Clip for 400cc Traps	23990	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Gas Delivery
Gas Purifiers



Supelpure-O Oxygen/Water Trap

The Supelpure-O trap reduces oxygen to less than 0.5ppm when the level in the incoming gas does not exceed 10ppm. It can extract contaminating oxygen at 10ppm from at least three 300ft (8.5m^3) cylinders. Because the oxygen-removing catalyst is coated on a molecular sieve, the trap also can remove significant amounts of water vapor (up to 1.5g for the 120cc trap; 10.2g for the 750cc trap).

DESCRIPTION	CAT. NO.	PRICE
SUPELPURE-O OXYGEN/WATER TRAP		
120cc, 1/8" Fittings	22449	
120cc, 1/4" Fittings	22450-U	
750cc, 1/4" Fittings	503088	
750cc, 1/2" Fittings	503096	
S-Trap, 1/8" Fittings	503126	
MOUNTING CLIP FOR SUPELPURE TRAPS		
for all 100cc Traps (each)	502936	
for all 120cc Traps (each)	23993	
for all 200cc Traps (each)	503231	
for all 250cc Traps (each)	23990	
for all 750cc Traps (each)	24983	

HELPFUL HINTS

Dimensions of Supelcarb and Supelpure Traps

120cc Traps: 1 3/8" OD (35mm) x 11 1/8" long (28.2cm)
750cc Traps: 2 5/16" OD (59mm) x 16 1/2" long (41.9cm)
S-Traps: 1/2" OD (13mm) x 5 9/16" wide (14.1cm) x 7 1/2" long (19cm) (total bed length: 19 3/4"/50.2cm)



Aeronex GateKeeper Purifiers

- Remove water, oxygen, CO_2, CO, and H_2 in bulk inert gases to less than 1ppb, at ambient temperature
- Stainless steel face seal fittings, for maximum sealing capability

High capacity + highly effective contaminant reduction = low cost per liter of purified gas. Using a proven, patented technology GateKeeper purifiers reduce contaminants in inert specialty gases to sub parts per billion levels (<1ppb), creating 99.9999999% pure gas from standard ultra high purity gas. In addition to being more effective than typical molecular sieve-type purifiers they last up to five times longer, providing a better return on your investment. The patented metallic purifying medium does not release trapped contaminants, and the units can be returned for recharging. The state of the art in inert gas purification.

SPECIFICATIONS

Construction:	Model 35K: 304 SST Model 400K: 304 SST Model: 500K: 316L SST (internal electropolish)
Max. Inlet Pressure:	200psig (1380 kPa)
Maximum Flow:	Model 35K: 1 liter/min Model 400K: 3 liters/min Model 500K: 60 liters/min
Operating Temp.:	-40°C to 65°C
Dimensions:	Model 35K: 3.31" x 1.5" OD (8.4 x 3.8cm) Model 400K: 20.86" x 1.5" OD (52.4 x 3.8cm) Model 500K: 7.94" x 3.0" OD (20.2 x 7.6cm)
Pure Gas Delivered: (Estimated)	Model 35K: 40,000 liters Model 400K: 400,000 liters Model 500K: 650,000 liters

DESCRIPTION	CAT. NO.	PRICE
Model 35K, 1/4" Face Seal Fittings	24970	
Model 500K, 1/4" Face Seal Fittings	24971	
Model 400K with Compression Fittings 1/4" Fittings	502987	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



Supelco Helium Purifier

- Removes O_2, water vapor, hydrocarbons, CO_2, CO from helium
- Output gas is 99.99999% pure
- Cost per cubic foot of purified gas is 50% that for other broad-spectrum purifiers

This purifier incorporates multiple beds of highly effective, high capacity adsorbent materials to remove oxygen, water vapor, hydrocarbons, carbon dioxide, and carbon monoxide from helium gas streams. The volumes of the various adsorbents in the Supelco helium purifier were determined through rigorous evaluations, to ensure that breakthrough of the five major contaminant types is as close to simultaneous as possible. Because you no longer have to replace a broad-spectrum purifier that has exhausted its capacity for one contaminant, but still has much of its capacity for other contaminants, you can reduce instrument down time and save money. Relative to separate traps for oxygen, water vapor, and hydrocarbons, combining these functions into one unit also reduces the potential for leaks at connections.

One purifier will easily purify the contents of 13 ~200ft cylinders of 99.997% purity helium to a cumulative level of 100ppb of O_2, H_2O, CO_2, CO, and hydrocarbons, at flow rates up to 8 liters/minute – and comparative investigations indicate that a purifier will deliver this gas purity for virtually 50% of the cost per cubic foot of gas, compared to any competitor's broad-spectrum purifier.

Supelco helium purifiers are ideal for any GC or GC/MS application in which high purity helium is essential.

SPECIFICATIONS

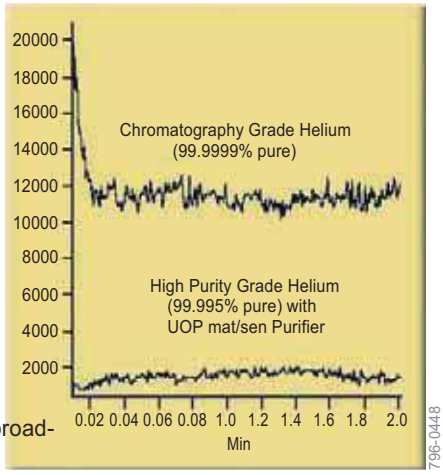
Contaminant Capacity[1]:	oxygen: 1.07L water vapor: 46g hydrocarbons[2]: 20g
Contaminant Removal Efficiency:	total: <100ppb oxygen: <2ppb water vapor: <20ppb hydrocarbons[2]: <30ppb CO_2: <20ppb CO: <20ppb
Output Gas Purity[3]:	99.99999%
Capacity:	>4000ft[3]
Maximum Flow Rate:	8L/min
Maximum Pressure:	500psig
Maximum Temperature:	100°C

[1] At standard temperature and pressure.

[2] As methane.

[3] 99.999% helium purified to 99.99999% helium, based on removal of 5 major contaminants.

DESCRIPTION	CAT. NO.	PRICE
1/8" Swagelok Stainless Steel Fittings	27600-U	
1/4" Swagelok Stainless Steel Fittings	27601-U	
Mounting Clip	24983	



UOP mat/sen Purifier

- Produces better than 99.9999% gas when supplied with 99.995% pure gas
- Original equipment in Finnigan, Hewlett-Packard, and Varian mass spectrometers
- Also used in Leco, Perkin-Elmer, and Shimadzu equipment

Assures mass spectrometer-suitable baselines from high purity (99.995%) gas. One of the most important factors in ensuring very sensitive detection in GC/MS analyses is the signal to noise ratio. Mass spectrometer manufacturers recommend that the signal be at least three times as large as the background noise to assure statistical significance. These UOP mat/sen purifier modules dramatically reduce levels of most contaminants, including oxygen, water, and hydrocarbons, from many parts per million to levels below detection. They adsorb a wider variety of contaminants than many commonly used adsorptive materials.

UOP mat/sen guarantees these purifiers produce gases that are at least a factor of ten higher in purity than 99.9999% "chromatography grade" gas when the purifier is supplied with 99.995% "high purity" gas. The cost difference between the two grades of gas will pay for the cost of the purifier several times over during the operating life of the purifier.

SPECIFICATIONS

Length:	21"/53.3cm
Diameter:	1.5"/3.8cm
Maximum Inlet Pressure:	250psig/1724 kPa
Maximum Flow:	500mL/min
Pressure Drop[1]:	<0.30 psig/2.1 kPa

[1] 120psig (827 kPa) inlet, 0 to 500mL/min

DESCRIPTION	CAT. NO.	PRICE
1/8" Compression Fittings	22680-U	
1/4" Compression Fittings	22681	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Gas Delivery
Gas Purifiers



P000333

Carbon Dioxide Traps

Designed to remove CO_2 from gases used in applications such as carbon-hydrogen determinations, analyses of respiratory gases, and especially in quantitative organic micro-analyses. The sodium hydroxide nonfibrous silicate trapping medium is universally accepted for its high absorptive capacity and indicating properties. Typically, this material will absorb 20-30% of its weight in carbon dioxide before replacement of the saturated material is required. As CO_2 is absorbed, the greenish-brown material turns white because of the formation of sodium carbonate. A water vapor trap should be installed downstream from this unit to absorb water evolved in the absorption of carbonic gases.

The trap body is constructed of borosilicate glass. The trap is available in two sizes, and with 1/8" and 1/4" fittings. Fittings are nickel plated and have sintered stainless steel frits. Exercise extreme caution when refilling the trap, due to the caustic nature of the absorbent.

DIMENSIONS	
100cc traps:	1 3/4"/44mm OD x 12 3/4/32.4cm long
250cc traps:	2"/51mm OD x 17 1/2"/44.4cm long

DESCRIPTION	CAT. NO.	PRICE
100cc, 1/8" Fittings	503185	
100cc, 1/4" Fittings	503193	
250cc, 1/8" Fittings	503207	
250cc, 1/4" Fittings	503215	
Absorbent Refill, 500cc	503223	
Mounting Clip for 100cc Traps	502936	
Mounting Clip for 250cc Traps	23990	

Purifiers For Less Demanding Applications

Gas purifiers listed below are economical, but cannot ensure output of chromatographic grade gas when impurity levels in the input gas exceed 10-15ppm.



P000334

Oxisorb Oxygen Scrubber reduces oxygen and water to less than 1ppm when incoming O_2 does not exceed 15ppm and H_2O does not exceed 10ppm. Use a new cartridge for each new cylinder of gas.

Dimensions: 2"/51mm OD (maximum) x 9 1/4" x 23.5cm long; replacement cartridge

DIMENSIONS	
Scrubber:	2"/51mm OD (maximum) x 9 1/4"/23.5cm long
Replacement Cartridge:	1 1/8"/29mm OD x 4 7/8"/12.4cm long

DESCRIPTION	CAT. NO.	PRICE
Oxisorb Oxygen Scrubber, 1/4" Fittings	20639-U	
Replacement Cartridge	20631	



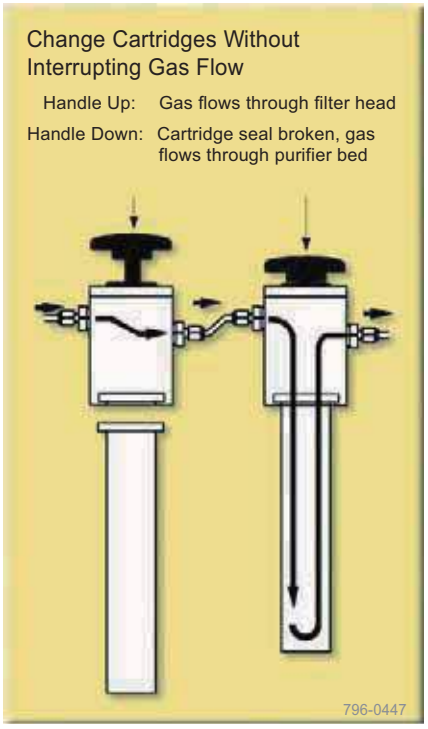
P000232

Oxiclear Disposable Gas Purifier removes oxygen, trace water, and organic contaminants from three 300ft³ (8.5m³) cylinders of inert carrier gas. Output is less than 1ppm when incoming O_2 does not exceed 10ppm.

DIMENSIONS	
Purifier:	1 7/8"/48mm OD x 7 1/2"/19.0cm long

DESCRIPTION	CAT. NO.	PRICE
with 1/8" fittings	22992	
with 1/4" fittings	22993	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco





QC+ Point-of-Operation Panels

- Replace up to four cartridges in one minute or less, purge time

QC+ panels make cartridge replacement fast and easy. Rotate the valve handle(s) on the filter head(s) counterclockwise, to allow gas to pass through the head. Replace the cartridge, then rotate the valve handle clockwise, to puncture the seal on the new cartridge and restore gas flow through the purifier bed.

Replacement cartridges are designed to remove hydrocarbons, moisture and oxygen. The 3-Head QC+ Panel (P/N 23999) includes P/Ns 23997, 23996 and 23995. The 4-Head QC+ Panel (P/N 23998) includes P/Ns 23997, 23996, 23995 and 24987.

The SupelCarb cartridge (P/N 24567) has twice the capacity for hydrocarbons, relative to the activated charcoal in the standard hydrocarbon-removing cartridge.

The indicating water-removing cartridge (P/N 23996) contains a mixture of Molecular sieve 5A and Drierite. The color changes from blue to pink as the material becomes spent.

The indicating oxygen-removing cartridge (P/N 24987) contains a Manganese oxide. The color changes from green to brown as the material becomes spent.

DESCRIPTION	CAT. NO.	PRICE
3-Head QC+ Panel, 1/8" Fittings	23999	
4-Head QC+ Panel, 1/8" Fittings	23998	
Replacement Cartridges		
Hydrocarbon-Removing Cartridge (GC-3)	23997	
SupelCarb Cartridge	24567	
Water-Removing Cartridge (GC-2)	23996	
Indicating Water-Removing Cartridge (GC2-I)	503061	
Oxygen-Removing Cartridge (GC-1)	23995	
Indicating Oxygen-Removing Cartridge (GC-4)	24987	

SPECIFICATIONS

3-Head QC+ Panel: 9 x 11 1/2 x 5" (23 x 29 x 13cm) (H x W x D)
4-Head QC+ Panel: 11 x 15 1/4 x 5" (28 x 39 x 13cm)
Max. Pressure: 125psig
Cartridge: 1 1/4"/32cm OD x 6 1/4"/15.9cm long*

* Cat. Nos. 503061 and 24567 are 6 3/4"/17.1cm long.

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

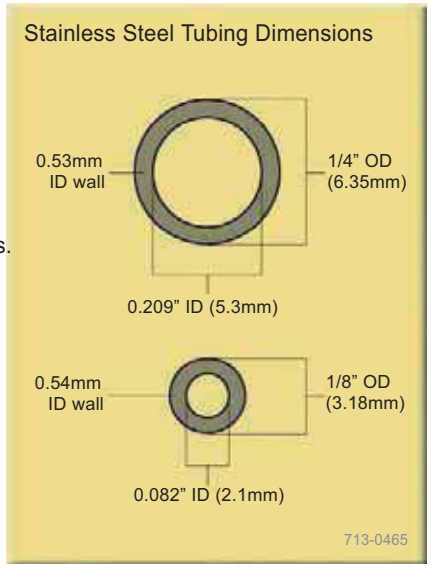
Gas Delivery
Tubing and Accessories

We offer more tubing choices. Our recommendations:

Premium Grade Stainless Steel—Grade 304 tubing, specially cleaned to ensure inertness. We make all our stainless steel columns from this tubing.

Fused Silica-Lined Stainless Steel—The strength of stainless steel with the inertness of deactivated fused silica.

Cleaned Copper—Solvent-washed to Supelco standards (ASTM B-280 plus Supelco cleaning), to remove residual hydrocarbons. Recommended for most GC plumbing applications.



DESCRIPTION (OD X ID; LENGTH)	CAT. NO.	PRICE
PREMIUM GRADE STAINLESS STEEL (304)		
1/8 x 0.085" (3.18 x 2.1mm); 50' Coil	20526-U	
1/4 x 0.209" (6.35 x 5.3mm); 50' Coil	20527	
1/16 x 0.010" (1.59 x 0.254mm); 100' Coil	20552	
1/16 x 0.030" (1.59 x 0.762mm); 100' Coil	20553	
Shorter Lengths, per foot		
FUSED SILICA-LINED STAINLESS STEEL		
1/16 x 0.01" (1.59 x 0.254mm); 25'	24951	
1/16 x 0.01" (1.59 x 0.254mm); 50'	24952	
1/16 x 0.01" (1.59 x 0.254mm); 100'	24953	
1/16 x 0.02" (1.59 x 0.508mm); 6'	24954	
1/16 x 0.02" (1.59 x 0.508mm); 25'	24955	
1/16 x 0.02" (1.59 x 0.508mm); 50'	24956	
1/16 x 0.02" (1.59 x 0.508mm); 100'	24957	
1/16 x 0.03" (1.59 x 0.762mm); 6'	24958	
1/16 x 0.03" (1.59 x 0.762mm); 25'	24959	
1/16 x 0.03" (1.59 x 0.762mm); 50'	24960	
1/16 x 0.03" (1.59 x 0.762mm); 100'	24961	
1/16 x 0.04" (1.59 x 1.016mm); 6'	24962	
1/16 x 0.04" (1.59 x 1.016mm); 25'	24963	
1/16 x 0.04" (1.59 x 1.016mm); 50'	24964	
1/8 x 0.085" (3.18 x 2.1mm); 6'	24965	
1/8 x 0.085" (3.18 x 2.1mm); 25'	24966	
1/8 x 0.085" (3.18 x 2.1mm); 50'	24967	
CLEANED COPPER (GC PLUMBING QUALITY; ASTM[1] B-280 PLUS SUPELCO CLEANING)		
1/8 x 0.065" (3.18 x 1.65mm); 50' Coil	20488	
1/4 x 0.190" (6.35 x 4.83mm); 50' Coil	20489	
Shorter Lengths, per foot		
GENERAL PURPOSE COPPER (ASTM B-280)		
1/8 x 0.065" (3.18 x 1.65mm); 50' Coil	20520-U	
1/4 x 0.190" (6.35 x 4.83mm); 50' Coil	20522	
Shorter Lengths, per foot		
SP-ALLOY (NICKEL ALLOY; FOR MAXIMUM INERTNESS)		
1/8 x 0.085" (3.18 x 2.1mm); 50' Coil	22709-U	
Shorter Lengths, per foot		
TEFLON (TFE) (MAX. TEMP.: 240°C)		
0.085 x 0.062" (2.1 x 1.58mm); 25' Coil	20531	
1/4 x 0.228" (6.35 x 5.8mm); 25' Coil	20533	
Shorter Lengths, per foot		
TEFLON (FEP) (MAX. TEMP.: 200°C)		
1/8 x 0.085" (3.18 x 2.1mm); 50' Coil	20532	
Shorter Lengths, per foot		

[1] American Society for Testing and Materials.



Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



SSI TC-20 Tubing Cutter P??????

A zero dead volume connection is important for maximum chromatographic performance. Unswept volume, caused by a poor fit between tubing and the mating seat, can cause sample dispersion and unsatisfactory chromatographic results.

The SSI Model TC-20 tube cutter assures a zero dead volume connection. Because the tubing is held securely in a clamp vise on the vertical swing arm, a square cut is produced when the swing arm is lowered against the abrasive cutting wheel, which produces a finished end. No lubricant or cutting fluid is required. The unit, which is CE marked, will cut most common tubing used in chromatography. 1/16", 1/8", and ¼" outside diameter tubing with inside diameters as small as 0.008" can be smooth-cut and dressed without distortion.

The precision ground dressing tool for the 1/16" OD tubing is included and is attached directly to the swing arm: it cannot be misplaced or lost. Dressing tools for all three diameters can be ordered separately.

DESCRIPTION	CAT. NO.	PRICE
SSI ELECTRIC STAINLESS STEEL TUBING CUTTER		
Voltage Selectable: 110/220 Volts 50-60 Hz, CE Approved	58539-U	
REPLACEMENT PARTS		
Cutting Wheels, TC-20 (pk. of 3)	58540-U	
DressingTool for 1/16" Tubing	58804	
Needle Insert for 1/16" Deburring Tool	58805	
ADDITIONAL PARTS		
Dressing Tool for 1/8" Tubing	58806	
Needle Insert for 1/8" Dressing Tool	58807	
Cutting Wheels, TC-10 (pk. of 3)[1]	58803	

[1] Replacement cutting wheels for SSI Model TC-10 tubing cutter. Will not fit Model TC-20.



58692-U

Tubing Cutter for 1/16" Stainless Steel Tubing

Low-cost tool cuts 1/16" stainless steel tubing without obstructing the bore. Easily cut 1/16" OD stainless steel tubing, then use the dressing tool to remove burrs from the cut end, to ensure a uniform flow of gas or liquid. Dressing tool kit includes dressing fixture, dressing tool, and file. Order tubing cutter and dressing tool kit separately.

DESCRIPTION	CAT. NO.	PRICE
Tubing Cutter for 1/16" SS Tubing	58692-U	
Cutting Wheels (pk. of 2)	22411	
Dressing Tool Kit	58691-U	

22410-U



20425-U

Tubing Cutters

The heavy duty tubing cutter is perfect for cutting 1/8" to 1 1/8" OD metal tubing. A spare cutting wheel is included.

The pocket-sized Imp tubing cutter is ideal for working in tight spaces.

DESCRIPTION	CAT. NO.	PRICE
Heavy Duty Tubing Cutter	20425-U	
Cutting Wheels (pk. of 3)	20626	
Imp Tubing Cutter	22410-U	
Cutting Wheels (pk. of 2)	22411	



20857

Tubing Benders

The heavy duty benders easily bend aluminum, copper, or stainless steel tubing up to 180°, without kinking or splitting the tubing.

The three-in-one tool bends 1/8", 3/16", or 1/4" (3, 4, or 6mm) tubing of standard wall thickness.

DESCRIPTION	CAT. NO.	PRICE
Heavy Duty Bender for 1/8" OD Tubing	20422-U	
Heavy Duty Bender for 1/4" OD Tubing	20424-U	
Three-Size Tubing Bender	20857	



20389

Tubing Reamer

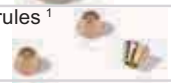
Does a fine job of opening and rounding the tubing end after cutting.

DESCRIPTION	CAT. NO.	PRICE
Tubing Reamer	20389	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Gas Delivery
Tubing Fittings

Swagelok fittings lead the tube connection field because they combine superior design principles with close manufacturing tolerances and rigid quality assurance programs. Since 1947, they have stood the test of time with unparalleled performance on the job. They have been used successfully on some of the most demanding applications in aerospace, chemical processing, oil refining, and nuclear research, commercial fossil and nuclear power, laser technology, electronics, pulp and paper and many other industries.

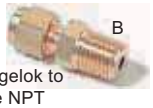
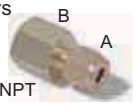
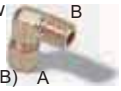
FITTING	SWAGELOK NO.	SIZE (IN.)	BRASS QTY.	BRASS CAT. NO.	BRASS PRICE	STAINLESS STEEL QTY.	STAINLESS STEEL CAT. NO.	STAINLESS STEEL PRICE
Nuts 	102-1	1/16	10	22021		2	22047	
	202-1	1/8	20	22011-U		5	22037	
	402-1	1/4	20	22000-U		5	22026	
Front Ferrules [1] 	103-1	1/16	10	22022-U		2	22048-U	
	203-1	1/8	20	22012		5	22038	
	403-1	1/4	20	22001		5	22027	
Back Ferrules[1] 	104-1	1/16	10	22023		2	22049-U	
	204-1	1/8	20	22013		5	22039	
	404-1	1/4	20	22002		5	22028	
	814-1	1/2	—	—	—	5	25825	
Nut, Front & Back Ferrule Sets 	100-S	1/16	10	22024		1	22050	
	200-S	1/8	10	22014		5	22040-U	
	400-S	1/4	10	22003		5	22029	
Port Connectors 	201-PC	1/8	2	22688		2	22689	
	401-PC	1/4	2	22690-U		—	—	—
	401-PC-2	1/4 to 1/8 reducer	2	22094-U		2	22095-U	
Caps (nuts & ferrules included) 	200-C	1/8	6	22018-U		—	—	—
	400-C	1/4	6	22008		2	22034	
Plugs 	100-P	1/16	3	22136-U		1	22137-U	
	200-P	1/8	6	22019-U		1	22045-U	
	400-P	1/4	6	22009		2	22035-U	
	810P	1/2	3	25814		1	25826	
Reducers 	100-R-2	1/16A x 1/8B	2	22017-U		1	22043	
	100-R-4	1/16A x 1/4B	2	22701		1	22702	
	200-R-4	1/8A x 1/4B	2	22006		1	22032	
	400-R-2	1/4A x 1/8B	2	21516		1	21517	
	400-R-8	1/4A x 1/2B	2	25815		1	25827	
Unions [A] 	100-6	1/16	1	22025		1	22051-U	
	200-6	1/8	2	22015		1	22041	
	400-6	1/4	2	22004		1	22030-U	
	810-6	1/2	2	25816		1	25828	
Reducing Unions 	200-6-1	1/8 x 1/16	2	22016		1	22042-U	
	300-6-2	3/16 x 1/8	2	22072		—	—	—
	400-6-1	1/4 x 1/16	2	22074		1	22075-U	
	400-6-2	1/4 x 1/8	2	22005		1	22031	
	400-6-3	1/4 x 3/16	—	—	—	1	22077-U	
	810-6-2	1/2 x 1/8	2	22714		—	—	—
	810-6-4	1/2 x 1/4	2	22716		—	—	—
Bored-Through Unions 	200-6BT	1/8 x 1/8	—	—	—	1	22088	
	400-6BT	1/4 x 1/4	1	21664		1	21518	
Bulkhead Unions for panel mounting 	100-61	1/16	1	21980-U		1	22665-U	
	200-61	1/8	1	21981-U		1	22666	
	400-61	1/4	1	21982-U		1	22667-U	
Zero-Dead Volume Unions 	I FO-6-GC	1/16	1	22053-U		1	22052	

[1] Teflon fittings for front and back ferrules are available. See chart on next page.

P000282, 283, 280, 297, 276, 281, 277, 279, 278, 294, 289, 295

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Gas Delivery
Tubing Fittings

FITTING	SWAGELOK NO.	SIZE (IN.)	BRASS QTY.	BRASS CAT. NO.	BRASS PRICE	STAINLESS STEEL QTY.	STAINLESS STEEL CAT. NO.	STAINLESS STEEL PRICE
Tees 	100-3	1/16	1	22132-U		1	22133-U	
	200-3	1/8	1	22020-U		1	22046	
	400-3	1/4	1	22010-U		1	22036	
	810-3	1/2	1	25817		1	25829	
Female Branch Tee 	200-3TTF	1/8NPT top 1/8 sides	1	22143-U		—	—	—
Union Crosses 	200-4	1/8	1	22684		—	—	—
	400-4	1/4	1	22686		—	—	—
Pipe Adapters  tube OD to male NPT	4-TA-1-2	1/4A x 1/8B	2	22100-U		—	—	—
Connectors  Swagelok to male NPT	200-1-2	1/8A x 1/8B	2	22082		1	22084-U	
	400-1-2	1/4A x 1/8B	2	22083		1	22085-U	
	200-1-4	1/8A x 1/4B	2	22066		1	22067	
	400-1-4	1/4A x 1/4B	2	21519		1	22700-U	
	810-1-4	1/2A x 1/4B	2	25818		1	25830	
Connectors  Swagelok to female NPT	200-7-2	1/8A x 1/8B	2	22703		—	—	—
	400-7-2	1/4A x 1/8B	2	22705-U		1	22706	
	200-7-4	1/8A x 1/4B	2	21978-U		1	21979-U	
	400-7-4	1/4A x 1/4B	2	22707		1	22708	
	810-7-4	1/2A x 1/4B	2	25819		1	25831	
90° Male Elbow  tube (A) to male NPT (B)	200-2-2	1/8A x 1/8B	2	21970-U		1	21974	
	200-2-4	1/8A x 1/4B	2	21971		—	—	—
	400-2-2	1/4A x 1/8B	2	21972		1	21976-U	
	400-2-4	1/4A x 1/4B	2	21973		1	21977-U	
Miniature Quick Connects Stem Assembly 	QM2-S-200	1/8	1	22710-U		1	22711-U	
Miniature Quick Connects **Body Assembly** 	QM2-B-200	1/8	1	22712-U		1	22713	

P000292, 290, 291, 296, 293, 288, 285, 286, 287

Teflon Fittings

	SWAGELOK NO.	SIZE (IN.)	QTY.	CAT. NO.	PRICE
Front Ferrules	103-1	1/16	5	22068	
	203-1	1/8	10	22058	
	403-1	1/4	10	22054	
Back Ferrules	104-1	1/16	5	22069	
	204-1	1/8	10	22059	
	404-1	1/4	10	22055-U	

HELPFUL HINTS

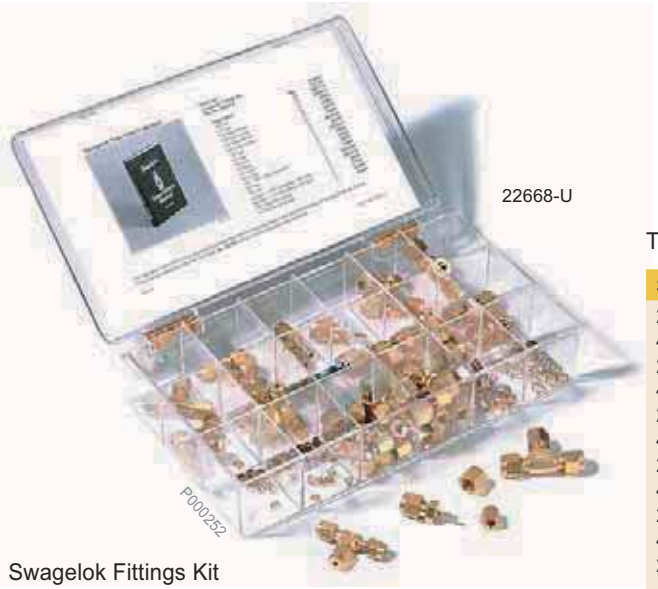
When ordering, please specify the number of packages, not the number per package. For example: 1 package of 22021, not 10 or you might get 10 packages!

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Gas Delivery
Tubing Fittings

High Quality Whitey/Nupro Valves

VALVE		SIZE (IN.)	BRASS CAT NO.	BRASS PRICE	STAINLESS STEEL CAT. NO.	STAINLESS STEEL PRICE
Toggle Valve (quick acting)	 P000274	1/8 straight	22699		22698	
		1/8 angle	22123-U		22124-U	
		1/4 straight	22697		—	—
		1/4 angle	22125-U		22126-U	
On/Off Throttling Valve	 P000273	1/8	22138-U		22139-U	
		1/4	22140-U		22141-U	
		1/2	—	—	25832	
Fine Metering Valve for accurate regulation	 P000275	1/8 straight	22116		22117	
		1/8 angle	22114		22115	
Vernier Handle for fine metering valve (Order valve separately)	 P000272		22122			



Swagelok Fittings Kit

- Save more than 30%, compared to prices for individual items

A useful assortment of 1/8" and 1/4" brass fittings, packaged in a compartmented clear plastic storage box. Have the parts you need on hand when you need them, and save money as well.

DESCRIPTION	CAT. NO.	PRICE
Swagelok Fittings Kit	22668-U	

The Swagelok Fittings Kit includes:

SWAGELOK NO.	DESCRIPTION	QTY.
202-1	1/8" nut	20
402-1	1/4" nut	20
203-1	1/8" front ferrule	20
403-1	1/4" front ferrule	20
204-1	1/8" back ferrule	20
404-1	1/4" back ferrule	20
200-C	1/8" cap	6
400-C	1/4" cap	6
200-P	1/8" plug	6
400-P	1/4" plug	6
200-6	1/8" union	2
400-6	1/4" union	2
400-6-2	1/4" x 1/8" reducing union	2
200-3	1/8" tee	2
400-3	1/4" tee	2
200-R-4	Reducer 1/8" Swagelok x 1/4" tube	2
400-R-2	Reducer 1/4" Swagelok x 1/8" tube	2
MS-IG-200	1/8" inspection gauge	1
MS-IG-400	1/4" inspection gauge	1

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



Gas Line Filter

This 7 micron gas line filter removes dust and small particles that could otherwise foul the needle valve in your chromatograph.

DESCRIPTION	CAT. NO.	PRICE
For 1/8" Fittings	20620	
For 1/4" Fittings	20621	
For 1/2" Fittings	25833	
Replacement 7µm Filter		
Stainless Steel, 1/8"	25810-U	
Stainless Steel, 1/4"	25809	



"T"-Type Gas Line Filter

With 7µm sintered stainless steel frit.

DESCRIPTION	CAT. NO.	PRICE
1/8" Brass	25805	
1/4" Brass	25806	
1/8" Stainless Steel	25807	
1/4" Stainless Steel	25808	
Replacement 7µm Filter		
Stainless Steel	25809	



Gap Inspection Gauge

Ensures correct tightening of Swagelok fittingsPlace in the gap between the fitting nut and body. The gauge will not fit if the nut has been tightened sufficiently.

DESCRIPTION	CAT. NO.	PRICE
For 1/8" Fittings	21984-U	



Tee Wrench

Holds Swagelok fittings firmly and precisely.Made by Swagelok specifically for 1/4" Swagelok union tees and crosses, this wrench allows sure, easy gripping on the fitting body – even in cramped areas. Rugged alloy steel with no-slip vinyl sleeve.

DESCRIPTION	CAT. NO.	PRICE
Swagelok Tee Wrench, 1/4"	21983-U	



Universal Mounting Brackets

Hold your valve or restrictor firmly in place. Easy and convenient mounting.

DESCRIPTION	CAT. NO.	PRICE
Universal Mounting Brackets (pk. of 2)	22131-U	

Swagelok Manual

A leak-free system requires proper tubing, quality fittings, and skilled installation. TheSwagelok Tube Fitter's Manualprovides detailed instructions for tubing selection and proper installation of Swagelok fittings. It will help you avoid many installation problems and can easily save you its purchase price.

DESCRIPTION	CAT. NO.	PRICE
Swagelok Manual	22339	

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GC Valves

Manual Sampling / Switching Valves

Column switching procedures make your GC system more versatile. Multiple port sampling and switching valves enable you to perform analyses that call for switching columns, reversing the elution sequence of sample components, or selecting between two columns to a single detector.

These valves also eliminate pressure surges and improve sample-to-sample reproducibility of peak separations.

Valco precision sampling and switching valves are low in dead volume and easily adapt to any type of tubing. Zero volume fittings allow you to make connections directly to the valve, minimizing dead volume for on-column injections. 303 stainless steel, with Tefzel rotor.

Manual Sampling and Switching Valves

Zero volume nuts, mounting bracket, 3-inch handle included.

Corrosive resistant Hastelloy C valves are available as custom.

NO. VALVE PORTS	FITTINGS	CAT. NO.	PRICE
175°C MAXIMUM TEMPERATURE			
4	1/8"	22975	
6	1/16"	22976	
	1/8"	22977	
10	1/8"	22981	
300°C MAXIMUM TEMPERATURE			
4	1/16"	22941	
	1/8"	22914	
6	1/16"	22950	
	1/8"	22915	
8	1/8"	22916	

Sample Loops for Gas Sampling

303 stainless steel; zero volume nuts not included.

VALVE FITTING	LOOP VOLUME (cc)	CAT. NO.	PRICE
6-PORT			
1/16"	0.25	22628	
	0.5	22629	
1/8"	0.5	22633	
	1.0	22634	
	5.0	22635	
10-PORT			
1/8"	0.5	22649	
	5.0	22651	

Shaft and Seal Assembly

For 175°C (max. temp.) 6-port valves[1]

DESCRIPTION	CAT. NO.	PRICE
Shaft and Seal for 1/16" valves	22926	

[1] Shaft and seal assemblies for 4-, 8-, and 10-port,175°C valves are available on request. Assemblies for 300°C valves are not available from Supelco – contact Valco Instruments.

Special Stainless Steel Adapter Fittings

For easy connection of the valve to the detector and injector through low dead volume fittings. Nuts and ferrules are included where needed. 303 stainless steel.

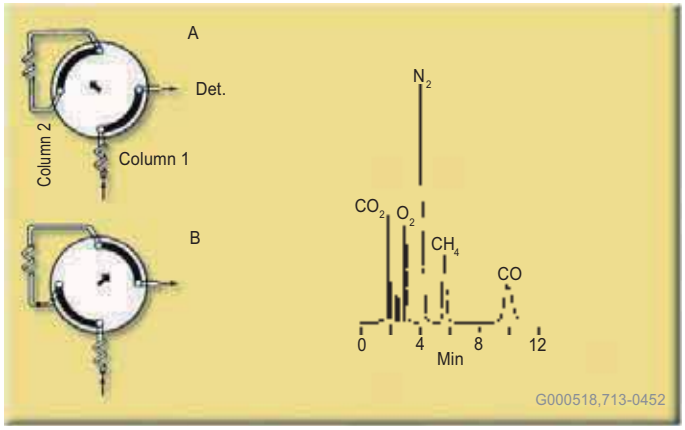
DESCRIPTION	CAT. NO.	PRICE
Zero Volume Union,1/16" to 1/16"	22997-U	
Reducing Union, 1/8" to 1/16"	22999	
Zero Dead Volume External Reducer 1/16" tubing to 1/8" injector or detector fitting	22948	
Zero Dead Volume Internal Reducer 1/16" tubing to 1/8" valve port	22949	

Recommended Spare Parts

Maintain a supply of spare nuts and ferrules. We also suggest having a spare shaft and seal assembly for each valve in use. An extension shaft for remote oven operation is included with each stand-off assembly.

DESCRIPTION	CAT. NO.	PRICE
Zero Volume Ferrules, 303 SS (pk. of 10)		
1/16"	22988	
1/8"	22989	
Zero Volume Nuts, 303 SS (pk. of 10)		
1/16"	22990-U	
1/8"	22991	
Stand-Off Assembly, 6"/15cm (for oven mounting a 4-, 6-, or 8-port valve)	22995-U	

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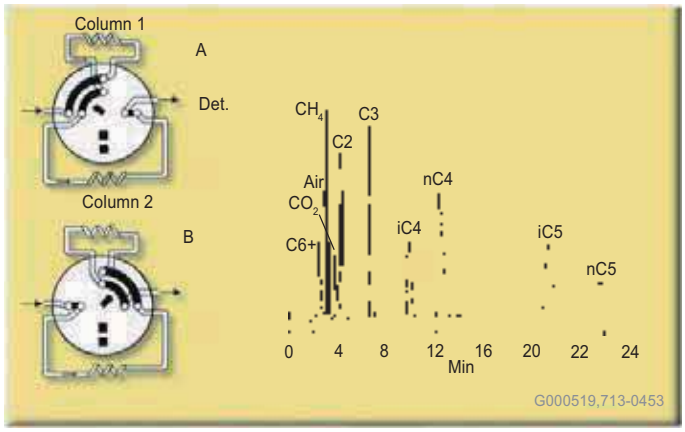


4-Port Valve Application

Isolate a column to prevent a compound, emerging from an upstream column, from being irreversibly adsorbed.

In the figure, CO_2 is separated from air in Column 1, and bypasses Column 2 when the valve is switched to position B. After the CO_2 is detected, the valve is switched back to position A and O_2, N_2, CH_4, and CO elute from Column 2 to the detector.

Column 1: 60/80 Chromosorb 102, 6' x 1/8" SS
Column 2: 60/80 Molecular Sieve 5A, 3' x 1/8" SS
Col. Temp.: 50°C, Sample: 1% mixture in H_2

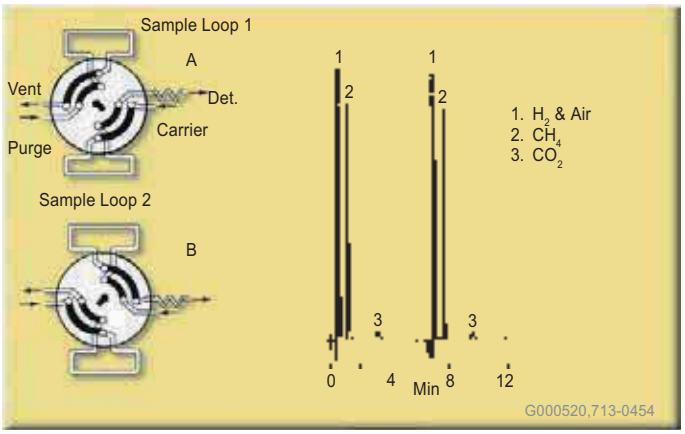


6-Port Valve Application

Foreflushing allows you to separate low molecular weight compounds. In the example shown, C1-C5 hydrocarbons are rapidly eluted from Column 1 onto Column 2 (position A).

When the valve is switched to position B, C6 and heavier compounds (which have moved slowly through Column 1) are eluted from Column 1 to the detector. C1-C5 hydrocarbons are eluted from Column 2 back onto Column 1, then to the detector.

30% DC-200 on 60/80 Chromosorb P AW,
2.5' x 1/8" SS (Column 1), 30' x 1/8" SS (Column 2)
Col. Temp.: 88°C

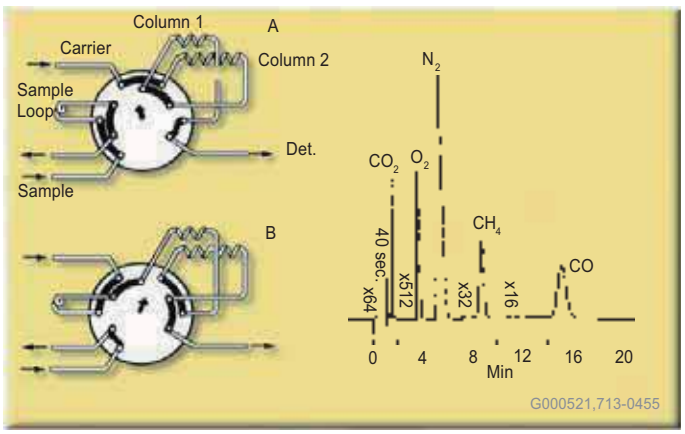


8-Port Valve Application

Select between two columns connected to a single detector requiring auxiliary gas for the second column.

The figure shows the 8-port sampling valve with two sample loops used for repetitive sample injections on one column.

Column: 60/80 Chromosorb 102, 5' x 1/8" SS
Col. Temp.: 40°C, Sample: 5% mixture in H_2



10-Port Valve Application

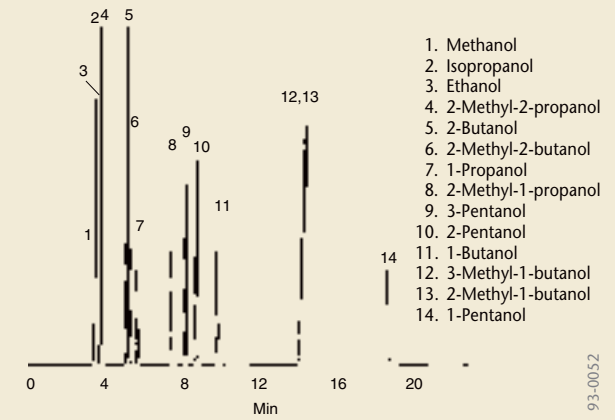
The figure illustrates the use of sequence reversal to monitor CO_2, CH_4, and CO in air.

The sample is injected onto Column 1 and held 40 seconds to allow the composite peak of air, CO, and CH_4 to pass onto Column 2. The valve is switched back to position A and the column sequence is reversed to allow CO_2 to pass to the detector, followed by O_2, N_2, CH_4, and CO.

Column 1: 60/80 Chromosorb 102, 5' x 1/8" SS
Column 2: 60/80 Molecular Sieve 5A, 5' x 1/8" SS
Col. Temp.: 70°C, Sample: 1% mixture in air

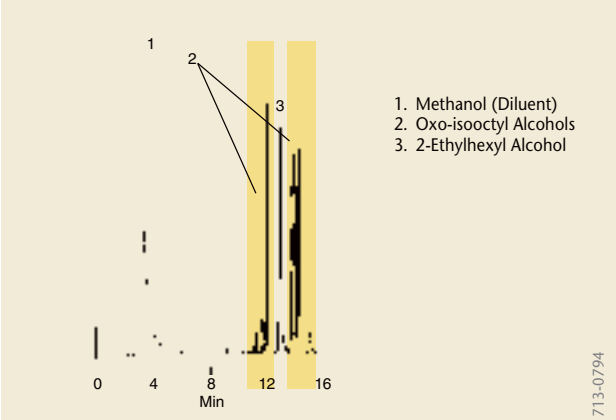
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GC Applications
Alcohols



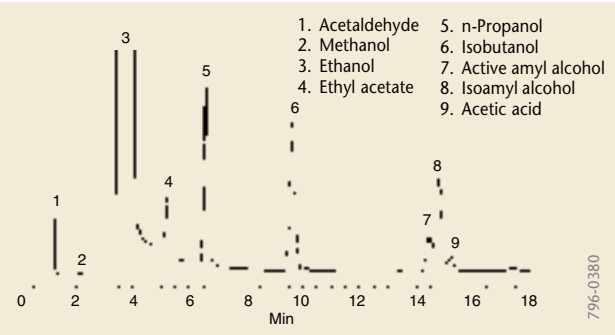
Alcohols (GC)

Column: **PAG, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **24223**
Oven: 60°C
Carrier: helium, 20cm/sec (set at 60°C), splitter vent flow 65-70cc/min
Det.: FID, 260°C
Inj.: 1µL alcohols in water (0.5-17mM each component), split 100:1, 250°C



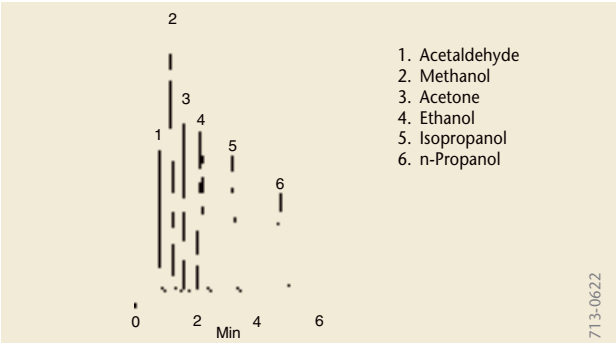
Alcohols (GC)

Column: **Nukol, 30m x 0.53mm ID, 0.5µm film**
Cat. No.: **25327**
Oven: 90°C to 160°C at 4°C/min, hold 5 min
Carrier: helium, 20cm/sec
Det.: FID, 200°C
Inj.: 0.2µL methanol, 2% isooctyl alcohols, 200°C



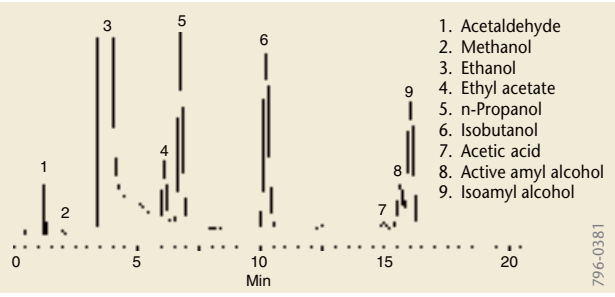
Alcohols (GC)

Packing: **80/120 Carbopack B AW /6.6% Carbowax PEG 20M**
Cat. No.: **11814** (15g/bottle)
Column: 2m x 2mm glass
Oven: 70°C to 150°C at 4°C
Carrier: nitrogen, 20mL/min
Det.: FID
Inj.: 1µL Scotch whiskey



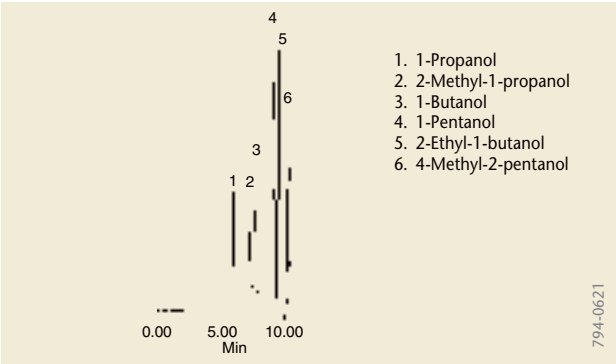
Alcohols, Blood (GC)

Packing: **60/80 Carbopack B/5% Carbowax 20M**
Cat. No.: **11766** (15g/bottle)
Column: 6m x 2mm ID glass stock columns available
Oven: 85°C
Carrier: helium, 20mL/min
Det.: FID
Inj.: 1µL water, 0.05-0.10% each analyte



Alcohols (GC)

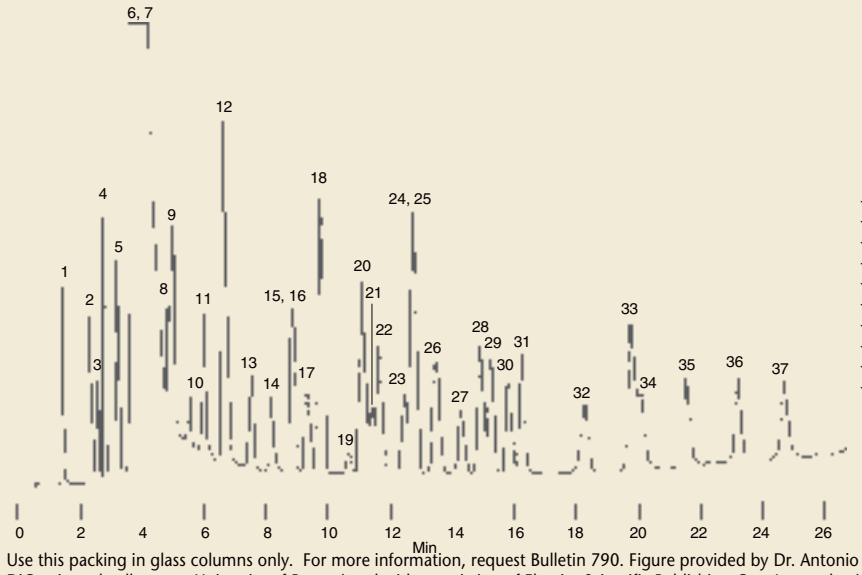
Packing: **80/120 Carbopack B / 5% Carbowax 20M**
Cat. No.: **11812-U** (15g/bottle)
Column: 2m x 2mm ID glass
Oven: 70°C to 150°C at 4°C
Carrier: nitrogen, 20mL/min
Det.: FID
Inj.: 1µL Scotch whiskey



Alcohols (GC)

Column: **Supel-Q PLOT, 30m x 0.53mm**
Cat. No.: **25462**
Oven: 35°C (3 min) to 250°C at 16°C/min
Carrier: helium, 3mL/min (set at 35°C)
Det.: FID, 250°C
Inj.: 0.1µL

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



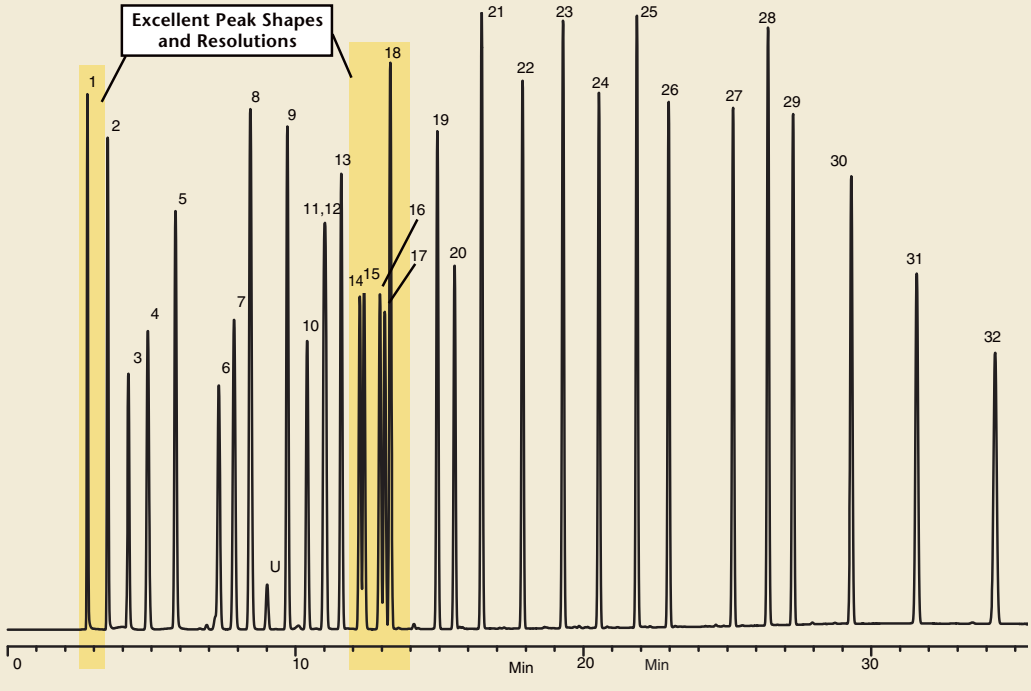
1. Acetaldehyde
2. Methanol
3. Propanal
4. Acetone
5. Methyl acetate
6. Ethanol
7. Isobutanal
8. Butanal
9. Isopropanol
10. Ethyl acetate
11. Diacetal
12. n-Propanol
13. Isopentanal
14. sec-Butanol
15. Pentanal
16. Ethyl propionate
17. Propyl acetate
18. Isobutanol
19. Acetal
20. Butanol
21. Ethyl isobutyrate
22. 3-Methylbutan-2-ol
23. 3-Pentanol
24. 2-Pentanol
25. Isobutyl acetate
26. Ethyl butyrate
27. Butyl acetate
28. 2-Methylpentan-1-ol
29. 1-Methylpentan-1-ol
30. Acetic acid
31. Pentanol
32. Isoamyl acetate
33. Furfural
34. Propionic acid
35. Hexanol
36. Isobutyric acid
37. Butyric acid

713-0711

Use this packing in glass columns only. For more information, request Bulletin 790. Figure provided by Dr. Antonio DiCorcia and colleagues, University of Rome (used with permission of Elsevier Scientific Publishing Co., Amsterdam).

Alcoholic Beverage/Fermentation Components (GC)

Packing: **80/120 Carbopack B AW/6.6% PEG 20M**
Cat. No.: **11814** (15g/bottle)
Column: 2m x 2mm ID glass
Oven: 80°C to 200°C at 4°C/min
Carrier: nitrogen
Det.: FID
Inj.: 1µL water:ethanol (50:50), 40-60ppm each analyte



1. Methanol
2. Ethanol
3. Isopropanol
4. t-Butanol
5. Propanol
6. 2-Butanol
7. Hexane
8. Isobutanol
U. Unkonwn
9. Butanol
10. 3-Methyl-2-butanol
11. 2-Pentanol
12. 3-Pentanol
13. Heptane
14. 3-Methyl-1-butanol
15. 2-Methyl-1-butanol
16. 3-Methyl-3-pentanol
17. 4-Methyl-2-pentanol
18. Pentanol
19. Octane
20. 4-Methyl-1-pentanol
21. Hexanol
22. Nonane
23. Heptanol
24. Decane
25. Octanol
26. Undecane
27. Dodecane
28. Decanol
29. Tridecane
30. Tetradecane
31. Pentadecane
32. Hexadecane

C001709

Hydrocarbons and Alcohols (GC)

Column: **Equity-1, 30m x 0.53mm ID, 3.0µm**
Cat. No.: **28076-U**
Oven: 40° C (5 min) to 225°C @ 8°C /min
Inj.: 250°C
Det.: FID, 275°C
Flow: Helium, 30 cm/sec @ 40°C
Injection: 0.10µL, split 100:1
Liner: Split, cup design
Sample: 32 component mixed solvent sample, equal by weight

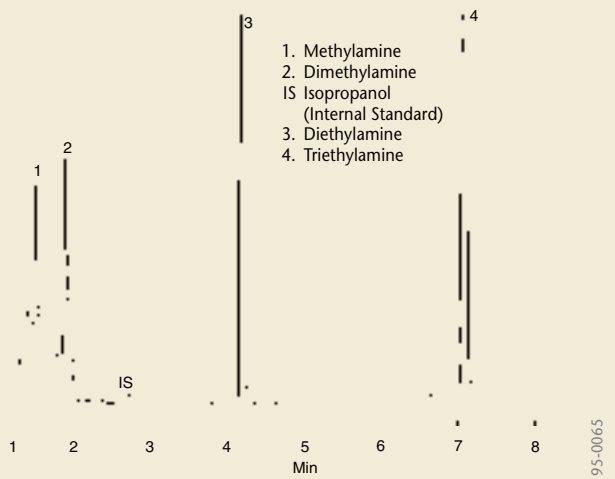
Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

GC Applications
Alcohols, Amines



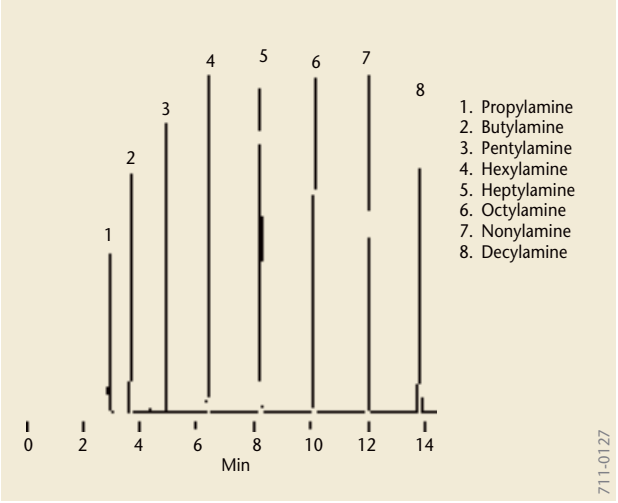
Alcohol Enantiomers (GC)

Column: **β-DEX 325, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **24308**
Oven: 110°C, 1-phenyl-2-propanol; 100°C, isopinocampheol; 90°C, 6-methyl-5-hepten-2-ol
Carrier: helium, 20cm/sec set at the analysis temperature
Det.: FID, 300°C
Inj.: 1µL methylene chloride (1mg/mL each analyte), split (100:1), 220°C



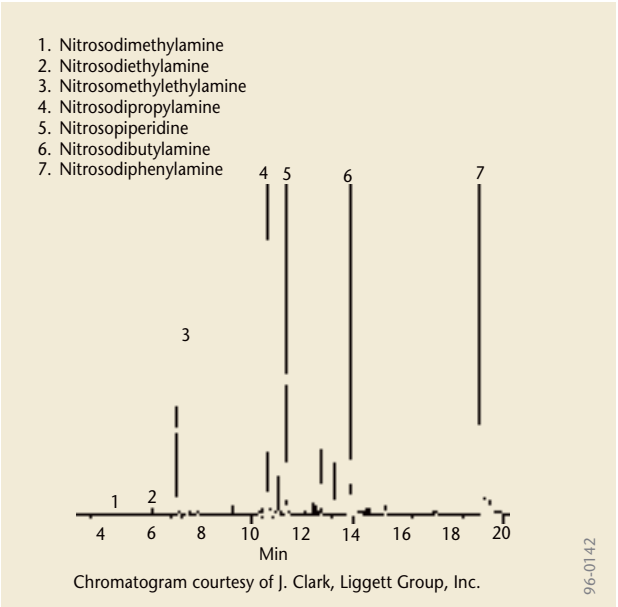
Amines (SPME/GC)

Sample: amines at 5ppm in water, 27% NaCl, pH 9.5
SPME Fiber: **polydimethylsiloxane/divinylbenzene, 65µm film**
Cat. No.: **57310**
Extraction: 20 min, fiber immersed in water, rapid stirring
Desorption: 5 min, 270°C
Column: **SPB-1 SULFUR, 30m x 0.32mm ID, 4.0µm film**
Cat. No.: **24158**
Oven: 50C (2min) to 150°C at 10°C/min
Carrier: helium, 25cm/sec (set at 50°C)
Det.: GC/MS, selected ions at 0.6 sec/scan
Inj.: splitless/split, closed initial 5 min, 270°C, 0.75mm ID splitless liner



Amines, Primary (GC)

Column: **Carbowax Amine, 30m x 0.53mm ID, 1.0µm film**
Cat. No.: **25353**
Oven: 50°C to 200°C at 8°C/min, hold 10 min
Carrier: helium, 20cm/sec (set at 170°C)
Det.: FID, 220°C
Inj.: 0.02µL neat amines mix, split (100:1), 220°C



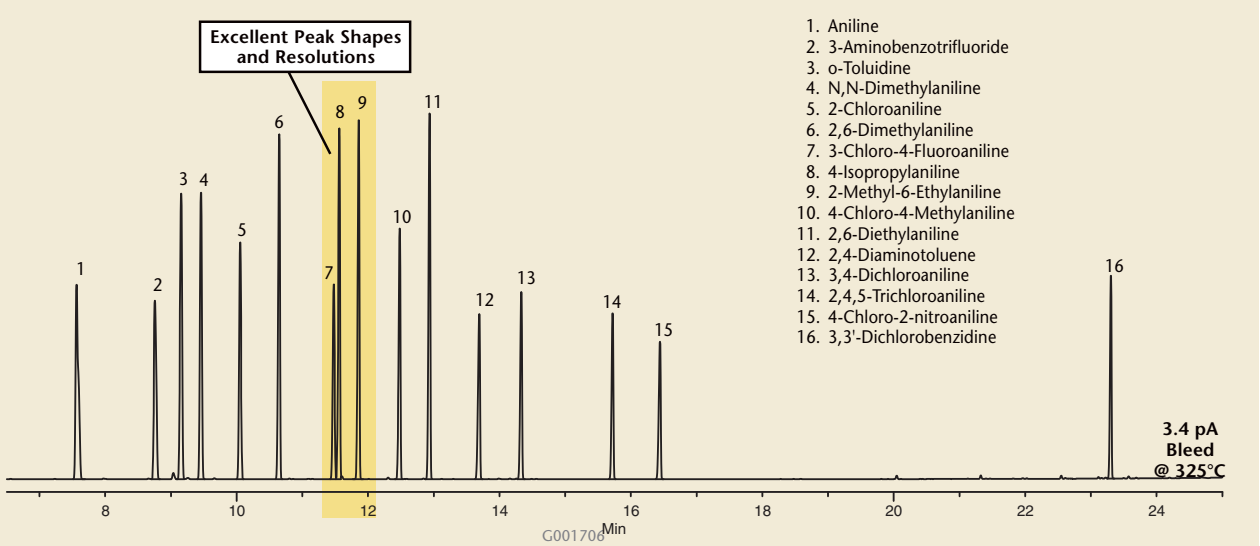
Chromatogram courtesy of J. Clark, Liggett Group, Inc.

Nitrosamines (SPME/GC)

Sample: analytes in water +25% KCl, pH 10.0
SPME Fiber: **polydimethylsiloxane/divinylbenzene, 65µm film**
Cat. No.: **57310-U**
Extraction: immersion, 15min (rapid stirring)
Desorption: 270°C, 1min
Column: **PTA-5, 30m x 0.32mm ID, 0.5µm film**
Cat. No.: **24331**
Oven: 50°C (1min) to 250°C at 10°C/min, hold 2 min
Carrier: helium, 30cm/sec
Det.: GC/MS (quadrupole, selected ion mode)
Inj.: splitless, 250°C (0.75mm ID liner)

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GC Applications
Anilines, Aromatics, Alditol Acetates



Anilines (GC)

Column: **Equity-5, 30m x 0.25mm ID, 0.25µm**
Cat. No.: **28089-U**
Oven: 50° C (2 min) to 200°C @ 10°C/min to 325°C @ 15°C/min
Inj.: 250°C
Det.: FID, 325°C
Flow: Helium, constant flow, 1.3 mL/sec @ 50°C
Injection: 1.0µL, splitless (0.5 min)
Liner: Splitless, 4mm ID single taper
Sample: 50ng on-column of a custom anilines mix

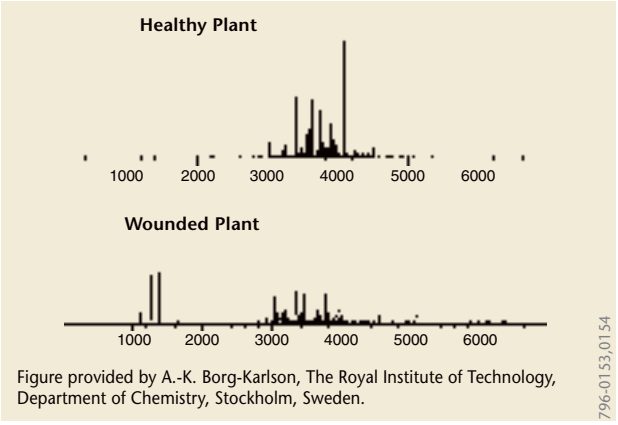
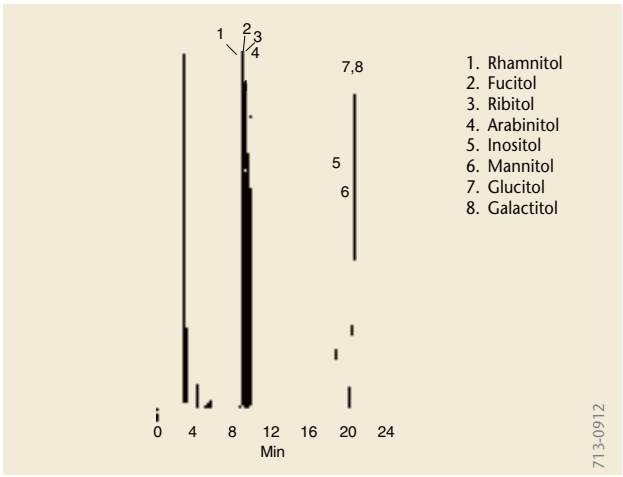


Figure provided by A.-K. Borg-Karlson, The Royal Institute of Technology, Department of Chemistry, Stockholm, Sweden.

Mono- and Sesquiterpenes in Spruce Seedlings (SPME/GC)

Sample: headspace surrounding *Picea abies* seedlings
SPME Fiber: **polydimethylsiloxane, 100µm film**
Cat. No.: **57300-U**
Extraction: headspace, 60 min
Desorption: 30 sec, 225°C
Column: poly(5% diphenyl/95% dimethylsiloxane), 30m x 0.25mm ID, 0.25µm film
Supelco Equivalent: **Equity-5 (Cat. No. 28089-U)**
Oven: 40°C (4 min) to 200°C at 4°C/min, hold 16 min
Carrier: helium, 10psi
Det.: EID, 70ev
Inj.: splitless (splitter opened after 30 sec), 225°C

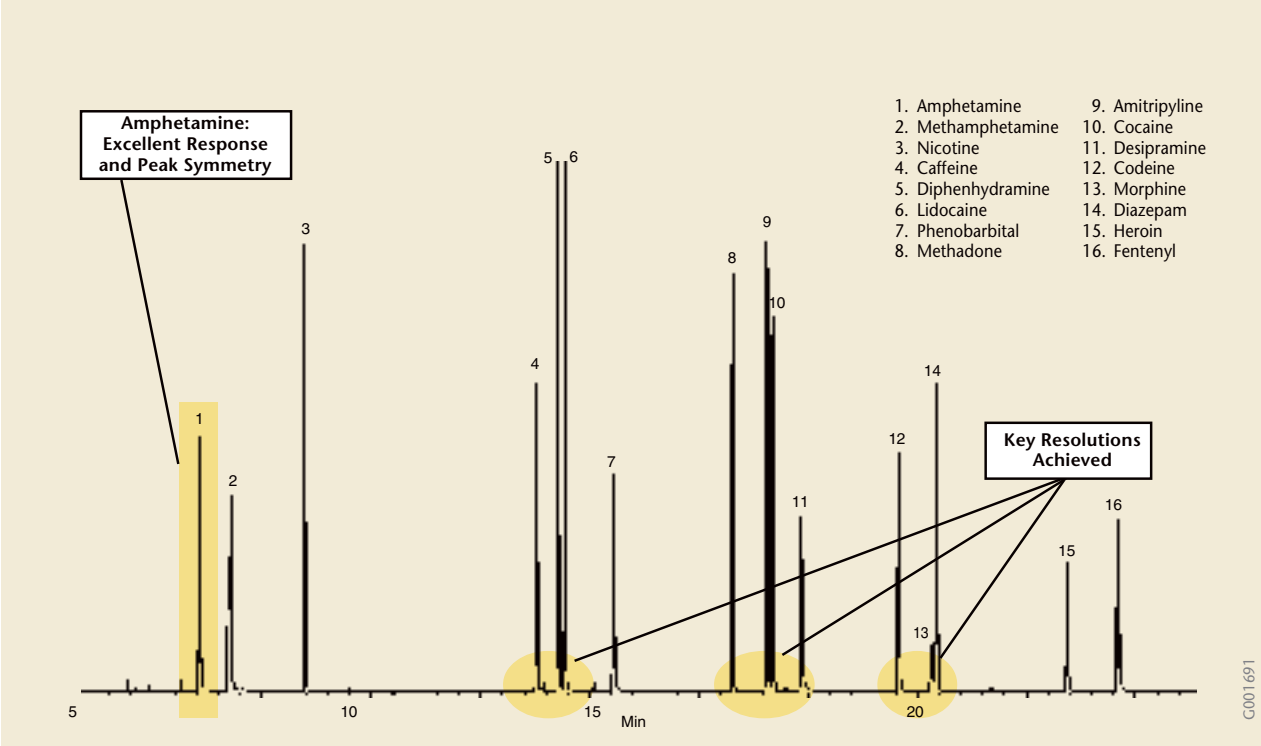


Alditol Acetates (GC)

Column: **SPB-1701, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **24113**
Oven: 220°C
Carrier: helium, 20cm/sec (set at 220°C)
Det.: FID, 260°C
Inj.: 1µL, split 100:1 (5ng each compound on column)

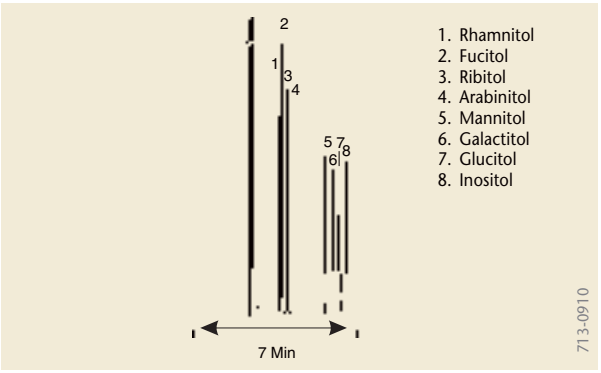
Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco
Gas Chromatography
SUPELCO

GC Applications
Alditol Acetates, Drugs



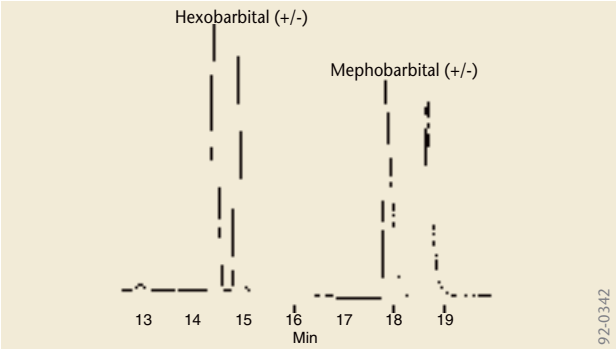
Drug Screen (GC/MS)

Column: **Equity-5, 30m x 0.25mm ID, 0.25µm**
Cat. No.: **28089-U**
Oven: 45°C (2 min) to 110°C @ 25°C/min to 200°C @ 15°C/min to 280°C
Inj.: 250°C
Det.: 5973 MSD, 40-450 amu scan range, 325°C transfer line
Flow: Helium, 40psi for 0.2 min then 0.7mL/min constant flow
Injection: 0.3µL pulsed splitless @ 50mL/min (0.5 min)
Liner: Splitless 2mm ID
Sample: ~15ng on-column of a 16-component drug standard



Alditol Acetates (GC)

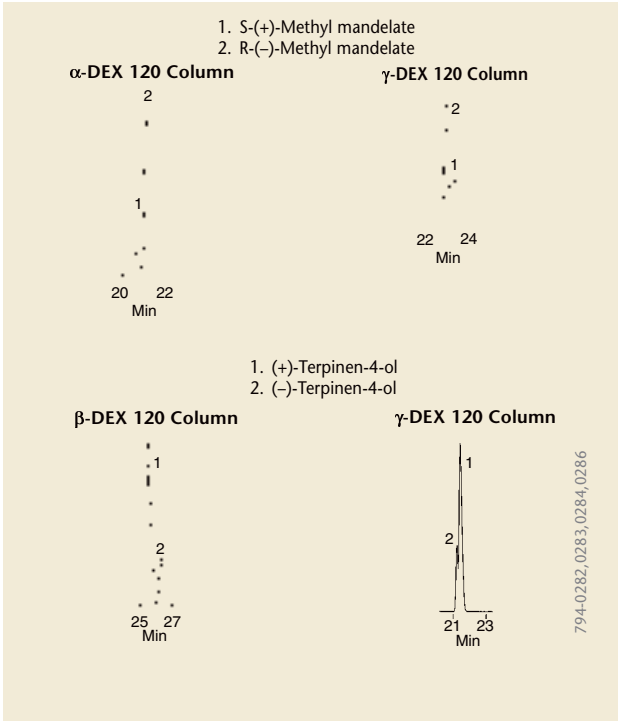
Column: **SP-2380, 30m x 0.25mm ID, 0.20µm film**
Cat. No.: **24110-U**
Oven: 275°C
Carrier: helium, 20cm/sec (set at 275°C)
Det.: FID
Inj.: 1µL chloroform containing 6µg each sugar, split ratio 100:1



Barbiturate Enantiomers (GC)

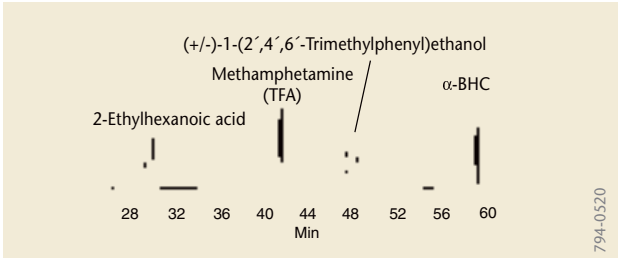
Column: **β-DEX 120, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **24304**
Carrier: helium, 20cm/sec
Temp.: 210°C
Det.: 300°C, FID
Inj.: 100:1 split, 300°C

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Enantio-Reversals (GC)

Columns: **30m x 0.25mm ID, 0.25µm film**
Cat. Nos.: **24310 (α-DEX),**
24304 (β-DEX)
24307 (γ-DEX)
Carrier: helium, 35cm/sec
Det.: FID, 300°C
Oven: 130°C (methyl mandelate); 100°C (terpinen-4-ol)
Inj.: 1µL (1mg/mL in methylene chloride), split (100:1), 250°C



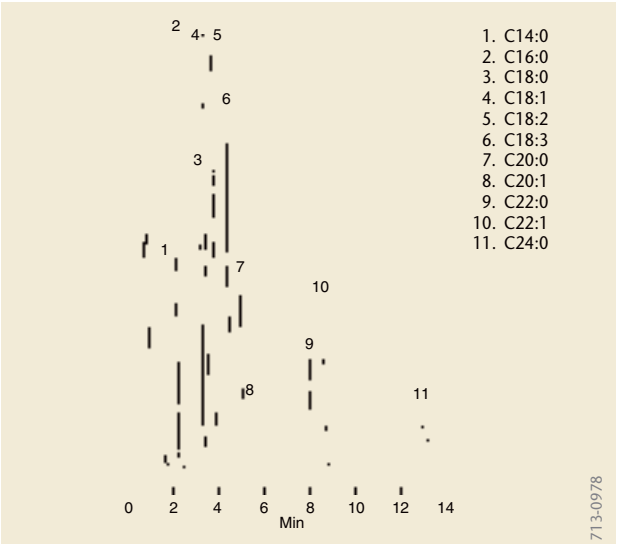
Enantiomers (GC)

Column: **γ-DEX 120, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **24307**
Oven : 90°C to 135°C at 1°C/min, then to 240°C at 5°C/min
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: 1µL (0.5mg/mL in methylene chloride), split (100:1), 300°C



Enantioseparation of 4-Methyloctanoic Acid (GC)

Column: **γ-DEX 120, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **24307**
Oven : 115°C
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride containing ~1mg/mL racemate, split 100:1, 220°C



For more information on fatty acids analyses by capillary GC, request Bulletin 855.

Fatty Acid Methyl Esters (GC)

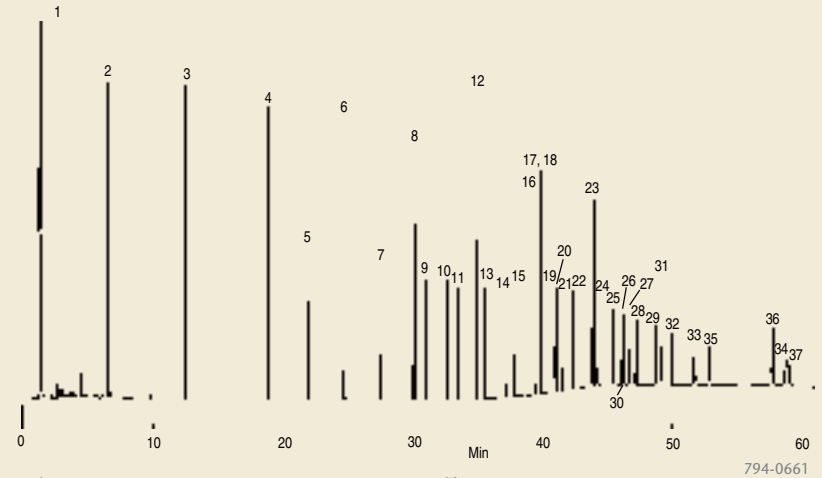
Column: **SUPELCOWAX 10, 30m x 0.53mm ID, 1.0µm film**
Cat. No.: **25301-U**
Oven: 240°C
Carrier: helium, 5cc/min (flow controlled)
Det.: FID, 260°C
Inj.: 0.1µL Rapeseed Oil Reference Mix (Cat. No. O7756-1AMP), 2.5µg FAMEs on column, direct injection, 250°C

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Gas Chromatography

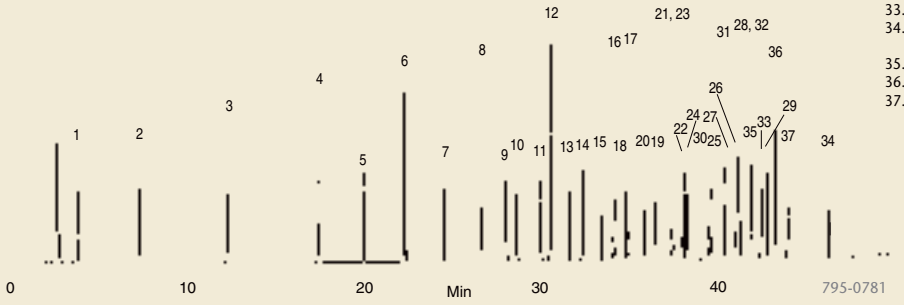
SUPELCO

GC Applications
FAMEs

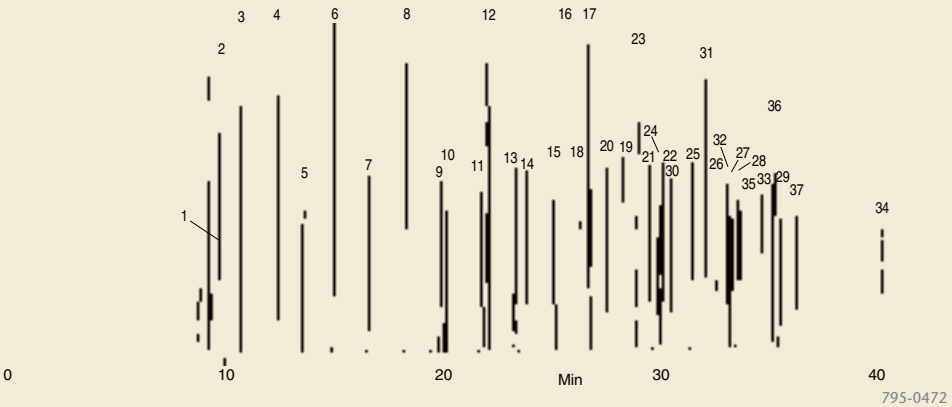


Component (acid methyl esters)	Weight %
1. C4:0 (Butyric)	4
2. C6:0 (Caproic)	4
3. C8:0 (Caprylic)	4
4. C10:0 (Capric)	4
5. C11:0 (Undecanoic)	2
6. C12:0 (Lauric)	4
7. C13:0 (Tridecanoic)	2
8. C14:0 (Myristic)	4
9. C14:1 (Myristoleic)	2
10. C15:0 (Pentadecanoic)	2
11. C15:1 (*cis*-10-Pentadecenoic)	2
12. C16:0 (Palmitic)	6
13. C16:1 (Palmitoleic)	2
14. C17:0 (Heptadecanoic)	2
15. C17:1 (*cis*-10-Heptadecenoic)	2
16. C18:0 (Stearic)	4
17. C18:1n9c (Oleic)	4
18. C18:1n9t (Elaidic)	2
19. C18:2n6c (Linoleic)	2
20. C18:2n6t (Linolelaidic)	2
21. C18:3n6 (γ-Linolenic)	2
22. C18:3n3 (α-Linolenic)	2
23. C20:0 (Arachidic)	4
24. C20:1n9 (*cis*-11-Eicosenoic)	2
25. C20:2 (*cis*-11,14-Eicosadienoic)	2
26. C20:3n6 (*cis*-8,11,14-Eicosatrienoic)	2
27. C20:3n3 (*cis*-11,14,17-Eicosatrienoic)	2
28. C20:4n6 (Arachidonic)	2
29. C20:5n3 (*cis*-5,8,11,14,17-Eicosapentaenoic)	2
30. C21:0 (Henicosanoic)	2
31. C22:0 (Behenic)	4
32. C22:1n9 (Erucic)	2
33. C22:2 (*cis*-13,16-Docosadienoic)	2
34. C22:6n3 (*cis*-4,7,10,13,16,19-Docosahexaenoic)	2
35. C23:0 (Tricosanoic)	2
36. C24:0 (Lignoceric)	4
37. C24:1n9 (Nervonic)	2

Column: **Omegawax 250, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **24136**
Oven: 50°C (2 min) to 220°C at 4°C/min, hold 15 min
Carrier: helium, 30cm/sec, 205°C



Column: **SP-2380, 30m x 0.25mm ID, 0.20µm film**
Cat. No.: **24110-U**
Oven: 50°C (2 min) to 250°C at 4°C/min, hold 15 min
Carrier: helium, 20cm/sec, 150°C



Column: **SP-2560, 100m x 0.25mm ID, 0.20µm film**
Cat. No.: **24056**
Oven: 140°C (5 min) to 240°C at 4°C/min, hold 15 min
Carrier: helium, 20cm/sec, 175°C

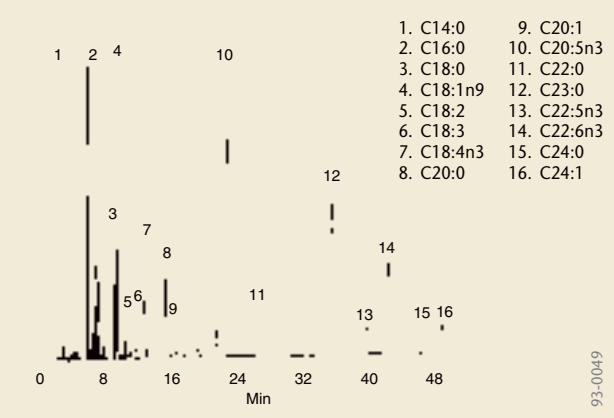
Fatty Acid Methyl Esters (GC)

General Conditions

Det.: FID, 260°C
Inj.: 1µL of Supelco 37 Component FAME Mix (Cat. No. 47885-U, 10mg/mL total), split 100:1, 250°C

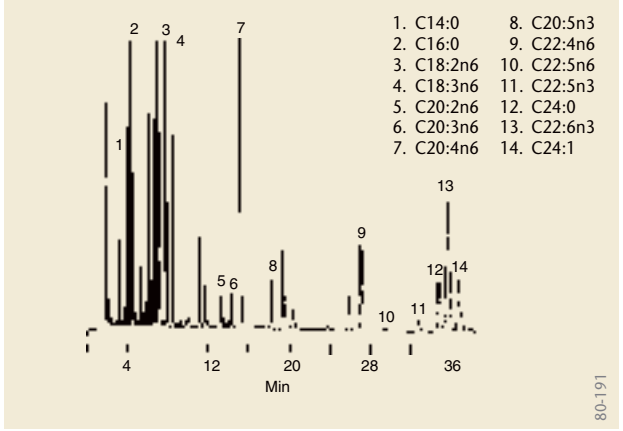
For more information on fatty acids analyis by capillary GC, request Bulletin 855 (T110855).

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



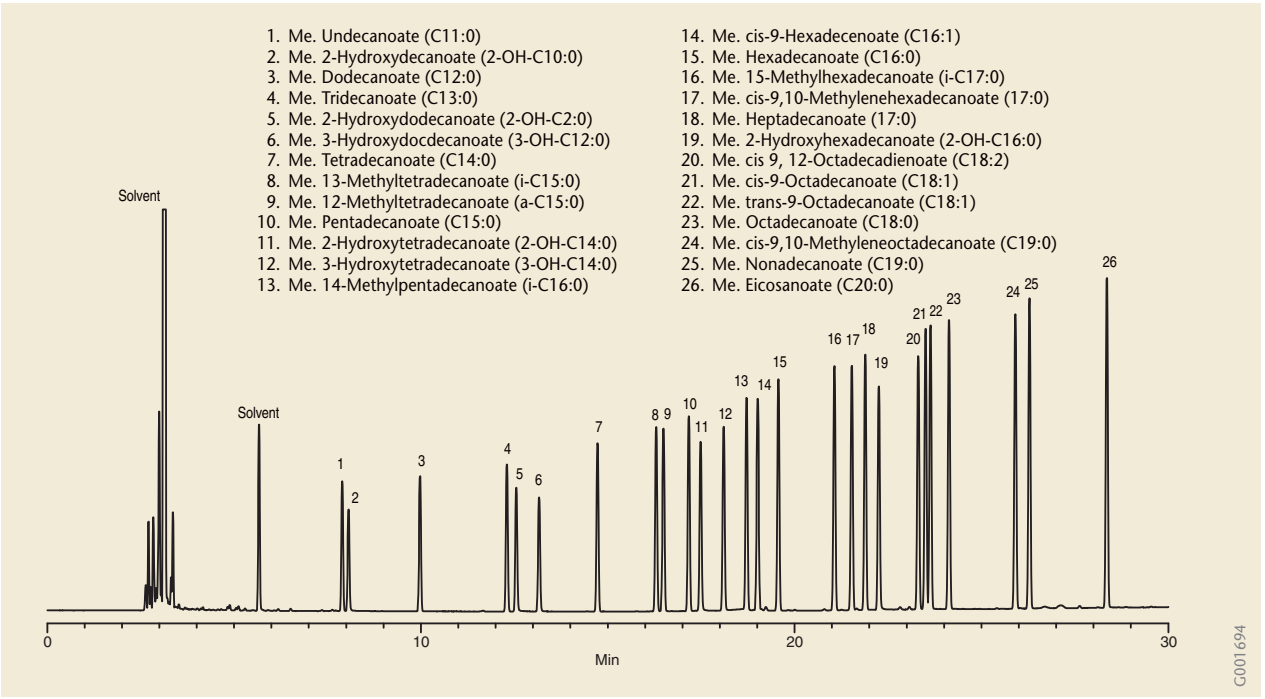
Fatty Acid Methyl Esters, Polyunsaturated (GC)

Column: **PAG, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **24223**
Oven: 220°C
Carrier: helium, 25cm/sec (set at 220°C)
Det.: FID, 260°C
Inj.: 1µL hexane, 50mg/mL PUFAs (Omegawax Test Mix, Cat. No. 48476), split 100:1, 250°C



Fatty Acid Methyl Esters,Omega-6 and Others (GC)

Column: **Omegawax 320, 30m x 0.32mm ID, 0.25µm film**
Cat. No.: **24152**
Oven: 200°C
Carrier: helium, 25cm/sec (set at 200°C)
Det.: FID, 260°C
Inj.: 1µL hexane containing 50µg animal source FAMEs, split 100:1, 250°C



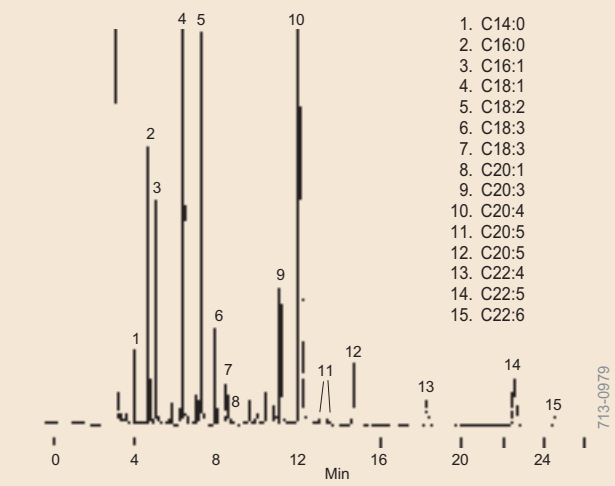
Bacterial Acid Methyl Esters (GC)

Column: **Equity-1, 30m x 0.25mm ID, 0.25µm**
Cat. No.: **28046-U**
Oven: 150°C (4 min) to 250°C @ 4°C/min (5 min)
Inj.: 250°C
Det.: FID, 280°C
Flow: Helium, 20cm/sec @ 150°C
Injection: 1.0µL, split 100:1
Liner: Split, cup design
Sample: 100ng on-column of a 26 component BAME standard (Cat. No. 47080-U)

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

SUPELCO

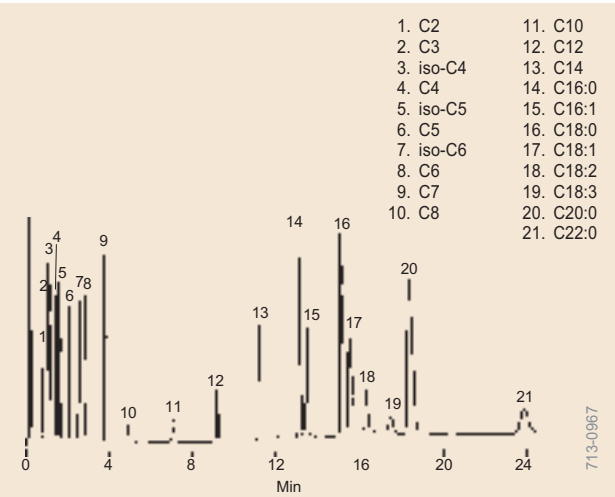
GC Applications
FAMEs, Fatty Acids



For more information on fatty acids analyses by capillary GC, request Bulletin 855.

Fatty Acid Methyl Esters (GC)

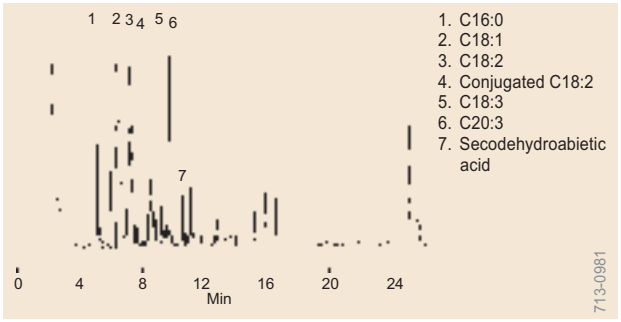
Column: SP-2330, 30m x 0.25mm ID, 0.20µm film
Cat. No.: 24019
Oven: 200°C
Carrier: helium, 20cm/sec (set at 200°C)
Det.: FID, 250°C
Inj.: 0.5µL chloroform containing FAMEs from natural source, split 100:1 (250°C)



For more information, request Bulletin 855.

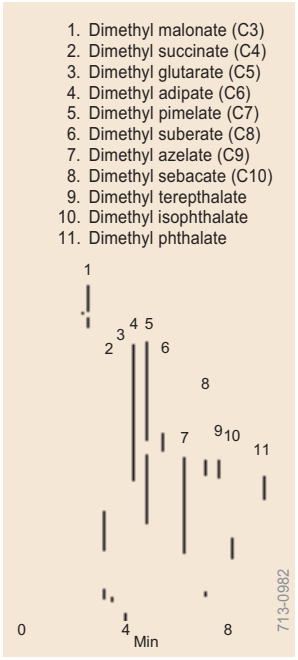
Fatty Acids, Free (GC)

Column: Nukol, 15m x 0.53mm ID, 0.5µm film
Cat. No.: 25326
Oven: 110°C to 220°C at 8°C/min
Carrier: helium, 20mL/min
Det.: FID, 250°C
Inj.: 1µL containing 25-400ng each analyte, direct injection, 250°C



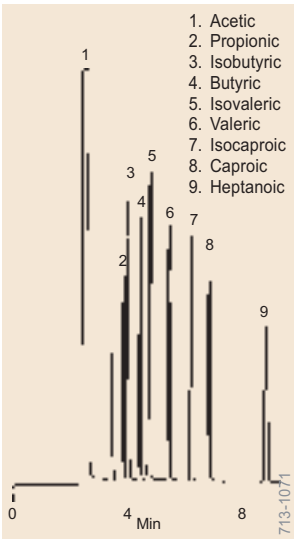
Tall Oil Methyl Esters (GC)

Column: SP-2380, 30m x 0.25mm ID, 0.20µm film
Cat. No.: 24110-U
Oven: 170°C to 260°C at 4°C/min, hold 4 min
Carrier: helium, 20cm/sec at 185°C
Det.: FID, 280°C
Inj.: 2µL methylene chloride, split 100:1, 250°C



Acid Methyl Esters, Dibasic (GC)

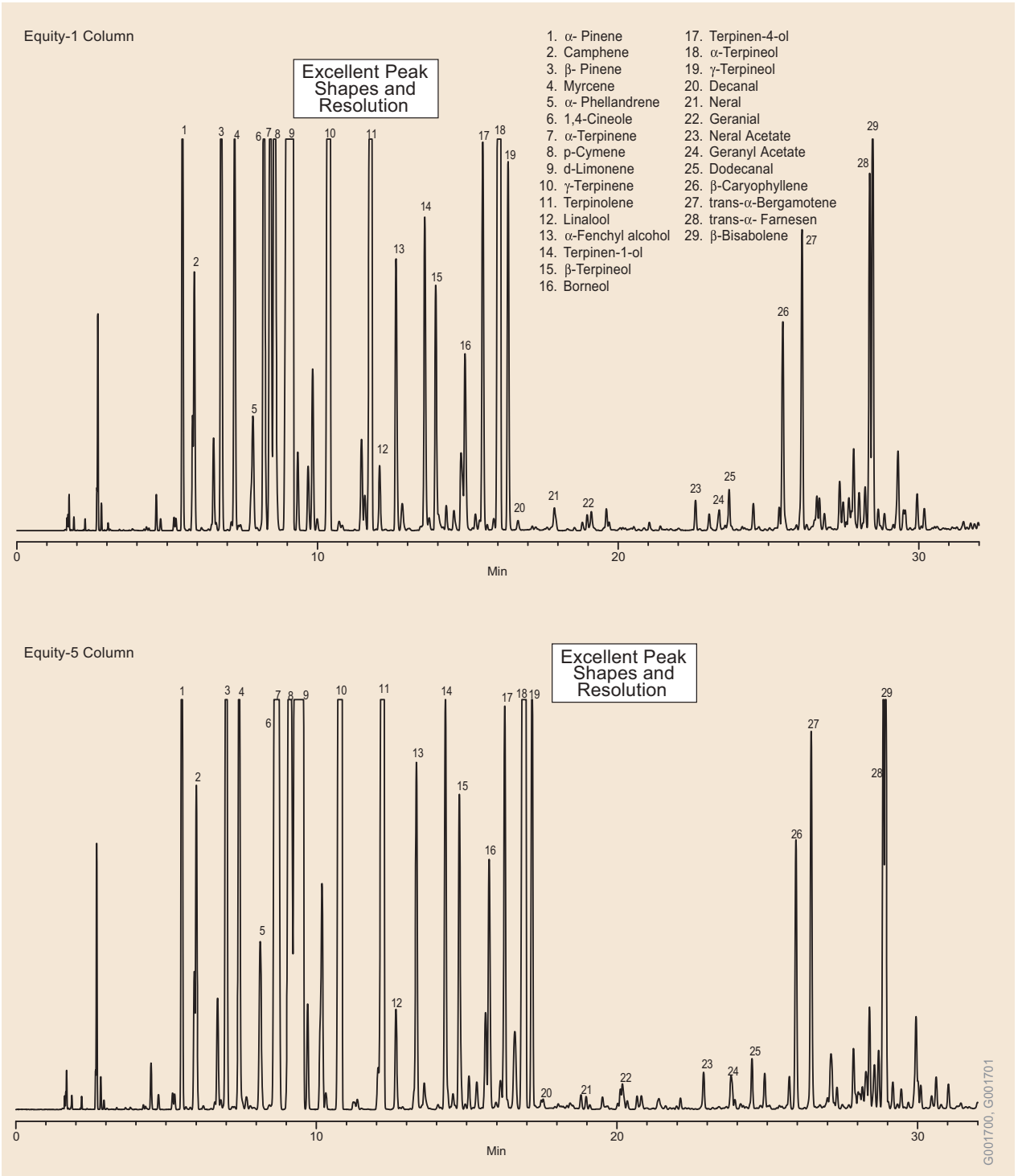
Column: SP-2380, 30m x 0.25mm ID, 0.20µm film
Cat. No.: 24110-U
Oven: 170°C to 200°C at 4°C/min
Carrier: helium, 20cm/sec at 185°C
Det.: FID, 250°C
Inj.: 0.1µL methylene chloride containing 0.1µg each analyte, split 100:1, 250°C



Fatty Acids, C2-C7 (GC)

Column: Nukol, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 24107
Oven.: 185°C
Carrier: helium, 20cm/sec (set at 185°C)
Det.: FID, 250°C
Inj.: 1µL water containing 10mM each analyte (Cat. No. 46975-U), split 100:1, 220°C

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



Distilled Lime Oil (GC)

Column: Equity-1, 30m x 0.25mm ID, 0.25µm
Cat. No.: 28046-U
Column: Equity-5, 30m x 0.25mm ID, 0.25µm
Cat. No.: 28089-U
Oven: 75°C (8 min) to 200°C @ 4°C/min (10 min)
Inj.: 250°C
Det.: FID, 250°C
Flow: Helium, 30cm/sec @ 110°C
Injection: Wet Needle, split 100:1
Liner: Split, cup design
Sample: Distilled lime oil

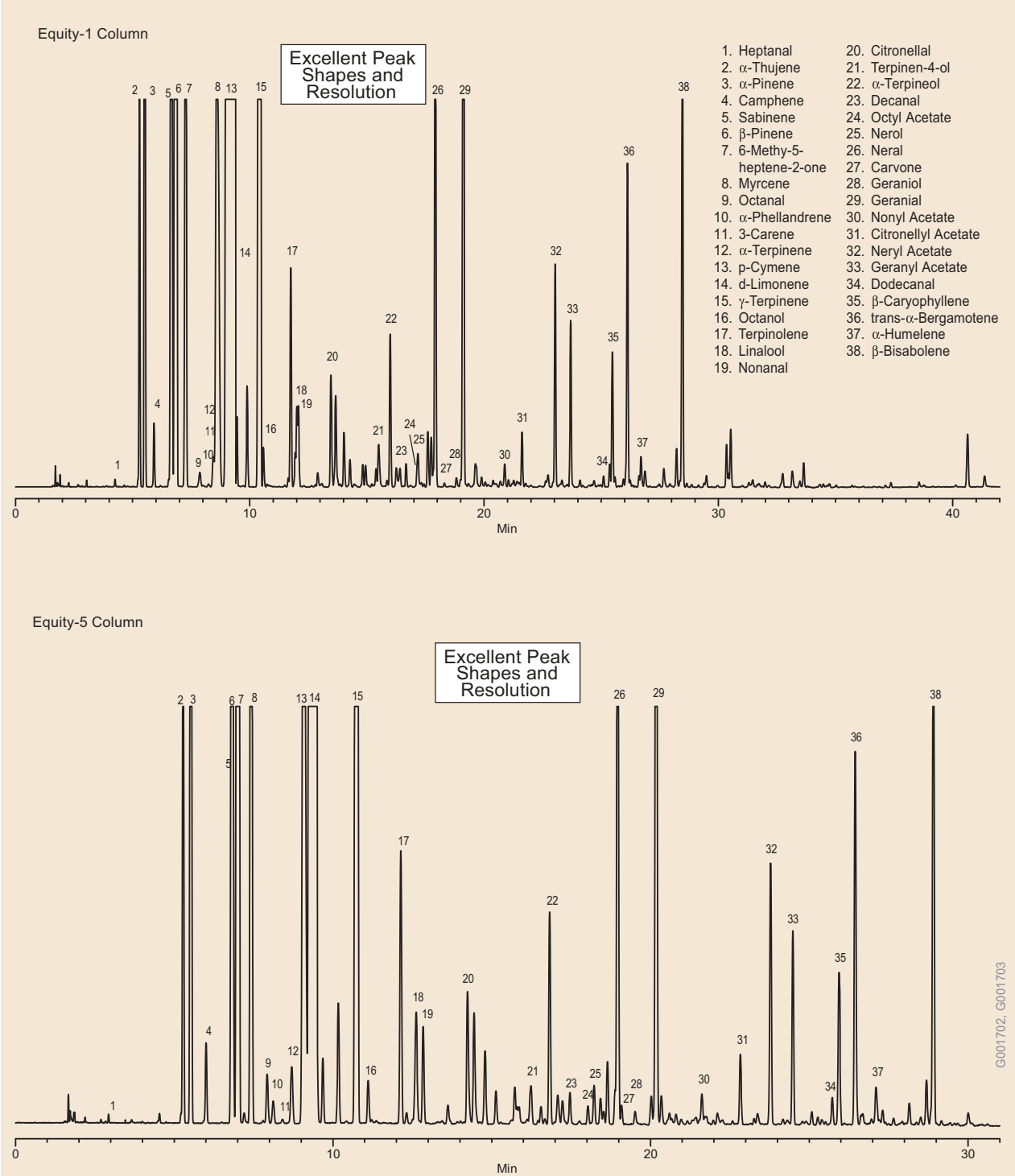
Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Gas Chromatography

SUPELCO

GC Applications

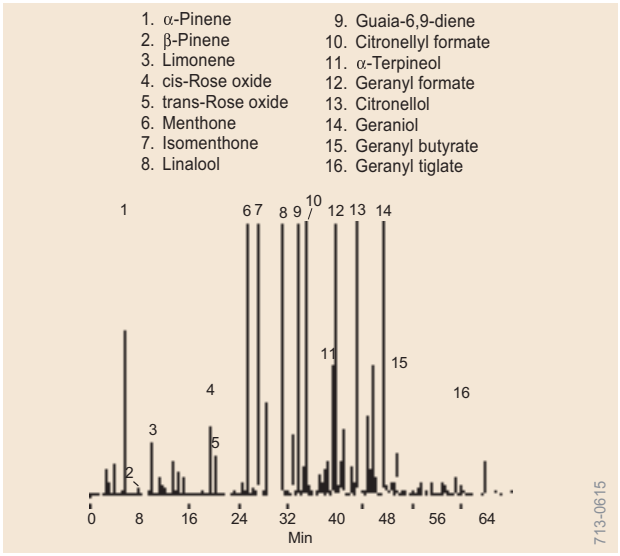
Foods, Flavors, and Fragrances



Cold Pressed Lemon Oil (GC)

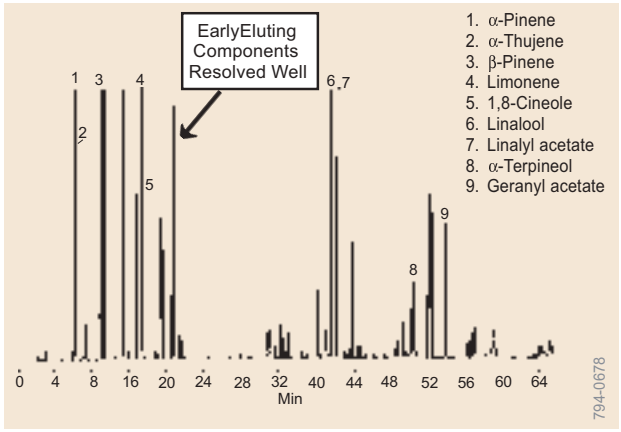
Column: Equity-1, 30m x 0.25mm ID, 0.25µm
Cat. No.: 28046-U
Column: Equity-5, 30m x 0.25mm ID, 0.25µm
Cat. No.: 28089-U
Oven: 75°C (8 min) to 200°C @ 4°C/min (10 min)
Inj.: 250°C
Det.: FID, 250°C
Flow: Helium, 30cm/sec @ 110°C
Injection: Wet Needle, split 100:1
Liner: Split, cup design
Sample: Distilled lime oil

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



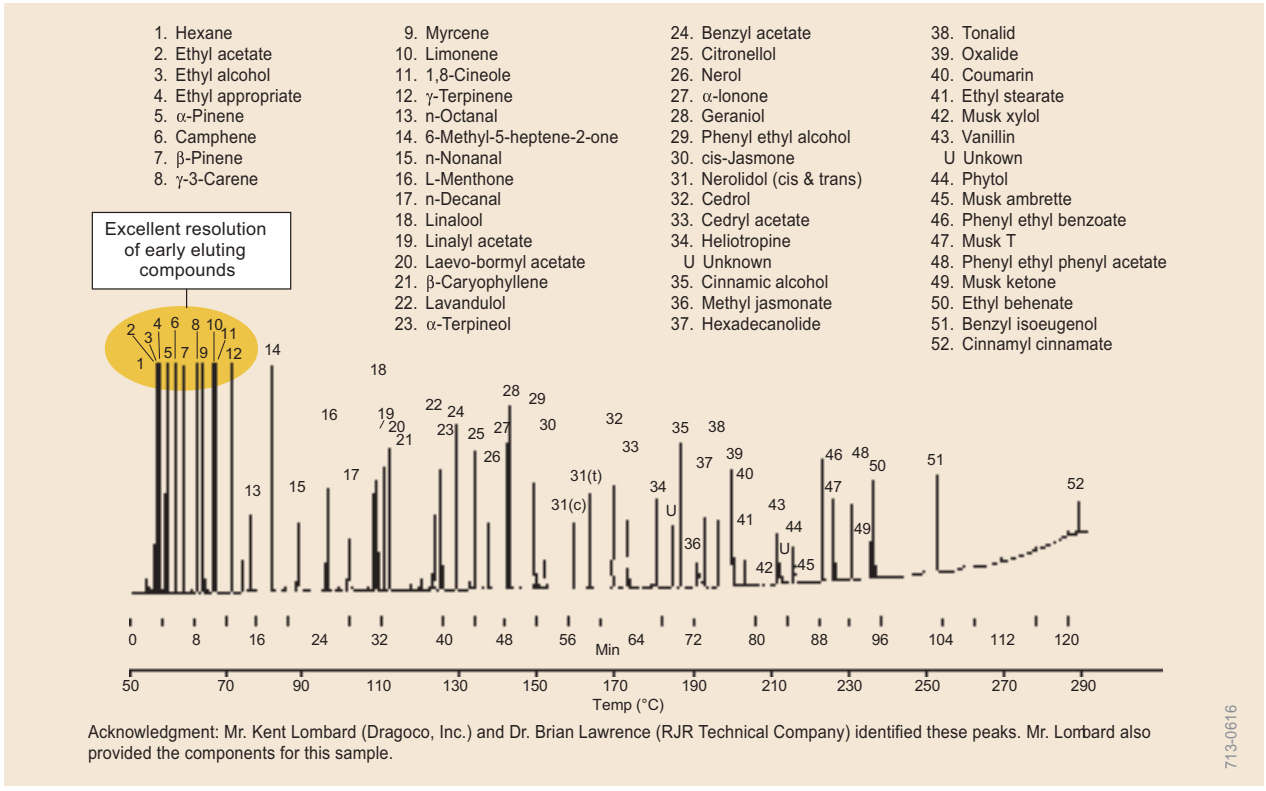
Geranium Oil Bourbon (GC)

Column: SUPELCOWAX 10, 30m x 0.25mm, 0.25µm film
Cat. No.: 24079
Oven: 50°C (2 min) to 230°C at 2°C/min, hold 1min
Carrier: helium, 20cm/sec (set at 155°C)
Det.: FID
Inj.: 0.2µL neat oil, split (100:1)



Bergamot Oil, Italian (GC)

Column: SUPELCOWAX 10, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 24079
Oven: 50°C for 2 min then to 230°C at 2°C/min, hold 1 min
Carrier: helium, 20cm/sec (set at 155°C)
Det.: FID
Inj.: 0.2µL, split (100:1)



Acknowledgment: Mr. Kent Lombard (Dragoco, Inc.) and Dr. Brian Lawrence (RJR Technical Company) identified these peaks. Mr. Lombard also provided the components for this sample.

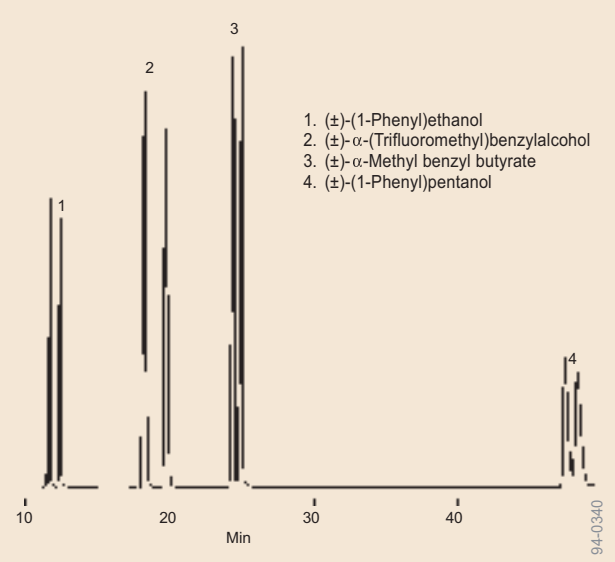
Fragrance Components (GC)

Column: SUPELCOWAX 10, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 24079
Oven: 50°C for 2 min then to 280°C at 2°C/min, hold 20 min
Carrier: helium, 25cm/sec (set at 200°C)
Det.: FID
Inj.: 0.2µL, split (100:1)

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco
Gas Chromatography
SUPELCO

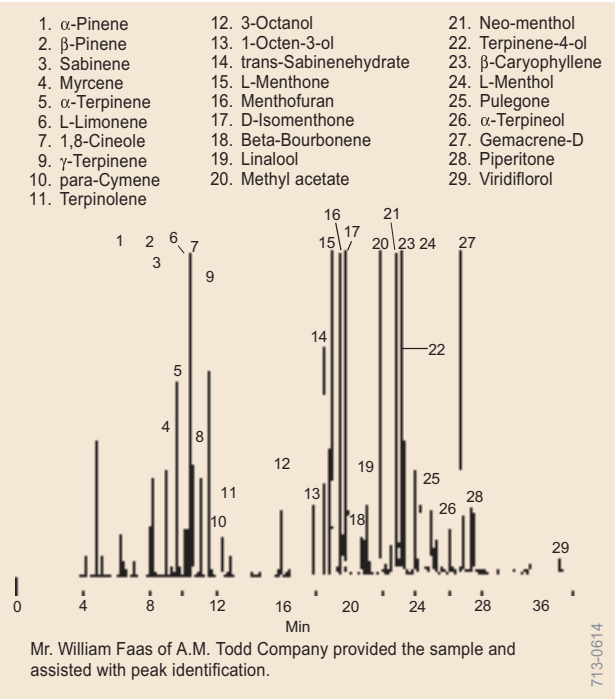
GC Applications

Foods, Flavors, and Fragrances



Phenylethanols (GC)

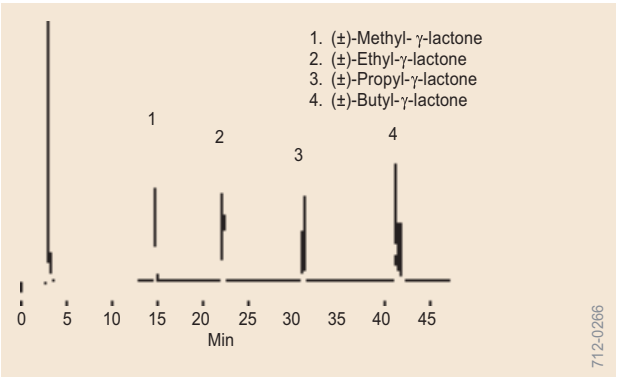
Column: β-DEX 120, 30m x 0.25mm, 0.25µm film
Cat. No.: 24304
Oven: 120°C
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride (0.5mg/mL each analyte), split (100:1) 200°C



Mr. William Faas of A.M. Todd Company provided the sample and assisted with peak identification.

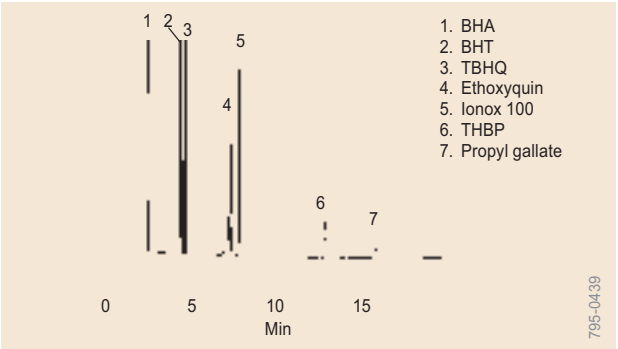
Peppermint Oil (GC)

Column: SUPELCOWAX 10, 60m x 0.25mm, 0.25µm film
Cat. No.: 24081
Oven: 4 min (75°C) to 200°C at 4°C/min, hold 5 min
Carrier: helium, 25cm/sec (set at 155°C)
Det.: FID
Inj.: 0.2µL, split (100:1)



Lactones (GC)

Column: β-DEX 110, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 24301
Oven: 90°C to 200°C at 1°C/min
Carrier: helium, 20cm/sec (set at 90°C)
Det.: FID, 300°C
Inj.: 1µL of 0.5mg/mL in CH_2Cl_2, split (100:1), 300°C

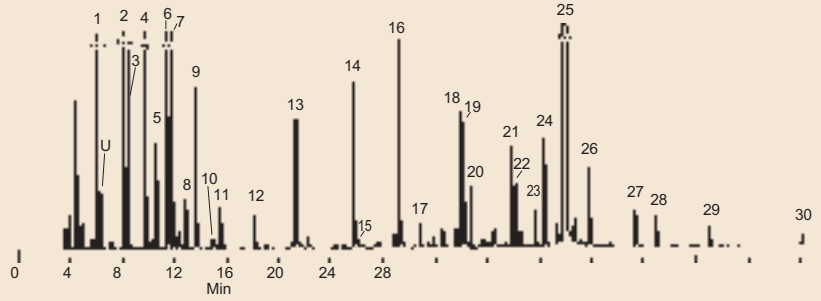


Antioxidants (GC)

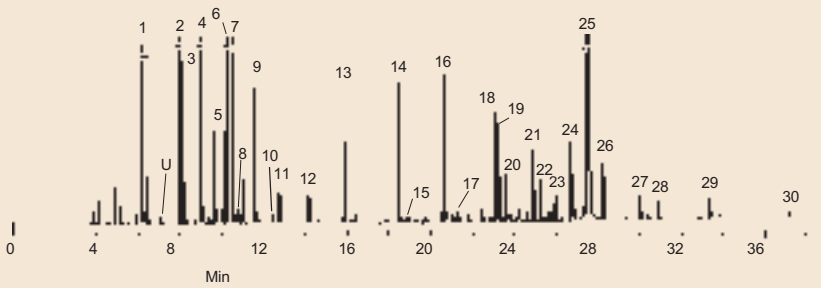
Column: SAC-5, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 24156
Oven: 200°C
Carrier: helium, 30cm/sec
Det.: FID, 250°C
Inj.: 2µL, 200µg/mL each component, split 100:1

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30m SUPELCOWAX 10 Column



60m SUPELCOWAX 10 Column



1. α-Pinene
2. β-Pinene
3. Sabinene
4. Myrcene
5. α-Terpinene
U Unknown
6. L-Limonene
7. 1,8-Cineole
9. γ-Terpinene
10. para-Cymene
11. Terpinolene
12. 3-Octyl acetate
13. 3-Octanol
14. trans-Sabinenehydrate
15. L-Menthone
16. Beta-Bourbonene
17. Linalool
18. Terpinene-4-ol
19. β-Caryophyllene
20. Dihydrocarvone
21. trans-Dihydrocarvyl acetate
22. trans-β-Farnesene
23. α-Terpineol
24. Gemacrene-D
25. Carvone
26. cis-Carvyl acetate
27. trans-Carveol
28. cis-Carveol
29. cis-Jasmone
30. Viridiflorol

794-0677, 0676

Mr. William Faas of A.M. Todd Company provided the sample and assisted with peak identification.

Native Spearmint Oil (GC)

Column: SUPELCOWAX 10, 30m x 0.25mm, 0.25µm film
Cat. No.: 24079
Column: SUPELCOWAX 10, 60m x 0.25mm, 0.25µm film
Cat. No.: 24081
Carrier: helium, 25cm/sec (set at 155°C)
Oven: 4min., at 75°C, then to 200°C at 4°C/min and hold 5 min
Det.: FID
Inj.: 0.2µL, split (100:1)



1. (+) Neomenthol
2. (-) Neomenthol
3. (+) Menthol
4. (-) Menthol
5. (-) Isomenthol
6. (+) Isomenthol

713-0089

Menthol Enantiomers (GC)

Column: α-DEX 120,
30m x 0.25mm, 0.25µm film
Cat. No.: 24310
Oven: 110°C
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: 1µL, split (100:1), 0.5mg/mL each component

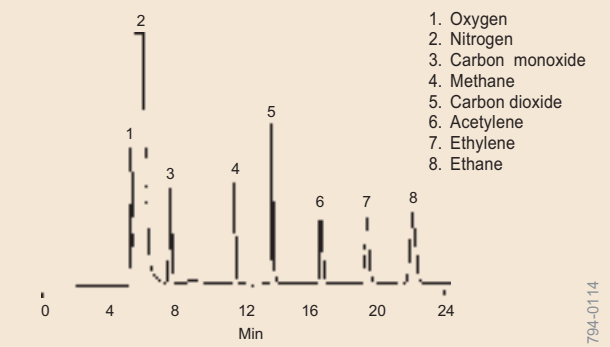
Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Gas Chromatography

SUPELCO

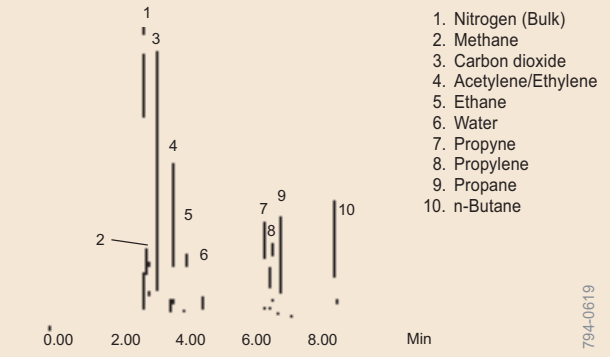
GC Applications

Permanent Gases and Light Hydrocarbons, Glycols



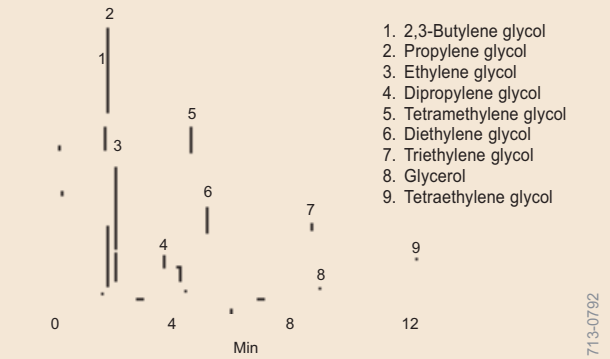
Permanent Gases and C2 Hydrocarbons (GC)

Packing: 60/80 Carboxen-1000
Column: 15 ft. x 1/8 in. stainless steel (2.1mm ID)
Cat. No.: 12390-U (general config.)
Oven: 35°C (5 min) to 225°C at 20°C/min
Carrier: helium, 30mL/min
Det.: TCD
Inj.: 0.6mL Scott gas mix (Cat. No. 23437) oxygen added 1% (4-6µg) each analyte (except nitrogen) on column



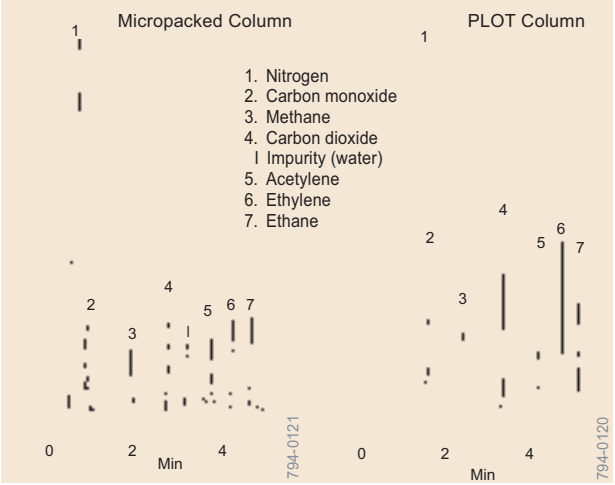
Permanent Gases and Light Hydrocarbons (GC)

Column: Supel-Q PLOT, 30m x 0.53mm
Cat. No.: 25462
Oven: 35°C (3 min) to 250°C at 16°C/min
Carrier: helium, 3mL/min (set at 35°C)
Det.: TCD, 250°C
Inj.: 0.1µL



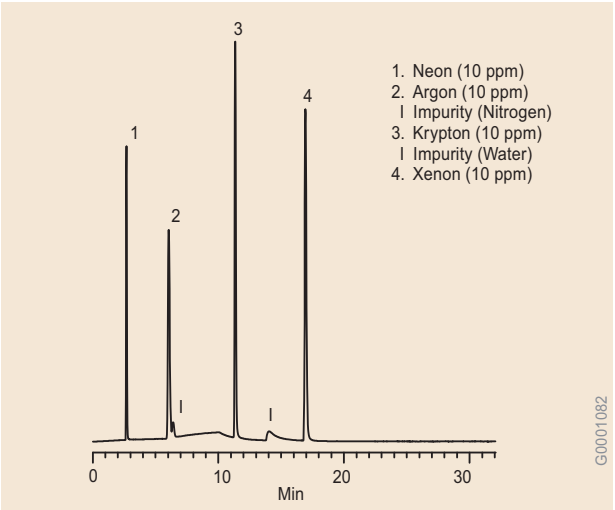
Glycols (GC)

Column: Nukol, 15m x 0.53mm ID, 0.5µm film
Cat. No.: 25326
Oven: 110°C to 220°C at 8°C/min
Carrier: helium, 15mL/min
Det.: FID, 250°C
Inj.: 1µL water containing 100ppm each glycol, direct injection



Permanent Gases and Light Hydrocarbons (GC)

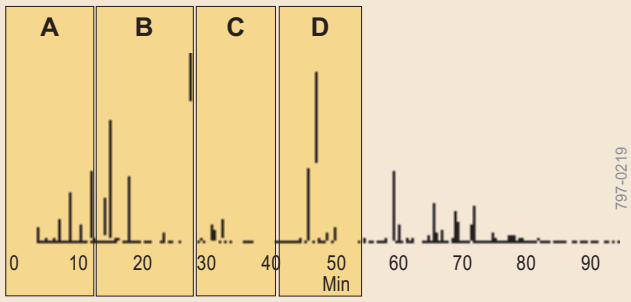
Column: Carboxen 1004 micropacked, 2m x 1/16 in. stainless steel
Cat. No.: 12846
Oven: 35°C (1 min) to 225°C at 24°C/min
Column: Carboxen 1006 PLOT, 30m x 0.53mm ID
Cat. No.: 25461
Oven: 35°C (5 min) to 225°C at 24°C/min
Carrier: helium, 22cm/sec
Det.: TCD, 230°C
Inj.: 50µL (micropacked column) or 35µL (PLOT column), 1% each analyte in nitrogen (Cat. No. 23437), direct, 230°C



Nobel Gases (GC)

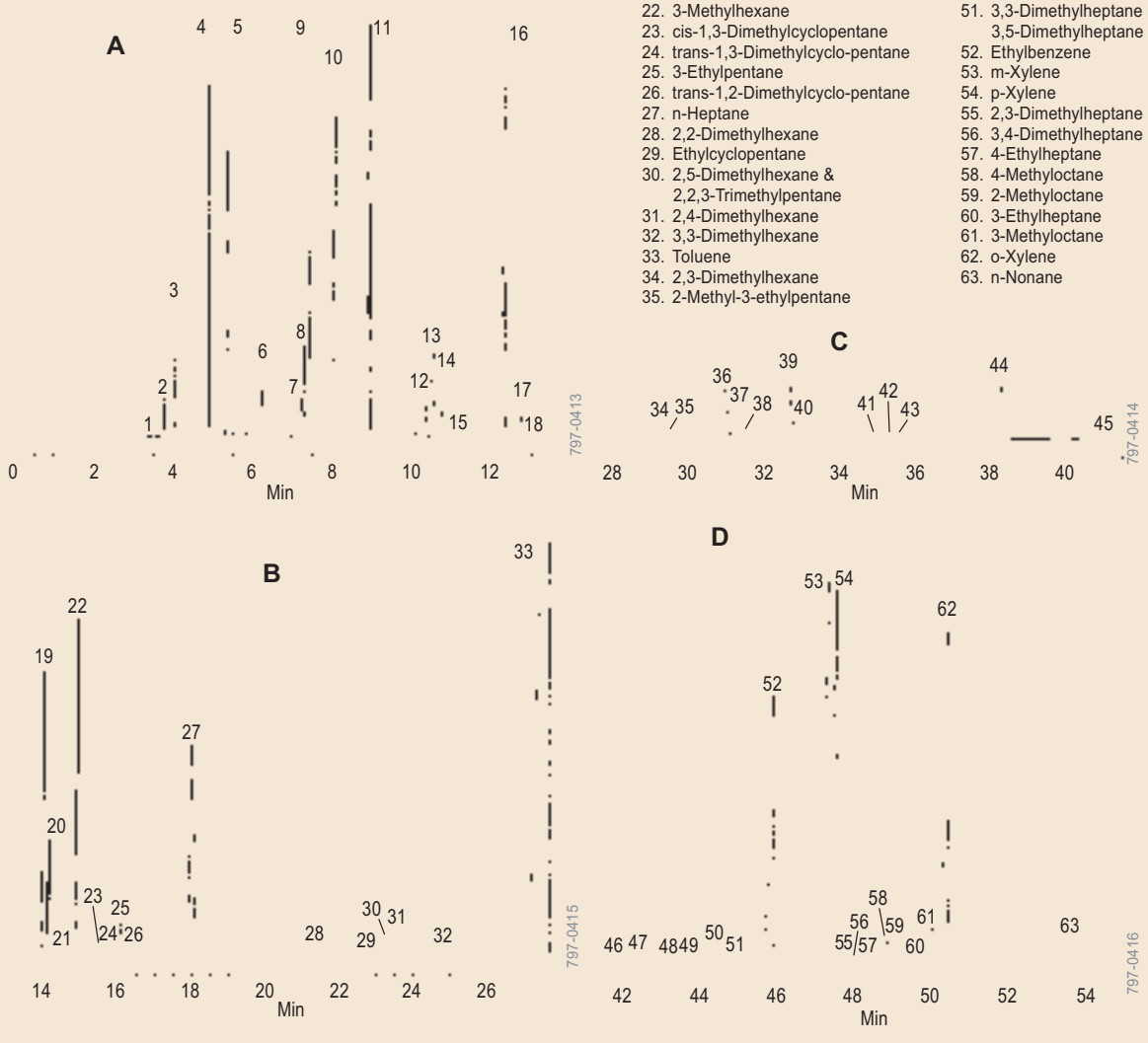
Column: Carboxen-1010 PLOT, 30m x 0.53mm ID
Cat. No.: 25467
Oven: 35°C (6 min) to 225°C at 24°C/min
Carrier: helium, 3mL/min (set at 35°C)
Det.: TCD

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



Qualitative Reference Reformate Standard (Cat. No. 48266)

1. Propane
2. Iso-Butane
3. n-Butane
4. Iso-Pentane
5. n-Pentane
6. 2,2-Dimethylbutane
7. Cyclopentane
8. 2,3-Dimethylbutane
9. 2-Methylpentane
10. 3-Methylpentane
11. n-Hexane
12. 2,2-Dimethylpentane
13. Methylcyclopentane
14. 2,4-Dimethylpentane
15. 2,2,3-Trimethylbutane
16. Benzene
17. 3,3-Dimethylpentane
18. Cyclohexane
19. 2-Methylhexane
20. 2,3-Dimethylpentane
21. 1,1-Dimethylcyclopentane
22. 3-Methylhexane
23. cis-1,3-Dimethylcyclopentane
24. trans-1,3-Dimethylcyclo-pentane
25. 3-Ethylpentane
26. trans-1,2-Dimethylcyclo-pentane
27. n-Heptane
28. 2,2-Dimethylhexane
29. Ethylcyclopentane
30. 2,5-Dimethylhexane & 2,2,3-Trimethylpentane
31. 2,4-Dimethylhexane
32. 3,3-Dimethylhexane
33. Toluene
34. 2,3-Dimethylhexane
35. 2-Methyl-3-ethylpentane
36. 2-Methylheptane
37. 4-Methylheptane & 3-Methyl-3-ethylpentane
38. 3,4-Dimethylhexane
39. 3-Methylheptane
40. 3-Ethylhexane
41. trans-1,3-Ethylmethyl-cyclopentane & 2,2,5-Trimethylhexane
42. cis-1,3-Ethylmethylcyclo-pentane
43. trans-1,2-Ethylmethyl-cyclopentane
44. n-Octane
45. cis-1,2-Ethylmethylcyclopentane & 2,3,5-Trimethylhexane
46. 2,2-Dimethylheptane
47. 2,4-Dimethylheptane
48. 2-Methyl-4-ethylhexane
49. 2,6-Dimethylheptane
50. 2,5-Dimethylheptane
51. 3,3-Dimethylheptane & 3,5-Dimethylheptane
52. Ethylbenzene
53. m-Xylene
54. p-Xylene
55. 2,3-Dimethylheptane
56. 3,4-Dimethylheptane
57. 4-Ethylheptane
58. 4-Methyloctane
59. 2-Methyloctane
60. 3-Ethylheptane
61. 3-Methyloctane
62. o-Xylene
63. n-Nonane



Hydrocarbons by ASTM Method D 5134 (GC)

Column: Petrocol DH 50.2, 50m x 0.20mm ID, 0.50µm film
Cat. No.: 24133-U
Oven: 35°C (30 min) to 200°C at 2°C/min (15 min)
Carrier: helium, 19-21cm/sec at 35°C (see ASTM D5134)
Fuel Gas: hydrogen (approx. 30mL/min)
Oxidizing Gas: air (approx. 250mL/min)
Make-up Gas: nitrogen (approx. 30mL/min)
Det.: FID, 250°C
Inj.: 0.2µL, split 200:1, 200°C

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Gas Chromatography

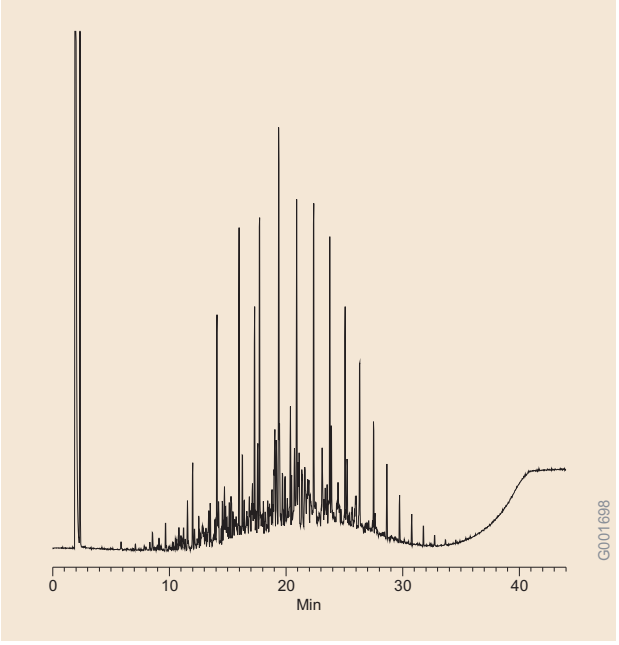
SUPELCO

GC Applications
Hydrocarbons



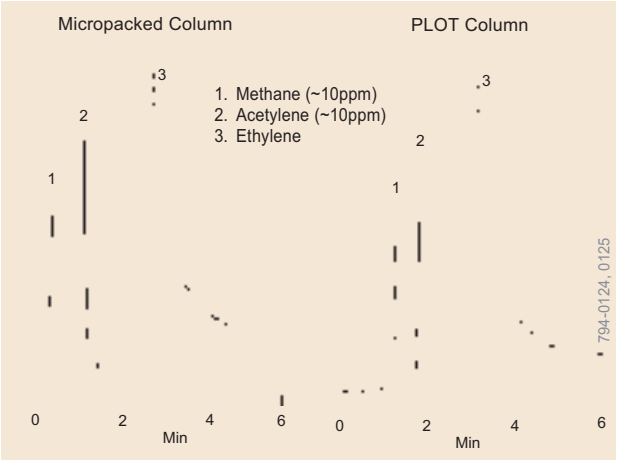
Simple Hydrocarbons (GC)

Column :	Equity-1, 30m x 0.25mm ID, 0.25µm
Cat. No.:	28046-U
Column :	Equity-5, 30m x 0.25mm ID, 0.25µm
Cat. No.:	28089-U
Oven:	40°C (8 min) to 325°C @ 12°C/min (16 min)
Inj.:	275°C
Det.:	FID, 325°C
Flow:	Helium, constant flow, 1.2 mL/sec @ 40°C
Injection:	1.0µL, splitless (2.0 min)
Liner:	2mm ID splitless
Sample:	100ng on-column of a 17 component n-hydrocarbons standard (Cat. No. 46855-U)



Diesel Fuel (GC)

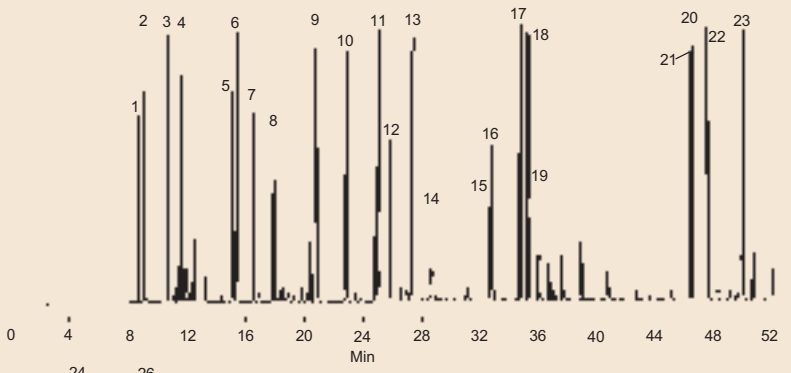
Column:	Equity-1, 30m x 0.25mm ID, 0.25µm
Cat. No.:	28046-U
Oven:	40°C (4 min) to 325°C @ 8°C/min
Inj.:	275°C
Det.:	FID, 325°C
Flow:	Helium, constant flow, 1.2mL/sec. @ 40°C
Injection:	1.0µL, split 200:1
Liner:	4mm ID single taper
Sample:	100ng on-column of a No. 2 Fuel Oil standard (Cat. No. 47515-U)



Ethylene Impurities (GC)

Column:	Carboxen 1004 micropacked, 2m x 1/16 in. stainless steel
Cat. No.:	12846
Column:	Carboxen 1006 PLOT, 30m x 0.53mm ID
Cat. No.:	25461
Oven:	165°C
Carrier:	helium, 22cm/sec (set at 35°C)
Det.:	FID, 230°C
Inj.:	10µL ethylene, direct, 230°C

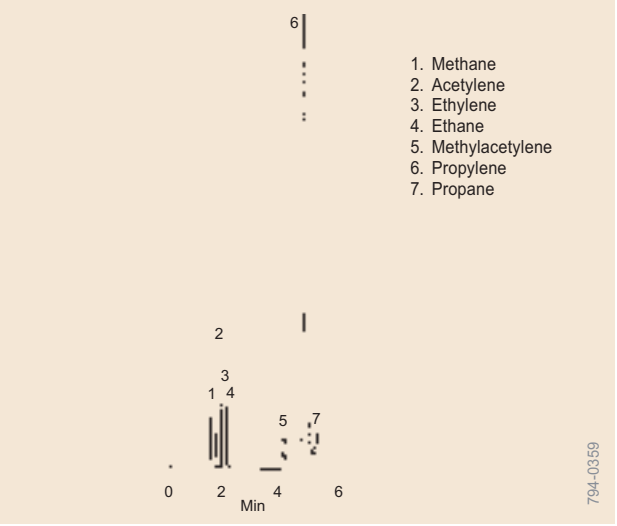
Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



1. Isobutane
2. n-Butane
3. Isopentane
4. n-Pentane
5. 2,3-Dimethylbutane
6. 2-Methylpentane
7. 3-Methylpentane
8. n-Hexane
9. 2,4-Dimethylpentane
10. Benzene
11. 2-Methylhexane
12. 3-Methylhexane
13. 2,2,4-Trimethylpentane
14. n-Heptane
15. 2,5-Dimethylhexane
16. 2,4-Dimethylhexane
17. 2,3,4-Trimethylpentane
18. Toluene
19. 2,3-Dimethylhexane
20. Ethylbenzene
21. m-Xylene
22. p-Xylene
23. o-Xylene
24. 1-Methyl-3-ethylbenzene
25. 1,3,5-Trimethylbenzene
26. 1,2,4-Trimethylbenzene
27. 1,2,3-Trimethylbenzene
28. Naphthalene
29. 2-Methylnaphthalene
30. 1-Methylnaphthalene
31. Dimethylnaphthalenes

Gasoline (GC)

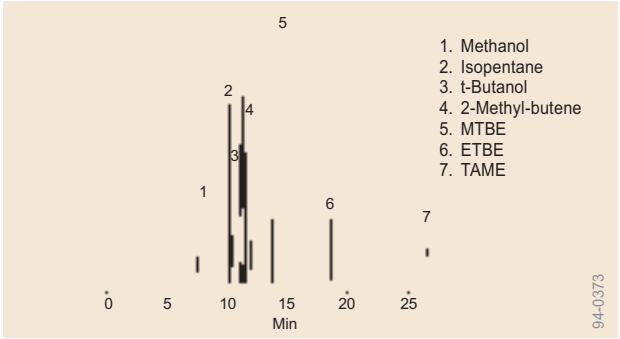
Column: Petrocol DH, 100m x 0.25mm ID, 0.5µm film
Cat. No.: 24160-U
Oven: 35°C (15 min) to 200°C at 2°C/min, hold 5 min
Carrier: helium, 20cm/sec (set at 35°C)
Det.: FID, 250°C
Inj.: 0.1µL premium unleaded gasoline, split 100:1, 250°C



1. Methane
2. Acetylene
3. Ethylene
4. Ethane
5. Methylacetylene
6. Propylene
7. Propane

Propylene Impurities (GC)

Column: Carboxen 1006 PLOT, 30m x 0.32mm ID
Cat. No.: 24241-U
Oven: 200°C (4 min) to 250°C at 24°C/min
Carrier: helium, 76cm/sec (set at 200°C)
Det.: FID, 230°C
Inj.: 20µL propylene, approx. 1% each contaminant, direct, 230°C



1. Methanol
2. Isopentane
3. t-Butanol
4. 2-Methyl-butene
5. MTBE
6. ETBE
7. TAME

MTBE Contaminants (GC)

Column: Petrocol DH Octyl, 100m x 0.25mm ID, 0.50µm film
Cat. No.: 24282
Oven: 35°C (15 min) to 200°C at 1°C/min, hold 15 min
Carrier: helium, 24cm/sec (set at 35°C)
Det.: FID, 250°C
Inj.: 0.1µL split (215:1), 250°C

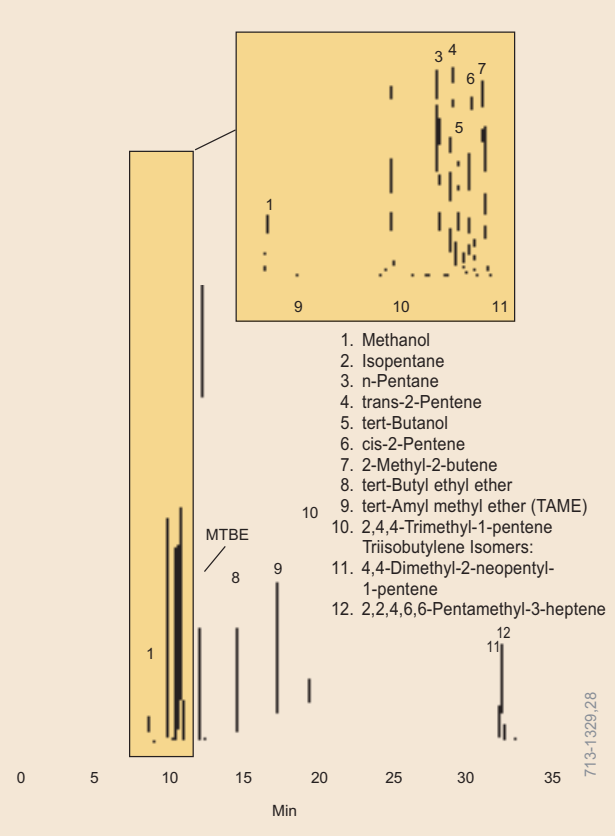
Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Gas Chromatography

SUPELCO

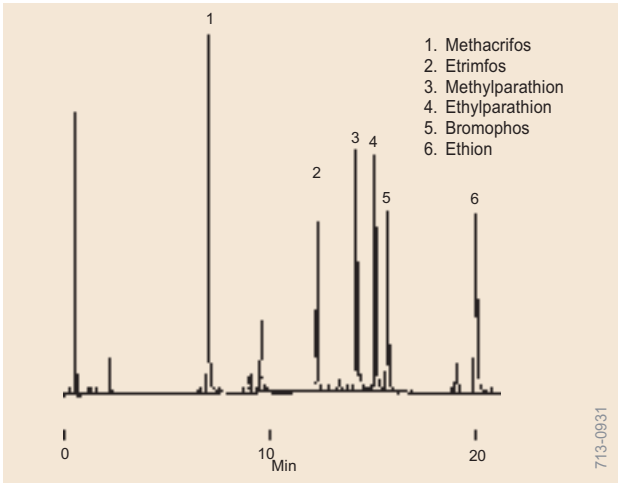
GC Applications

Hydrocarbons, Free Acids, Pesticides



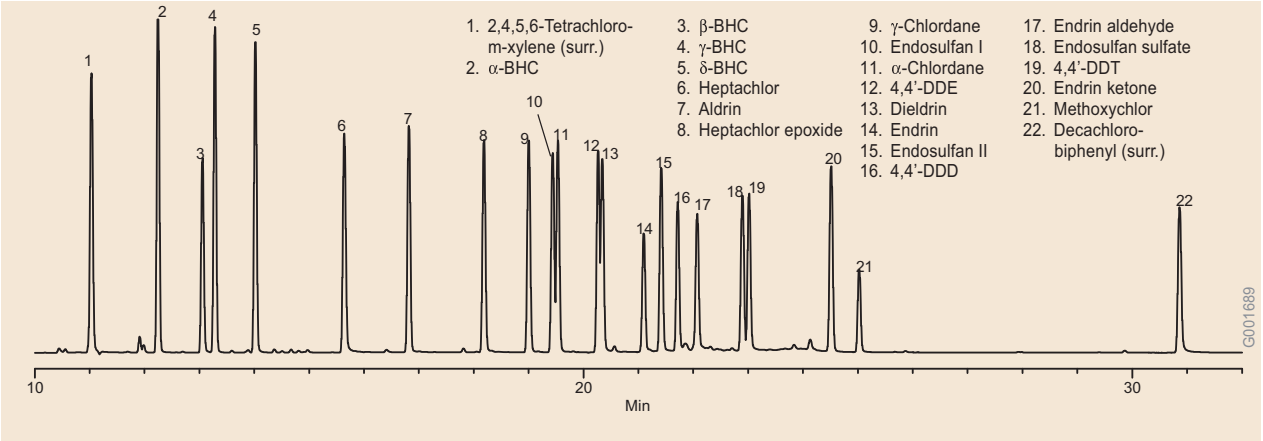
MTBE Contaminants (GC)

Column: Petrocol DH, 100m x 0.25mm ID, 0.50µm film
Cat. No.: 24160-U
Oven: 50°C (13 min) to 180°C at 10°C/min
Carrier: helium, 20cm/sec; vent flow 140mL/min (set at 35°C)
Det.: FID (310°C)
Inj.: 1µL MTBE containing 1% each analyte (MTBE Contaminants Mix A, Cat. No. 47942) split (200:1) (250°C)



Organophosphorus Pesticides (GC)

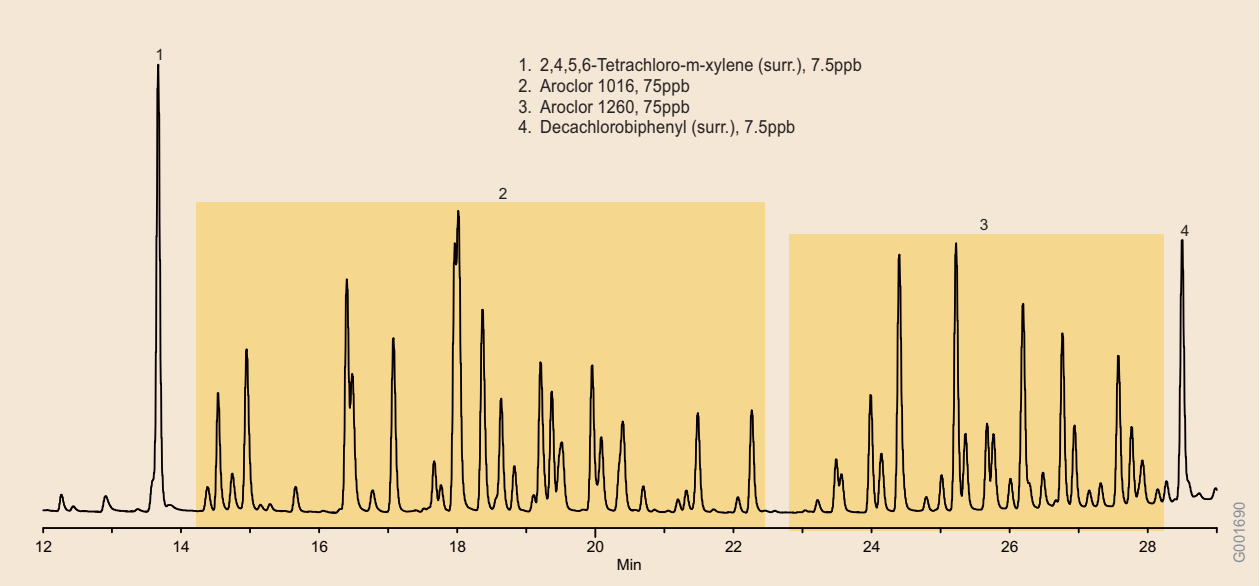
Column: SPB-608, 30m x 0.53mm ID, 0.5µm film
Cat. No.: 25312
Oven: 125°C (0.5 min) to 230°C at 6°C/min, hold 2 min, to 245°C at 3°C/min
Carrier: helium, 8mL/min
Det.: FPD, 280°C
Inj.: 1µg/mL each component, direct injection



US EPA Method 8081 Chlorinated Pesticides (GC)

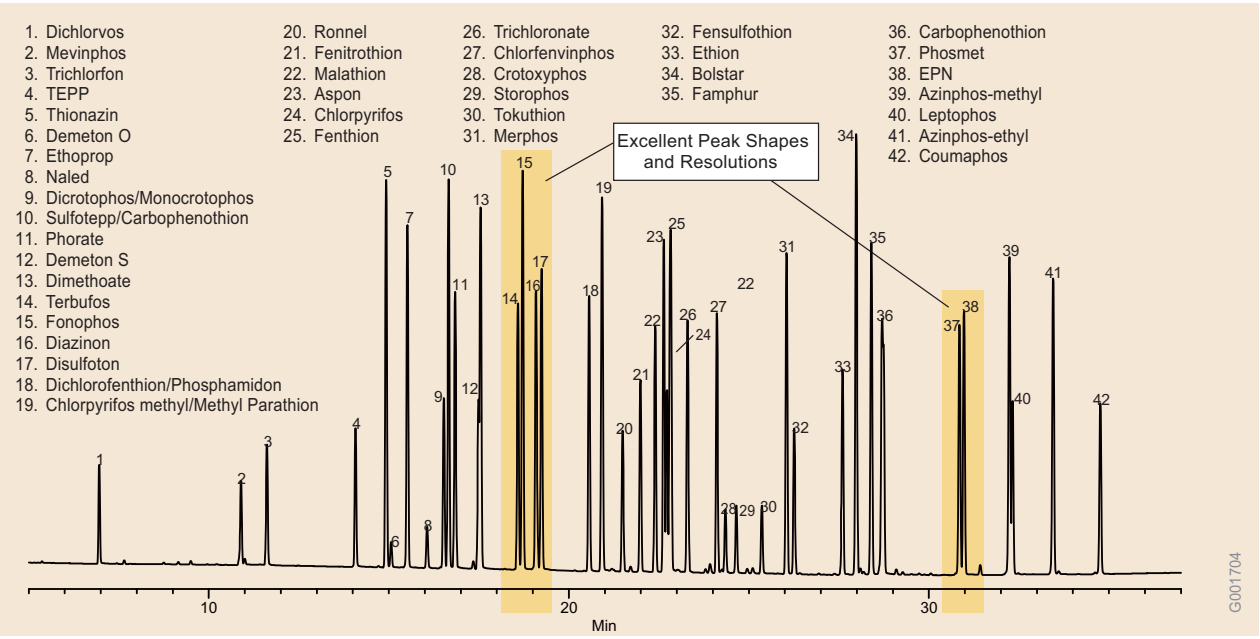
Column: Equity-5, 30m x 0.25mm ID, 0.25µm
Cat. No.: 28089-U
Oven: 100°C (2 min) to 160°C @ 15°C/min to 300°C @ 5°C/min (10 min)
Inj.: 225°C
Det.: ECD, 310°C
Flow: Helium, 30cm/sec @ 100°C
Injection: 2.0µL, splitless (0.5 min)
Liner: Splitless double taper, unpacked
Sample: 50ppb of a 22 component chlorinated pesticide standard (Cat. No. 46845-U)

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



US EPA Method 8082 Polychlorinated Biphenyls (GC)

Column: Equity-5, 30m x 0.25mm ID, 0.25µm
Cat. No.: 28089-U
Oven: 100°C (2 min) to 160°C @ 15°C/min to 300°C @ 5°C/min (10 min)
Inj.: 225°C
Det.: ECD, 310°C
Flow: Helium, 30cm/sec. @ 100°C
Injection: 2.0µL, splitless (0.5 min)
Liner: Splitless double taper, unpacked
Sample: Aroclor Mix 1 standard at 75ppb with surrogates at 7.5ppb (Cat. No. 46846-U)

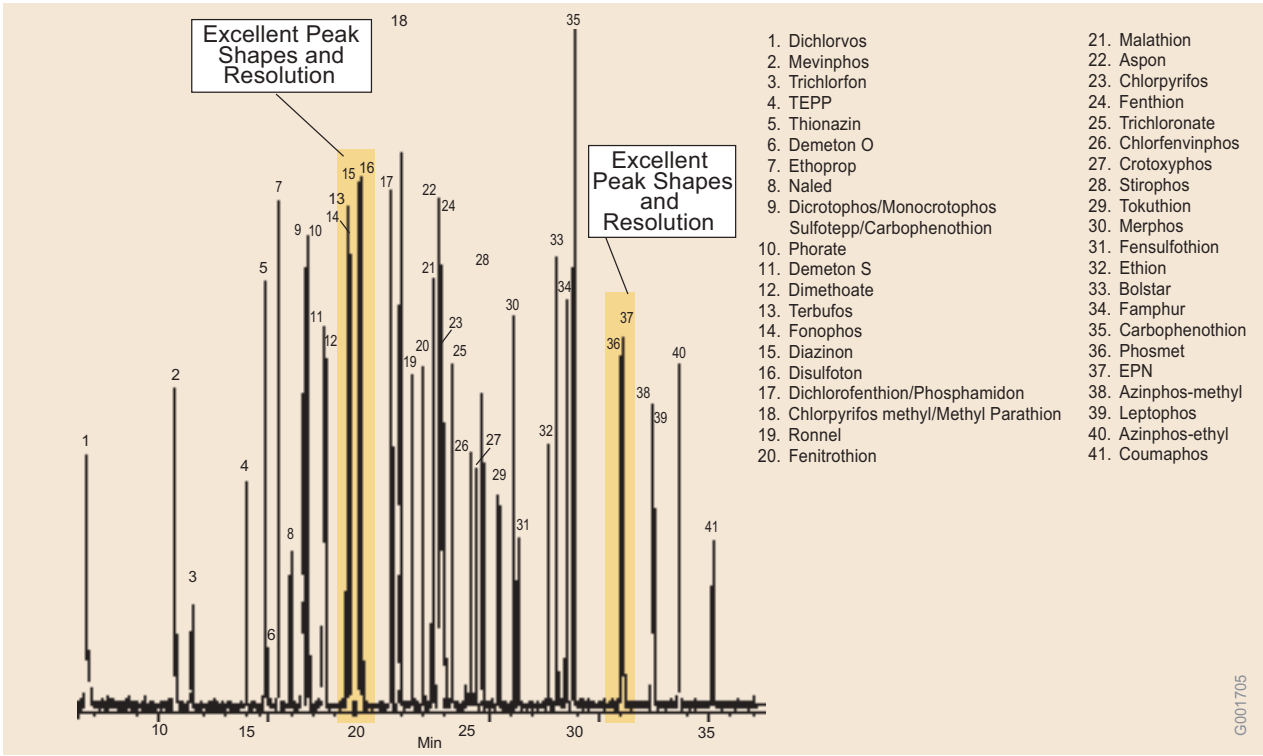


US EPA Method 8141 Organophosphorus Pesticides (GC)

Column: Equity-5, 30m x 0.25mm ID, 0.25µm
Cat. No.: 28089-U
Oven: 120°C (3 min) to 300°C @ 5°C/min
Inj.: 250°C
Det.: NPD, 320°C
Flow: Helium, 25cm/sec @ 120°C
Injection: 1.0uL, splitless (0.5 min)
Liner: Splitless, double taper
Sample: 40ng on-column of a custom organophosphorus pesticides mix

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco
Gas Chromatography
SUPELCO

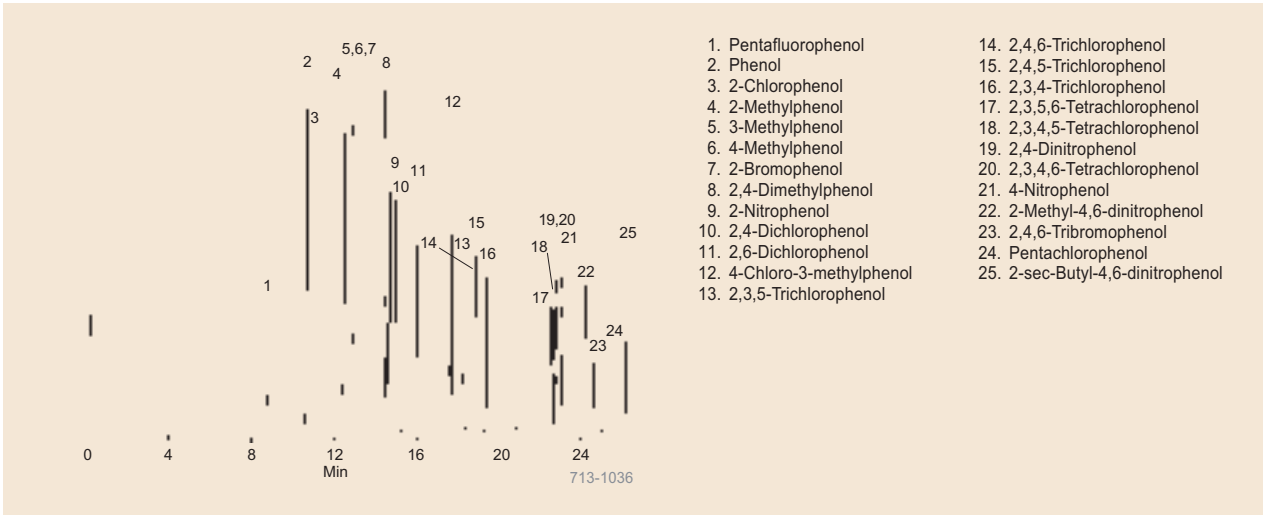
GC Applications
Pesticides, Phenols



1. Dichlorvos
2. Mevinphos
3. Trichlorfon
4. TEPP
5. Thionazin
6. Demeton O
7. Ethoprop
8. Naled
9. Dicrotophos/Monocrotophos Sulfotepp/Carbophenothion
10. Phorate
11. Demeton S
12. Dimethoate
13. Terbufos
14. Fonophos
15. Diazinon
16. Disulfoton
17. Dichlorofenthion/Phosphamidon
18. Chlorpyrifos methyl/Methyl Parathion
19. Ronnel
20. Fenitrothion
21. Malathion
22. Aspon
23. Chlorpyrifos
24. Fenthion
25. Trichloronate
26. Chlorfenvinphos
27. Crotoxyphos
28. Stirophos
29. Tokuthion
30. Merphos
31. Fensulfothion
32. Ethion
33. Bolstar
34. Famphur
35. Carbophenothion
36. Phosmet
37. EPN
38. Azinphos-methyl
39. Leptophos
40. Azinphos-ethyl
41. Coumaphos

US EPA Method 8141 Organophosphorus Pesticides (GC/MS)

Column: Equity-5, 30m x 0.25mm ID, 0.25µm
Cat. No.: 28089-U
Oven: 120°C (3 min) to 270°C @ 5ºC/min
Inj.: 250°C
Det.: MSD, Scan range 45-450 amu, 325°C transfer line
Flow: Helium, 30cm/sec @ 120ºC
Injection: 1.0uL, splitless (0.3 min)
Liner: Splitless, double taper
Sample: 40ng on-column of a custom organophosphorus pesticides mix

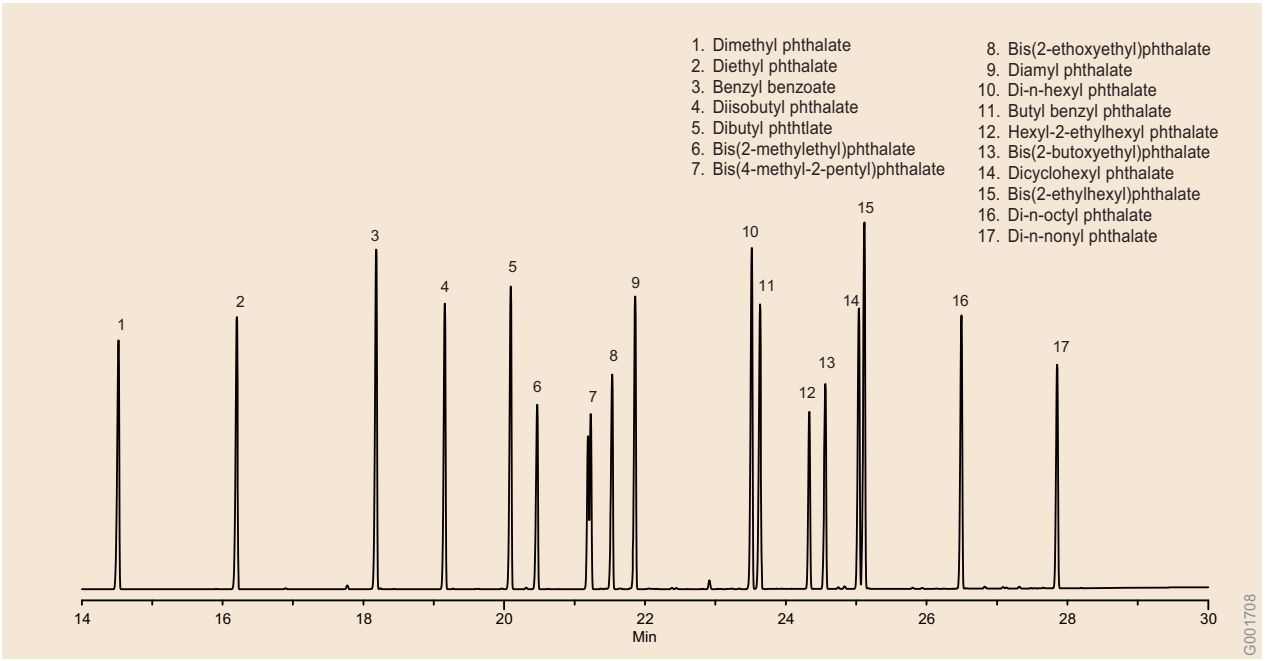


1. Pentafluorophenol
2. Phenol
3. 2-Chlorophenol
4. 2-Methylphenol
5. 3-Methylphenol
6. 4-Methylphenol
7. 2-Bromophenol
8. 2,4-Dimethylphenol
9. 2-Nitrophenol
10. 2,4-Dichlorophenol
11. 2,6-Dichlorophenol
12. 4-Chloro-3-methylphenol
13. 2,3,5-Trichlorophenol
14. 2,4,6-Trichlorophenol
15. 2,4,5-Trichlorophenol
16. 2,3,4-Trichlorophenol
17. 2,3,5,6-Tetrachlorophenol
18. 2,3,4,5-Tetrachlorophenol
19. 2,4-Dinitrophenol
20. 2,3,4,6-Tetrachlorophenol
21. 4-Nitrophenol
22. 2-Methyl-4,6-dinitrophenol
23. 2,4,6-Tribromophenol
24. Pentachlorophenol
25. 2-sec-Butyl-4,6-dinitrophenol

Phenols by US EPA Method 8040 (GC)

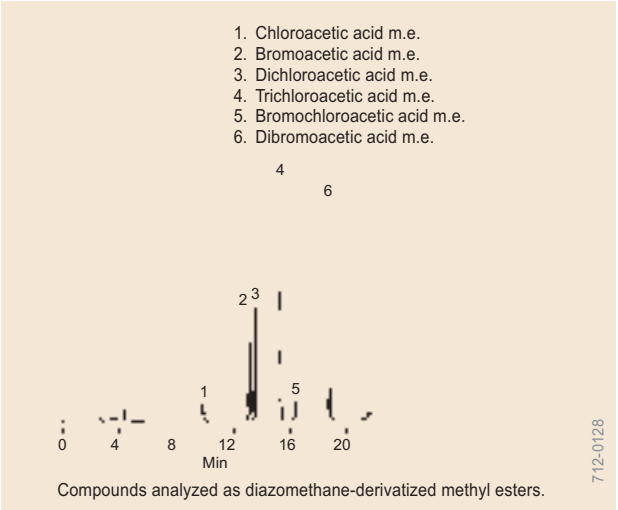
Column: SPB-608, 30m x 0.53mm ID, 0.5µm film
Cat. No.: 25312
Oven: 40°C (4 min) to 250°C at 8°C/min
Carrier: helium, 30cm/sec (set at 120°C)
Det.: FID, 275°C
Inj.: 1µL (200µg/mL each analyte in propanol), split 100:1

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



Phthalate Esters (GC)

Column: Equity-5, 30m x 0.25mm ID, 0.25µm
Cat. No.: 28089-U
Oven: 40°C (1 min) to 325°C @ 10ºC/min
Inj.: 250°C
Det.: FID, 325°C
Flow: Helium, Constant flow, 1.3mL/sec @ 40ºC
Injection: 1.0uL, splitless (0.75 min)
Liner: Splitless, 4mm ID single taper
Sample: 50ng on-column of a custom phthalate ester mix



Compounds analyzed as diazomethane-derivatized methyl esters.

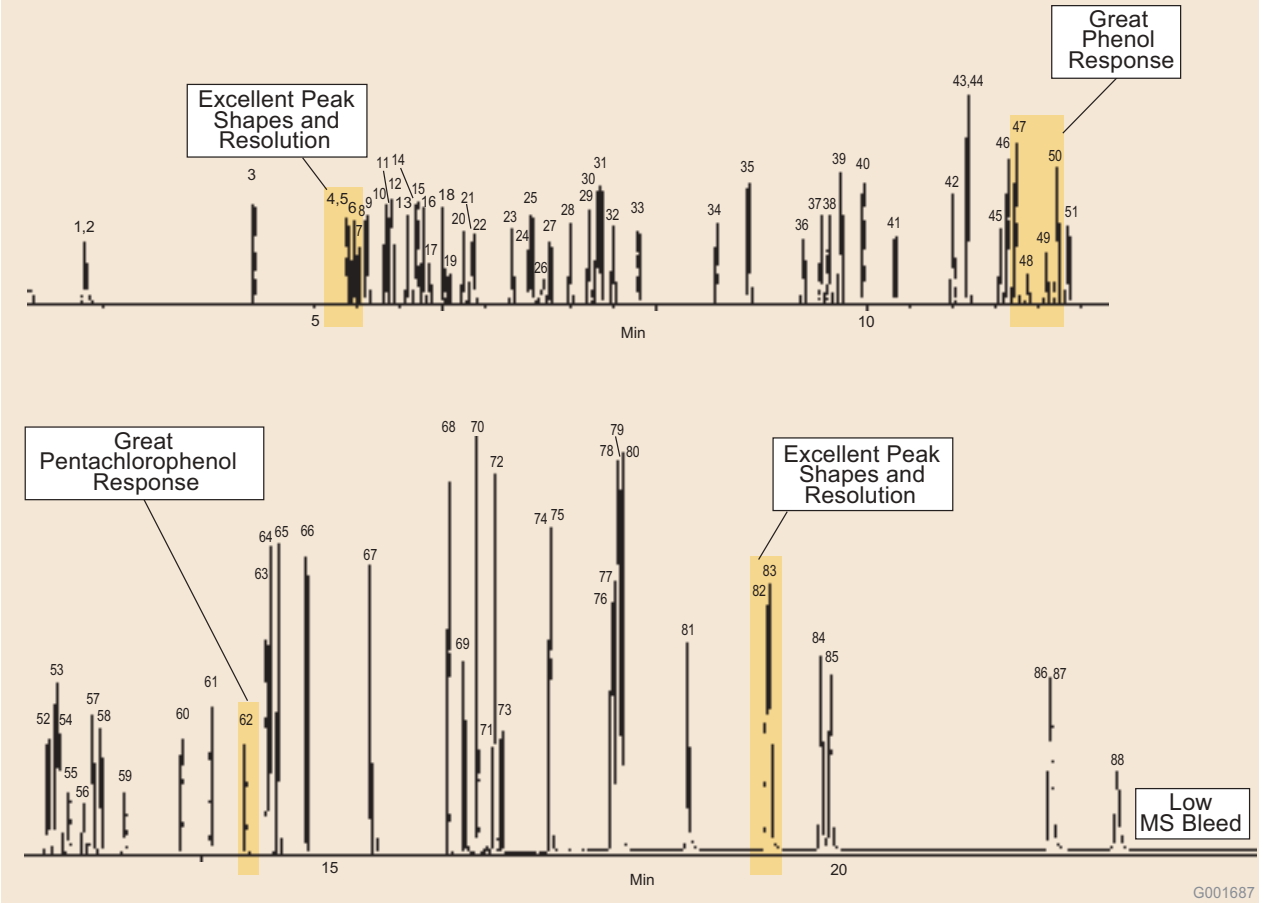
Haloacetic Acid Methyl Esters by US EPA Method 552 (GC)

Column: SPB-1701, 30m x 0.32mm ID, 0.25µm film
Cat. No.: 24184
Oven: 50°C (10 min) to 120°C at 10°C/min, hold 3 min
Carrier: helium, 25cm/sec
Det.: ECD, 300°C
Inj.: 1µL MTBE (20ng/mL bromochloroacetic acid, all others 200ng/mL each), splitless, 200°C

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco
Gas Chromatography
SUPELCO

GC Applications
Semivolatiles

1. Pyridine
2. N-nitrosodimethylamine
3. 2-Fluorophenol (Surr.)
4. Phenol-d6 (Surr.)
5. Phenol
6. Aniline
7. Bis(2-chloroethyl)ether
8. 2-Chlorophenol-d4 (Surr.)
9. 2-Chlorophenol
10. 1,3-Dichlorobenzene
11. 1,4-Dichlorobenzene-d4 (Int. Std.)
12. 1,4-Dichlorobenzene
13. Benzyl alcohol
14. 1,2-Dichlorobenzene-d4 (Surr.)
15. 1,2-Dichlorobenzene
16. 2-Methylphenol
17. Bis(2-chloroisopropyl)ether
18. 4-Methylphenol
19. N-Nitroso-di-n-propylamine
20. Hexachloroethane
21. Nitrobenzene-d5 (Surr.)
22. Nitrobenzene
23. Isophorone
24. 2-Nitrophenol
25. 2,4-Dimethylphenol
26. bis(2-Chloroethoxy)methane
27. Benzoic Acid
28. 2,4-Dichlorophenol
29. 1,2,4-Trichlorobenzene
30. Naphthalene-d8 (Int. Std.)
31. Naphthalene
32. 4-Chloroaniline
33. Hexachlorobutadiene
34. 4-Chloro-3-methylphenol
35. 2-Methylnaphthalene
36. Hexachlorocyclopentadiene
37. 2,4,6-Trichlorophenol
38. 2,4,5-Trichlorophenol
39. 2-Fluorobiphenyl (Surr.)
40. 2-Chloronaphthalene
41. 2-Nitroaniline
42. Dimethyl phthalate
43. Acenaphthylene
44. 2,6-Dinitrotoluene
45. 3-Nitroaniline
46. Acenapthene-d10 (Int. Std.)
47. Acenaphthene
48. 2,4-Dinitrophenol
49. 4-Nitrophenol
50. Dibenzofuran
51. 2,4-Dinitrotoluene
52. Diethyl phthalate
53. Fluorene
54. 4-Chlorophenyl phenyl ether
55. 4-Nitroaniline
56. 2-Methyl-4,6-dinitrophenol
57. N-nitrosodiphenylamine
58. Azobenzene
59. 2,4,6-Tribromophenol (Surr.)
60. 4-Bromophenyl phenyl ether
61. Hexachlorobenzene
62. Pentachlorophenol
63. Phenanthrene-d10 (Int. Std.)
64. Phenanthrene
65. Anthracene
66. Carbazole
67. Di-n-butyl phthalate
68. Fluoranthene
69. Benzidine
70. Pyrene
71. Aramite#1
72. Terphenyl-d14 (Surr.)
73. Aramite#2
74. 3,3'-Dimethylbenzidine
75. Butylbenzyl phthalate
76. 3,3'-Dichlorobenzidine
77. Bis(2-ethylhexyl) phthalate
78. Benzo(a)anthracene
79. Chrysene-d12 (Int. Std.)
80. Chrysene
81. Di-n-octyl phthalate
82. Benzo(b)fluoranthene
83. Benzo(k)fluoranthene
84. Benzo(a)pyrene
85. Perylene-d12 (Int. Std.)
86. Indeno(1,2,3-cd)pyrene
87. Dibenz(a,h)anthracene
88. Benzo(g,h,i)perylene

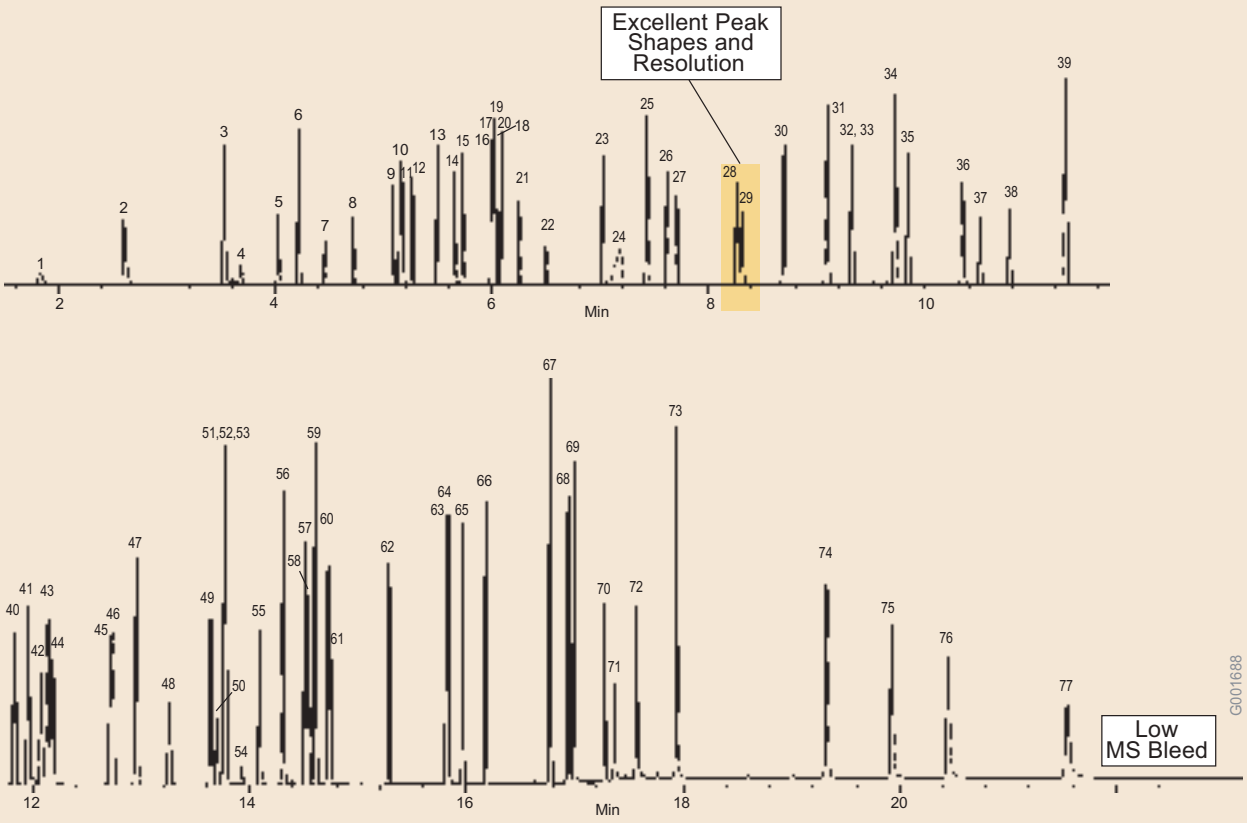


US EPA Method 8270 Semivolatile Compounds (GC/MS), Primary Analyte List

Column: Equity-5, 30m x 0.25mm ID, 0.5µm
Cat. No.: 28092-U
Oven: 40°C (2 min) to 100°C @ 50°C/min to 200°C @ 10°C/min to 325°C @ 30°C/min (7.5 min)
Inj.: 280°C
Det.: 5973 MSD, Scan range 45-450 amu, 325°C transfer line
Flow: Pressure programmed, 20psi (0.0 min), ramp to 80psi (0.0 min), ramp to 16.5psi (3 min),ramp to 25psi (hold for remainder o f run)
Injection: 1.0µL, splitless (0.61 min)
Liner: Single taper, unpacked
Sample: 50ng on-column of a 74 component semivolatile standard, 6 internal standards, and 8 surrogates

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

1. 1,4-Dioxane
2. Pyridine
3. 2-Picoline
4. N-Nitroso-methylethylamine
5. Methyl Methanesulfonate
6. 2-Fluorophenol (surr)
7. N-Nitrosodiethylamine
8. Ethyl Methanesulfonate
9. Phenol-d6 (surr)
10. Aniline
11. Pentachloroethane
12. 2-Chlorophenol-d4 (surr)
13. 1,4-Dichlorobenzene-d4 (internal std.)
14. Benzyl alcohol
15. 1,2-Dichlorobenzene-d4 (surr)
16. 3-Methylphenol
17. N-Nitrosopyrrolidine
18. Acetophenone
19. N-Nitrosomorpholine
20. o-Toluidine
21. Nitrbenzene-d5 (surr)
22. N-Nitrosopiperidine
23. o,o,o-Triethylphosphorothioate
24. α,α-Dimethylphenethylamine
25. Naphthalene-d8 (internal std.)
26. 2,6-Dichlorophenol
27. Hexachloropropene-1
28. Phenylenediamine
29. N-Nitrosodibutylamine
30. Safrole
31. 1-Methylnaphthalene
32. 1,2,4,5-Tetrachlorobenzene
33. Isosafrole
34. 2-Fluorobiphenyl (surr)
35. Isosafrole-2
36. 1,4-Naphthoquinone
37. 1,3-Dinitrobenzene
38. 1,4-dinitrobenzene
39. Acenaphthene-d10
40. Pentachlorobenzene
41. 1-Naphthylamine
42. 2,3,5,6-Tetrachlorophenol
43. 2-Naphthylamine
44. 2,3,4,6-Tetrachlorophenol
45. 5-Nitro-o-toluidine
46. Thionazin
47. Diphenylamine
48. 2,4,6-Tribromophenol (surr)
49. Sulfotep
50. 1,3,5-Trinitrobenzene
51. Diallate-1
52. Phorate
53. Phenacetin
54. Diallate-2
55. Dimethoate
56. 4-Aminobiphenyl
57. Pronamide
58. Pentachloronitrobenzene
59. Phenanthrene-d10 (internal std.)
60. Disulfoton
61. Dinoseb
62. Methyl Parathion
63. 4-Nitroquinoline-1-oxide
64. Parathion
65. Methapyrilene
66. Isodrin
67. p-Terphenyl-d14 (surr)
68. 4-Dimethylaminoazobenzene
69. Chlorobenzilate
70. Famphur
71. Kepone
72. 2-Acetylaminofluorene
73. Chrysene-d12 (internal std.)
74. 7,12,-Dimethylbenz(a)anthracene
75. Perylene-d12 (internal std.)
76. 3-Methylcholanthrene
77. Dibenzo(a,j)acridine



US EPA Method 8270 Semivolatile Compounds (GC/MS), Supplemental Appendix IX List

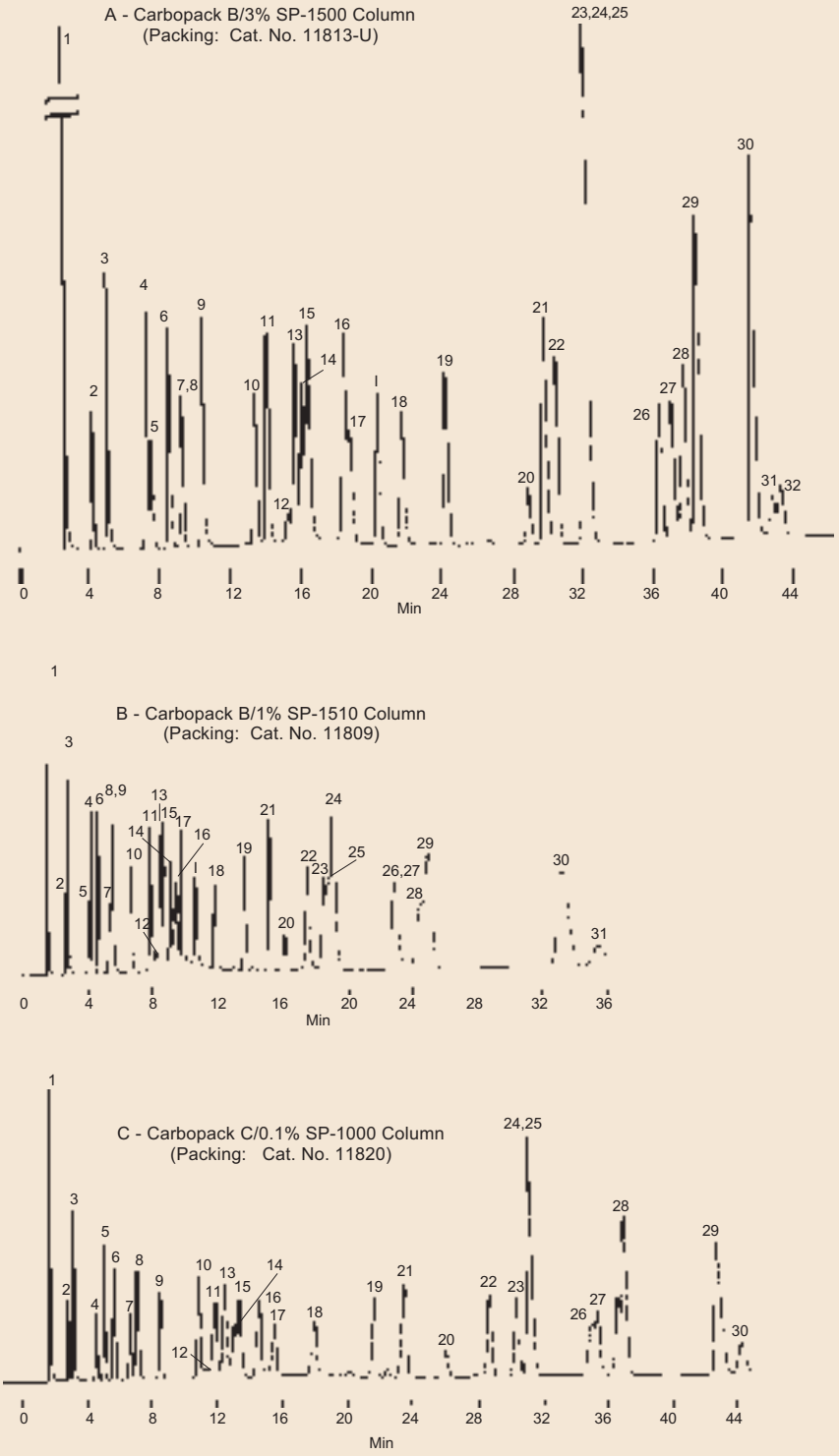
Column: Equity-5, 30m x 0.25mm ID, 0.5µm
Cat. No.: 28092-U
Oven: 40°C (2 min) to 100°C @ 50°C/min to 200°C @ 10°C/min to 325°C @ 30°C/min (7.5 min)
Inj.: 280°C
Det.: 5973 MSD, Scan range 45-450 amu, 325°C transfer line
Flow: Pressure programmed, 20psi (0.0 min), ramp to 80psi (0.0 min), ramp to 16.5psi (3 min), ramp to 25psi (hold for remainder of run)
Injection: 1.0µL, splitless (0.61 min)
Liner: Single taper, unpacked
Sample: 50ng on-column of a 62 component semivolatile standard, 6 internal standards, and 8 surrogates

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Gas Chromatography

SUPELCO

GC Applications
Solvents



1. Methanol
2. Methyl formate
3. Ethanol
4. Acetone
5. Methylene chloride
6. Isopropyl alcohol
7. Ethyl formate
8. Methyl acetate
9. n-Propyl alcohol
10. Tetrahydrofuran (THF)
11. Methyl ethyl ketone (MEK)
12. Methyl Cellosolve
13. sec-Butyl alcohol
14. Ethyl acetate
15. Isobutyl alcohol
16. 2-Nitropropane
17. n-Butyl alcohol
I Impurity
18. Ethyl Cellosolve
19. n-Propyl acetate
20. sec-Butyl acetate
21. Cyclohexanone
22. Isobutyl acetate
23. n-Butyl acetate
24. Toluene
25. Mesityl oxide
26. Cellosolve acetate
27. Butyl Cellosolve
28. Isoamyl acetate
29. Ethylbenzene
30. m-Xylene
31. p-Xylene
32. o-Xylene

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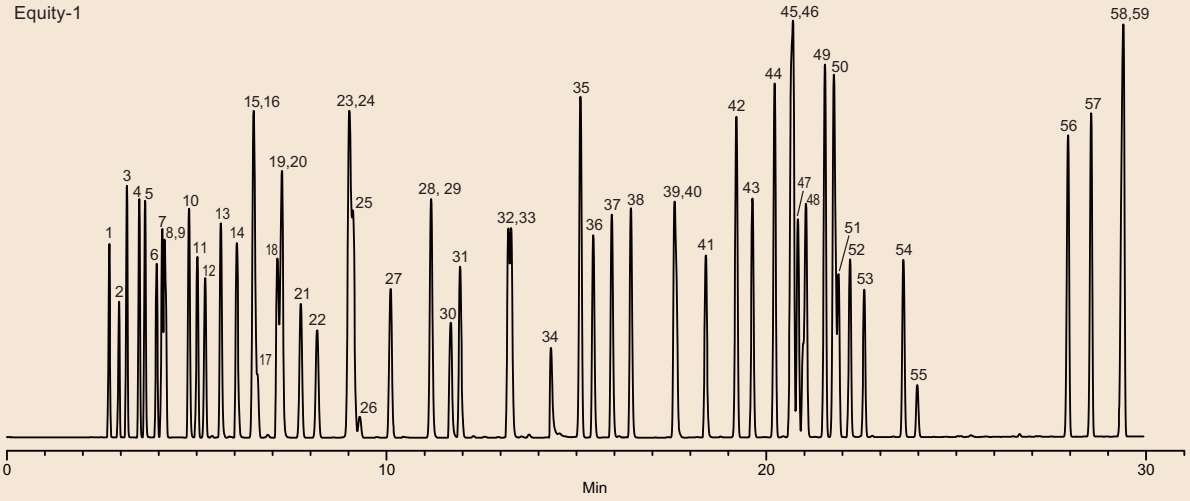
For more information, request Bulletin 816.

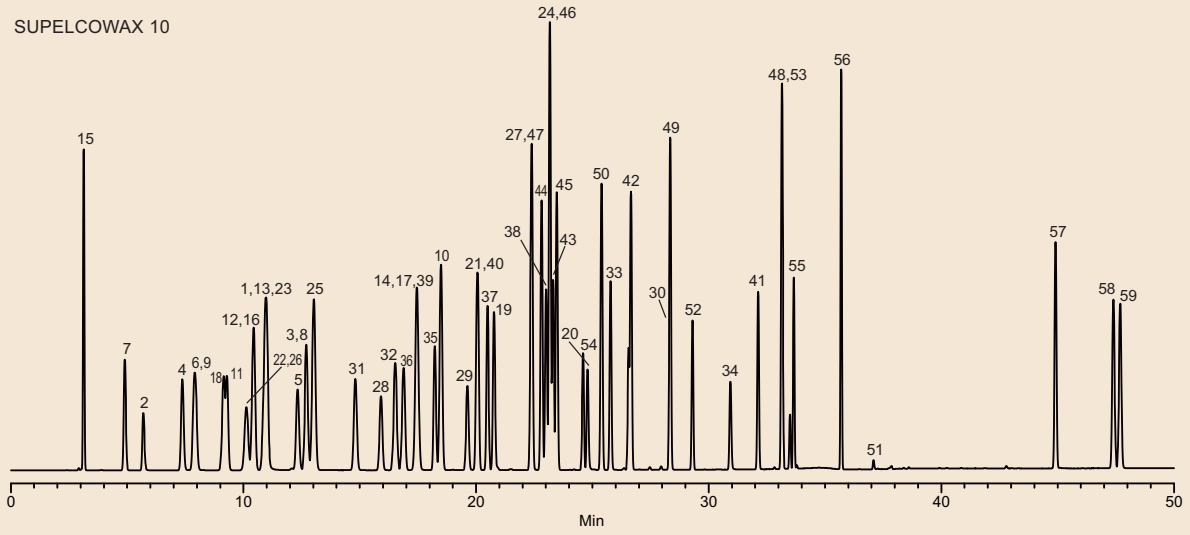
Industrial Solvents (GC)

Columns: 10' x 1/8" stainless steel
Oven: A & C - 70°C to 225°C at 4°C/min
B - 100°C to 225°C at 8°C/min
Carrier: nitrogen, 20mL/min
Det.: FID
Inj.: 0.3µL, 3% each component by volume (approx. 12µg each)

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

1. Methanol
2. Methyl formate
3. Ethanol
4. Acetone
5. 2-Propanol
6. Ethyl formate
7. 1,1-Dichloroethylene
8. Methylene chloride
9. Methyl acetate
10. 1-Propanol
11. trans-1,2-Dichloroethylene
12. 1,1-Dichloroethane
13. 2-Butanone
14. sec-Butanol
15. Hexane
16. Ethyl acetate
17. Chloroform
18. Tetrahydrofuran
19. Isobutanol
20. 2-Methoxyethanol
21. 1,2-Dichloroethane
22. 1,1,1-Trichloroethane
23. Isopropyl acetate
24. n-Butanol
25. Benzene
26. Carbon Tetrachloride
27. 2-Nitropropane
28. Trichloroethylene
29. 1,4-Dioxane
30. 2-Ethoxyethanol (cellosolve)
31. n-Propyl acetate
32. 4-Methyl-2-pentanone
33. Isoamyl alcohol
34. Dimethylformamide
35. Toluene
36. Isobutyl acetate
37. 2-Hexanone
38. Mesityl oxide
39. Tetrachloroethene
40. n-butyl acetate
41. Diacetone alcohol
42. Chlorobenzene
43. 5-Methyl-2-hexanone
44. Ethyl benzene
45. m-Xylene
46. p-Xylene
47. Isoamyl acetate
48. Cyclohexanol
49. Styrene
50. o-Xylene
51. 1,1,2,2-Tetrachloroethane
52. 2-Ethoxyethyl acetate
53. Butyl cellosolve
54. n-Amyl acetate
55. 2-Methylcyclohexanol
56. 1,2-Dichlorobenzene
57. 2-Methylphenol
58. 3-Methylphenol
59. 4-Methylphenol





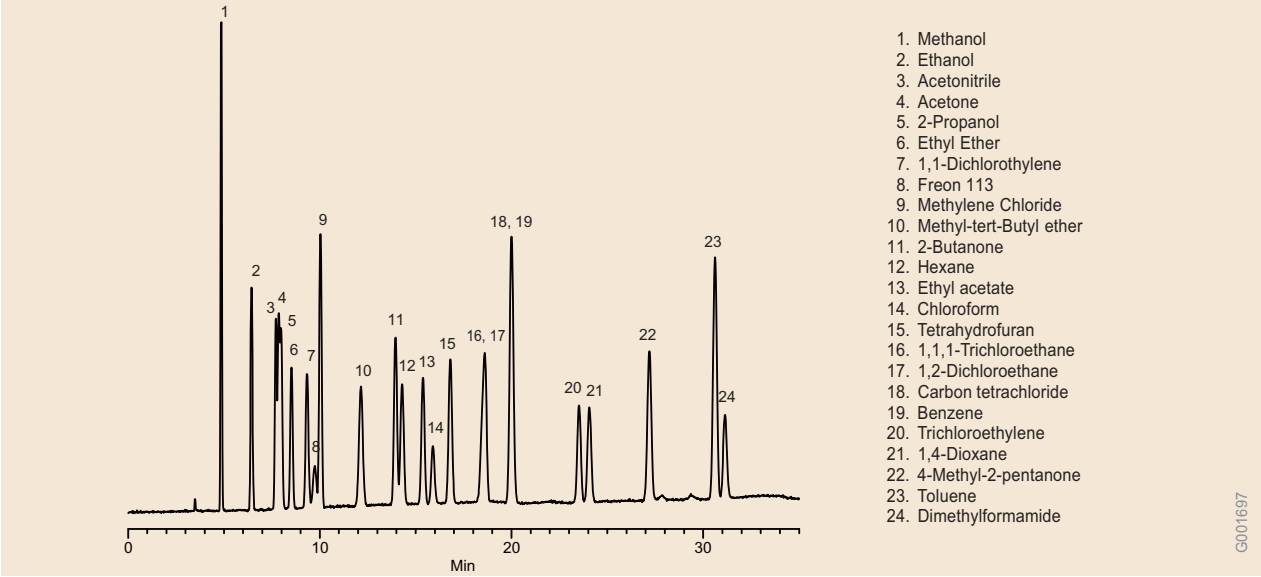
G001692, G001693

Industrial Solvents (GC)

Column 1:	Equity-1, 30m x 0.32mm ID, 1.0µm
Column 1 Cat. No.:	28057-U
Column 2:	SUPELCOWAX 10, 30m x 0.32mm ID, 1.0µm
Column 2 Cat. No.:	24211
Oven:	35°C (8 min) to 130°C @ 4°C/min. (2 min)
Inj.:	250°C
Det.:	FID, 250°C
Flow:	Helium, 25cm/sec constant @ 35°C
Injection:	0.5µL, split (200:1)
Liner:	Split, cup design
Sample:	0.5µL of a 59 component neat solvent mixture

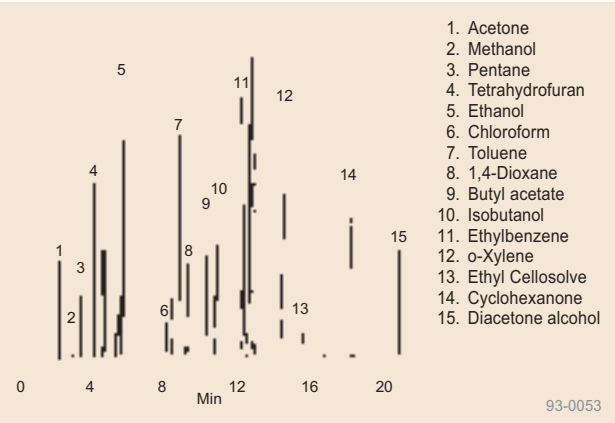
Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

GC Applications
Solvents, Sterols



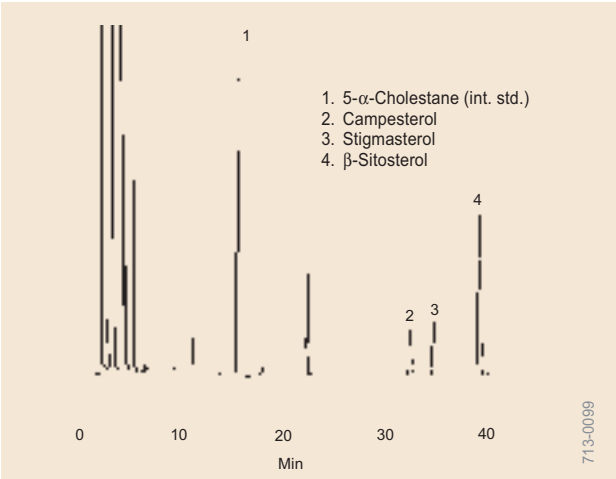
Residual Solvents (GC)

Column: Equity-5, 30m x 0.53mm ID, 5.0µm
Cat. No.: 28279-U
Oven: 40°C (6 min) to 100°C @ 2°C/min
Inj.: 225°C
Det.: FID, 250°C
Flow: Helium, 20cm/sec @ 40°C
Injection: 1.0µL, split 10:1
Liner: Split, cup design
Sample: 5ng on-column of a 24 component solvent standard



Solvents (GC)

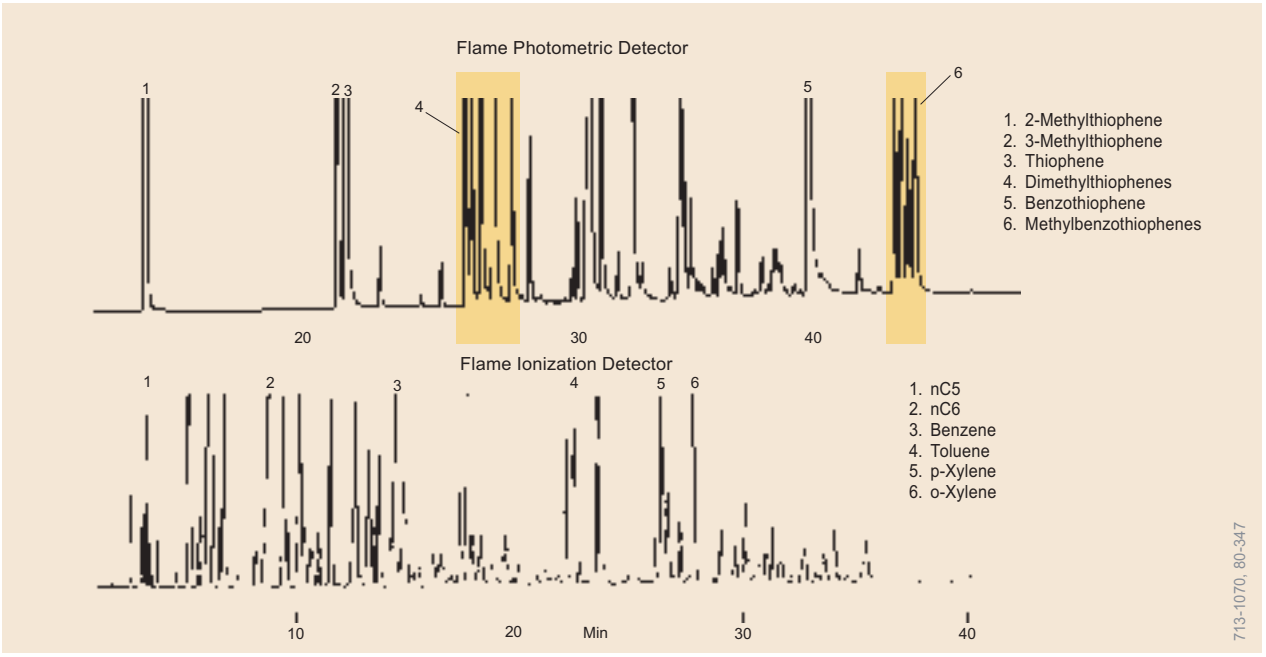
Column: PAG, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 24223
Oven: 30°C (4 min) to 200°C at 4°C/min, hold 4 min
Carrier: helium, 20cm/sec (set at 165°C),
Det.: FID (260°C)
Inj.: 0.1µL neat solvents mix, split 100:1, 250°C



Sterols (GC)

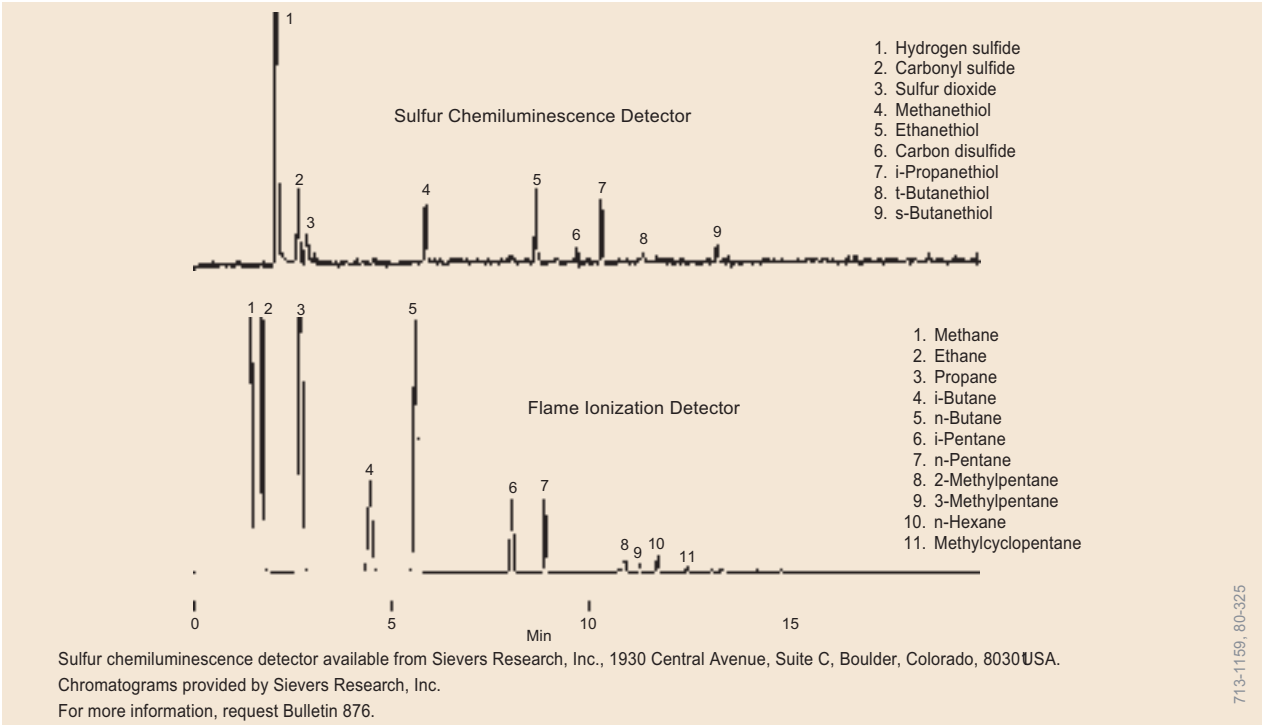
Column: SAC-5, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 24156
Oven.: 265°C
Carrier: helium, 20cm/sec (set at 265°C)
Det.: FID, 300°C
Inj.: 1µL soybean oil, split 100:1, 300°C

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Sulfur Compounds, C3-C12 Matrix: Commercial Gasoline (GC)

Column: SPB-1 SULFUR, 30m x 0.32mm ID, 4µm film
Cat. No.: 24158
Oven: -10°C (3 min) to 300°C at 10°C/min
Det.: FID/FPD
Inj.: 2.0µL liquid, split 10:1



Sulfur chemiluminescence detector available from Sievers Research, Inc., 1930 Central Avenue, Suite C, Boulder, Colorado, 80301 USA.
Chromatograms provided by Sievers Research, Inc.
For more information, request Bulletin 876.

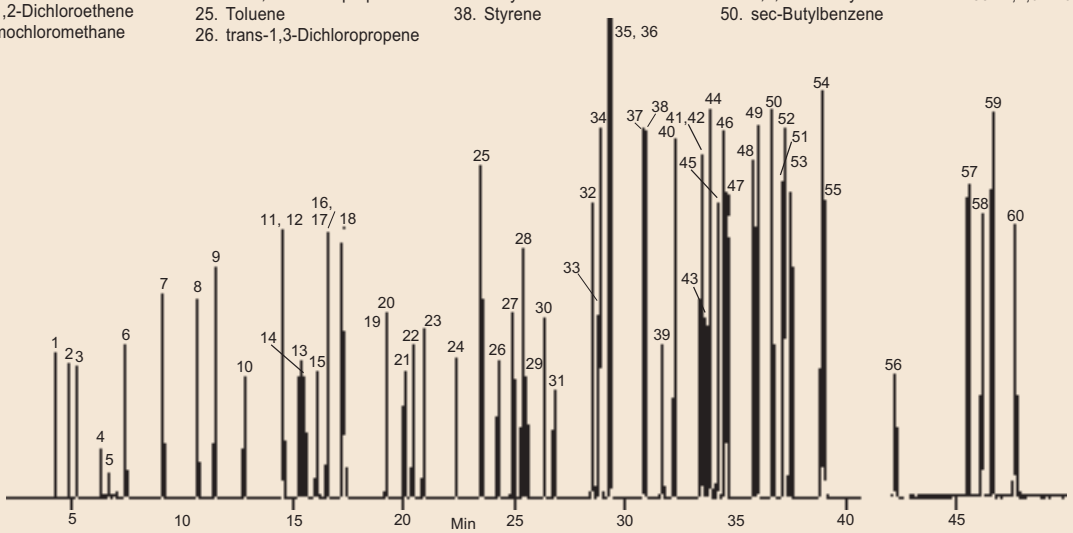
Sulfur Compounds, C1-C6 Matrix: Sour Natural Gas (GC)

Column: SPB-1 SULFUR, 30m x 0.32mm ID, 4µm film
Cat. No.: 24158
Oven: -10°C (3 min) to 300°C at 10°C/min
Det.: FID/SCD
Inj.: 2.0µL liquid, split 10:1

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

GC Applications
Volatiles

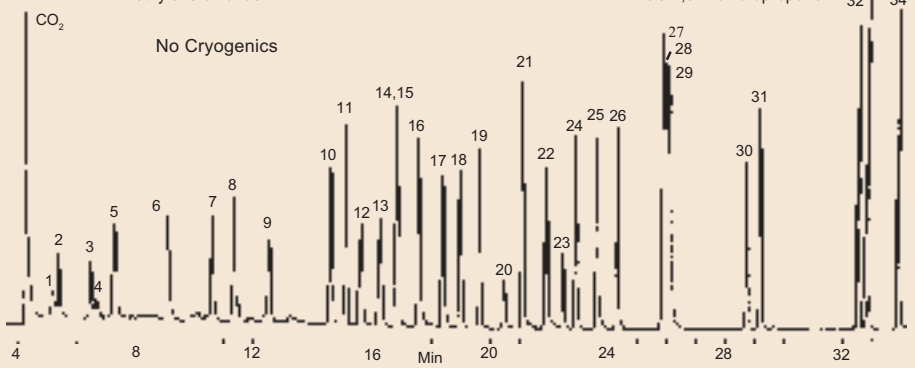
1. Dichlorodifluoromethane
2. Chloromethane
3. Vinyl chloride
4. Bromomethane
5. Chloroethane
6. Trichlorofluoromethane
7. 1,1-Dichloroethene
8. Methylene chloride
9. trans-1,2-Dichloroethene
10. 1,1-Dichloroethane
11. 2,2-Dichloropropane
12. cis-1,2-Dichloroethene
13. Bromochloromethane
14. Chloroform
15. 1,1,1-Trichloroethane
16. 1,1-Dichloropropene
17. Carbon tetrachloride
18. Benzene
19. 1,2-Dichloroethane
20. Trichloroethene
21. 1,2-Dichloropropane
22. Dibromomethane
23. Bromodichloromethane
24. cis-1,3-Dichloropropene
25. Toluene
26. trans-1,3-Dichloropropene
27. 1,1,2-Trichloroethane
28. Tetrachloroethene
29. 1,3-Dichloropropane
30. Dibromochloromethane
31. 1,2-Dibromoethane
32. Chlorobenzene
33. 1,1,1,2-Tetrachloroethane
34. Ethylbenzene
35. m-Xylene
36. p-Xylene
37. o-Xylene
38. Styrene
39. Bromoform
40. Isopropylbenzene
41. 1,1,2,2-Tetrachloroethane
42. Bromobenzene
43. 1,2,3-Trichloropropane
44. n-Propylbenzene
45. 2-Chlorotoluene
46. 1,2,3-Trimethylbenzene
47. 4-Chlorotoluene
48. tert-Butylbenzene
49. 1,2,4-Trimethylbenzene
50. sec-Butylbenzene
51. 1,3-Dichlorobenzene
52. p-Isopropyltoluene
53. 1,4-Dichlorobenzene
54. n-Butylbenzene
55. 1,2-Dichlorobenzene
56. 1,2-Dibromo-3-chloropropane
57. 1,2,4-Trichlorobenzene
58. Hexachlorobutadiene
59. Naphthalene
60. 1,2,3-Trichlorobenzene



Volatiles (GC)

Column: SPB-624, 60m x 0.25mm ID, 1.4µm film
Cat. No.: 24256
Oven: 35°C (4min) to 200°C at 4°C/min
Carrier: helium, 33cm/sec (set at 40°C)
Det.: MS (m/z = 45-300)
Inj.: Split (70:1), 250°C 5ng/component on column

1. Chloromethane
2. Vinyl chloride
3. Bromomethane
4. Chloroethane
5. Trichlorofluoromethane
6. 1,1-Dichloroethylene
7. Methylene chloride
8. trans-1,2-Dichloroethylene
9. 1,1,-Dichloroethane
10. Chloroform
11. Bromochloromethane (IS)
12. 1,1,1-Trichloroethane
13. Carbon tetrachloride
14. Benzene
15. 1,2-Dichloroethane
16. Difluorobenzene (IS)
17. Trichloroethylene
18. 1,2-Dichloropropane
19. Bromodichloromethane
20. 2-Chloroethyl vinyl ether
21. cis-1,3-Dichloropropene
22. Toluene
23. trans-1,3-Dichloropropene
24. 1,1,2-Trichloroethane
25. Tetrachloroethylene
26. Chlorodibromomethane
27. Chlorobenzene-d_6 (IS)
28. Chlorobenzene
29. Ethylbenzene
30. Bromoform
31. 1,1,2,2-Tetrachloroethane
32. 1,3-Dichlorobenzene
33. 1,4-Dichlorobenzene
34. 1,2-Dichlorobenzene

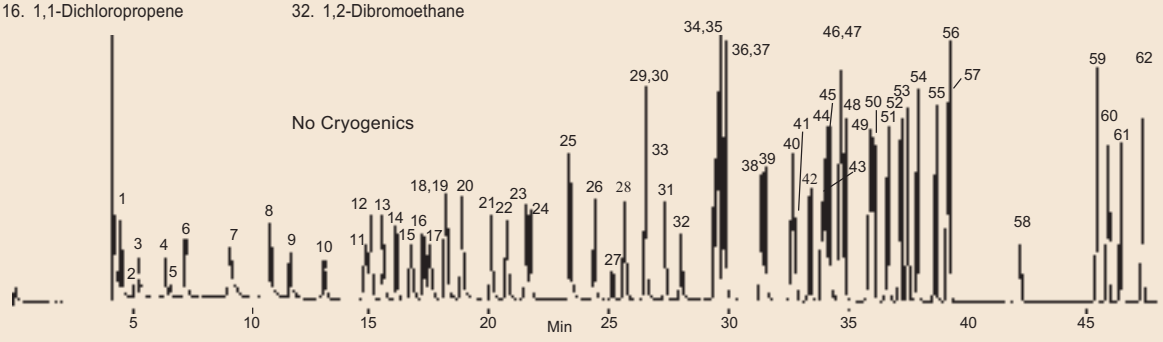


Volatile Compounds by US EPA Method 624 (PT/GC)

Sample: 20ppb each component in 5mL water
Trap: VOCARB 3000
Cat. No.: 21066-U
Purge: 11 min, 35mL/min
Dry Purge: 3 min
Desorb. Temp: 250°C for 4 min
Bake: 60°C for 10 min
Column: VOCOL, 105m x 0.53mm ID, 3.0µm film
Cat. No.: 25358
Oven: 35°C (4 min) to 200°C at 6°C/min
Carrier: helium, 7.5mL/min
Det.: MS, Scan Range m/z = 35-260 at 0.6 sec/scan

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

1. Dichlorodifluoromethane
2. Chloromethane
3. Vinyl chloride
4. Bromomethane
5. Chloroethane
6. Trichlorofluoromethane
7. 1,1-Dichloroethylene
8. Methylene chloride
9. trans-1,2-Dichloroethylene
10. 1,1,-Dichloroethane
11. 2,2-Dichloropropane
12. cis-1,2-Dichloroethylene
13. Chloroform
14. Bromochloromethane
15. 1,1,1-Trichloroethane
16. 1,1-Dichloropropene
17. Carbon tetrachloride
18. 1,2-Dichloroethane
19. Benzene
20. Fluorobenzene (int std)
21. Trichloroethylene
22. 1,2-Dichloropropane
23. Bromodichloromethane
24. Dibromomethane
25. cis-1,3-Dichloropropene
26. Toluene
27. trans-1,3-Dichloropropene
28. 1,1,2-Trichloroethane
29. 1,3-Dichloropropane
30. Tetrachloroethylene
31. Chlorodibromomethane
32. 1,2-Dibromoethane
33. Chlorobenzene
34. 1,1,1,2-Tetrachloroethane
35. Ethylbenzene
36. m-Xylene
37. p-Xylene
38. o-Xylene
39. Styrene
40. Isopropylbenzene
41. Bromoform
42. 1,1,2,2-Tetrachloroethane
43. 1,2,3-Trichloropropane
44. n-Propylbenzene
45. Bromobenzene
46. 1,3,5-Trimethylbenzene
47. 2-Chlorotoluene
48. 4-Chlorotoluene
49. tert-Butylbenzene
50. 1,2,4-Trimethylbenzene
51. sec-Butylbenzene
52. p-Isopropyltoluene
53. 1,3-Dichlorobenzene
54. 1,4-Dichlorobenzene
55. n-Butylbenzene
56. 1,2-Dichlorobenzene-d_4 (int std)
57. 1,2-Dichlorobenzene
58. 1,2-Dibromo-3-chloropropane
59. 1,2,4-Trichlorobenzene
60. Hexachlorobutadiene
61. Naphthalene
62. 1,2,3-Trichlorobenzene

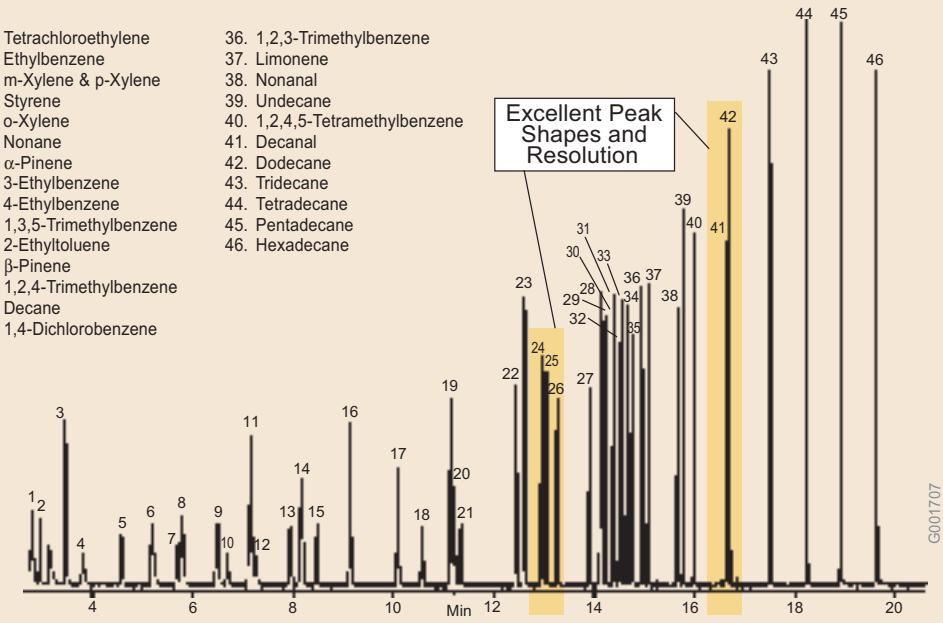


Volatile Compounds by US EPA Method 524.2 (PT/GC)

Sample: 10ppb each component in 5mL water
Trap: VOCARB 3000
Cat. No.: 21066-U
Purge: 11min, 40mL/min
Dry: 3 min
Desorb. Temp: 250°C for 4 min
Bake: 280°C for 10 min

Column: VOCOL, 105m x 0.53mm ID, 3.0µm film
Cat. No.: 25358
Oven: 35°C (10 min) to 200°C at 4°C/min, hold 10 min
Carrier: helium, 10mL/min
Det.: MS, Scan Range m/z = 35-260 at 0.6 sec/scan

1. Ethanol
2. Acetone
3. 2-Propanol
4. Methylene chloride
5. 1-Propanol
6. 2-Butanone
7. Hexane
8. Ethyl acetate & Chloroform
9. 1,2-Dichloroethane & 2,4-Dimethylpentane
10. 1,1,1-Trichloroethane
11. Benzene and 1-Butanol
12. Carbon tetrachloride
13. 1,2-Dichloropropane
14. Bromodichloromethane, Isooctane & Trichloroethene
15. Heptane
16. 4-Methyl-2-pentanone
17. Toluene
18. Chlorodibromomethane
19. n-Butyl acetate
20. Octane
21. Tetrachloroethylene
22. Ethylbenzene
23. m-Xylene & p-Xylene
24. Styrene
25. o-Xylene
26. Nonane
27. α-Pinene
28. 3-Ethylbenzene
29. 4-Ethylbenzene
30. 1,3,5-Trimethylbenzene
31. 2-Ethyltoluene
32. β-Pinene
33. 1,2,4-Trimethylbenzene
34. Decane
35. 1,4-Dichlorobenzene
36. 1,2,3-Trimethylbenzene
37. Limonene
38. Nonanal
39. Undecane
40. 1,2,4,5-Tetramethylbenzene
41. Decanal
42. Dodecane
43. Tridecane
44. Tetradecane
45. Pentadecane
46. Hexadecane



Indoor Air (GC/MS)

Column: Equity-1, 30m x 0.25mm ID, 1.0µm
Cat. No.: 28049-U
Oven: 35°C (3 min) to 100°C @ 8°C/min to 250°C @ 20°C/min (10 min)
Inj.: 250°C
Det.: MSD, Scan range 33-350 amu, 325°C transfer line
Flow: Helium, 30cm/sec @ 35°C
Injection: 1.0µL, split 10:1
Liner: Split, cup design
Sample: 100ng on-column of the Japanese Indoor Air Standards Mix (Cat. No. 47537-U)

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Gas Chromatography

SUPELCO

Did you know...

- SPME is an innovative, solvent free technology that is fast, economical, and versatile.
- SPME is a fiber coated with a liquid (polymer), a solid (sorbent), or a combination of both. The fiber coating removes the compounds from your sample by absorption in the case of liquid coatings or adsorption the case of solid coatings.
- SPME has gained widespread acceptance as the technique of preference for many applications.

Our experts can help you utiliz SPME technology to maximize t benefits for virtually any application.



Supelco services include...

- Custom Capabilities

If you have special needs beyond what is listed, please inquire about a custom order. We can honor many special requests for custom gauges, coatings, field samplers, etc.

- Available When You Need It
- Easy Ordering
- On-Time Delivery
- Superior Support

Solid Phase Microextraction

TechTip

Be sure to avoid overtightening GC injection port septa to avoid breaking or stripping the SPME fiber.

We recommend the use of... pre-drilled septa or a septumless injector system.



Solid Phase Microextraction

Getting Started in SPME 350
- Introduction to SPME 350

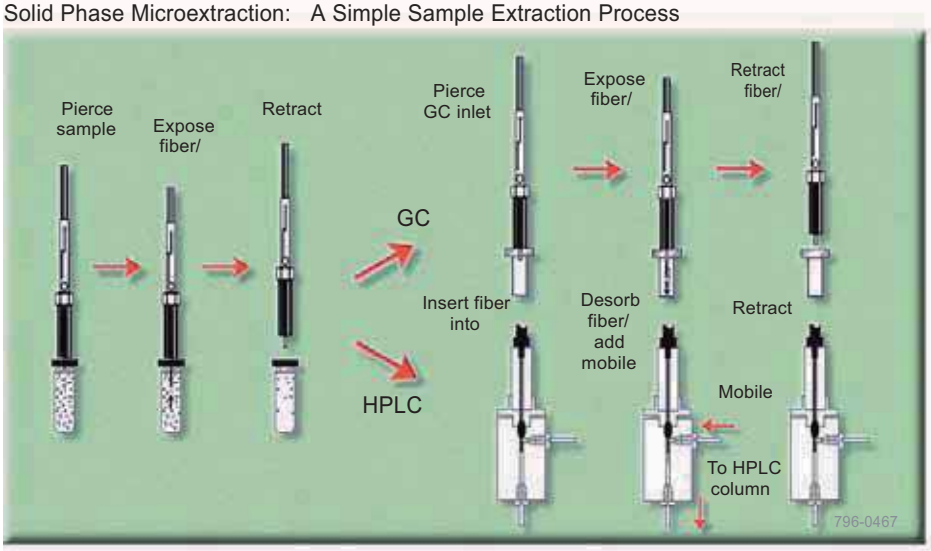
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Getting Started in SPME

Introduction to SPME

Solid Phase Microextraction: A Simple Sample Extraction Process



The extraction of organic compounds from a sample matrix usually consists of purge-and-trap or headspace methods for concentrating volatiles; and liquid-liquid extraction, solid phase extraction, or supercritical fluid extraction for semivolatiles and nonvolatiles. These methods have various drawbacks, including high cost and excessive preparation time. A unique sample preparation technique, SPME, eliminates most drawbacks to extracting organics.

SPME requires no solvents or complicated apparatus. It can concentrate volatile and nonvolatile compounds, in both liquid and gaseous samples, for analysis by GC, GC/MS, or HPLC.

SPME offers some important advantages:

- Fast – reduces sample preparation time by 70%
- Solvent reduction – minimizes the use of solvents, and their disposal
- Economical and reusable – more than 50 extractions per fiber on average
- Versatile – adapts to any GC or HPLC system, can be automated with Varian autosamplers

An SPME unit consists of a length of fused silica fiber coated with a polymer material, in some cases mixed with a solid adsorbent (e.g., a divinylbenzene polymer or porous carbon). The fiber is attached to a stainless steel plunger sheathed by a protective needle.

The SPME operating steps are simple:

Sample Extraction

- With the fiber retracted, pass the needle through the sample vial septum.
- Depress the plunger to expose the fiber to the liquid sample or the headspace above the sample.
- Analytes adsorb to the fiber in 2 to 30 minutes.
- Retract the fiber into the needle and remove the needle from the sample vial.

GC Analysis

- Insert the needle into the GC injector port.
- Depress the plunger, exposing the fiber in the heated zone of the injector to desorb the analytes onto the column.
- Retract the fiber and remove the needle.

HPLC Analysis

- Insert the needle into the SPME/HPLC interface desorption chamber (injection valve in load position).
- Expose the fiber and close the sealing clamp.
- Switch the injection valve to “inject.” Mobile phase will flow through the chamber, desorb the analytes and carry them to the c
- Switch the injection valve to “load,” retract the fiber, and remove the needle.

[1] US patent no. 5,691,206. European patent #0523092. Technology licensed exclusively to Supelco.



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Getting Started in SPME
Introduction to SPME

Choose a Fiber According to the Analytes You Want to Extract

In SPME, you can adsorb analytes from a liquid sample, by immersion or headspace extraction, or a solid sample, by headspace extraction, using a polymer-coated fused silica fiber. Analytes are desorbed from the fiber by exposing the fiber in the injection port of a GC or in the desorption chamber of an SPME/HPLC interface.

Determine the type of fiber you need according to the molecular weights and polarity of the analytes.

- Low molecular weight or volatile compounds usually require a 100µm polydimethylsiloxane (PDMS)-coated fiber.
- Larger molecular weight or semivolatile compounds are more effectively extracted with a 30µm PDMS fiber or a 7µm PDMS fiber.
- To extract very polar analytes from polar samples, use an 85µm polyacrylate-coated fiber.
- More volatile polar analytes, such as alcohols or amines, are adsorbed more efficiently and released faster with a 65µm polydimethylsiloxane/divinylbenzene (PDMS/DVB)-coated fiber.
- A 60µm PDMS/DVB fiber is a general purpose fiber for HPLC.
- For trace-level volatiles analysis, use a 75µm PDMS/Carboxen fiber.
- For an expanded range of analytes (C3-C20), use a 50/30 divinylbenzene/Carboxen on PDMS fiber.

Most of these fibers are compatible with HPLC solvents, but the 100µm, 30µm, and 7µmPDMS-coated fibers cannot be used with hexane.

SPME fiber holders are available in two versions, one for manual use and one for use with autosamplers or with our SPME/HPLC interface. Both versions include the following features:

- A handtight needle hub assembly for quick interchange of fibers.
- A window in the barrel, to identify the fiber by its color-coded hub.

The manual holder has an adjustable needle gauge that controls the depth of fiber introduction into the sample vial or injection port. A spring retracts the fiber into the protective needle and a locking mechanism secures the fiber in the exposed position during extraction or desorption.

The automated holder is similar in design to the manual version. The autosampler controls fiber movement, allowing automatic sample extraction.

The automated holder also is required for use with an SPME/HPLC interface.

A specialized type of manual SPME holder, the SPME portable sampler, allows you to concentrate organics from air or water, in the field, then store them for transport to the laboratory.

Some typical applications for SPME are:

- Surfactants, other industrial applications
- Headspace analysis of trace impurities in polymers and solid samples
- Environmental analyses of water samples
- Flavor analyses of food products
- Forensic analyses of arson/explosives samples
- Toxicology analyses: blood alcohol or drugs in urine/serum
- ppt odor analyses



SPME Products and Accessories
Fiber Assemblies and Holders

SPME Fiber Assemblies

SPME fiber assemblies can be reused for up to 100 analyses, or more, depending on the application and the care they are given. For reuse, simply condition with solvent or heat before and after every analysis. Each assembly has a color-coded or notched hub in the type of coating on the fiber. Choose the assembly that is appropriate for the holder: manual or autosampler/HPLC. Since SPME users must order both a holder and a fiber assembly.

SPME Fiber Assemblies (pk. of 3)

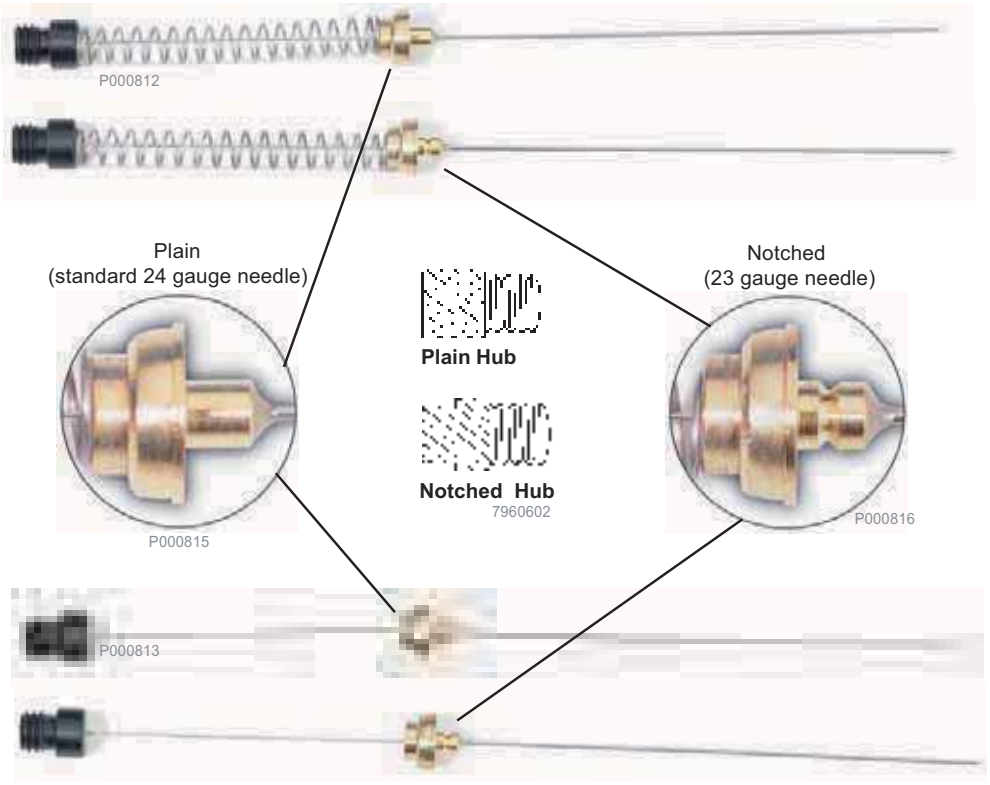
Fibers are 1cm long unless noted otherwise.

DESCRIPTION	FIBER GAUGE	MANUAL, USED WITH FIBER HOLDER 57330-U CAT. NO.	PRICE	AUTOMATIC/HPLC, USED WITH FIBER HOLDER 57331 OR 57347 CAT. NO.	PRICE
FOR GASES AND LOW MOLECULAR WEIGHT COMPOUNDS (MW 30-225)					
75µm Carboxen/polydimethylsiloxane [3]	24	57318		57319	
75µm Carboxen/polydimethylsiloxane [3]	23[4]	57344-U		57343-U	
85µm Carboxen/polydimethylsiloxane on a StableFlex fiber [6]	24	57334-U		57335-U	
FOR VOLATILES (MW 60-275)					
100µm polydimethylsiloxane [1]	24	57300-U		57301	
100µm polydimethylsiloxane [1]	23[4]	57342-U		57341-U	
FOR VOLATILES, AMINES, AND NITROAROMATIC COMPOUNDS (MW 50-300)					
65µm polydimethylsiloxane/divinylbenzene [3]	24	57310-U		57311	
65µm polydimethylsiloxane/divinylbenzene [3]	23[4]	57346-U		57345-U	
65µm polydimethylsiloxane/divinylbenzene on a StableFlex fiber [5]	24	57326-U		57327-U	
FOR POLAR SEMIVOLATILES (MW 80-300)					
85µm polyacrylate [3]	24	57304		57305	
FOR NONPOLAR HIGH MOLECULAR WEIGHT COMPOUNDS (MW 125-600)					
7µm polydimethylsiloxane [2]	24	57302		57303	
FOR NONPOLAR SEMIVOLATILES (MW 80-500)					
30µm polydimethylsiloxane [1]	24	57308		57309	
FOR ALCOHOLS AND POLAR COMPOUNDS (MW 40-275)					
65µm Carbowax/divinylbenzene [3]	24	57312		57313	
70µm Carbowax/divinylbenzene on a StableFlex fiber [5]	24	57336-U		57337-U	
70µm Carbowax/divinylbenzene on a StableFlex fiber [5]	23[4]	57338-U		57339-U	
FOR FLAVORS (VOLATILES AND SEMIVOLATILES, C3-C20) (MW 40-275)					
50/30µm divinylbenzene/Carboxen on polydimethylsiloxane on a StableFlex fiber [6]	24	57328-U		57329-U	
FOR TRACE LEVEL (MW 40-275)					
50/30µm divinylbenzene/Carboxen on polydimethylsiloxane on a 2cm StableFlex fiber [6]	24	57348-U		—	—
FOR AMINES AND POLAR COMPOUNDS (HPLC USE ONLY)					
60µm polydimethylsiloxane/divinylbenzene [3]	24	—	—	57317	
FOR SURFACTANTS AND OTHER POLAR ANALYTES (HPLC USE ONLY)					
50µm Carbowax/templated resin [3]	24	—	—	57315	

[1] Nonbonded phase.
[2] Bonded phase.
[3] Partially crosslinked phase.
[4] Designed for use with Merlin Microseal sealing system; also can be used with other septumless systems.
[5] Coating bonded to a flexible fused silica core, yielding a more stable coating on a less breakable fiber. There may be a slight difference in extraction selectivity compared to the same coating on a standard fused silica core. 2cm fiber assembly contains no spring.
[6] High retention for trace analysis.

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Fiber Assembly Used With SPME Holder 57330-U (For Manual Use)



Fiber Assembly Used With SPME Holders 57331 and 57347-U

SPME Fiber Assortment Kits – 24-gauge fibers, 1 fiber of each type as listed.

DESCRIPTION	USED WITH FIBER HOLDER 57330-U CAT. NO.	PRICE	USED WITH FIBER HOLDER 57331 or 57347-U CAT. NO.	PRICE
SPME StableFlex Fiber Assortment Kit 65µm PDMS/DVB coating 50/30µm DVB/Carboxen/PDMS coating 85µm Carboxen/PDMS coating 70µm Carbowax/DVB coating	57550-U		57551-U	
Kit 1 – For Volatiles and Semivolatiles 85µm polyacrylate coating 100µm polydimethylsiloxane coating 7µm polydimethylsiloxane coating	57306		57307	
Kit 2 – For Volatile or Polar Organics in Water 75µm Carboxen/polydimethylsiloxane coating 65µm polydimethylsiloxane/divinylbenzene coating 65µm Carbowax/divinylbenzene coating	57320-U		57321-U	
Kit 3 – For SPME/HPLC Analysis 60µm polydimethylsiloxane/divinylbenzene coating 50µm Carbowax/templated resin coating 100µm polydimethylsiloxane coating	—	—	57323-U	
Kit 4 – For Flavors and Odors 100µm polydimethylsiloxane coating 65µm polydimethylsiloxane/divinylbenzene coating 75µm Carboxen/polydimethylsiloxane coating	57324-U		57325-U	

RELATED INFORMATION

Applications involving SPME are included in the Applications section at the end of this chapter. Titles of our SPME publications appear before the Applications section. For a list of SPME journal articles, contact our Technical Service chemists, or visit our web site: www.sigma-aldrich.com/supelco

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Solid Phase Microextraction
SUPELCO

SPME Products and Accessories

SPME Samplers

SPME Fiber Holders

The holder protects the coated fiber, and controls exposure of the fiber during analyte adsorption and desorption. The holder is reusable indefinitely and accepts the replaceable fiber assembly. First time users must order both a holder and a fiber assembly.

Fiber Holder for Manual Sampling

An adjustable depth guide positions the fiber for sampling and for correct placement in the heated zone of the GC injection port. The fiber can be locked in the exposed position.

Fiber Holder for Automated Sampling or HPLC Analysis

Use this fiber holder with a Varian 8100/8200 AutoSampler or with our SPME/HPLC interface. An SPME upgrade kit is necessary for operation with the Varian AutoSampler – contact Varian Instrument Division for information concerning system requirements.

Fiber Holder for CTC Combi PAL Autosampler*

Use this holder with SPME fiber assemblies that are designed for automated sampling.

SPME Portable Field Sampler

Concentrate and Store Analytes from Water; Sample Indoor Air - The SPME portable field sampler is an efficient and economical way of extracting and transporting volatile and semivolatile compounds from field samples. Extracted compounds are safely sealed behind a replaceable septum. Table 1 shows that storage losses for pesticides extracted and stored using a portable field sampler were significantly lower than losses from stored whole water samples. The sampler can be reused 50-100 times, and is disposed of when the fiber is no longer usable.

The portable field sampler also efficiently detects organic compounds in air. In our studies, the sampler allowed us to monitor typical HPLC and GC solvents at ppb levels in laboratory air. Four fibers are available: a polydimethylsiloxane (PDMS)/Carboxen fiber for trace levels of volatiles, a general purpose PDMS fiber, a PDMS/DVB fiber for semi-volatiles and larger volatiles, and a Carbowax/DVB fiber for polar semivolatiles.

Five slots in the needle guide/depth gauge control the depth of needle insertion into a sample container, or into the injection port during fiber desorption.

* Autosampler distributed by Varian, Leap, and Gerstel

DESCRIPTION	CAT. NO.	PRICE
Fiber Holder		
For Manual Sampling	57330-U	
For Varian Autosampler or HPLC Analysis	57331	
For CTC Autosampler	57347-U	
SPME Portable Field Samplers (pk. of 2)		
75µm PDMS/Carboxen Fiber	504831	
100µm PDMS Fiber	504823	
65µm PDMS/DVB StableFlex Fiber	57359-U	
70µm Carbowax/DVB	57340-U	
Replacement Septa (pk. of 100)	20638	
SPME Septum Removing Tool	504858	

Fiber holder disassembles for fiber replacement

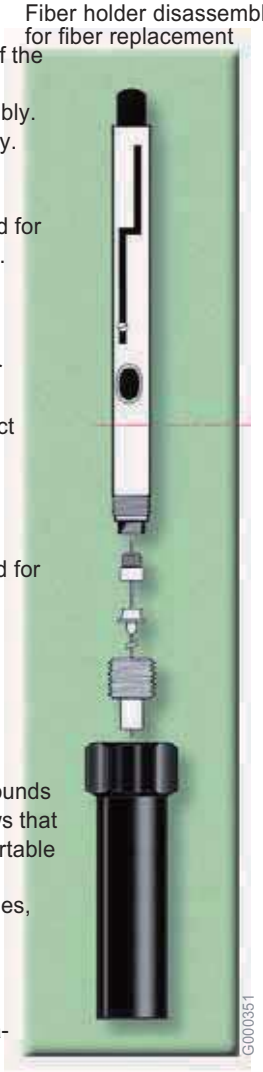




Table 1. Recovery of Pesticides Extracted/Stored in SPME Field Sampler is Much Higher than for Stored Water Samples

ANALYTE	% LOSS ON STORAGE[1] SPME FIBER[2]	STORED WATER[3]	ANALYTE	% LOSS ON STORAGE SPME FIBER	STORED WATER
Atrazine	-15	-57	Methoxychlor	-14	-88
DDE	-12	-98	Methyl parathion	-7	-68
Disulfoton	-8	-93	Parathion	-15	-83
Endrin ketone	-10	-82	Phorate	-3	-84
Famphur	-3	-60	Simazine	-10	-53
Heptachlor epoxide	-12	-83	Sulfotep	+4	-81
Lindane	-2	-74	TEPP	-8	-54
Malathion	-6	-74	Thionazin	-3	-68
			Mean	-8%	-75%

[1] Relative to immediate analysis. 10ppb each pesticide in water.

[2] Pesticides extracted by SPME and stored on PDMS fiber (24 hours / 4°C).

[3] Water sample stored in a silanized vial (24 hours / 4°C), then extracted by SPME.

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SPME/HPLC Interface for Easy HPLC Analyses with SPME

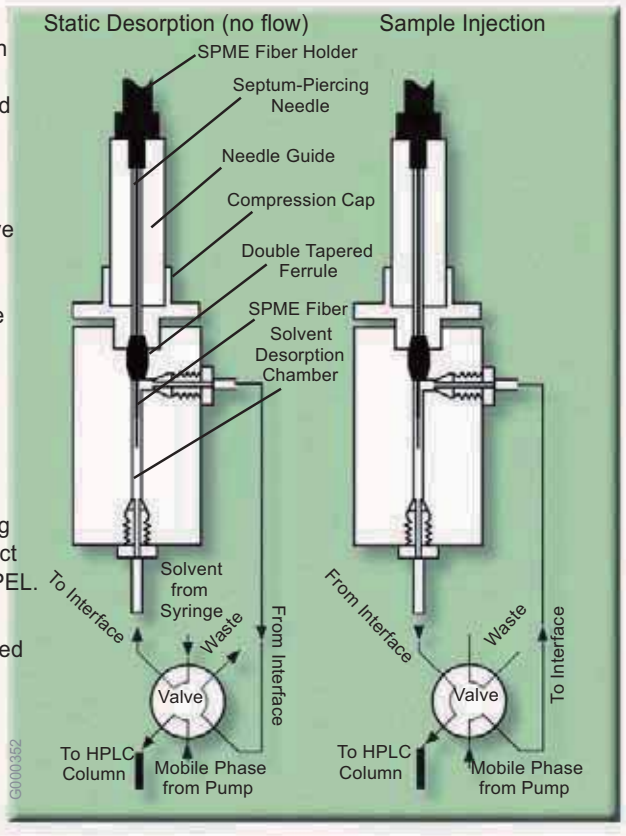
Investigators in several laboratories have shown that SPME can be effective for monitoring drugs and drug metabolites in biological fluids – and SPME also has pharmacological and food and beverage applications.

The SPME/HPLC interface enables HPLC analysts to take advantage of the time and cost savings offered by SPME. The interface allows mobile phase to contact the SPME fiber, remove the adsorbed analytes, and deliver them to the column for separation. The interface consists of a six-port injection valve and a desorption chamber that replaces the injection loop in the HPLC system. Easily installed and removed, the desorption chamber includes a PEEK (polyetheretherketone) needle guide, a stainless steel body and compression cap, a double-tapered VESPEL ferrule, and a sealing clamp.

The SPME fiber is introduced into the desorption chamber with the injection valve in the "load" position. The unit is made leak-tight (to 5000psi/35mPa) by closing the clamp and compressing the ferrule against the SPME needle. All surfaces which contact the SPME fiber or the mobile phase are stainless steel or VESPEL.

Analytes often can be removed via a stream of mobile phase (dynamic desorption). When analytes are more strongly adsorbed to the fiber, the fiber can be soaked in mobile phase before the material is injected onto the column (static desorption).

SPME/HPLC Interface: Operation



SPME/HPLC Interface, Replacement Parts, and Accessories

DESCRIPTION	CAT. NO.	PRICE
SPME/HPLC Interface (includes 2 ferrules)		
Rheodyne valve version	57353	
Ferrules (pk. of 10)	57351	
Rotor seal for Rheodyne valve 7125	58830-U	
Rhebuild kit for Rheodyne valve 7125	55045	
SPME holder for HPLC use[1]	57331	
Fiber assemblies for HPLC use[1]		
60µm polydimethylsiloxane/divinylbenzene, for drugs, vitamins, preservatives, general purpose	57317	
50µm Carbowax/templated resin, for surfactants	57315	
85µm polyacrylate, for polar semivolatiles	57305	
100µm polydimethylsiloxane, for volatiles	57301	
Fiber Kit 3 (one fiber of each)		
50µm Carbowax/templated resin, 60µm polydimethylsiloxane/divinylbenzene, 100µm polydimethylsiloxane	57323-U	

[1] First time users must order both holder and fiber assembly. Holder is reusable indefinitely.

RELATED INFORMATION

For more information about SPME/HPLC analyses, request the following publications:

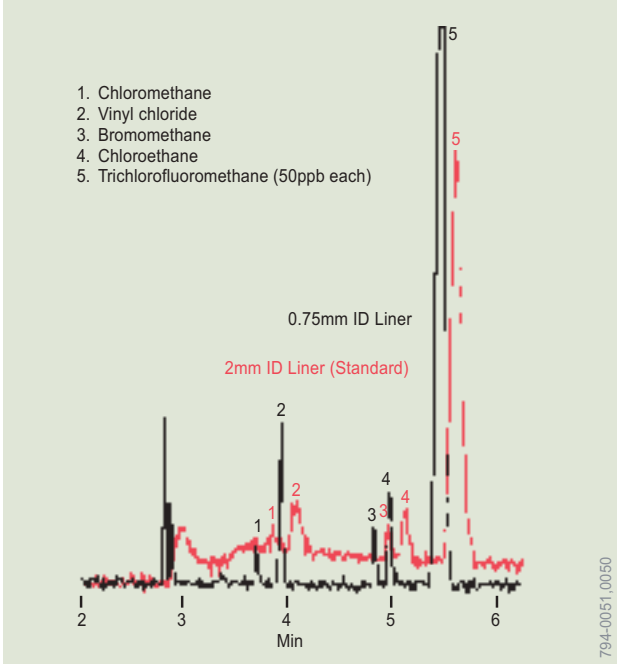
No.	Title
T396098	SPME for Explosives
T396099	SPME for PAHs
T396106	SPME for Surfactants
T396110	SPME for Food Antioxidants and Preservatives
T397121	SPME for Carbamates

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Solid Phase Microextraction
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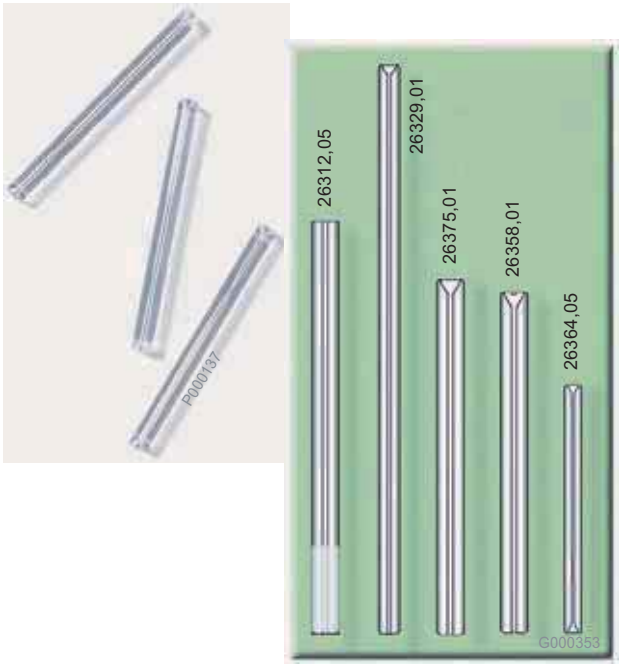
SPME Products and Accessories

SPME / GC Inlet Liners

FIGURE A. NARROW BORE INLET LINERS MAKE SPME/GC PEAKS SHARPER



Fiber: PDMS, 100µm
Cat. No.: 57300-U
Column: VOCOL, 60m x 0.25mm ID x 1.5µm ID
Cat. No.: 24154
Oven: 35°C
Carrier: helium, 40cm/sec
Inj.: 230°C



Achieve Sharper Peaks with SPME/GC Analyses, Using Supelco Inlet Liners

GC injection port liners are designed for optimum sample introduction for specific injection techniques. When analyzing by SPME/GC, a 0.75mm ID inlet liner increases linear velocity, compared to a conventional, larger volume 2mm ID liner, and rapidly introduces analytes onto the column in a narrow band. The sharp peaks obtained with the 0.75mm ID liner also demonstrate that the compounds are rapidly desorbed from the fiber (Figure A).

To minimize sample loss or peak tailing, the inlet liner must be inert. Our proprietary, high-temperature silanization technique thoroughly deactivates Supelco inlet liners to minimize adsorption of active sample components. Using the appropriate inlet liner, combined with efficient, solvent-free sample introduction by SPME, helps to achieve excellent chromatography.

Inlet Liners for SPME

DESCRIPTION	CAT. NO.	PRICE
AGILENT/HP (5880, 5890 SERIES, 6890)		
Each	26375,01	
pk. of 5	26375,05	
pk. of 25	26375,25	
VARIAN 1075/1077 INJECTORS		
Each	26358,01	
pk. of 5	26358,05	
pk. of 25	26358,25	
VARIAN 1078/1079 SPLITLESS		
Each	26378,01	
pk. of 5	26378,05	
VARIAN 1093/1094 SPI INJECTORS		
Each	26364,01	
pk. of 5	26364,05	
pk. of 25	26364,25	
PERKIN-ELMER		
(Auto System Split/Splitless Injector)		
pk. of 5	26312,05	
SHIMADZU GC MODELS 9A/15A/16		
(SPL-G9/15 Injector)		
Each	26329,01	
pk. of 5	26329,05	
pk. of 25	26329,25	
SHIMADZU GC MODELS 14/15A/16 (SPL-14 INJECTOR)		
Each	26335,01	
pk. of 5	26335,05	
pk. of 25	26335,25	
SHIMADZU GC MODELS 17A (SPL-17 INJECTOR)		
Each	26339,01	
pk. of 5	26339,05	
pk. of 25	26339,25	
SPME INSERTS		
Flash On-Column, Varian SPME Injector		
pk. of 5	26364,05	

RELATED INFORMATION

For more information about analysis of VOCs by SPME/GC, request Application Note T394056. For more information on inlet liners, request T196899.

SPME Products and Accessories

SPME Accessories



Manual SPME Sampling Stand

Holds eight vials while supporting the SPME syringe for consistent fiber immersion depth. Cat. No. 57333-U accommodates 4mL vials only; Cat. No. 57357-U accommodates 15mL vials. Order the 15mL vial puck (Cat. No. 57358-U) as a replacement for the 15mL unit, or to use 15mL vials with the 4mL unit. Not for use with automated / HPLC fiber holders.

Heat/Stir Plate

Fits compactly on the base of the SPME sampling stand. Heating range is 40-550°C, stirring range is 60-1200rpm.

40mL Vial Holder

Use this aluminum block for heating/stirring during headspace SPME sampling of odors or other volatiles. Holds six 40mL vials.

Thermometer

For monitoring sample temperature when using the SPME sampling stand and a heat/stir plate.

DESCRIPTION	CAT. NO.	PRICE
SPME sampling stand for 4mL vials	57333-U	
SPME sampling stand for 15mL vials	57357-U	
Vial puck for 15mL vials	57358-U	
40mL Vial Holder	33313-U	
Corning heat/stir plate, 120VAC	Z262129-1EA	
Thermometer, 5”	57332	

Pre-Drilled Thermogreen LB-2 Septa for SPME



Easier needle penetration and high puncture tolerance – ideal for autosamplers. Reduce septum coring that can cause extraneous peaks. Already conditioned, ready-to-use. Extremely low bleed over a wide range of inlet temperatures – from 100°C to 350°C. Rubber formulation exclusive to Supelco.

DESCRIPTION	CAT. NO.	PRICE
9.5mm (pk. of 25)	23161	
9.5mm (pk. of 50)	23162-U	
11mm (pk. of 25)	23167	
11mm (pk. of 50)	23168	

SPME Inlet Guide

Secures the SPME fiber holder in the injection port during the thermal desorption process. Interchangeable among Merlin Microseal sealing system and most Varian and Hewlett-Packard chromatographs.

DESCRIPTION	CAT. NO.	PRICE
SPME inlet guide	57356-U	

SPME Inlet Guide





P000047

Merlin Microseal High Pressure Septa

Eliminate siloxane background, prolong septum lifetime. To eliminate septum coring during SPME injections, use the Merlin Microseal system, a patented long-life replacement for the standard septum and septum nut on a capillary or purged packed inlet system. Two sequential seals provide a much longer life than conventional septa. The new high pressure units allow operation at 2-100psi. Use only with 23 gauge SPME fiber assembly.

DESCRIPTION	CAT. NO.	PRICE
FOR AGILENT/HP GC MODELS 5800, 5900 SERIES, 6890		
1 nut and 2 septa	24814-U	
1 nut and 1 septum	24815-U	
1 replacement septum	24816-U	
FOR VARIAN GC MODELS 3400, 3800 (1078, 1079 INJECTORS)		
1 Varian nut, 1 septum, & 1 inlet adapter	24817-U	
1 replacement septum	24818-U	

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SPME Products and Accessories

SPME Accessories



Vials for Varian 8200 Autosampler

DESCRIPTION	QTY.	CAT. NO.	PRICE
LARGE OPENING 2ML VIALS (12MM OD X 32MM) WITH POLYPROPYLENE CAPS, PTFE/SILICONE SEPTA			
Clear, 2mL	100	27531	
Amber, 2mL	100	27532	
10ML SAMPLE HEADSPACE VIALS 24.5MM X 50MM (FOR THIN SEALS DESIGNED FOR SPME)			
Clear vials only, 10mL Crimped top	36	27385	
Clear vials only, 10mL Crimped top	144	27286	
CLOSURES FOR 10ML VIALS			
20mm seal with thin Viton septa (0.030")	36	33146-U	
20mm seal with thin Viton septa (0.030")	100	27245	
20mm PTFE/silicone septa (0.030")	100	27539	

Headspace Vials for CTC Autosampler (Combi PAL)*

DESCRIPTION	QTY.	CAT. NO.	PRICE
FLAT BOTTOM			
10mL clear glass (23mm x 46mm)	100	27198	
20mL clear glass (23mm x 75mm)	100	27199	
ROUND BOTTOM			
10mL clear glass (22.6mm x 46mm)	100	27294	
10mL clear glass (22.6mm x 46mm)	1000	27295	
20mL clear glass (22.6mm x 75mm)	100	27296	
20mL clear glass (22.6mm x 75mm)	1000	27297	
CLOSURES AND ACCESSORIES FOR BOTH 10mL AND 20mL VIALS			
Closures (Tin Plate, Magnetic Seals) with PTFE lined silicone	100	27300	
Adjustable crimper for 20mm seals (5-100mL)	1	22316-U	

*Autosampler distributed by Leap, Varian and Gerstel

Vials for SPME Sampling Stand

DESCRIPTION	QTY.	CAT. NO.	PRICE
WITH 4ML VIAL HOLDER PUCK			
4mL screw top vials (15mm x 45mm)			
Clear, preassembled, phenolic caps & PTFE/silicone	100	27136	
Amber, preassembled, phenolic caps & PTFE/silicone	100	27006	
Vials only, clear	100	27111	
Vials only. clear	1000	27031	
Vials only, amber	100	27115-U	
Vials only, amber	1000	27032	
Vials only, clear silanized	100	27114	
Vials only, clear silanized	1000	27220-U	
Vials only, amber silanized	100	27217	
Open closures and septa for 4mL vials			
Phenolic cap with hole	100	27120-U	
White PTFE silicone septa (11mm)	100	27356	
White PTFE silicone septa	1000	27369-U	
Viton Septa (11mm)	100	27351	
Viton Septa	1000	27364	
WITH 15ML VIAL HOLDER PUCK			
15mL screw top vials (21mm x 70mm)			
Clear, preassembled, phenolic caps & PTFE /silicone	100	27159	
Amber, preassembled, phenolic caps & PTFE/ silicone	100	27008	

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Vials for 40mL Heating Block

DESCRIPTION	QTY.	CAT. NO.	PRICE
40ML SCREW TOP VIALS(29MM X 81MM ONLY)			
Clear, preassembled, phenolic cap and PTFE/silicone	100	27180	
Amber, preassembled, phenolic cap and PTFE/silicone	100	27010-U	
Vial only, clear	100	27184	
Vial only, amber	100	27185-U	
CLOSURES FOR 40ML VIAL			
Phenolic caps with hole	100	27187	
Viton septa (22mm)	100	27355	
PTFE/Silicone septa	100	27188-U	

RELATED INFORMATION

No. Title

Biochemical / Food and Beverage

T195869 Solid Phase Microextraction: Solventless Sample Preparation for Monitoring Flavor Compounds by Capillary Gas Chromatography (AYM)
T196901 Solid Phase Microextraction/Capillary GC Analysis of Drugs, Alcohols, and Organic Solvents in Biological Fluids (AYY)
T396110 SPME Reduces Extraction Time in HPLC Analyses of Food Antioxidants and Preservatives
T397140 Analysis of Fat Soluble Vitamins from Tablets, Using SPME/HPLC (BKK)
T398147 Solid Phase Microextraction of Odors in Drinking Water, for Analysis by GC/MS (BRG)

Pharmaceutical

T394062 Monitor Organic Volatile Impurities (OVIs) in Pharmaceutical Products, Using Solid Phase Microextraction/Capillary GC (AQX)

Forensic

T196901 Solid Phase Microextraction/Capillary GC Analysis of Drugs, Alcohols, and Organic Solvents in Biological Fluids (AYY)
T198922 SPME/GC for Forensic Applications: Explosives, Fire Debris, and Drugs of Abuse (BQS)
T394061 Solid Phase Microextraction/Capillary GC: Rapid, Sensitive Detection of Gasoline in Fire Debris (AQW)
T396098 SPME / HPLC Interface Combines Fast Sample Extraction with Efficient Analysis for Explosives (ASE)

Environmental

T394011 Solid Phase Microextraction of Volatile Compounds in US EPA Method 524.4 (AOM)
T394017 Polyacrylate Film Fiber for Solid Phase Microextraction of Polar Semivolatiles from Water (AOS)
T394056 Fast Analysis of Volatile Organic Compounds by Solid Phase Microextraction/Capillary GC (AQL)
T394058 Fast Screening for Chlorinated Pesticides by Solid Phase Microextraction/Capillary GC (AQN)
T395081 Monitor BTEX Compounds and Fuels in Water, Using Solid Phase Microextraction and Capillary GC (ARO)
T395085 Solid Phase Microextraction/Capillary GC Analysis of Nitrogen-Containing Herbicides in Water (ARS)
T396094 Solid Phase Microextraction of Organophosphate Insecticides and Analysis by Capillary GC/MS (ASB)
T396099 SPME / HPLC: A Rapid and Sensitive Analysis of Polynuclear Aromatic Hydrocarbons in Water (ASF)
T396106 Analysis of Surfactants in Water by SPME/HPLC
T397121 Solid Phase Microextraction for HPLC Analysis of Carbamate and Urea Pesticides (BGU)
T397141 Air Sampling of VOCs Using SPME for Analysis by Capillary GC (BKF)
T397143 Field Sampling for Pesticides, Using Solid Phase Microextraction/Capillary GC (BJT)
T398147 Solid Phase Microextraction of Odors in Drinking Water, for Analysis by GC/MS (BRG)

Lab Hints and Selection Guides

T101928 SPME Troubleshooting Guide
T101929 A Practical Guide To Quantitation with SPME
T198923 Solid Phase Microextraction: Theory and Optimization of Conditions
T199925 SPME Applications CD-ROM
T396098 SPME / HPLC Interface Combines Fast Sample Extraction with Efficient Analysis for Explosives (ASE)
T413019 Solid Phase Microextraction – Fiber Assemblies and Accessories (AIM)
T496037 Solid Phase Microextraction Sampling Stand (AWS)
T496049 SPME / HPLC Interface (AWV)
T497105 SPME Portable Field Sampler with Carboxen/PDMS Fiber (BIZ)
T497174 SPME Portable Field Sampler with 100µm PDMS Fiber (BKL)

Visit www.sigma-aldrich.com/supelco

Our website features complete information about SPME, including product descriptions, applications, and answers to common quest ions.

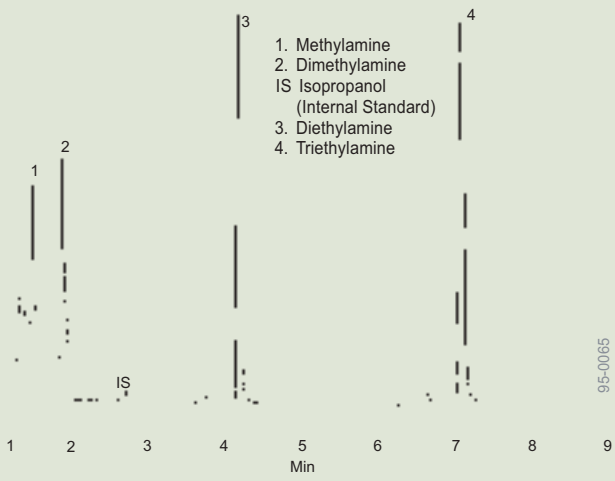
Contact us at techservice@sial.com

Our knowledgeable research and development chemists will answer any questions you have about SPME.

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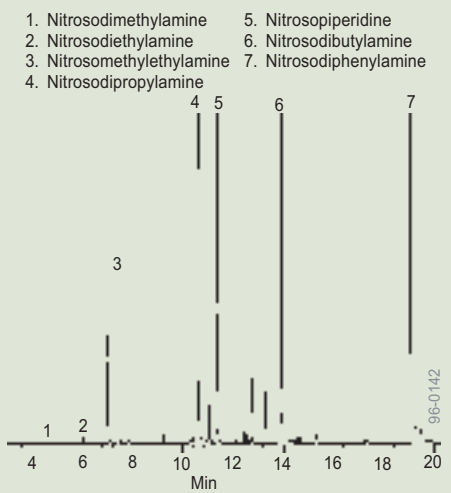


SPME Applications
Amines, Aromatics, Explosives



Amines (SPME/GC)

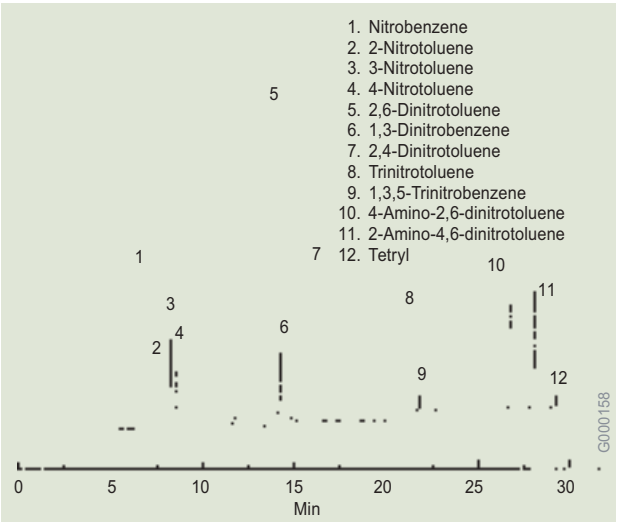
Sample:	amines at 5ppm in water, 27% NaCl, pH 9.5
SPME Fiber:	polydimethylsiloxane/divinylbenzene, 65µm film
Cat. No.:	57310
Extraction:	20 min, fiber immersed in water, rapid stirring
Desorption:	5 min, 270°C
Column:	SPB-1 SULFUR, 30m x 0.32mm ID, 4.0µm film
Cat. No.	24158
Oven:	50°C (2min) to 150°C at 10°C/min
Carrier:	helium, 25cm/sec (set at 50°C)
Det.:	GC/MS, selected ions at 0.6 sec/scan
Inj.:	splitless/split, closed initial 5 min, 270°C, 0.75mm ID splitless liner



Chromatogram courtesy of J. Clark, Liggett Group, Inc.

Nitrosamines (SPME/GC)

Sample:	analytes in water + 25% KCl, pH 10.0
SPME Fiber:	polydimethylsiloxane/divinylbenzene, 65µm film
Cat. No.:	57310-U
Extraction:	immersion, 15min (rapid stirring)
Desorption:	270°C, 1min
Column:	PTA-5, 30m x 0.32mm ID, 0.5µm film
Cat. No.:	24331
Oven:	50°C (1min) to 250°C at 10°C/min, hold 2 min
Carrier:	helium, 30cm/sec
Det.:	GC/MS (quadrupole, selected ion mode)
Inj.:	splitless, 250°C (0.75mm ID liner)



Reproduced from The Analysis of High Explosives Residues by Solid-Phase Microextraction Followed by HPLC, GC/ECD and GC/MS, José R. Almirall, Metro-Dade Police Crime Laboratory, Miami, FL, US. Presented at Academy of Forensic Science 2/13/98.

Explosives in Water (SPME/GC)

Sample:	50ng/mL each explosive in water
SPME Fiber:	polydimethylsiloxane/divinylbenzene, 65µm film
Cat. No.:	57310-U
Sampling:	immersion, 30 min
Desorption:	5 min, 250°C
GC Column:	cyanopropyl silicone, 30m x 0.25mm ID, 0.25µm film
Supelco Equivalent:	SPB-1701 (Cat. No. 24113)
Oven:	95°C (3 min) to 182°C at 8°C/min (4 min) to 250°C at 8°C/min (6 min)
Carrier:	nitrogen, 60mL/min
Det.:	ECD, 250°C
Inj.:	split/splitless, 180°C

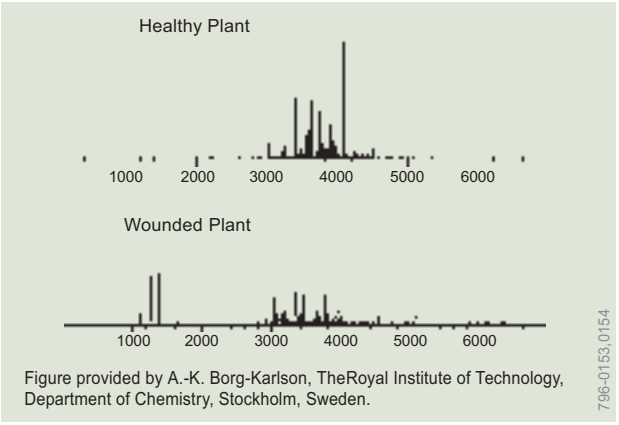


Figure provided by A.-K. Borg-Karlson, TheRoyal Institute of Technology, Department of Chemistry, Stockholm, Sweden.

Mono- and Sesquiterpenes in Spruce Seedlings (SPME/GC)

Sample:	headspace surrounding Picea abies seedlings
SPME Fiber:	polydimethylsiloxane, 100µm film
Cat. No.:	57300-U
Extraction:	headspace, 60 min
Desorption:	30 sec, 225°C
Column:	poly(5% diphenyl/95% dimethylsiloxane), 30m x 0.25mm ID, 0.25µm film
Supelco Equivalent:	Equity-5 (Cat. No. 28089-U)
Oven:	40°C (4 min) to 200°C at 4°C/min, hold 16 min
Carrier:	helium, 10psi
Det.:	EID, 70ev
Inj.:	splitless (splitter opened after 30 sec), 225°C

Solid Phase Microextraction
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SUPELCO

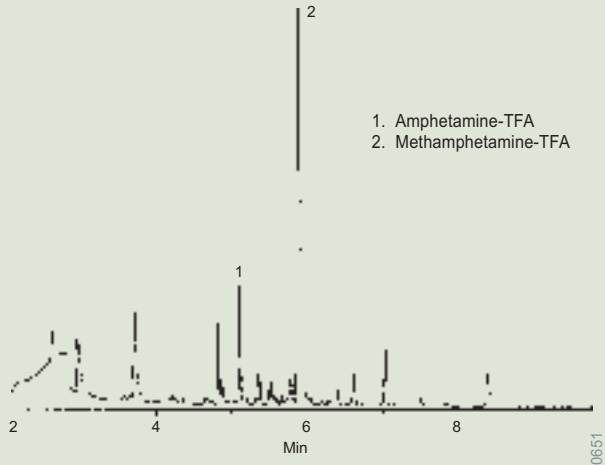


Figure provided by Thomas Brettell, New Jersey State Police Laboratory.

Amphetamines (SPME/GC)

Sample:	1mL urine + 0.7g K_2CO_3 in 20mL headspace vial, equilibrated at 80°C, 30 min
SPME Fiber:	polydimethylsiloxane, 100µm film
Cat. No.:	57300-U
Extraction:	headspace, 3-5 min, 80°C
Derivatization:	methyl bis-trifluoroacetamide (headspace, 0.5 min, ambient)
Desorption:	1 min, 270°C
Column:	methylsiloxane, 12.5m x 0.2mm ID, .033µm film
Supelco Equivalent:	Equity-1 (available on request)
Oven:	60°C (1 min) to 140°C (4 min) at 30°C/min, then to 276°C at 20°c/min, 4 min
Det.:	MS, full scan
Inj.:	splitless (closed 1 min), 270°C

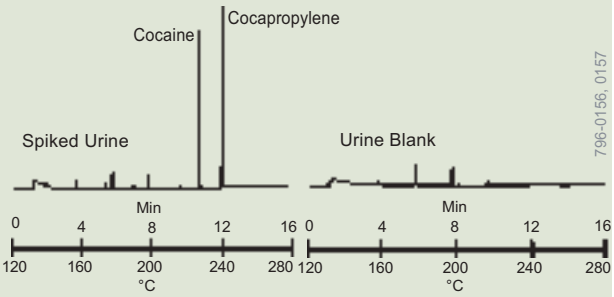


Figure provided by T. Kumazawa and K. Sato, Dept. Legal Medicine, Showa University School of Medicine, Tokyo, Japan and K. Watanabe, H. Seno, A. Ishii, and O. Suzuki, Dept. Legal Medicine, Hamamatsu University School of Medicine, Hamamatsu, Japan.

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Cocaine in Urine (SPME/GC)

Sample:	0.5mL urine (250ng each analyte, 20µL 2.5% NaF) in 1mL vial
SPME Fiber:	polydimethylsiloxane, 100µm film
Cat. No.:	57300-U
Extraction:	immersion, 30 min
Desorption:	3 min, 240°C
Column:	polydimethylsiloxane, 30m x 0.32mm ID, 0.25µm film
Supelco Equivalent:	Equity-1 (Cat. No. 28055-U)
Oven:	120°C to 280°C at 10°C/min
Carrier:	helium, 3mL/min
Det.:	NPD, 280°C
Inj.:	splitless (splitter opened after 1 min), 240°C

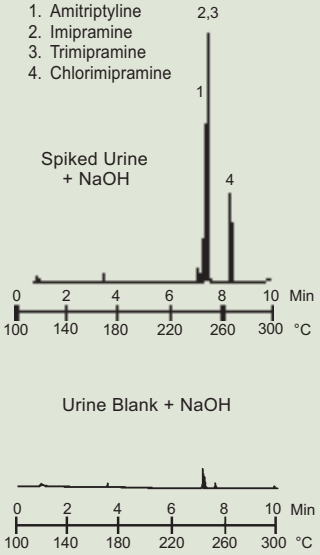


Figure provided by T. Kumazawa, X.-P. Lee, M.-C. Tsai, and K. Sato, Dept. Legal Medicine, Showa University School of Medicine, Tokyo, Japan and H. Seno and A. Ishii, Dept. Legal Medicine, Hamamatsu University School of Medicine, Hamamatsu, Japan.

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Tricyclic Antidepressants in Urine (SPME/GC)

Sample:	1mL urine (1µg each analyte + 50µL 5M NaOH) in 7.5mL vial
SPME Fiber:	polydimethylsiloxane, 100µm film
Cat. No.:	57300-U
Extraction:	headspace, 15 min, 100°C (sample incubated 30 min)
Desorption:	3 min, 280°C
Column:	polydimethylsiloxane, 30m x 0.32mm ID, 0.25µm film
Supelco Equivalent:	Equity-1 (Cat. No. 28055-U)
Oven:	100°C to 300°C at 20°C/min
Carrier:	helium, 3cm/sec
Det.:	FID, 280°C
Inj.:	splitless (splitter opened after 1 min), 280°C

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Solid Phase Microextraction
SUPELCO

SPME Applications
Foods, Flavors and Fragrances

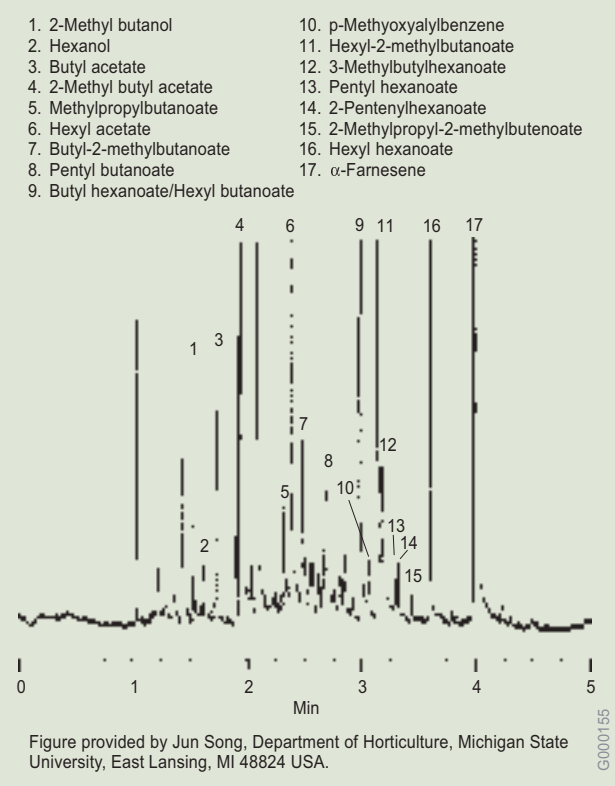
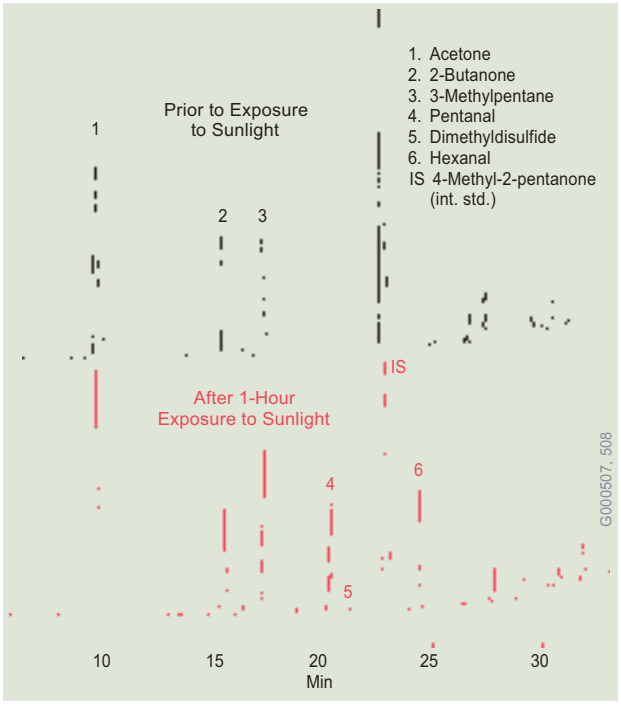


Figure provided by Jun Song, Department of Horticulture, Michigan State University, East Lansing, MI 48824 USA.

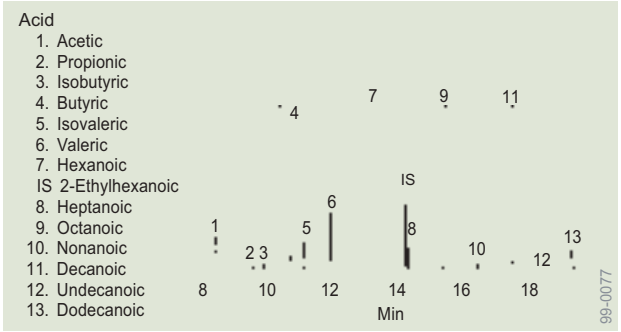
Aroma Volatiles from Stored Apples (SPME/GC)

Sample:	300-450g intact fruit in a 3 liter flask at ambient temp., exposed to an air flow of 25-30mL/min.
SPME Fiber:	polydimethylsiloxane/divinylbenzene, 65µm film headspace extraction (as described for Sample), 4 min; analytes desorbed (250°C) to a cool (<100°C) precolumn, then volatilized by heating to 150°C in 15 sec.
Cat. No.:	57310-U
GC Column:	poly(5% diphenyl/95% dimethylsiloxane) type, 25m x 0.25mm ID, 0.34µm film
Supelco Equivalent:	Equity-5 (available on request)
Oven:	40°C (1.5 min) to 250°C at 50°C/min, hold 1 min
Carrier:	helium, 1.5mL/min (44cm/min)
Det.:	mass spectrometer, m/z = 40-300 (40 spectra/sec)



Milk Sample Off-Flavors (SPME/GC)

Sample:	3g of 2% milk + 10µL internal standard solution (20µg/mL 4-methyl-2-pentanone) (9mL GC vial)
SPME Fiber:	PDMS/Carboxen, 75µm film
Cat. No.:	57318
Extraction:	headspace, 15 min with constant stirring at 45°C
Desorption:	5 min, 250°C
Column:	Supel-Q PLOT, 30m x 0.32mm ID
Cat. No.:	24242
Oven:	70°C (2 min) to 140°C at 6°C/min (2 min hold) then to 220°C at 6°C/min (5 min hold)
Carrier:	helium, 35cm/sec
Det.:	GC/MS ion trap, m/z = 33-300



Free Fatty Acids in Parmesan Cheese (SPME/GC)

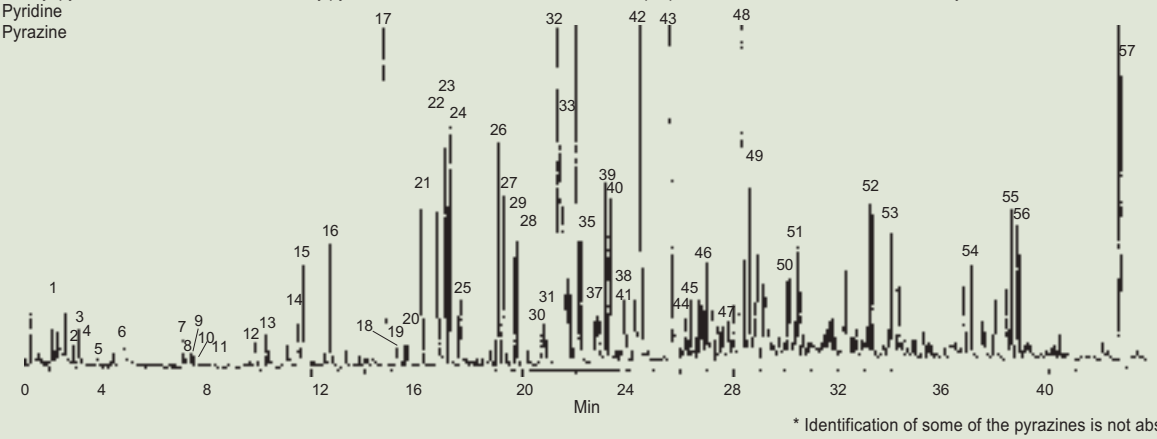
Sample:	100mg cheese in 40mL vial
SPME Fiber:	65µm Carbowax/divinylbenzene StableFlex
Cat. No.:	57336-U
Sampling:	65°C 15 min (headspace)
Desorption:	250°C, 1 min
GC Column:	Nukol, 15m x 0.25mm, 0.25µm film
Cat. No.:	24106-U
Oven:	50°C (2 min) to 220°C at 10°C/min
Carrier:	helium, 30cm/sec
Det.:	FID, 260°C
Inj.:	splitless/split (closed 1 min), 250°C

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SPME Applications
Foods, Flavors and Fragrances

Coffee Components*

1. 2-Methyl furan
2. 2-Butanon
3. 2-Pentanone
4. 3-Methyl butanal
5. 2,5-Dimethylfuran
6. 2-Acetyloxy-2-propanone
7. 2-Ethyl hexanol
8. Dimethylsulfoxide
9. Phenol
10. Hexanal
11. 2-Methyl thiophene
12. n-Methyl pyrrole
13. 4-Methylphenol
14. 2-Ethyl pyrrole
15. Pyridine
16. Pyrazine
17. Methyl pyrazine
18. 4-Methyl thiazole
19. 3-Hydroxy butanone
20. Dimethyl phenol (isomer)
21. 1,2-Ethanediol monoacetate
22. 2,5-Dimethylpyrazine
23. 2,3-Dimethylpyrazine
24. 2-Ethylpyrazine
25. 2,6-Dimethylpyrazine
26. 2-Ethyl-6-methylpyrazine
27. 2-Ethyl-5-methylpyrazine
28. Trimethylpyrazine
29. 2-Ethyl-3-methylpyrazine
30. 2,6-Diethylpyrazine
31. 2-Ethenylpyrazine
32. 2-Ethyl-3,5-dimethylpyrazine
33. Glycerol
34. 2,3-Diethylpyrazine
35. 2-Ethyl-3,6-dimethylpyrazine
36. 2-Furancarboxaldehyde
37. 2-Isopropenylpyrazine
38. 3,5-Diethyl-2-methylpyrazine
39. Furfural formate
40. 2-Furonyl ethanone
41. Methyl benzoylformate
42. Furanmethanol acetate
43. 5-Methyl-2-furancarboxaldehyde
44. Furanmethanol propionate
45. Furfanyl furan
46. Pyridine methanol
47. 2-Methyl-5-propenylpyrazine
48. Furanmethanol
49. 3-Ethyl-4-methyl-2,5-furandione
50. Pyrazine carboxamide
51. 2-Ethyl-3-hydroxy-4H-pyran-4-one
52. 1-(2-Furanylmethyl)pyrrole
53. 2-Methoxyphenol
54. 1-(1H-Pyrrole-2-yl)ethanone
55. 4-Ethyl-2-methoxy phenol
56. 3-Phenylpropenal or 2-Methylbenzofuran
57. 3,5-Dimethylbenzoic acid



* Identification of some of the pyrazines is not absolute.

Ground Coffee (SPME/GC)

Sample: 5g ground coffee in 40mL vial
SPME Fiber: 50/30µm DVB/Carboxen/PDMS (StableFlex fiber)
Cat. No.: 57348-U
Extraction: 30 min, 65°C (headspace)
Desorption: 270°C, 5 min

GC Column: SUPELCOWAX 10, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 24079
Oven: 40°C (5 min) to 230°C at 4°C/min
Det.: ion trap MS, m/z = 30-350, 0.6 sec/scan
Inj.: splitless/split (closed 0.5 min), 270°C (0.75mm ID inlet liner)

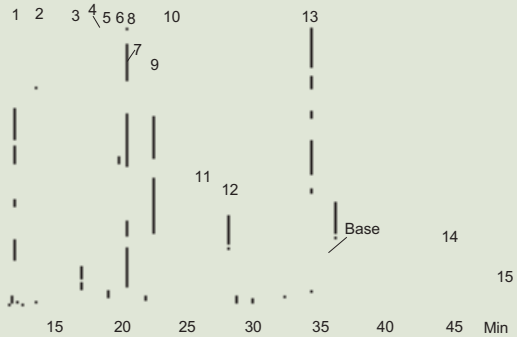


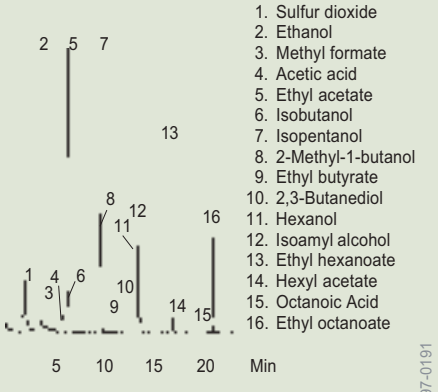
Figure provided by Eleanor Wiesenfeld, Manager, Analytical Services, Noville, Inc., 3 Empire Boulevard, South Hackensack, NJ 07606-1806 USA.

	Analyte	Boiling Pt. (°C)
1.	Myrcene	167
2.	Limonene	177
3.	Linalool	198
4.	Citronellal	206
5.	Benzyl acetate	215
6.	Menthol	216
7.	Methyl salicylate	223
8.	α-Terpineol	219
9.	Citronellol	225
10.	Linalyl acetate	220
11.	Heliotropine	263
12.	Eugenol	253
13.	Methyl ionone gamma	255
14.	Hexyl cinnamic aldehyde	305
15.	Benzyl salicylate	300

797-0627

Shampoo Base with Fragrance (SPME/GC)

Sample: 0.5g shampoo base with 1% fragrance test mix, diluted 1:1 with NaCl/water in a 10mL vial
SPME Fiber: polydimethylsiloxane, 100µm film
Cat. No.: 57300-U
Extraction: headspace, 5 min, 80°C (with sample stirring)
Desorption: 5 min, 250°C
Column: methyl silicone, 50m x 0.25mm ID, 0.25µm film
Supelco Equivalent: Equity-1 (available on request)
Oven: 35°C to 240°C at 3°C/min
Cryo: -50°C w/liquid CO_2
Flow: 0.5mL/min
Det.: MSD, scan m/z = 29-350 AMU
Inj.: split, 250°C



1. Sulfur dioxide
2. Ethanol
3. Methyl formate
4. Acetic acid
5. Ethyl acetate
6. Isobutanol
7. Isopentanol
8. 2-Methyl-1-butanol
9. Ethyl butyrate
10. 2,3-Butanediol
11. Hexanol
12. Isoamyl alcohol
13. Ethyl hexanoate
14. Hexyl acetate
15. Octanoic Acid
16. Ethyl octanoate

97-0191

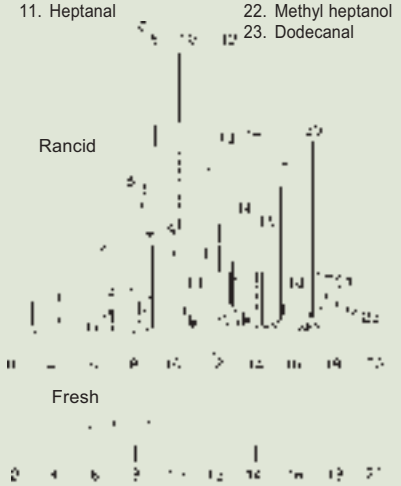
Volatiles in White Wine (SPME/GC)

Sample: White wine + 25% NaCl
SPME Fiber: Carboxen/PDMS
Cat. No.: 57318
Extraction: 10 min, 40°C (headspace)
Desorption: 3 min at 290°C
Column: VOCOL, 30m x 0.25mm ID, 1.5µm film
Cat. No.: 24205-U
Det.: GC/MS, quadrupole, m/z = 31-240

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SPME Applications
Foods, Flavors and Fragrances

1. Acetic acid
2. Pentanal
3. Butanoic acid
4. Propyl acetate
5. Methyl butyrate
6. Hexanal
7. Octane
8. Methyl hexanal
9. Hexanoic acid
10. Heptanone
11. Heptanal
12. Heptanoic acid
13. Octanal
14. Octanoic acid
15. Nonanone
16. Nonanal
17. Butyl hexanoate
18. Decanal
19. Undecanone
20. Pentyl hexanoate
21. Dodecanone
22. Methyl heptanol
23. Dodecanal



G000075.76

Potato Chips (SPME/GC)

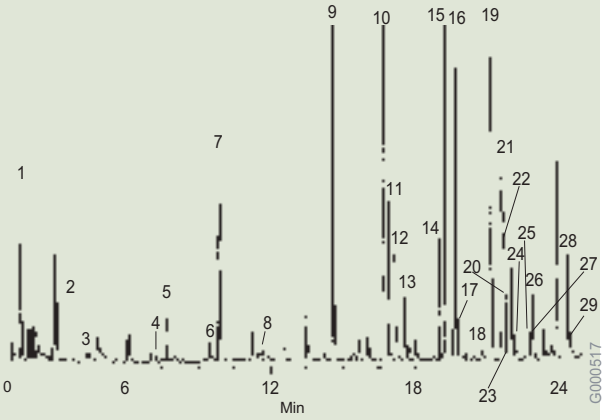
Sample:	3g crushed potato chips in 15mL vial
SPME Fiber:	DVB/Carboxen/PDMS, 50/30µm film, StableFlex
Cat. No.:	57328-U
Extraction:	headspace, 65°C, 20 min, with stirring
Desorption.:	3 min, 250°C
GC Column:	SPB-1 SULFUR30m x 0.32mm ID, 4.0µm film
Cat. No.:	24158
Oven:	45°C (1.5 min) to 250°C at 12°C/min, hold 10 min
Carrier:	helium, 40cm/sec
Det.:	quadrupole mass spectrometer, m/z = 35-290 at 0.6 sec/scan

Some Volatile Components in Peanut Butter

1. Carbon disulfide
2. 3-Methylbutanal
3. Pentanal
4. Dimethyl disulfide
5. Hexanal
6. 1-Methyl pyrrole
7. 4-Methyl-pentene-2-one
8. Heptanal

Pyrazines in Peanut Butter

9. 2-Methyl pyrazine
10. 2,5-Dimethyl pyrazine
11. 2,3-Dimethyl pyrazine
12. 2-Ethyl pyrazine
13. 2,6-Dimethyl pyrazine
14. 2-Ethyl-6-methyl pyrazine
15. 2-Ethyl-5-methyl pyrazine
16. Trimethyl pyrazine
17. 2-Ethyl-3-methyl pyrazine
18. 2,6-Diethyl pyrazine
19. 2-Ethyl-3,5-dimethyl pyrazine
20. 2,3-Diethyl pyrazine
21. 2-Methyl-5-isopropyl pyrazine
22. 3-Ethyl-2,5-dimethyl pyrazine
23. 5-Methyl-2-propyl pyrazine
24. 2-Methyl-5-propyl pyrazine
25. 2-Ethenyl-6-methyl pyrazine
26. 3,5-Diethyl-2-methyl pyrazine
27. 2-Ethenyl-5-methyl pyrazine
28. 2-Methyl-6-cis propenyl pyrazine
29. 2-Allyl-5-methyl pyrazine



G000517

Pyrazines in Peanut Butter (SPME/GC)

Sample:	5g peanut butter in 40mL vial
SPME Fiber:	divinylbenzene-Carboxen-polydimethylbenzene StableFlex
Cat. No.:	57328-U
Extraction:	headspace, 30 min at 65°C in heating block
Desorption:	270°C for 5 min
Column:	SUPELCOWAX 10, 30m x 0.25mm, 0.25µm film
Cat. No.:	24079
Oven:	40°C (5 min) to 230°C at 4°C/min
Inj.:	splitless/split, closed 0.5 min, 270°C, with 0.75mm liner
Det.:	ion trap mass spectrometer, m/z = 30-350 at 0.6 sec/scan Selected ions used for quantitation.

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SPME Applications
Hydrocarbons and Pesticides

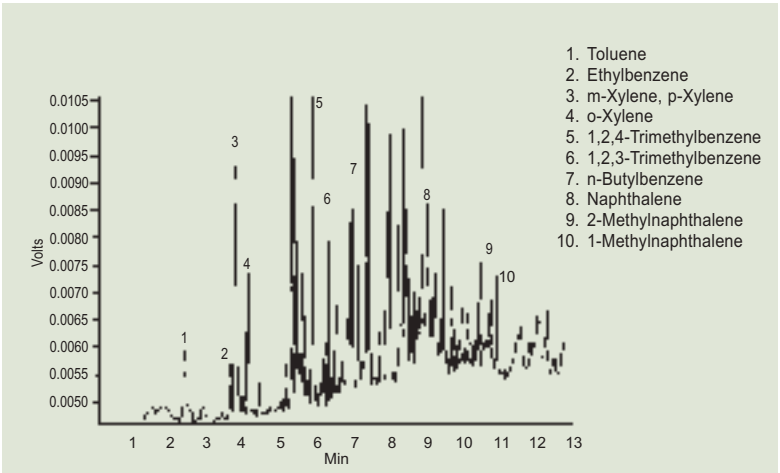
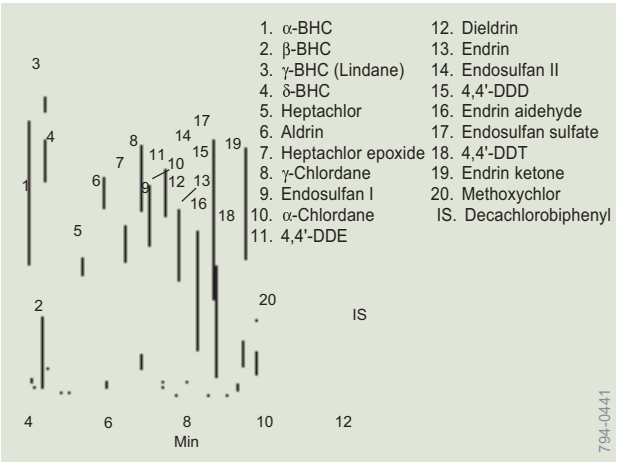


Figure courtesy of José Almirall, Crime Laboratory Bureau, Metro-Dade Police Department, Miami, FL, USA, and Kenneth Furton and Juan Bruna, Department of Chemistry, Florida International University, Miami.

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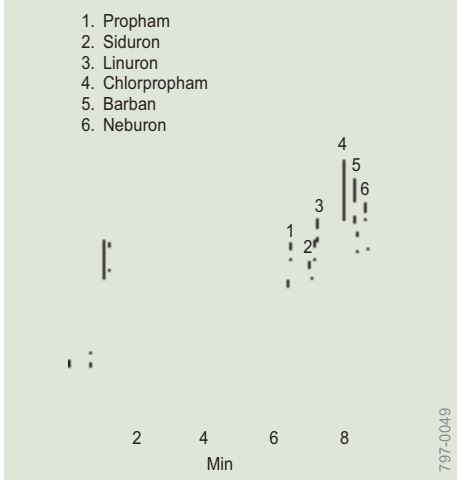
Gasoline in Arson Samples (SPME/GC)

SPME: polydimethylsiloxane phase fiber, 100µm film
headspace sampling (20 min) 10 sec desorption (splitless mode)
Cat. No.: 57300-U
Column: polydimethylsiloxane phase, 30m x 0.25mm ID, 0.25µm film
Supelco Equivalent: Equity-1 (Cat. No. 28046)
Oven: 35°C (2 min) to 220°C at 10°C/min, hold 2 min, to 300°C at 30°C/min, hold 5 min
Carrier: helium, 1mL/min (split 50:1)
Det.: FID, 300°C
Inj.: splitless (closed 3 min), 220°C (2mm ID injector liner)



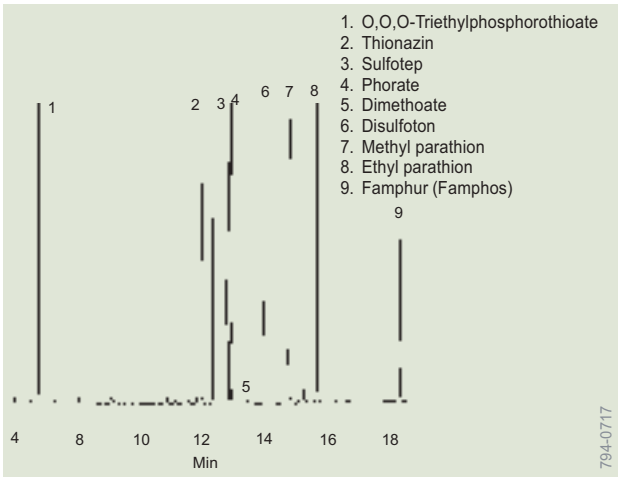
Chlorinated Pesticides (SPME/GC)

Sample: 200ppt each in 2mL water
Extraction: 15 min immersed in water with rapid stirring
SPME Fiber: polydimethylsiloxane, 100µm film
Cat. No.: 57300-U
Column: SPB-5, 15m x 0.20mm ID, 0.20µm film
Cat. No.: 24165-U
Oven: 120°C (1 min) to 180°C at 30°C/min, then to 290°C at 10°C/min
Carrier: helium, 37cm/sec (set at 120°C)
Det.: ECD, 300°C
Inj.: 260°C (splitless - closed 3min)



Carbamate and Urea Pesticides (SPME/HPLC)

Sample: 3mL water containing 8ng/mL of each analyte in 10% NaCl
SPME Fiber: PDMS/DVB, 60µm film
Cat. No.: 57317
Extraction: immersion, 40 min, rapid stirring
Desorption: static, 5 min in acetonitrile:water (65:35); dynamic, valve open during run
Column: SUPELCOSIL LC-8, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 58220-U
Mobile Phase: acetonitrile:water (18:82 to 65:35 in 9 min, hold 3 min)
Flow Rate: 2.0mL/min
Temp.: 35°C
Det.: UV, 240nm

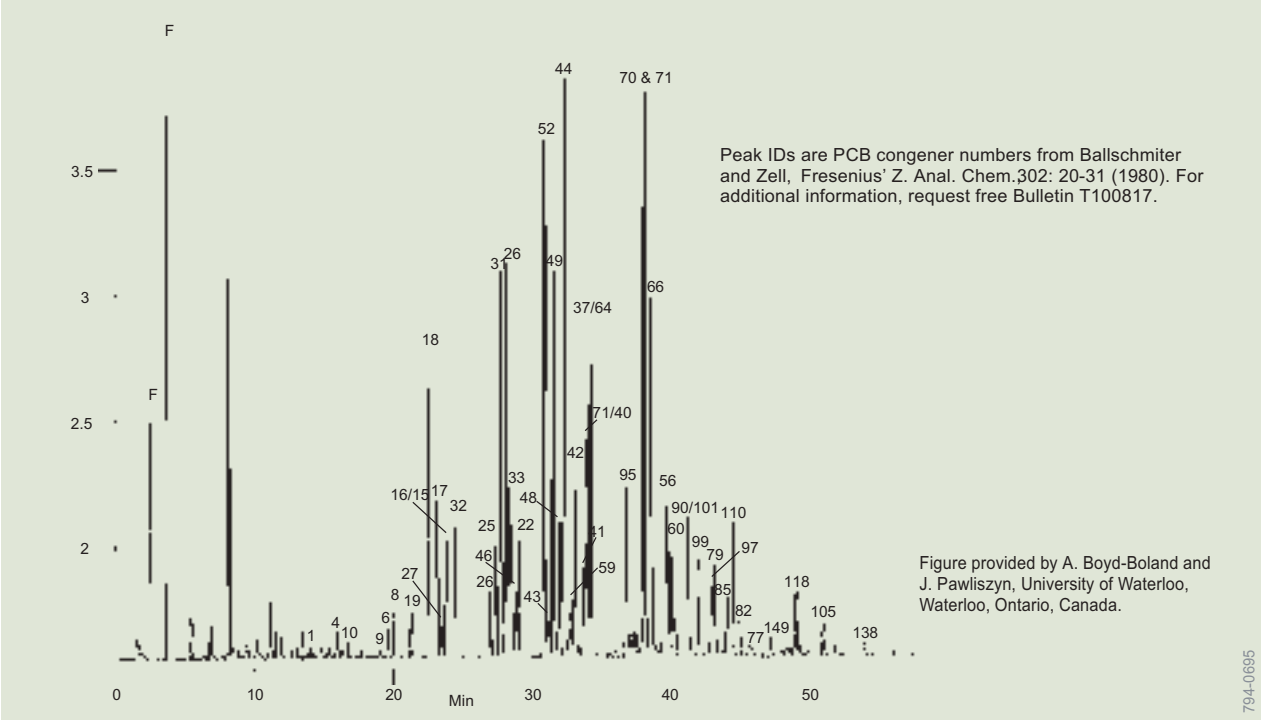


Organophosphorous Pesticides (SPME/GC)

Sample: 50ppb each in 1.5mL saturated salt water, pH 7.2
Extraction: 20 min immersion with rapid stirring
SPME Fiber: polydimethylsiloxane, 100µm film
Cat. No.: 57300-U
Column: PTE-5, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 24135-U
Oven: 60°C (1 min) to 300°C at 12°C/min, hold 5 min
Carrier: helium, 30cm/sec
Det.: MS (m/z = 45-400, 0.6sec/scan)
Inj.: splitless (0.75mm ID liner), 270°C

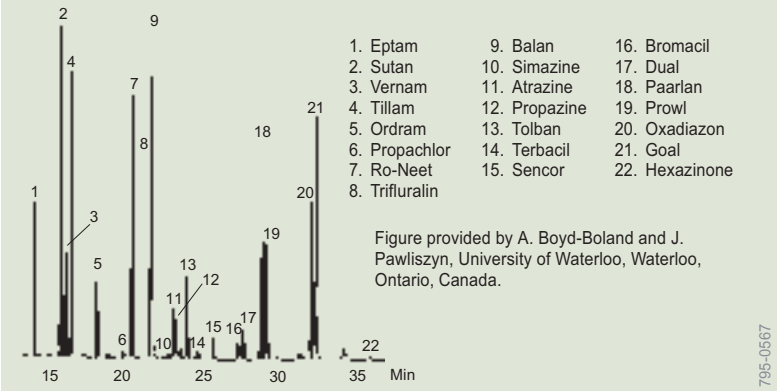
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SPME Applications
Herbicides, PCBs, and Phenols



PCB Congeners in Stream Sediment (SPME/GC)

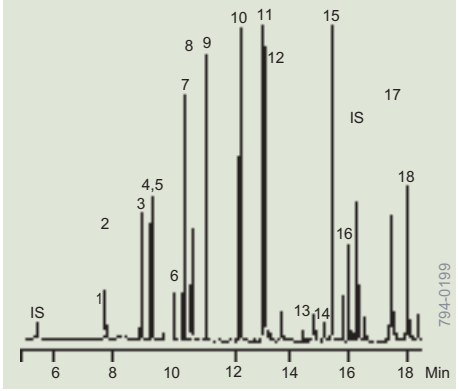
SPME Fiber: PDMS, 100µm film
Cat. No.: 57300-U
Extraction: headspace, 90°C/30 min
Desorption: 280°C/2 min, splitless
Column: SPB-Octyl, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 24218-U
Oven: 50°C/1 min at 10°C/min to 150°C/0 min
Sample: 5g stream sediment, downstream from industrial sites



Nitrogen-Containing Herbicides Extracted from Water (SPME/GC)

Sample: 4mL (water + 100ng/mL each analyte 1g/mL NaCl), pH 2, in 4.6mL vial
SPME Fiber: polyacrylate, 85µm film
Cat. No.: 57304
Extraction: immersion, ambient temp., 50 min (constant stirring)
Desorption: 5 min, 230°C
Column: PTE-5, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 24135-U
Oven: 40°C (5 min) to 100°C at 30°C/min, to 275°C at 5°C/min
Carrier: helium, 40cm/sec, set at 40°C
Det.: MS (Ion Trap Manifold: 250°C;
Mass Scan Range: m/z = 45-400 at 0.6 sec/scan)
Inj.: splitless, 230°C

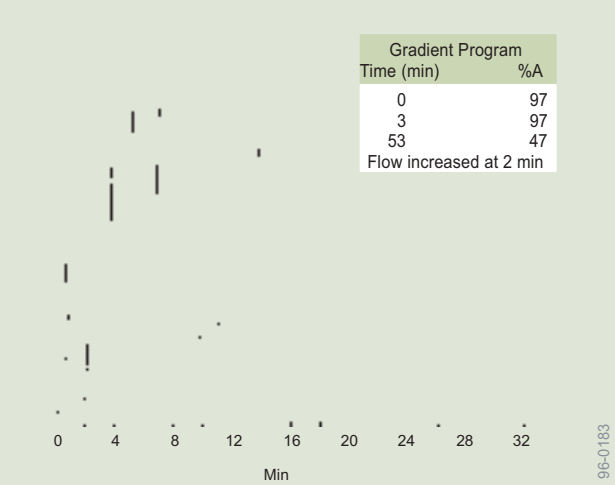
IS 2-Fluorophenol (int. std.)
1. Phenol
2. 2-Chlorophenol
3. 2-Methylphenol
4. 3-Methylphenol
5. 4-Methylphenol
6. 2-Nitrophenol
7. 2,4-Dimethylphenol
8. 2,4-Dichlorophenol
9. 2,6-Dichlorophenol
10. 4-Chloro-3-methylphenol
11. 2,4,5-Trichlorophenol
12. 2,4,6-Trichlorophenol
13. 2,4-Dinitrophenol
14. 4-Nitrophenol
15. 2,3,4,6-Tetrachlorophenol
16. 2-Methyl-4,6-dinitrophenol
IS 2,4,6-Tribromophenol (int. std.)
17. Pentachlorophenol
18. Dinoseb



Phenols in Water (SPME/GC)

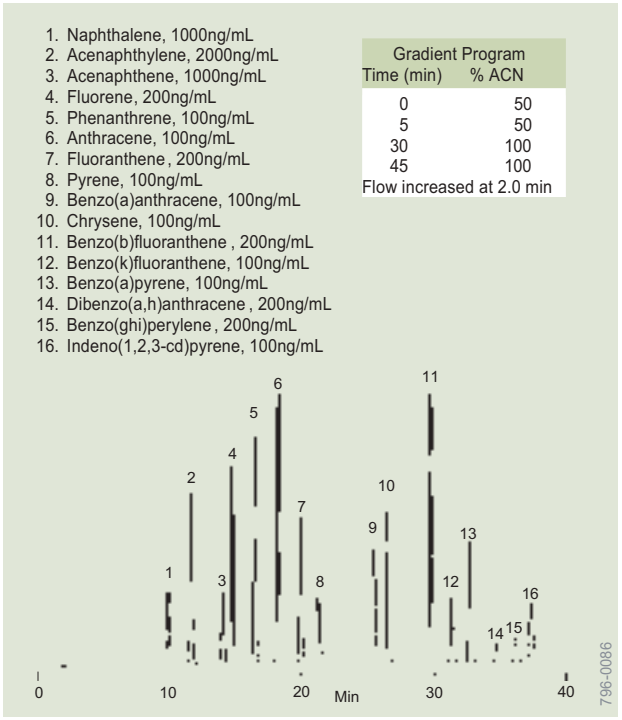
Sample: 50ppb phenols in 1.8mL saturated salt water, pH 2
Extraction: 20 min immersed in water with rapid stirring
SPME Fiber: polyacrylate, 85µm film
Cat. No.: 57304
Desorption: splitless, 280°C (closed 3 min)
Column: PTE-5, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 24135-U
Oven: 40°C (4 min) to 260°C at 12°C/min
Carrier: helium, 40cm/sec at 40°C
Det.: MS, Scan Range m/z = 45-465 at 0.6 sec/scan

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Nonionic Surfactants in Water (SPME/HPLC)

Sample: Triton X-100 in water (500mg/mL)
SPME Fiber: Carbowax/TPR-100, 65µm film
Cat. No.: 57315
Extraction: immersion, 50 min (rapid stirring)
Desorption: static, 200µL, mobile phase A:B (97:3), 2 min
Column: SUPELCOSIL LC-NH_2, 25cm x 4.6mm, 5µm particles
Cat. No.: 58338
Mobile Phase: A = hexane:2-propanol (90:10) B = 2-propanol:water (90:10)
Flow Rate: 0.5mL/min (0-2 min) 1.5mL/min (2-53min)
Det.: UV, 220nm
Inj.: 200µL



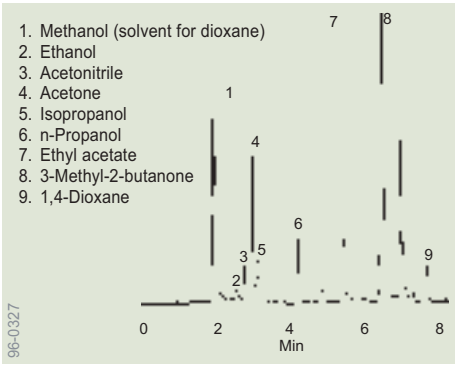
PAHs in Water (SPME/HPLC)

Sample: 5µL PAH mix (Cat. No. 4-8743) in 5mL water
SPME Fiber: polydimethylsiloxane, 100µm film
Cat. No.: 57301
Extraction: immersion, 30 min (rapid stirring)
Desorption: static, 200µL acetonitrile:water, 40:60, 2 min
Column: SUPELCOSIL LC-PAH, 15cm x 4.6mm ID, 5µm particles
Cat. No.: 58318
Mobile Phase: acetonitrile:water gradient (see program)
Flow Rate: 0-2 min: 0.2mL/min 2-45 min: 1.0mL/min
Det.: UV, 254nm

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

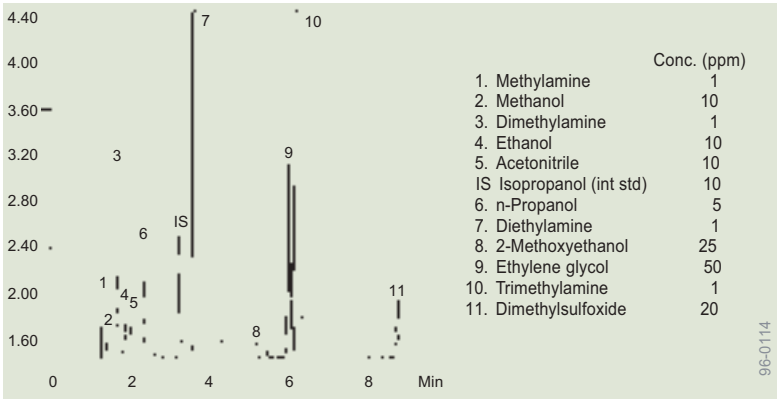


SPME Applications
Semivolatiles, Solvents



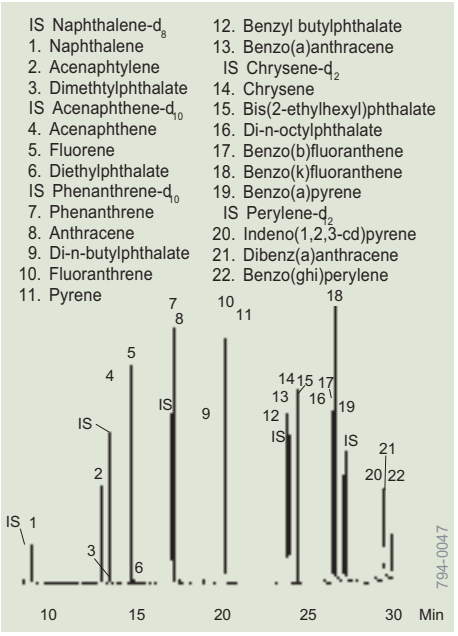
Solvents in Water at 20ppb (SPME /GC)

Sample:	solvents at 20ppb in 4mL water + 25% NaCl in 4mL vial
SPME Fiber:	Carboxen/PDMS, 75µm film
Cat. No.:	57318
Extractions:	immersion, 10 min., rapid stirring
Desorption:	3 min., 260°C
Column:	SPB-SULFUR, 30m x 0.32mm ID, 4.0µm film
Cat. No.:	24158
Oven:	50°C (2 min) to 150°C at 10°C/min
Carrier:	helium, 30cm/sec
Det.:	FID
Inj.:	splitless (closed 2 min), 260°C, 0.75mm ID liner



Pharmaceutical Solvents (SPME/GC)

Sample:	water + 25% NaCl, pH 11.0 immersion: 3.9mL sample + 0.1mL 50% Na_3PO_4 / 1g NaCl headspace: 2.4mL sample + 0.06mL 50% Na_3PO_4 / 0.6g NaCl
SPME Fiber:	polydimethylsiloxane/DVB, 65µm film
Cat. No.:	57310-U
Extraction:	immersion, 15 min (rapid stirring or headspace, 15 min, 55°C)
Desorption:	270°C, 5 min
Column:	SPB-1 SULFUR, 30m x 0.32mm ID, 4.0µm film
Cat. No.:	24158
Oven:	50°C (2 min) to 180°C at 10°C/min
Carrier:	helium, 50cm/sec
Det.:	FID
Inj.:	splitless (3 min), 270°C (0.75mm ID liner)



Semivolatiles in Water (SPME/GC)

Sample:	water spiked with PAHs and phthalates at 50ppb
SPME Fiber:	polydimethylsiloxane, 7µm film
Cat. No.:	57302
Sampling:	direct immersion in water, 15 min (rapid stirring)
Inj.:	split/splitless, 280°C (closed 4 min)
Column:	PTE-5, 30m x 0.25mm ID, 0.25µm film
Cat. No.:	24135-U
Oven.:	60°C (3 min) to 320°C at 10°C/min
Carrier:	helium, 40cm/sec at 60°C
Det.:	MS, Scan Range m/z = 45-465 at 0.6 sec/scan

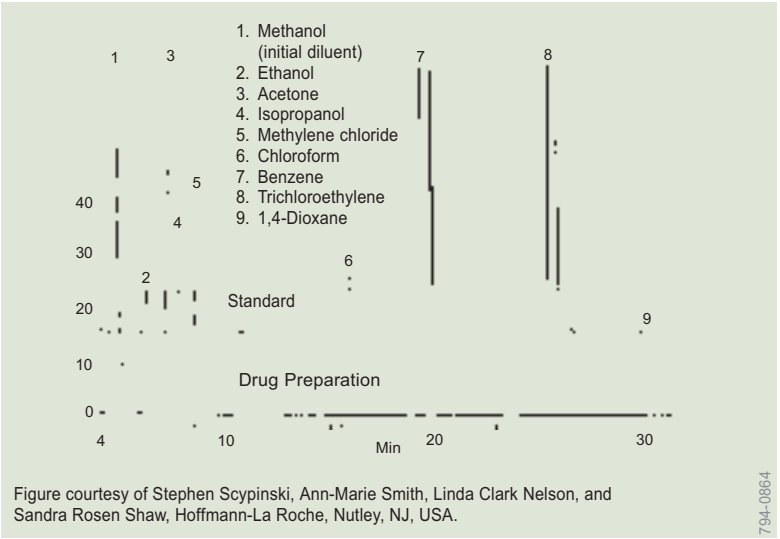


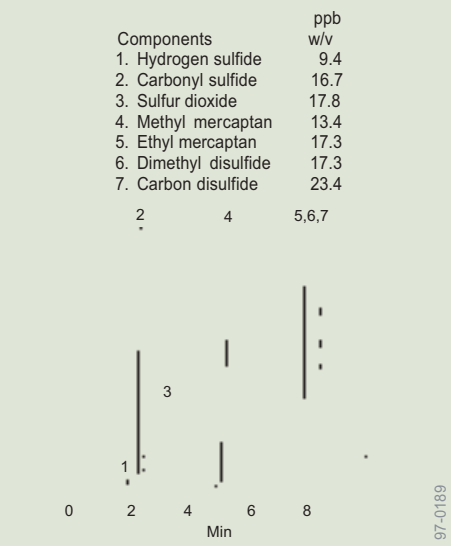
Figure courtesy of Stephen Scypinski, Ann-Marie Smith, Linda Clark Nelson, and Sandra Rosen Shaw, Hoffmann-La Roche, Nutley, NJ, USA.

Residual Solvents in Pharmaceutical Preparations (SPME/GC)

SPME Fiber:	polydimethylsiloxane, 100µm film
Cat. No.:	57300-U
Extraction:	headspace or immersion sampling (15 min) 1 min desorption
Column:	SPB-624, 75m x 0.53mm ID, 3.0µm film
Cat. No.:	25432
Oven:	40°C (35 min) to 220°C at 40°C/min, hold 5 min
Carrier:	helium, 35cm/sec
Det.:	FID, 250°C
Inj.:	splitless (closed 3 min), 200°C

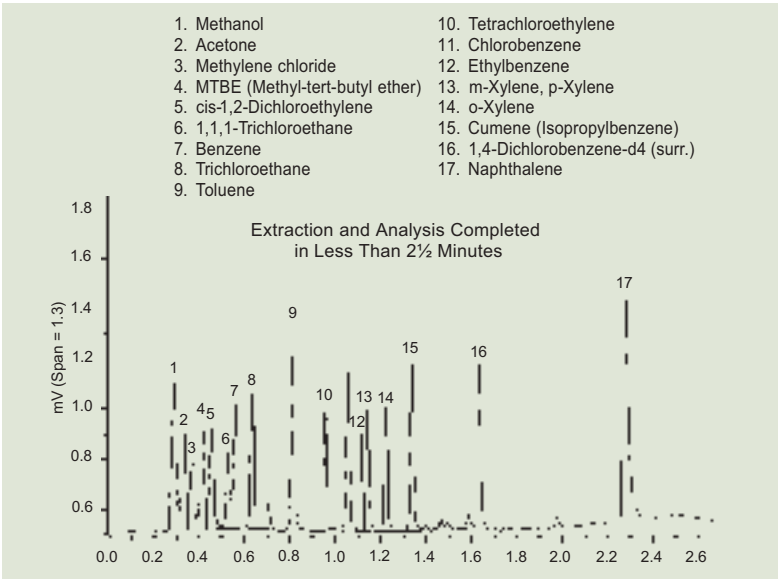
Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

SPME Applications
Odors, Sulfur Compounds and Volatiles



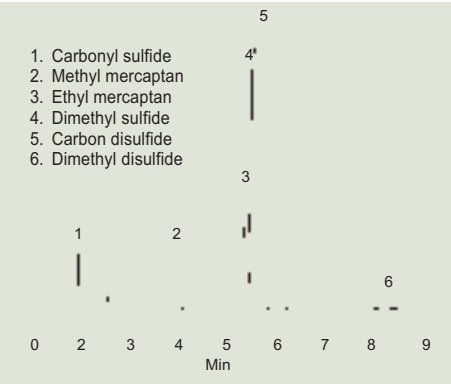
Sulfur Gases (SPME/GC)

Sample: sulfur gases in 40mL vial
SPME Fiber: Carboxen/PDMS, 75µm film
Cat. No.: 57318
Extraction: 10 min headspace at 40°C
Desorption: 3 min at 290°C
Column: Supel-Q PLOT, 30m x 0.32mm ID
Cat. No.: 24242
Oven: 45°C (1 min) to 250°C at 15°C/min



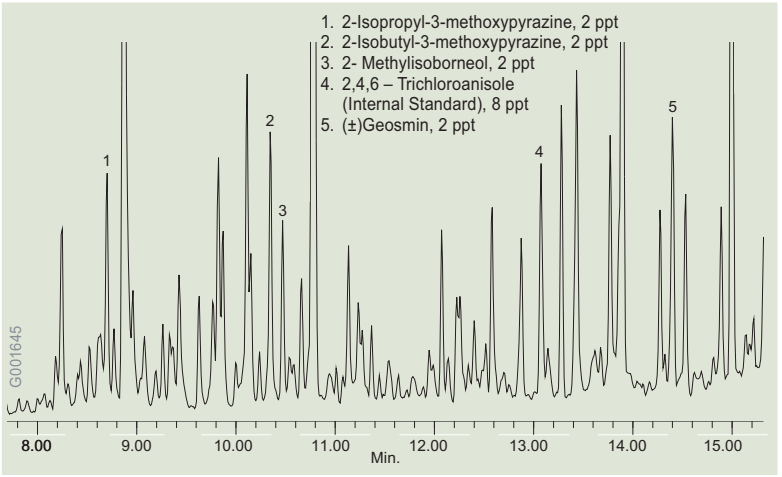
Water Sample Screened for BTEX and Other Compounds (SPME/GC)

Sample: 0.7mL water spiked with 2-600µg/liter each analyte, 0.25g NaCl added
SPME Fiber: 30µm PDMS
Cat. No.: 57309
Extraction: headspace, 12 sec (no stirring), ambient temp.
Desorption: 2-3 min, 250°C (0.75-1. 0mm ID inj. port liner)
GC Column: Equity-1 , 10m x 0.20mm ID, 1.2µm film (available on request)
Oven: 70°C (0.2 min) to 180°C at 50°C/min
Carrier: hydrogen, 12psi (+ 30mL/min nitrogen make-up gas)
Det.: FID, 250°C



Sulfur Gases at 1ppm (SPME/GC)

Sample: sulfur gases in air at 1ppm, 250mL bulb
SPME Fiber: Carboxen/PDMS, 75µm film
Cat. No.: 57318
Extraction: headspace, 5 min., ambient temp.
Desorption: 2 min., 250°C
Column: Supel-Q PLOT, 30m x 0.32mm ID
Cat. No.: 24242
Oven: 45°C (0.75 min.) to 250°C at 25°C/min
Carrier: helium, 25cm/sec
Injection: splitless/split (closed 2 min.), 0.75mm ID liner
Detector: MS quadrupole, m/z = 32 - 125 (0.6sec/scan)

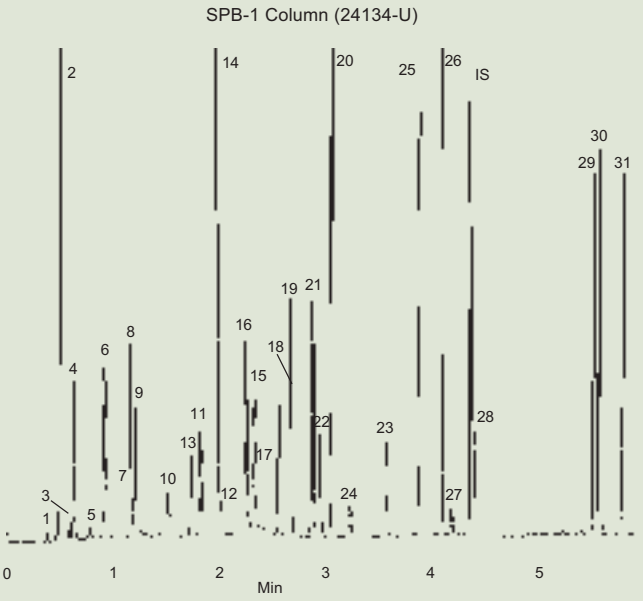


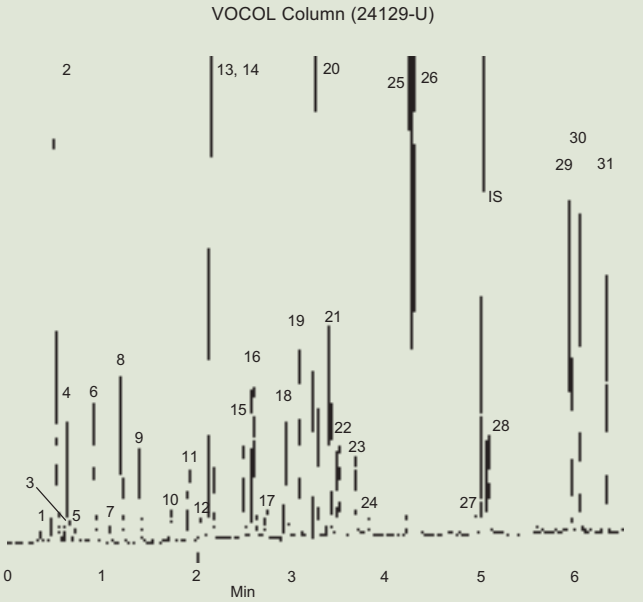
Trace Odors in Drinking Water (SPME/GC)

Sample: 25mL of water containing 25% NaCl and drinking water odors kit, Cat. No. 47529-U
SPME Fiber: 2cm StableFlex coated with 50/30µm DVB/Carboxen/PDMS
Cat. No.: 57348-U
Extraction: headspace, 65°C (30 min.)
Column: Equity-5, 30m x 0.25mm, 0.25µm film
Cat. No.: 28089-U
Desorption: 3 min. at 260°C
Oven: 60°C (2min) to 200°C at 8°C/min
GC Liner: 0.75mm SPME liner
Detector: MS, selected ions (SIM) 95, 112, 124, 137, 197; interface at 280°C
Flow: Helium, 37cm/sec @ 60°C (1mL/min constant flow)
Inj.: SPME fiber, splitless opened at after 1 min at 50mL/min.

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SPME Applications
Volatiles





1. Chloromethane
2. Vinyl chloride
3. Bromomethane
4. Chloroethane
5. Trichlorofluoromethane
6. 1,1-Dichloroethylene
7. Methylene chloride
8. trans-1,2-Dichloroethene
9. 1,1,-Dichloroethane
10. Chloroform
11. 1,1,1-Trichloroethane
12. Carbon tetrachloride
13. Benzene
14. 1,2-Dichloroethane
15. Trichloroethylene
16. 1,2-Dichloropropane
17. Bromodichloromethane
18. 2-Chloroethyl vinyl ether
19. cis-1,3-Dichloropropene
20. Toluene
21. trans-1,3-Dichloropropene
22. 1,1,2-Trichloroethane
23. Tetrachloroethylene
24. Dibromochloromethane
25. Chlorobenzene
26. Ethylbenzene
27. Bromoform

IS 1,4-Dichlorobutane

28. 1,1,2,2-Tetrachloroethane
29. 1,3-Dichlorobenzene
30. 1,4-Dichlorobenzene
31. 1,2-Dichlorobenzene

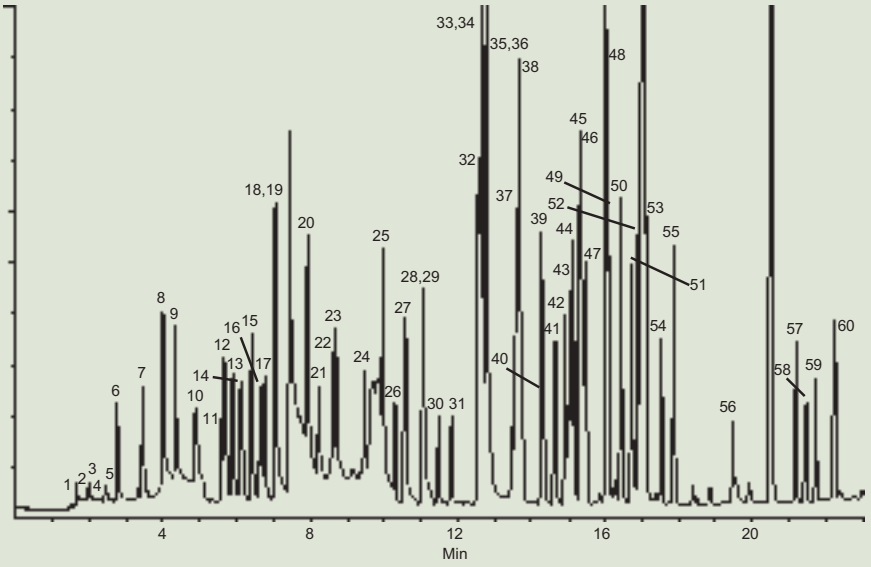
794-0438, 0439

Volatiles (SPME/GC)

Sample:	50ppb each analyte in 1.8mL saturated salt water
SPME Fiber:	polydimethylsiloxane, 100µm film
Cat. No.:	57300-U
Extraction:	5 min immersed in water with rapid stirring
Columns:	10m x 0.20mm ID, 1.2µm film
Oven:	40°C (0.75 min) to 160°C at 20°C/min
Carrier:	helium, 40cm/sec
Det.:	FID, 260°C
Inj.:	230°C, splitless (closed 3 min)

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

1. Dichlorodifluoromethane
2. Chloromethane
3. Vinyl chloride
4. Bromomethane
5. Chloroethane
6. Trichlorofluoromethane
7. 1,1-Dichloroethylene
8. Methylene chloride
9. trans-1,2-Dichloroethylene
10. 1,1,-Dichloroethane
11. 2,2-Dichloropropane
12. cis-1,2-Dichloroethylene
13. Chloroform
14. Bromochloromethane
15. 1,1,1-Trichloroethane
16. 1,1-Dichloropropene
17. Carbon tetrachloride
18. 1,2-Dichloroethane
19. Benzene
IS Fluorobenzene
20. Trichloroethylene
21. 1,2-Dichloropropane
22. Bromodichloromethane
23. Dibromomethane
24. cis-1,3-Dichloropropene
25. Toluene
26. trans-1,3-Dichloropropene
27. 1,1,2-Trichloroethane
28. 1,3-Dichloropropane
29. Tetrachloroethylene
30. Chlorodibromomethane
31. 1,2-Dibromoethane
32. Chlorobenzene
33. 1,1,1,2-Tetrachloroethane
34. Ethylbenzene
35. m-Xylene
36. p-Xylene
37. o-Xylene
38. Styrene
39. Isopropylbenzene
40. Bromoform
41. 1,1,2,2-Tetrachloroethane
42. 1,2,3-Trichloropropane
43. n-Propylbenzene
44. Bromobenzene
45. 1,3,5-Trimethylbenzene
46. 2-Chlorotoluene
47. 4-Chlorotoluene
48. tert-Butylbenzene
49. 1,2,4-Trimethylbenzene
50. sec-Butylbenzene
51. p-Isopropyltoluene
52. 1,3-Dichlorobenzene
53. 1,4-Dichlorobenzene
54. n-Butylbenzene
IS 1,2-Dichlorobenzene-d_4
55. 1,2-Dichlorobenzene
56. 1,2-Dibromo-3-chloropropane
57. 1,2,4-Trichlorobenzene
58. Hexachlorobutadiene
59. Naphthalene
60. 1,2,3-Trichlorobenzene



97-0183

Volatile Compounds by US EPA 524.2 (SPME/GC)

Sample: 1ppb each analyte in 3mL water (25% NaCl added) in 4mL vial
SPME Fiber: Carboxen/PDMS, 75µm film
Cat. No.: 57318
Extraction: headspace, 40°C (20 min.), with stirring
Desorption: 5 min., 310°C

Column: VOCOL, 30m x 0.25mm ID, 1.5µm film
Cat. No.: 24205-U
Oven: 40°C (2 min.) to 210°C at 8°C/min
Carrier: helium, 35cm/sec
Injection: splitless/split (closed 2 min), 0.75mm ID liner
Detector: ion trap, MS, m/z = 45 - 260 (0.6sec/scan)

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Solid Phase Microextraction

SUPELCO

Did you know...

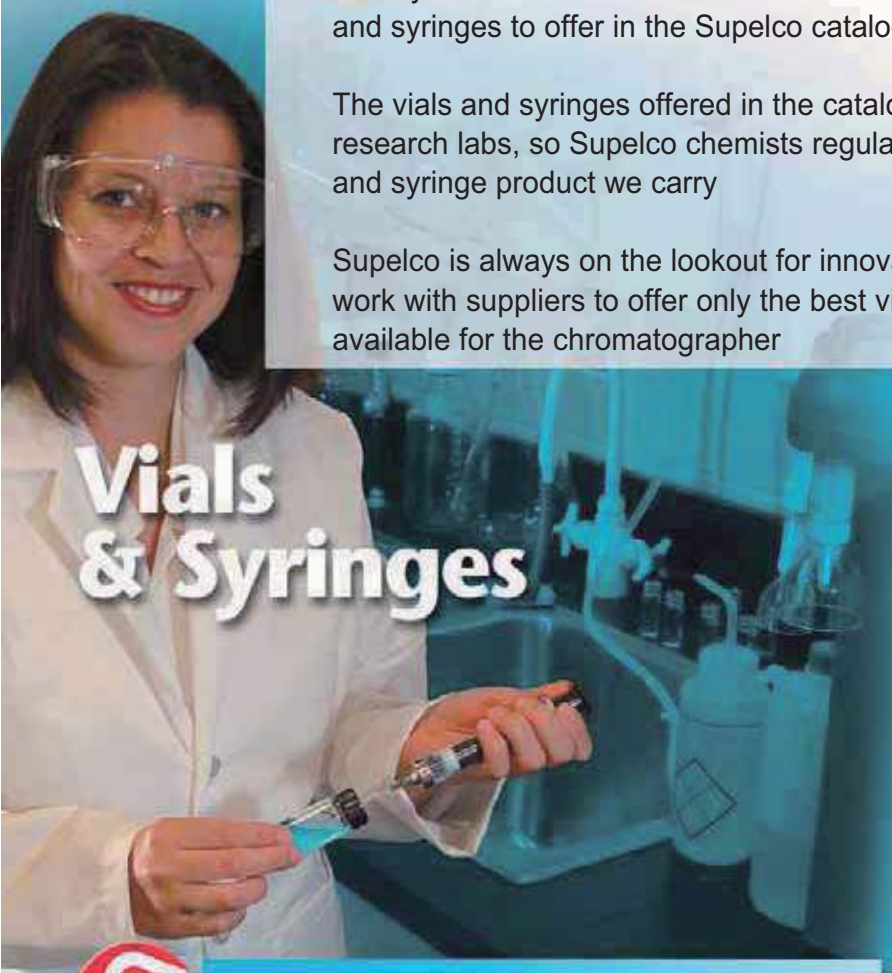
Supelco has the best vial & syringe solution to meet your chromatography needs



Quality is the #1 consideration when choosing which vials and syringes to offer in the Supelco catalog

The vials and syringes offered in the catalog are also used in our research labs, so Supelco chemists regularly evaluate every vial and syringe product we carry

Supelco is always on the lookout for innovative ideas, and we regularly work with suppliers to offer only the best vial and syringe products available for the chromatographer



Vials & Syringes

Supelco vial and syringe products include...

- Hamilton, SGE, and VICI Precision Sampling syringes
- A comprehensive line to fit leading GC and HPLC autosampler systems
- An extensive inventory that allows same-day shipping
- A propriety vial silanization process for the best possible recovery of analytical compounds
- A complete line of accessories for maintaining the best possible vial and syringe performance
- A large inventory of septa varieties to fit from 8mm to 22mm vials

Whatever your chromatography vial or syringe need, Supelco provides a solution. If you have questions about which product is right for your application, simply contact Supelco's Technical Service group for a quick and easy recommendation.

TechTip

Silanization is not always the best answer for vials. When working with trace levels of acidic compounds, an acid treated vial will yield improved performance over a silane treated vial. If you find yourself in this situation...

We recommend purchasing unsilanized vials and treating them with phosphoric acid immediately before using.

Call Supelco Technical Service for more details.



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Vials
Selecting Vials, Inserts, and Caps

Vial Varieties



Screw Top Vials
These standard and large opening vials are available in both clear and amber glass. They come with a variety of closures and septa.



Crimp Top Vials
These standard and large opening vials are used with aluminum seals. The 11mm aluminum seals have 6mm openings.



Shell Vials
Cylindrical shell vials compatible with plug-style needle closures to make syringe extraction easier.



Snap-Top Vials
For use with snap-ring seals as well as standard aluminum seals.



ABC Screw Top Vials
These vials have a unique thread design that allows you to screw on the caps, and still use them in a robotic autosampler.



LVI Vials
These large opening, crimp top vials have a cone-shaped insert.

Insert Varieties



Shell Style Inserts – These economical inserts stand unsupported in the carrier vial. Capacity 0.25-0.35mL.



Cone-Shaped Inserts – These economical inserts stand unsupported in the carrier vial. Capacity 0.10-0.20mL.



Inserts with Top Springs – With the unique design, the insert is centered in the neck of the vial. The needle extracts nearly all of the sample.



Inserts with Bottom Springs – The unique design allows the insert to be centered in the vial.

Cap Varieties



Phenolic Hole Cap
Temp. Limit 149°C



Polypropylene Hole Cap
Temp. Limit 135°C



Polypropylene Solid Cap w/ Aluminum
Temp. Limit 135°C
Not Autoclavable



Phenolic Solid Cap w/Teflon
Temp. Limit 205°C
Not Autoclavable

Selecting Screw Top Vials and Components

Volume	Vial OD x Height	Cap Diameter	Cap Thread (GCMI Spec.)	Septum Diameter
2mL (0.5 drams)	12 x 32mm	12mm	8-425	8mm
4mL (1 dram)	15 x 45mm	13mm	13-425	11mm
7mL (2 drams)	17 x 60mm	15mm	15-425	13mm
15mL (4 drams)	21 x 70mm	18mm	18-400	16mm
22mL (6 drams)	23 x 85mm	20mm	20-400	18mm
40mL (10.7 drams)	29 x 81mm	24mm	24-400	22mm
40mL (10.7 drams)	28 x 98mm	24mm	24-400	22mm

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Vials
ABC Autosampler Vials



ABC Vials, Large Opening, Preassembled, 2mL

Universal autosampler vials, can be used as either crimp-top or screw top. Use with autosamplers that require 12 x 32mm screw top or crimp top vials.

VIAL DESCRIPTION	QTY.	CAT. NO.	PRICE
POLYPROPYLENE CAP, PTFE/SILICONE SEPTUM			
Clear glass	100	27487-U	
	1000	27542	
Clear glass w/marking spot	100	27490-U	
	1000	27548-U	
Amber glass	100	27493	
Amber glass w/marking spot	100	27496	
	1000	27549-U	
POLYPROPYLENE CAP, PTFE/RUBBER SEPTUM			
Clear glass	100	27488-U	
	1000	27544-U	
Clear glass w/marking spot	100	27491-U	
	1000	27550-U	
Amber glass	100	27494	
Amber glass w/marking spot	100	27497-U	
	1000	27551	
POLYPROPYLENE CAP, PTFE/SILICONE/PTFE SEPTUM			
Clear glass	100	27489	
	1000	27546-U	
Clear glass w/marking spot	100	27492-U	
	1000	27552	
Amber glass	100	27495	
Amber glass w/marking spot	100	27498	



ABC Vials, Large Opening with 0.3mL LVI Insert

Packs of 100.

VIALS	CAT. NO.	PRICE
Clear glass, no cap	27562-U	
Clear glass, w/PTFE red rubber cap	27564-U	
Clear glass, w/PTFE silicone cap	27565-U	
Clear glass, w/PTFE/silicone/PTFE cap	27566-U	
Clear glass, w/PTFE lined cap	27567-U	
Amber glass, no cap	27563-U	

ABC Vials Only, Large Opening, 2mL

VIAL DESCRIPTION	QTY.	CAT. NO.	PRICE
Clear glass	100	27329	
	1000	27554	
Clear glass w/marking spot	100	27330	
	1000	27556	
Amber glass	100	27331	
	1000	27555-U	
Amber glass w/marking spot	100	27332	
	1000	27557	

Screw Caps with Septa for ABC Vials

CAP COLOR	QTY.	CAT. NO.	PRICE
PTFE/SILICONE			
Clear	100	27326	
Clear	1000	27558	
PTFE/RED RUBBER			
Clear	100	27327	
Clear	1000	27559	
RED PTFE/SILICONE			
Black	100	507393	
Red	100	507423	
Yellow	100	507466	
PTFE/SILICONE/PTFE			
Clear	100	27328	
Clear	1000	27560-U	
TAN PTFE/SILICONE			
Black	100	507385	
Yellow	100	507458	
PTFE/SILICONE/PTFE			
Black	100	507407	
Yellow	100	507474	

Inserts for ABC Vials

INSERT DESCRIPTION	QTY.	CAT. NO.	PRICE
0.35mL glass, shell style	100	24715	
	1000	24716	
0.25mL glass, conical	100	24717	
0.15mL glass w/top spring	100	24719	
0.20mL glass w/bottom spring	100	24721	
0.20mL polypropylene w/bottom spring	100	24722	

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Vials

Pre-Assembled Screw Top Sampling Vials



Vials with Open-Top Screw Caps

Packs of 100.

CAPACITY	CAT. NO.	PRICE
PHENOLIC CAP, PTFE/SILICONE SEPTUM		
Clear Glass		
2mL	27124-U	
4mL	27136	
7mL	27148	
15mL	27159	
22mL	27170	
40mL (29 x 81mm)	27180	
40mL (28 x 98mm)	27089-U	
Amber Glass		
2mL	27005	
4mL	27006	
7mL	27007	
15mL	27008	
22mL	27009-U	
40mL (29 x 81mm)	27010-U	
40mL (28 x 98mm)	27121-U	
PHENOLIC CAP, PTFE/RED RUBBER SEPTUM		
Clear Glass		
2mL	27123-U	
4mL	27135	
7mL	27147	
15mL	27158	
Amber Glass		
2mL	27011	
4mL	27012	
7mL	27013	
15mL	27014-U	
22mL	27015	

CAPACITY	CAT. NO.	PRICE
POLYPROPYLENE CAP, PTFE/SILICONE SEPTUM		
Clear Glass		
2mL	27208-U	
4mL	27209-U	
7mL	27210	
15mL	27211	
22mL	27212	
40mL (29 x 81mm)	27213	
Amber Glass		
2mL	27046-U	
4mL	27047	
7mL	27048-U	
15mL	27049	
22mL	27050-U	
40mL (29 x 81mm)	27051	
POLYPROPYLENE CAP, PTFE/RED RUBBER SEPTUM		
Clear Glass		
2mL	27202-U	
4mL	27203-U	
7mL	27204	
15mL	27205	
Amber Glass		
2mL	27040-U	
4mL	27041	
7mL	27042-U	
22mL	27044-U	

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Vials

Pre-Assembled Screw Top Sampling Vials



Vials with Solid-Top Screw Caps
Packs of 100.

CAPACITY	CAT. NO.	PRICE
PHENOLIC CAP, TEFLON LINER		
Clear Glass		
2mL	27134	
4mL	27138	
7mL	27150-U	
15mL	27161	
22mL	27172-U	
40mL (29 x 81mm)	27181	
Amber Glass		
2mL	27000	
4mL	27001-U	
7mL	27002-U	
15mL	27003	
22mL	27004	
40mL (29 x 81mm)	27182	
PHENOLIC CAP, ALUMINUM LINER		
Clear Glass		
2mL	27125-U	
4mL	27137	
7mL	27149	
15mL	27160-U	
22mL	27171	
Amber Glass		
2mL	27468-U	
7mL	27470-U	
22mL	27472	



Graduated Vials with Screw Caps
Packs of 100.

CAPACITY	CAT. NO.	PRICE
HOLE CAP, BARRIER SEPTUM		
7mL	27524	
22mL	27526	
40mL	27527	
SOLID CAP, TEFLON LINER		
2mL	27505-U	
4mL	27506-U	
7mL	27507	
15mL	27508	
22mL	27509	
HOLE CAP, THERMOSEAL SEPTUM		
2mL	27499	
4mL	27500-U	
15mL	27502-U	
HOLE CAP, BLUE PTFE/SILICONE		
2mL	27516	
4mL	27517	
7mL	27518	
15mL	27519	
22mL	27520-U	
40mL	27521	

2mL Large Opening Vials with Open-Top Screw Caps
Packs of 100.

VIAL DESCRIPTION	CAT. NO.	PRICE
POLYPROPYLENE CAP, RED PTFE/SILICONE SEPTUM		
Clear glass	27531	
Amber glass	27532	
POLYPROPYLENE CAP, DOUBLE-FACED SILICONE SEPTUM		
Clear glass	27533	
Amber glass	27535	
POLYPROPYLENE CAP, PTFE SEPTUM W/SLIT		
Clear glass	27534	
Amber glass	27536	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Vials

Screw Top Vials, Caps



Vials Only

Screw top glass vials; caps not included. Packs of 100.

CAPACITY	CAT. NO.	PRICE
CLEAR		
1.5mL	507369	
2mL	27078	
2mL – Large Opening	27265	
4mL	27111	
7mL	27151	
15mL	27162	
22mL	27173	
40mL (29 x 81mm)	27184	
40mL (28 x 98mm)	27379	
AMBER		
2mL	27083-U	
2mL – Large Opening	27267-U	
4mL	27115-U	
7mL	27072-U	
15mL	27088-U	
22mL	27073-U	
40mL (29 x 81mm)	27185-U	
40mL (28 x 98mm)	27382	



Graduated Vials Only

Graduated screw top clear glass vials; caps not included. Packs of 100.

CAPACITY	CAT. NO.	PRICE
2mL	27023	
4mL	27024	
7mL	27025	
15mL	27026	
22mL	27027-U	
40mL	27028-U	



Screw Caps Only

Packs of 100.

VIAL CAPACITY	CAT. NO.	PRICE
PHENOLIC W/HOLE		
2mL	27094-U	
4mL	27120-U	
7mL	27154	
15mL	27165	
22mL	27176	
40mL	27187	
POLYPROPYLENE W/HOLE		
2mL	27052	
2mL Large Opening	27271	
4mL	27053	
7mL	27054	
22mL	27056	
40mL	27057	
SOLID W/TEFLON LINER		
2mL	27091-U	
2mL Large Opening	27416	
4mL	27141	
7mL	27152	
15mL	27163	
22mL	27174-U	
40mL	27186	
SOLID W/ALUMINUM LINER		
2mL	27092-U	
2mL Large Opening	27415	
4mL	27142	
7mL	27153	
15mL	27164	
22mL	27175-U	



Assembled Screw Caps with Septa

Hole caps with PTFE/silicone septa.

VIAL CAPACITY	QTY.	CAT. NO.	PRICE
2mL	100	27262	
2mL Large Opening	100	27273	
4mL	100	27018	
7mL	100	27019	
15mL	100	27020	
22mL	100	27021	
40mL	100	27022	

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All septa in packs of 100.






VIAL VOLUME/ SEPTA DIAMETER	RED PTFE/SILICONE CAT. NO.	$	TAN PTFE/SILICONE CAT. NO.	$	BLUE PTFE/SILICONE CAT. NO.	$	THERMOSEAL CAT. NO.	$
2mL / 8mm	27097-U		27095-U		27510-U		27191	
2mL L.O.*/ 10mm	27277		—	—	—	—	—	—
4mL / 11mm	—	—	27144		27511		27192	
7mL / 13mm	—	—	27155		27512		27193	
15mL / 16mm	—	—	27166		27513		27194	
22mL / 18mm	—	—	27177		27514		27195	
40mL / 20mm	—	—	27236		—	—	27540-U	
40mL / 22mm	—	—	27188-U		27515		27196	






Oversized for better sealing ability

VIAL VOLUME/ SEPTA DIAMETER	PTFE/SILICONE W/SLIT CAT. NO.	$	PTFE/RED RUBBER CAT. NO.	$	WHITE PTFE/SILICONE CAT. NO.	$	TEFLON LINER (0.010) CAT. NO.	$
2mL / 8mm	27098-U		27132		—	—	27133	
2mL L.O.*/ 10mm	27279		—	—	—	—	27281	
4mL / 11mm	—	—	27145		27356		27146	
7mL / 13mm	—	—	27156		—	—	27157	
15mL / 16mm	—	—	27167		—	—	27168	
22mL / 18mm	—	—	27178		—	—	27179	
40mL / 20mm	—	—	27233		27361		—	—





VIAL VOLUME/ SEPTA DIAMETER	BARRIER CAT. NO.	$	VITON CAT. NO.	$	PTFE/SILICONE/PTFE CAT. NO.	$
2mL / 8mm	24882-U		27350-U		27096-U	
2mL L.O.*/ 10mm	—	—	—	—	27275	
4mL / 11mm	24883		27351		27122-U	
7mL / 13mm	24884		27352		—	—
15mL / 16mm	24885-U		—	—	—	—
22mL / 18mm	24886-U		27354		—	—
40mL / 20mm	27189		27247		—	—
40mL / 22mm	27190-U		27355		—	—

*L.O. - Large opening

P000874-84

Compatibility/Incompatibility of Septa

Barrier (maximum temp. 350°C)
Silicone bonded to aluminum. Use in sealing applications where non-permeability and low volatility are required at temperatures above 177°C. Affected by many organic solvents (see examples under Silicone).

Butyl (maximum temp. 200°C)
Use with many organic solvents: acetic acid (<50%), acetonitrile, acetone, alcohols, DMSO, phenol. Not compatible with alkanes, benzene, carbon disulfide, chlorinated solvents, cyclohexane.

Red rubber (maximum temp. 100°C)
Use with many hydrocarbons, acetonitrile, alcohols, cyclohexane. Not compatible with chlorinated solvents.

Silicone (maximum temp. 250°C)
Use with acetone, alcohols, DMSO, ether, aqueous samples. Affected by many organic solvents: acetonitrile, benzene, chloroform, hexane, pyridine, tetrahydrofuran, toluene.

Teflon/Rubber (maximum temp. 100°C)
Use with most organics (until pierced). Resistant to chlorosilanes.

PTFE/Teflon/Silicone (maximum temp. 250°C)
Use with most organics (until pierced). Not recommended for use with chlorosilanes.

PTFE/Thermoseal (maximum temp. 300°C)
An improved grade of silicone septa that can be used at higher temperatures. Affected by many organic solvents (see examples under Silicone).

Viton (maximum temp. 315°C)
Resists mineral oil, aliphatic and aromatic hydrocarbons, high concentrations of acids, high temperatures. Not compatible with strong bases, ketones, low molecular weight esters.

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Vials
Screw Top Autosampler Vials



2mL SCREW TOP VIALS

12 x 32mm (12 x 35mm WITH CAP)

Use with:

Agilent / HP 7670A, 7671A, 1042, 1090	Infochroma	Sedere
AIM CPS-100	Jasco♦	Shimadzu♦ SIL-6A, AOC9
ASC	Kontron	Spectra-Physics♦ 8875, 8880
Beckman 501, 507	LDC/Milton Roy	TOA Model ICA450, ICA5450
Bruker LC51	Magnus Scientific	TOA Model ICA450, ICA5450
Carlo Erba AS105, 8000	Perkin-Elmer ISS 100, ISS 200	TosoH TSK-6080
Gilson (Rack 30P)	Perkin-Elmer Autosystem♦	United Technologies♦
Hitachi AS-2000, AS-4000	Phillips LC-XP	Varian♦ 8000, 8100, 8200, 8035, 8055/85
IBM	Precision Sampling GC111, GC311, LC24	Varian Vista Series
		Vavex

♦ Screw top vial with polypropylene cap only. ♦ Black phenolic closure. Cat. No. 27094-U is recommended.

2mL Screw Top and Shell Vials

DESCRIPTION	QTY.	CAT. NO.	PRICE
VIALS ONLY			
2mL clear glass	100	27078	
	1000	27079	
2mL amber glass	100	27083-U	
	1000	27087-U	
2mL clear, precleaned	100	27339	
2mL amber, precleaned	100	27344	
2mL clear glass, silanized	100	27029-U	
	1000	27030	
2mL amber glass, silanized	100	27238	
	1000	27219	
2mL clear, with graduations	100	27023	
2mL clear glass w/marking spot	100	27080-U	
	1000	27081-U	
2mL amber glass w/marking spot	100	27084-U	
	1000	27085-U	
0.75mL polypropylene	100	24709	
	1000	24710	
SHELL VIALS WITH CLOSURES			
2mL clear TITESEAL	200	27255	
	2000	27256	
2mL amber TITESEAL	200	27257	
	2000	27258	
SCREW TOP MICRO-VIALS			
0.1mL clear glass	12	33206-U	
	144	33241	
0.1mL polypropylene	200	24712	
	1000	24713	
0.1mL plastic w/glass insert	100	27090-U	
0.1mL amber plastic w/ glass insert w/8mm thread	100	27412	
CLOSURES, 8 X 425			
Phenolic, solid caps w/PTFE liner	100	27091-U	
Phenolic, solid caps w/aluminum liner	100	27092-U	
Phenolic, black, open top	100	27094-U	
Polypropylene, black, open top	100	27052	
	1000	24764	
Polypropylene, yellow, open top	1000	24765	
Top seal, polypropylene, clear, 0.010"	100	27402	
Hole cap, black, large opening	100	27401	
Top hat, black, w/silicone septa	100	27403-U	
Top hat, yellow, w/silicone septa	100	27404	

DESCRIPTION	QTY.	CAT. NO.	PRICE
OPEN-TOP CLOSURES, PRE-ASSEMBLED			
Polypropylene w/red PTFE/silicone septa	100	27262	
Polypropylene KIM-LOK w/PTFE/silicone septa	100	27261-U	
Phenolic w/tan PTFE/silicone septa	100	27093-U	
	1000	33242	
SEPTA, 8mm			
Red PTFE/silicone/red PTFE, 0.040"	100	27096-U	
	1000	23182-U	
Tan PTFE/silicone, 0.065"	100	27095-U	
	1000	33213	
Red PTFE/white silicone, 0.065"	100	27097-U	
	1000	23243	
PTFE/silicone w/slit, 0.040"	100	27098-U	
	1000	24881	
Black Viton, 30 mil thickness	100	27350-U	
White PTFE, 0.010" (for use w/solid cap)	100	27133	
PTFE/ red rubber	100	27132	
INSERTS, SHELL STYLE			
0.25mL glass, 5 x 31mm	200	24701	
	1000	24702	
INSERTS, CONICAL			
0.10mL glass, 5 x 31mm	200	24703	
	1000	24704	
0.15mL glass w/polyflange, 5 x 29mm	100	24705	
	500	24706	
0.05mL glass w/bottom spring	100	27400-U	
0.15mL glass w/bottom spring, 5 x 29mm	100	24707	
0.15mL polypropylene w/bottom spring, 5 x 29mm	100	24708	

1.5mL SCREW TOP VIALS

12 x 30mm, 8/425 FINISH

Use with:

Perkin-Elmer Autosampler

CAUTION: The inserts on this page will not fit 1.5mL vials.

DESCRIPTION	QTY.	CAT. NO.	PRICE
1.5mL	100	507369	
	1000	507377	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

2mL SCREW TOP VIALS – LARGE OPENING (10mm OPENING)

12 x 32mm

Use with:
- Alcott 738
- Hitachi AS-2000, AS-4000
- Shimadzu AOC-14/1400, AOC-17, SIL 6B, SIL 9A, SIL 6A
  (Use white and yellow closures only.)
- Varian 8100, 8200
- Waters Alliance



2mL Screw Top Vials – Large Opening

DESCRIPTION	QTY.	CAT. NO.	PRICE
VIALS ONLY			
2mL clear glass	100 2000	27265 27266	
2mL amber glass	100	27267-U	
2mL step vials, amber glass	100	27406	
2mL step vials, clear glass, with 0.25mL glass insert	100	27418	
2mL step vials, amber glass, with 0.25mL glass insert	100	27419	
0.5mL polypropylene w/10mm thread	100	27410	
0.75mL polypropylene w/10mm thread	100	27411	
1.0mL polypropylene	100 1000	27269 27270-U	
PRE-ASSEMBLED VIALS			
2mL clear, w/red PTFE/silicone septa	100	27531	
2mL amber, w/red PTFE/silicone septa	100	27532	
2mL clear, w/ PTFE/silicone/PTFE septa	100	27533	
2mL amber, w/ PTFE/silicone/PTFE septa	100	27535	
2mL clear, w/ PTFE/silicone septa, w/slit	100	27534	
2mL amber, w/ PTFE/silicone septa, w/slit	100	27536	
CLOSURES, 10 x 425			
Polypropylene, black, open top	100 1000	27271 27272-U	
Polypropylene, yellow, open top, 10mm	100	27413	
Polypropylene, white, open top, 10mm	100	27414	
Polypropylene, black, solid caps, foil lined	100	27415	
Polypropylene, black, solid caps, PTFE lined	100	27416	
Top seal, clear polypropylene, 0.010”	100	27417	
OPEN-TOP CLOSURES, PRE-ASSEMBLED			
Polypropylene w/PTFE/silicone septa	100	27273	

DESCRIPTION	QTY.	CAT. NO.	PRICE
SEPTA, 10mm			
Red PTFE/silicone/red PTFE, 0.040"	100 1000	27275 27276	
Red PTFE/silicone, 0.063"	100 1000	27277 27278	
PTFE/silicone w/slit, 0.040"	100 1000	27279 27280-U	
White PTFE, 0.010" (for use with solid cap)	100 1000	27281 27282	
INSERTS, SHELL STYLE			
0.35mL glass, 6 x 31mm	100 1000	24715 24716	
INSERTS, CONICAL			
0.05mL glass w/glass flange, 6 x 25mm	100	27408	
0.25mL glass, 6 x 31mm	100	24717	
0.15mL glass w/top spring, 6 x 29mm	100	24719	
0.20mL glass w/bottom spring, 6 x 29mm	100	24721	
0.20mL polypropylene w/bottom spring, 6 x 29mm	100	24722	
INSERTS FOR STEP VIALS			
0.25mL glass w/glass flange	100	27407	
0.25mL polypropylene w/plastic flange	100	27409	
KIM-BIN WORK STATION			
Station with 2000 clear screw top 2mL (normal opening) vials w/caps and PTFE/silicone septa	1	27264-U	
Unfilled station	1	27263	



27263

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Vials
Screw Top Autosampler Vials

4mL SCREW TOP VIALS
15 x 45mm
Use with: Brucker LC51 Gilson Kontron MSI 660 Perkin-Elmer Autosystem Phillips LC-XP Shimadzu AOC-14/1400, SIL-2AS, LC-10A Spark Marathon TosoH TSK-6080 Waters 48-Position, 717



4mL Screw Top Vials

DESCRIPTION	QTY.	CAT. NO.	PRICE
SCREW TOP VIALS, 15 x 45mm			
4mL clear glass	100	27111	
	1000	27031	
4mL amber glass	100	27115-U	
	1000	27032	
4mL clear, precleaned	100	27340	
4mL amber, precleaned	100	27345	
4mL clear, silanized	100	27114	
	1000	27220-U	
4mL amber, silanized	100	27217	
4mL clear, with graduations	100	27024	
4mL clear w/marking spot	100	27112	
	1000	27113	
4mL amber w/marking spot	100	27116-U	
	1000	27117-U	
4mL plastic w/glass insert	100	27243	
OPEN-TOP CLOSURES, 13-425			
Phenolic, black	100	27120-U	
Polypropylene, black	100	27053	
Polypropylene cap w/PTFE/silicone septa, 0.065"	100	27018	
13mm black top hat, w/PTFE/silicone septa	100	27439	
SOLID CAPS, 13-245			
w/PTFE liner	100	27141	
w/Aluminum liner	100	27142	



Pre-Assembled Vials Kit

Includes each of the following (in packs of 100).

Screw top vials, 15 x 45mm, 4mL glass inserts, 0.30mL clear glass, conical springs for 0.30mL conical insert closures, open top, phenolic, black septa, red PTFE/red rubber

DESCRIPTION	CAT. NO.	PRICE
4mL Screw Top Vials Kit		
Clear glass	27110	
Amber glass	27528	

DESCRIPTION	QTY.	CAT. NO.	PRICE
SEPTA, 11mm			
Red PTFE/silicone/red PTFE, 0.040"	100	27122-U	
PTFE/red rubber	100	27145	
White PTFE, 0.010" (for solid cap)	100	27146	
Tan PTFE/silicone septa, 0.060"	100	27144	
White PTFE/white silicone	100	27356	
	1000	27369-U	
Viton	100	27351	
	1000	27364	
INSERTS AND SPRINGS			
0.75mL clear glass, shell style, 8 x 43mm	200	24746	
	1000	24747	
0.25mL clear glass, conical, 6 x 39mm	100	27118-U	
	1000	27076	
0.275mL glass w/plastic flange	100	27443	
0.3mL glass w/top spring	100	27444	
0.3mL polypropylene w/top spring	100	27445	
Spring (for 0.30mL conical insert)	100	27086-U	
0.15mL clear glass w/bottom spring, 6 x 38mm	100	24748	
0.15mL polypropylene w/bottom spring, 6 x 38mm	100	24749	

Polypropylene Limited Volume Shell Vials With Starburst Conical Snap Plugs



These polypropylene limited volume shell vials, with uniquely designed conical interior, eliminate the need for glass vials and inserts. No tedious laboratory assembly is required. These vials work in 48-position autosamplers.

Precise conical design permits maximum sample evacuation. They are more effective and cost efficient than standard glass vials and inserts. The starburst design in the snap plug allows easy penetration.

DESCRIPTION	QTY.	CAT. NO.	PRICE
3mL SHELL VIALS, 15 x 45mm			
Polypropylene w/starburst conical snap plugs	100	27538	

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Silane-Treated Vials and Accessories

- Proprietary silane treatment shields active silanol groups on untreated glass surfaces
- Improved recovery of submicrogram polar compounds
- Save time and money

To obtain a quote on silane treatment for other sizes of glassware, please contact your Sigma-Aldrich representative.



BESCHREIBUNG	PK.	KAT. NR.	PREI
CRIMP TOP VIALS, 2mL			
Large Opening Vials, Silane-Treated, 12 x 32mm			
2mL clear glass, large opening (6mm)	100	27060-U	
	1000	27061	
2mL amber glass, large opening (6mm)	100	27225-U	
	1000	27216	
Aluminum Seals, Color Coded, 11mm			
w/PTFE/red rubber, silver	100	27102-U	
	1000	33233-U	
w/Red PTFE/silicone	100	27360-U	
	1000	27373	
w/Black Viton liner	100	27107	
	1000	33278-U	
w/Red PTFE/silicone/red PTFE	100	27108	
	1000	27109-U	
w/Removable center (no septa)	100	27099-U	
SCREW TOP VIALS, 2mL			
Standard Opening Vials, Silane-Treated, 12 x 32mm			
2mL clear glass	100	27029-U	
	1000	27030	
2mL amber glass	100	27238	
	1000	27219	
Open-Top Closures, Pre-Assembled			
Polypropylene w/red PTFE/silicone septa	100	27262	
Polypropylene KIM-LOK w/PTFE/silicone septa	100	27261-U	
Phenolic w/red PTFE/silicone septa	100	27093-U	
	1000	33242	

BESCHREIBUNG	PK.	KAT. NR.	PREI
SCREW TOP VIALS, 2mL (cont'd)			
Solid Caps, 8-425			
Phenolic, solid caps w/Teflon liner	100	27091-U	
Phenolic, solid caps w/aluminum liner	100	27092-U	
Phenolic, black, open top	100	27094-U	
Polypropylene, black, open top	100	27052	
	1000	24764	
Polypropylene, yellow, open top	1000	24765	
Septa for Screw Top Vials, 8mm			
Red PTFE/silicone/red PTFE, 0.040"	100	27096-U	
	1000	23182-U	
Tan PTFE/silicone, 0.065"	100	27095-U	
	1000	33213	
Red PTFE/white silicone, 0.065"	100	27097-U	
	1000	23243	
PTFE/red rubber	100	27132	
Standard Opening Vials, Silane-Treated, 15 x 45mm			
4mL clear glass	100	27114	
	1000	27220-U	
4mL amber glass	100	27217	
Open-Top Closures, 13-425			
Phenolic, black	100	27120-U	
Polypropylene, black	100	27053	
Polypropylene cap with PTFE/silicone liner, 0.065"	100	27018	
Solid Caps, 13-425			
w/PTFE liner	100	27141	
w/Aluminum liner	100	27142	
Septa for Screw Top Vials, 11mm			
Red PTFE/silicone/red PTFE, 0.040"	100	27122-U	
PTFE/red rubber	100	27145	
Tan PTFE/silicone septa, 0.060"	100	27144	
AMPULS AND INSERTS			
Ampuls, Silane-Treated			
2mL amber glass	144	27033	
Conical Inserts, Silane-Treated, 0.3mL			
Fit 15 x 45mm screw top vials	1000	27128-U	

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Vials

SPME Autosampler Vials



Vials for Varian 8200 Autosampler

DESCRIPTION	QTY.	CAT. NO.	PRICE
LARGE OPENING 2mL VIALS WITH CAPS, PTFE/SILICONE SEPTA			
Clear, 2mL (12mm OD x 32mm)	100	27531	
Amber, 2mL (12mm OD x 32mm)	100	27532	
10mL SCREW TOP VIALS, WITH CAPS, PTFE/SILICONE SEPTA			
Clear, 10mL, Preassembled	100	27529	
Amber, 10mL, Preassembled	100	27530	
CAPS, SEPTA FOR 10mL SCREW TOP VIALS			
Vial only, clear (24.5mm x 52mm)	36 144	27387 27388	
Vial only, amber (24.5mm x 52mm)	36 144	27389 27390-U	
Cap with hole (22mm)	144	23236	
PTFE/silicone septa 0.125" thick, 20mm diameter	100	27236	
10mL CRIMP TOP VIALS (FOR THIN SEALS)			
Clear vials only, 10mL (24.5mm x 50mm)	36	27385	
Clear vials only, 10mL (24.5mm x 50mm)	144	27286	
CLOSURES FOR 10mL CRIMP TOP VIALS			
20mm seal with thin Viton septa (0.030")	36	33146-U	
20mm seal with thin Viton septa (0.030")	100	27245	
20mm PTFE/silicone septa (0.030")	100	27539	



Headspace Vials for CTC Autosampler (Combi PAL)*

DESCRIPTION	QTY.	CAT. NO.	PRICE
FLAT BOTTOM			
10mL clear glass (23mm x 46mm)	100	27198	
20mL clear glass (23mm x 75mm)	100	27199	
ROUND BOTTOM			
10mL clear glass (22.6mm x 46mm)	100	27294	
10mL clear glass (22.6mm x 46mm)	1000	27295	
20mL clear glass (22.6mm x 75mm)	100	27296	
20mL clear glass (22.6mm x 75mm)	1000	27297	
CLOSURES AND ACCESSORIES FOR BOTH 10mL AND 20mL VIALS			
Closures (Tin Plate, Magnetic Seals) with PTFE lined silicone	100	27300	
Adjustable crimper for 20mm seals	1	22316-U	

* Autosampler distributed by Leap, Varian and Gerstel



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* Heating block not included

Vials for SPME Sampling Stand

DESCRIPTION	QTY.	CAT. NO.	PRICE
WITH 4mL VIAL HOLDER PUCK			
4mL screw top vials (15mm x 45mm)			
Clear, preassembled, phenolic caps & PTFE/silicone	100	27136	
Amber, preassembled, phenolic caps & PTFE/silicone	100	27006	
Vials only, clear	100	27111	
Vials only. clear	1000	27031	
Vials only, amber	100	27115-U	
Vials only, amber	1000	27032	
Vials only, clear silanized	100	27114	
Vials only, clear silanized	1000	27220-U	
Vials only, amber silanized	100	27217	
Open closures and septa for 4mL vials			
Phenolic cap with hole	100	27120-U	
White PTFE silicone septa (11mm)	100	27356	
White PTFE silicone septa	1000	27369-U	
Viton Septa (11mm)	100	27351	
Viton Septa	1000	27364	
WITH 15mL VIAL HOLDER PUCK			
15mL screw top vials (21mm x 70mm)			
Clear, preassembled, phenolic caps & PTFE /silicone	100	27159	
Amber, preassembled, phenolic caps & PTFE/ silicone	100	27008	

Vials for 40mL Heating Block

DESCRIPTION	QTY.	CAT. NO.	PRICE
40mL SCREW TOP VIALS (29mm x 81mm only)			
Clear, preassembled, phenolic cap and PTFE/silicone	100	27180	
Amber, preassembled, phenolic cap and PTFE/silicone	100	27010-U	
Vial only, clear	100	27184	
Vial only, amber	100	27185-U	
CLOSURES FOR 40mL VIAL			
Phenolic caps with hole	100	27187	
Viton septa (22mm)	100	27355	
PTFE/Silicone septa	100	27188-U	

Manual SPME Sampling Stand

Holds eight vials while supporting the SPME syringe for consistent fiber immersion depth. Cat. No.57333-U accommodates 4mL vials only. Cat. No. 57357-U accommodates 15mL vials. Order the 15mL vial puck (Cat. No. 57358-U) as a replacement for the 15mL unit, or to use 15mL vials with the 4mL unit. Not for use with automated / HPLC fiber holders.



Heat/Stir Plate

Fits compactly on the base of the SPME sampling stand. Heating range is 40-550°C, stirring range is 60-1200rpm.

40mL Vial Holder

Use this aluminum block for heating/stirring during headspace SPME sampling of odors or other volatiles. Holds six 40mL vials.

DESCRIPTION	CAT. NO.	PRICE
SPME sampling stand for 4mL vials	57333-U	
SPME sampling stand for 15mL vials	57357-U	
Vial puck for 15mL vials	57358-U	
40mL Vial Holder	33313-U	
Corning heat/stir plate, 120VAC	Z262129-1EA	
Thermometer, 5”	57332	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Vials
Crimp Top Autosampler Vials

VIALS TAKING 8mm CRIMP SEALS
CHROMACOL VIALS, 6 x 32mm

Use with:
Waters 96-Position Autosampler



27283

DESCRIPTION	QTY.	CAT. NO.	PRICE
VIALS			
0.2mL clear glass, tapered bottom	200	27283	
	1000	27284	
0.3mL clear glass, round bottom	200	24725	
	1000	24726	
CRIMP SEALS, 8mm			
w/Red PTFE/silicone/red PTFE	200	33265-U	
	1000	33266-U	
w/PTFE/silicone	200	33273-U	
	1000	33274-U	
w/Red PTFE/silicone	100	27359	
	1000	27372	
w/PTFE/red rubber	200	33135-U	
	1000	33136	

VIALS TAKING 8mm CRIMP SEALS
CHROMACOL UNI-VI VIALS, 7 x 30mm, 7 x 32mm

Use with:

Agilent / HP (not 1090A)	PU 4247
Autometric 4100	Shimadzu AOC-14/1400
Beckman 501/502/507	SIL 6B/9A/LC-1
Dani ALS 86.80	Spark Promis
LDC Marathon, Promis	Spectra-Physics
Perkin-Elmer Integral 4000	



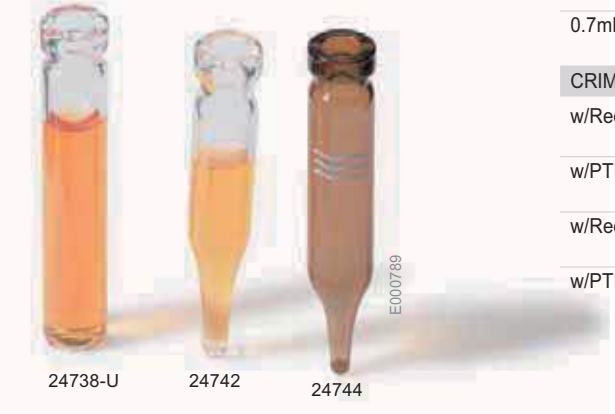
27314 27312 27316 + 27312

DESCRIPTION	QTY.	CAT. NO.	PRICE
VIALS			
0.6mL amber glass, conical (7 x 30mm)	200	27312	
	1000	27313	
0.8mL amber glass, round bottom (7 x 32mm)	100	27314	
	1000	27315	
PTFE support sleeve (required with above)	40	27316	
CRIMP SEALS, 8mm			
w/Red PTFE/silicone/red PTFE	200	33265-U	
	1000	33266-U	
w/PTFE/silicone	200	33273-U	
	1000	33274-U	
w/Red PTFE/silicone	100	27359	
	1000	27372	
w/PTFE/red rubber	200	33135-U	
	1000	33136	

VIALS TAKING 8mm CRIMP SEALS
7 x 40mm

Use with:

Beckman 504	Gilson 231-401, 232-401
Carlo Erba AS200S, A2005	(Rack 9) (not ASPEC)
du Pont	ICI LC1600
Finnigan A200S	Phillips S4, S8, 4700LC/GC
	SGE LS-3200



24738-U 24742 24744

DESCRIPTION	QTY.	CAT. NO.	PRICE
VIALS			
0.8mL clear glass	200	24738-U	
	2000	24739	
0.8mL amber glass	200	24740-U	
	2000	24741	
0.7mL clear glass, conical	200	24742	
	1000	24743	
0.7mL amber glass, conical	200	24744	
	1000	24745	
CRIMP SEALS, 8mm			
w/Red PTFE/silicone/red PTFE	200	33265-U	
	1000	33266-U	
w/PTFE/silicone	200	33273-U	
	1000	33274-U	
w/Red PTFE/silicone	100	27359	
	1000	27372	
w/PTFE/red rubber	200	33135-U	
	1000	33136	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Vials
Crimp Top, Snap Plug Autosampler Vials

VIALS TAKING 8mm CRIMP SEALS
8 x 30mm

Use with:
- Carlo Erba AS-V60
- Dynatech GC1111, 60, GC311
- Hitachi AS-2000, AS-4000
- Perkin-Elmer AS100, LC600(60), AS2000, AS100B, AS300, LLLC30, 2000, B2000
- Sigma 2000



DESCRIPTION	QTY.	CAT. NO.	PRICE
VIALS			
0.5mL clear glass	200	33275	
	1000	33276	
0.5mL amber glass	200	24723	
	2000	24724	
CRIMP SEALS, 8mm			
w/Red PTFE/silicone/red PTFE	200	33265-U	
	1000	33266-U	
w/PTFE/silicone	200	33273-U	
	1000	33274-U	
w/Red PTFE/silicone	100	27359	
	1000	27372	
w/PTFE/red rubber	200	33135-U	
	1000	33136	

VIALS TAKING 8mm SNAP PLUGS
VIALS WITH POLYPROPYLENE PLUGS, 8 x 35mm

Use with:
- Alcott 728



DESCRIPTION	QTY.	CAT. NO.	PRICE
VIALS			
0.75mL clear glass	200	24727	
	1000	24728	
0.75mL amber glass	200	24729	
	1000	24730	
DISPLACEMENT PLUGS			
Polypropylene, blue	100	27289	

VIALS TAKING 8mm SNAP PLUGS
8 x 40mm

Use with:
- Shmiadzu 10A Autosampler
- Waters 96-Position Autosampler



DESCRIPTION	QTY.	CAT. NO.	PRICE
VIALS			
1mL clear glass, without closure	200	33320-U	
	1000	33325-U	
1mL amber glass, without closure	1000	24732	
1mL clear glass, with closure	200	33321-U	
	1000	33326	
1mL amber glass, with closure	250	27290	
	1000	27291	
0.7mL shell vials (polypropylene w/starburst conical snap plugs)	100	27537	
SNAP PLUG CLOSURES, COLOR CODED, 8mm			
Natural	200	33322-U	
	1000	33327	
Red	200	33323	
	1000	33328-U	
Blue	200	33324	
	1000	33329	
INSERTS AND SPRINGS FOR 8 x 40mm VIALS			
0.20mL clear glass conical (requires spring)	200	24733	
	1000	24734	
Spring for 24733 & 24734	200	24735	
0.10mL clear glass conical w/bottom spring	100	24737	
0.15mL polypropylene w/bottom spring	100	24708	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Vials
Crimp Top Autosampler Vials

VIALS TAKING 11mm CRIMP SEALS

12 x 32mm

Use with:

- Agilent / HP 7673 series I/II, 7670A, 7671A, 1042, 1090, 8042, 1050, 1082, 1080, 1084, 7683
- AIM C x PS-200
- A.I. (42 vial tray)
- Alcott 738
- Altex
- AMS 42
- Antek 736
- ASC
- Beckman 501, 507
- Carlo Erba AS V42, AS 105
- Carnegie CMA 230/200
- Chrompack
- Dani 39.80, ALS 39.80
- Dynatech 42
- Finnigan 200S
- Gilson (Rack 30P)
- Gynkotek
- Hitachi AS-2000, AS-4000
- IBM
- Infochroma
- Kipp
- Kontron 360
- Packard
- Perkin-Elmer Autosystem, ISS 100, ISS 200, 400, LC600(42), 4900, 420B
- Phillips LC-XP
- Precision Sampling GC111, GC311, LC241
- Shimadzu AOC-14/1400, SIL-6B/9A
- Spark
- Spectra-Physics 7110, 8110
- Talbot
- TosoH TSK-6080
- United Technologies
- Varian 8100, 8200, Marathon, LC 9100/9095



Crimp Top Vials, 4.6mm Opening

DESCRIPTION	QTY.	CAT. NO.	PRICE
VIALS			
2mL clear glass	100	27068-U	
	1000	27069	
2mL amber glass	100	27070-U	
	1000	27071-U	
INSERTS			
Shell style 0.25mL clear glass, 5x 31mm	100	24701	
	1000	24702	
Conical style 0.10mL glass, 5 x 31mm	200	24703	
	1000	24704	
0.15mL glass w/polyflange, 5 x 29mm	100	24705	
0.15mL glass w/bottom spring, 5 x 29mm	100	24707	
0.15mL polypropylene w/bottom spring, 5 x 30mm	100	24708	



Crimp Top Vials, 6.0mm Opening

DESCRIPTION	QTY.	CAT. NO.	PRICE
VIALS			
2mL clear glass	100	27058	
	1000	27059	
2mL amber glass	100	27064	
	1000	27065	
2mL clear glass with marking spot	100	27062-U	
	1000	27063	
2mL amber glass with marking spot	100	27066-U	
	1000	27067-U	
INSERTS			
Shell style 0.35mL clear glass,6 x 31mm	100	24715	
	1000	24716	
Conical style 0.25mL glass, 6 x 31mm	100	24717	
0.15mL glass w/top spring, 6 x 29mm	100	24719	
	1000	24720	
0.20mL glass w/bottom spring, 6 x 29mm	100	24721	
0.20mL polypropylene w/bottom spring, 6 x 29mm	100	24722	

Convenience Packs: Vials and Seals

Multi-pack combinations of 2mL large opening vials and 11mm PTFE/red rubber aluminum seals.

DESCRIPTION	QTY.	CAT. NO.	PRICE
Clear	100	27239	
	1000	27240-U	
Amber	100	27241	
	1000	27242-U	

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VIALS TAKING 11mm CRIMP SEALS

12 x 32mm

Use with autosamplers listed on previous page.

Maximum Recovery Clear Glass Vial
27274



Vial with Conical Bottom
27333





33195

KOMBO Pack
27106





33281

Crimp Top Vials, Special Varieties

DESCRIPTION	QTY.	CAT. NO.	PRICE
VIALS, LARGE OPENING			
Maximum recovery vials, 1.5mL AP-2000, clear	100	27274	
Limited volume vials, 0.1mL, clear glass	100	24714	
MICRO VIALS, STANDARD OPENING, CONICAL			
0.1mL clear glass	12	33208	
	144	33232	
0.1mL polypropylene	100	27075-U	
	1000	33217-U	
0.1mL plastic w/glass cone	100	27074-U	
0.6mL plastic w/glass cone	100	33255-U	
VIALS, TAPERED BOTTOM			
1.1mL clear glass	100	27310	
	1000	27311	
SUPPORT SLEEVES, PTFE, NONDISPOSABLE			
For 27310 or 27311	50	27335	
VIALS, CONICAL BOTTOM			
0.9mL clear glass, 10 x 32mm	125	27333	

11mm Crimp Seals

DESCRIPTION	QTY.	CAT. NO.	PRICE
CRIMP SEALS, COLOR CODED, 11mm			
w/PTFE/red rubber, silver	100	27102-U	
	1000	33233-U	
w/PTFE/red rubber, red	100	27103	
	1000	27473	
w/PTFE/red rubber, blue	100	27104	
	1000	27381	
w/PTFE/red rubber, gold	100	27105	
	1000	27474	
KOMBO Pack (12 colors, 25 of each color)	300	27106	
w/Red PTFE/silicone, silver	100	27360-U	
	1000	27373	
w/White PTFE/white silicone, silver	100	27214-U	
	1000	27215	
w/Black Viton liner, silver	100	27107	
w/Red PTFE/silicone/red PTFE, silver	100	27108	
	1000	27109-U	
w/Removable center (no septa), silver	100	27099-U	
CRIMPERS AND DECAPPERS, 11mm			
Hand crimper	1	33195	
Pliers-type decapper	1	33281	
Hand decapper	1	33181-U	



27263

KIM-BIN Work Station

A convenient way to organize your vials. Available filled with supplies or unfilled. Cat. No. 27231-U includes 3000 clear large opening 2mL vials, PTFE/red rubber 11mm septa, and seals. Cat. No. 27264-U includes 2000 clear screw top 2mL vials (standard opening), red PTFE/silicone septa, and black phenolic closures (recommended for Varian and Spectra Physics autosamplers).

DESCRIPTION	CAT. NO.	PRICE
Station with Crimp Top Vials	27231-U	
Station with Screw Top Vials	27264-U	
Unfilled Station	27263	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Vials
Snap Top Autosampler Vials

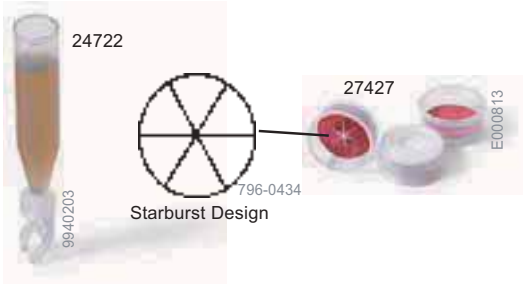
VIALS TAKING 11mm SNAP TOP SEALS

LARGE OPENING, 12 x 32mm

Use with:

- Agilent / HP 7673 series I/II, 7670A, 7671A, 1042, 1090, 8042, 1050, 1082, 1080, 1084
- AIM CPS-200
- A.I. (42 vial tray)
- Alcott 738
- Altex
- AMS 42
- Antek 736
- ASC
- Beckman 501, 507
- Carlo Erba AS V42, AS 105
- Carnegie CMA 230/200
- Chrompack
- Dani 39.80, ALS 39.80
- Dynatech 42
- Finnigan 200S
- Gilson (Rack 30P)
- Gynkotek
- Hitachi AS-2000, AS-4000
- Infochroma
- Kipp
- Packard
- Perkin-Elmer Autosystem, ISS 100, 200, 400, LC600(42), 4900, 420B
- Phillips LC-XP
- Precision Sampling GC111, GC311, LC241
- Shimadzu AOC-14/1400, SIL-6B/9A
- Spark
- Spectra-Physics 7110, 8110
- Talbot
- TosoH TSK-6080
- United Technologies
- Varian 8100, 8200, Marathon, LC 9100





Snap Top Vials, Large Opening

DESCRIPTION	QTY.	CAT. NO.	PRICE
VIALS			
2mL clear glass	100 2000	24750-U 24751	
2mL amber glass	100 2000	24752 24753	
2mL clear glass w/marking spot	100 1000	27249 27250-U	
2mL amber glass w/marking spot	100 1000	27251 27252	
0.75mL polypropylene	100 1000	27253 27254	
0.50mL polypropylene	100	27422	
0.10mL polypropylene	100	27423	
POLY-CRIMP SEAL CAPS			
w/PTFE liner	100	24754	
w/PTFE/red rubber	100	24756	
w/PTFE/silicone liner	100	24758	
w/PTFE/silicone with slit	100	27426	
w/PTFE/silicone with starburst	100	27427	
w/PTFE/silicone/PTFE with starburst	100	27428	
w/PTFE/silicone/PTFE	100	24760-U	
GC-SNAP RINGS(tighter seal for pressurized systems)			
Polypropylene with PTFE/rubber septa	100	27430-U	
Polypropylene with PTFE/silicone/PTFE septa	100	27432	
INSERTS, SHELL STYLE			
0.35mL clear glass, 6 x 31mm	100 1000	24715 24716	
INSERTS, CONICAL			
0.25mL glass, 6 x 31mm	100	24717	
0.15mL glass w/top spring, 6 x 29mm	100	24719	
0.20mL glass w/bottom spring, 6 x 29mm	100	24721	
0.20mL polypropylene w/bottom spring, 6 x 29mm	100	24722	
0.25mL polypropylene w/plastic flange (for step vial)	100	27409	
0.25mL glass w/glass flange (for step vial)	100	27407	

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Crimp Top Vials, 2mL to 100mL

These vials are constructed of clear, borosilicate glass.

DESCRIPTION	QTY.	CAT. NO.	PRICE
2mL VIALS AND CLOSURES (11mm DIAMETER)			
Vials only (12 x 32mm), 2mL, clear◆	100 1000	27058 27059	
Vials only (12 x 32mm), 2mL, amber◆	100 1000	27064 27065	
2.5mL VIALS (13mm DIAMETER)			
Vials only (11.7 x 34.5mm), 2.5mL	288	33121	
Closures for 33121			
Crimp seals, removable center, no septum	100	27222-U	
Crimp seals, removable center, PTFE/rubberseptum	100 1000	27223 27451	
Crimp seals, silver w/PTFE/silicone liner	100	27452	
PTFE/rubber septum	100	27156	
Butyl stopper	100	27224	
Red rubber stopper	100	27226	

Accessories for 2mL-2.5mL Crimp Top Vials

DESCRIPTION	QTY.	CAT. NO.	PRICE
ALUMINUM CRIMP SEALS, 13mm			
Removable center	100	27222-U	
ALUMINUM CRIMP SEALS, 11mm			
Open center	100	27099-U	
STOPPERS, 13mm			
Butyl	100	27224	
Red rubber	100	27226	
STOPPERS, 11mm			
Butyl◆	100	27100-U	
SEPTA, 11mm			
Teflon/red rubber◆	100	27101	

◆ For standard opening vials – 4.6mm.

Crimpers and Decappers

DESCRIPTION	CAT. NO.	PRICE
8mm		
Hand Crimper	33272-U	
Pliers-type Decapper	33284	
Hand Decapper	33180-U	
11mm		
Hand Crimper	33195	
Hand Crimper, Adjustable	22313-U	
Pliers-type Decapper	33281	
Hand Decapper	33181-U	
13mm		
Hand Crimper	33279-U	
Pliers-type Decapper	33282	
Hand Decapper	33182-U	
20mm		
Hand Crimper	33280-U	
Hand Crimper, Adjustable	22316-U	
Pliers-type Decapper	33283	
Hand Decapper	33183	



33195



33281

Vials

Crimp Top Headspace Vials



Headspace Vials Taking 20mm Crimp Seals

DESCRIPTION	QTY.	CAT. NO.	PRICE
VIALS, BEVELED FINISH			
6mL clear glass (22 x 38mm)	100 1000	27292 27293	
6mL clear glass (23 x 38mm)	100	27197	
10mL clear glass (23 x 46mm)	100	27198	
10mL clear glass (22.6 x 46mm)	100 1000	27294 27295	
20mL clear glass, flat bottom (23 x 75mm)	100	27199	
20mL clear glass, round bottom (22.6 x 75mm)	100 1000	27296 27297	
27mL clear glass (30 x 60mm)	100 1000	27298 27299	



Serum Bottles, 5mL to 100mL

These vials are constructed of clear, borosilicate glass.

DESCRIPTION	QTY.	CAT. NO.	PRICE
SERUM BOTTLES, 5-100mL VIALS (20mm DIAMETER)			
Vials only (25 x 40mm), 5mL, clear	36 288	33102-U 33103	
Vials only (25 x 40mm), 5mL, amber	36	33141-U	
Vials only (25 x 50mm), 10mL, clear	36 288	33104 33105-U	
Vials only (25 x 50mm), 10mL, amber	36 288	33143 33144	
Vials only (36.6 x 62.8mm), 30mL, clear	36 288	33106 33107-U	
Vials only (43 x 73mm), 50mL, clear	36 272	33108-U 33109-U	
Vials only (51.7 x 94.5mm), 100mL, clear	36 144	33110-U 33111-U	

Convenience Packs

Each pack contains 100 crimp top vials (20mm) and 100 pressure release aluminum seals.

SEAL DESCRIPTION	CAT. NO.	PRICE
10mL VIAL CAPACITY		
With PTFE/silicone	27303-U	
With PTFE/butyl rubber	27304-U	
20mL VIAL CAPACITY		
With PTFE/butyl	27305-U	
With PTFE/silicone	27306	
With PTFE/butyl rubber	27307	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



Pressure Release, Open Center



Open Center



Removable Center



Tear Away





Teflon/Rubber Septa





Mininert Valves

Accessories for Vials w/20mm Opening

DESCRIPTION	QTY.	CAT. NO.	PRICE
ALUMINUM CRIMP SEALS/SEPTA, 20mm			
Open center, PTFE/rubber septum■	100	27454-U	
Open center, PTFE/silicone septum■	100	27455-U	
Removable center, PTFE red rubber septum■	100	27228	
Tin plate, open center, PTFE/silicone septum■▲	100	27300	
Open center, PTFE/white silicone, 2 mil PTFE septum	100	27229	
Open center, white PTFE/white silicone, 5 mil PTFE septum	100 1000	27362 27375	
Tin plate, open center, PTFE/butyl rubber septum	100	27301-U	
Open center, Viton septum	36	33146-U	
Open center, black Viton septum▲	100 1000	27245 27246	
ALUMINUM CRIMP SEALS, 20mm w/o SEPTA			
Open center	100	27227-U	
Open center	100	27230-U	
Tear away center	100	27016	
Tear away center■	100	27200	
SEPTA, 20mm			
Black Viton◆	100 1000	27247 27248-U	◆
PTFE/Teflon faced butyl	100	27201	
PTFE/Teflon/rubber	100	27233	
PTFE/Teflon (2mil)/silicone (125 mil total)	100	27236	
PTFE/Teflon (10mil)/silicone (100 mil total)	100	27237-U	
Barrier (foil/silicone)	100	27189	
PTFE/silicone (60 mil total)	100	27541	
PTFE/silicone (125 mil total, 5/120)	100 1000	27361 27374	
Thermoseal	100	27540-U	
STOPPERS, 20mm			
Gray Butyl	100	27232	
Red rubber	100	27234	
Silicone	100	27235-U	

■ For 6mL, 10mL, 20mL headspace vials.
▲ For use with Carlo Erba HS 500 & 700, Leap HS 500, and CTC Combi-PAL autosamplers.
◆ This septum is thinner than most (0.030"), and requires the use of an adjustable crimper.

Mininert Valves for Crimp Top Vials

- Fit 5-100mL vials (20mm seal)
- Install without tools
- Inert Teflon construction

DESCRIPTION	QTY.	CAT. NO.	PRICE
Mininert valves	12	33305	
Replacement septa	50	33310-U	
Septum inserter	1	33311	



Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Vials
Precleaned Sampling Containers



Precleaned Vials

Cleaned for water sampling according to US EPA 40CFR 136, Guidelines for Establishing Test Procedures for the Analysis of PollutantsThese vials are assembled with open-top screw caps and specially designed septa (10 mils of Teflon facing on 90 mils of silicone). Clear vials are made of Wheaton-33 low extractable borosilicate glass. Amber vials are Wheaton-320 borosilicate glass.

CAPACITY	CAP SIZE	QTY.	CAT. NO.	PRICE
CLEAR GLASS				
2mL	8-425	100	27339	
4mL	13-425	100	27340	
7mL	15-425	100	27341	
15mL	18-400	100	27342	
22mL	20-400	100	27343	
40mL (28 x 98mm)	24-400	72	23188	
AMBER GLASS				
2mL	8-425	100	27344	
4mL	13-425	100	27345	
7mL	15-425	100	27346	
15mL	18-400	100	27347	
22mL	20-400	100	27348	
40mL (28 x 98mm)	24-400	72	23189	
REPLACEMENT SEPTA FOR 40mL SAMPLING VIALS				
10 mil Teflon/90 mil silicone		100	27188-U	



Precleaned Containers

The following containers are cleaned according to US EPA protocol B. Black polypropylene cap with 0.030” Teflon liner.

CAPACITY	CAP SIZE	QTY.	CAT. NO.	PRICE
CLEAR GLASS, TALL, WIDE MOUTH				
4 oz.	48/400	24	24551-U	
8 oz.	58/400	24	24552	
16 oz.	63/400	12	24553-U	
32 oz.	89/400	12	24554	
CLEAR GLASS, TALL, NARROW MOUTH				
32 oz.	33/400	12	24550-U	
AMBER GLASS, SHORT, WIDE MOUTH				
4 oz.	38/400	12	24555	
8 oz.	45/400	12	24556	
16 oz.	53/400	12	24557-U	
32 oz.	53/400	12	24558	
AMBER GLASS, SHORT, NARROW MOUTH				
32 oz.	33/430	12	24559	
AMBER GLASS JUG, NARROW MOUTH				
80 oz.	38/430	6	24560	
128 oz.	38/430	4	24561	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Micro Reaction Vessels

Cone shaped inside for easy removal of small samples. Heavy wall borosilicate glass. Supplied with Teflon-faced red rubber septum and cap. Can be autoclaved or centrifuged.



Screw Top Vessels with Caps and Septa

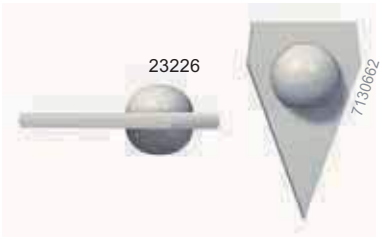
CAPACITY	OD/HT./DEPTH	CAP	QTY.	CAT. NO.	PRICE
CLEAR GLASS (GRADUATED)					
With hole cap					
0.1mL	16.5 x 32 x 16mm ▲	15mm	12	33289	
0.3mL	16.5 x 34 x 23mm ▲	15mm	12	33291	
1mL	16.5 x 40 x 33mm ▲	15mm	12	33293	
2mL	16.5 x 58 x 48mm ▲	15mm	12	33295	
3mL	20.5 x 42 x 42mm ▲	20mm	12	33297	
5mL	20.5 x 61 x 58mm ▲	20mm	12	33299	
10mL*	24.0 x 72mm ▲	24mm	12	27479	
With solid cap					
0.1mL	16.5 x 32 x 16mm ▲	15mm	12	27034	
0.3mL	16.5 x 34 x 23mm ▲	15mm	12	27035	
1mL	16.5 x 40 x 33mm ▲	15mm	12	27036	
2mL	16.5 x 58 x 48mm ▲	15mm	12	27037	
3mL	20.5 x 42 x 42mm ▲	20mm	12	27038-U	
5mL	20.5 x 61 x 58mm ▲	20mm	12	27039	
AMBER GLASS					
With hole cap					
1mL	13 x 41mm ■	13-425	12	27475-U	
2mL	20 x 41mm ■	20-400	12	27476	
3mL	20 x 47mm ■	20-400	12	27477-U	
5mL	20 x 62mm ■	20-400	12	27478-U	

▲ Height with cap; depth from septum to bottom of cone.
■ Height without cap.
* Not graduated.

Crimp Top Vessels

CAPACITY	DIAMETER	QTY.	CAT. NO.	PRICE
2mL	20mm	12	27377	
5mL	20mm	12	27378	







Accessories for Micro Reaction Vessels

DESCRIPTION	QTY.	CAT. NO.	PRICE
PHENOLIC HOLE SCREW CAPS			
13mm	100	27120-U	
15mm	100	27154	
20mm	100	27176	
24mm	100	27187	
SEPTA			
For 13mm screw cap	100	27145	
For 15mm screw cap	100	27156	
For 20mm screw cap	100	27178	
For 24mm screw cap	100	27188-U	
MININERT VALVES			
For 13mm screw cap	12	33300	
For 15mm screw cap	12	33301	
For 18mm screw cap	12	33302	
For 20mm screw cap	12	33303	
For 24mm screw cap	12	33304	
For 20mm crimp top	12	33305	
Replacement septa	50	33310-U	
Septum inserter	1	33311	
CRIMP SEALS			
For 2mL & 5mL vessels	100	27229	
MAGNETIC STIRRING BARS (TRIANGULAR)			
For 0.1-2.0mL vessels	6	23226	
For 3.0-5.0mL vessels	6	23227	



Plastic Coated Storage Bottles, Caps Included

DESCRIPTION		QTY.	CAT. NO.	PRICE
100mL	10 x 59mm	12	23171	
500mL	187 x 91mm	12	23172	
1000mL	224 x 104mm	12	23173	
Caps (GL-45)				
polypropylene w/seal ring, 45mm		12	23170-U	

Vials
Sampling and Storage Containers

Large Amber Screw Top Septum Bottles

Protect your sample from sunlight. Only glass and Teflon contact the contents.



DESCRIPTION	QTY.	CAT. NO.	PRICE
30mL (32 x 80mm)			
Bottles w/hole cap, Teflon/silicone septa	12	23228	
Bottles	12	23232	
Hole caps, no septa	100	27176	
Solid caps, polyseal liner	144	23238	
Septa, Teflon/silicone	144	23242-U	
60mL (38 x 95mm)			
Bottles w/hole cap, Teflon/silicone septa	12	23229	
Bottles	12	23233	
Hole caps, no septa	100	27176	
Solid caps, polyseal liner	144	23238	
Septa, Teflon/silicone	144	23242-U	
120mL (49 x 114mm)			
Bottles w/hole cap, Teflon/silicone septa	12	23230-U	
Bottles	12	23234	
Hole caps, no septa	144	23236	
Solid caps, polyseal liner	144	23240-U	
Septa, Teflon/silicone 2 mil Teflon, 0.120” 10 mil Teflon, 0.100”	 100 100	 27236 27237-U	
240mL (61 x 143mm)			
Bottles w/hole cap, Teflon/silicone septa	12	23231	
Bottles	12	23235	
Hole caps, no septa	144	23237	
Solid caps, polyseal liner	144	23241	
Septa, Teflon/silicone	144	23245-U	

Screw Top Mini Flasks

Heat resistant borosilicate glass flasks provide an inert seal when used with a hole cap and Teflon silicone septum (included) or a Mininert valve. Excellent for liquid-liquid extraction of trihalomethanes from drinking water. Also useful for sample collection, solution preparations, derivatization reactions, extractions, and many other applications.



DESCRIPTION	QTY.	CAT. NO.	PRICE
10mL	12	64715	
25mL	12	64716-U	
Screw caps w/hole, 20mm	12	27176	
Septa, PTFE/silicone	100	27177	
Mininert valves, 20mm	12	33303	





Crimpers and Decappers

DESCRIPTION	CAT. NO.	PRICE
8mm		
Hand Crimper	33272-U	
Pliers-type Decapper	33284	
Hand Decapper	33180-U	
11mm		
Hand Crimper	33195	
Hand Crimper, Adjustable	22313-U	
Pliers-type Decapper	33281	
Hand Decapper	33181-U	
13mm		
Hand Crimper	33279-U	
Pliers-type Decapper	33282	
Hand Decapper	33182-U	
20mm		
Hand Crimper	33280-U	
Hand Crimper, Adjustable	22316-U	
Pliers-type Decapper	33283	
Hand Decapper	33183	

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Glass Magnet Products

Our Glass Magnet Sheet prevents your glass apparatus from being knocked over accidentally. This 2' x 2' sheet (61cm x 61cm), with its tacky surface, effectively secures the vessels in place. It can be cut with a razor blade or utility knife to fit strategically on counter tops or in drawers containing fragile glassware. Add it to carts when transporting glass to another lab or into the field.

The Glass Magnet Vial Holder keeps individual vials, ampuls, and other vessels in place.

DESCRIPTION	CAT. NO.	PRICE
Glass Magnet Sheet, 2' x 2' (61 x 61cm)	57269	
Glass Magnet Vial Holder, 4" dia., pk. of 2	57270	

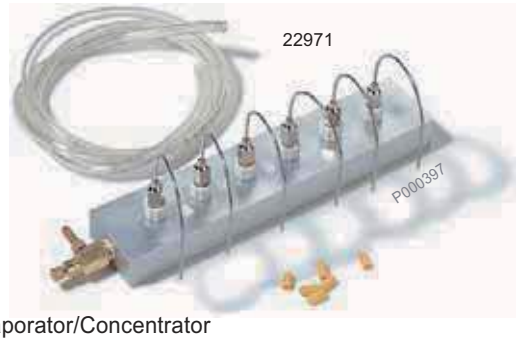


Space Saver Stack Racks

Economical and convenient storage for samples in your screw cap and crimp seal vials. Can be stacked when empty or full. Autoclavable, 120°C. Each case contains 5 racks.

VIAL DIAM (mm)	NO. VIALS PER RACK	RACK DIMENSIONS L x W x H (mm)	CAT. NO.	PRICE
6-8	96	183 x 125 x 23	23204-U	
11-12	50	192 x 100 x 23	23207	
15-16	48	268 x 95 x 30	23205-U	
17	90	320 x 170 x 30	23202	
22	36	320 x 90 x 30	23201	
29	50▲	336 x 175 x 30	23206	

▲ 40mL EPA vial.



Mini-Vap Evaporator/Concentrator

The 6-Port Mini-Vap concentrator/evaporator processes six miniature vials or containers at one time. Comes with six stainless steel needles, fine control needle valve, and three feet (0.9m) of plastic tubing.

The adjustable Mini-Vap is a versatile concentrator/evaporator that can be used with a single container. The unique design allows for any size container, from the smallest vial to a 250mL beaker. The Mini-Vap includes a needle valve for fine metering of air or nitrogen drying gas. Ideal for a wide variety of needs in evaporation or concentration.

DESCRIPTION	CAT. NO.	PRICE
6-Port Mini-Vap, 7½ x 1½ x ¾" (19 x4 x 2cm)	22971	
Adjustable Mini-Vap, 1½ x 8½" *	22970	

*Adjusts to 11½ in.



Block Heater

Constant temperatures for derivatization and other reactions. The block heater features:

- Two temperature ranges, ambient to 60°C, 50°C to 130°C
- Three-position power switch and two adjustable thermostats
- Pilot light shows heat cycling operation

Two models: 120 volts (100 watts, 0.83 amps, 50/60 Hz) and 240 volts (100 watts, 0.42 amps, 50/60 Hz). Order blocks separately.

Block 1 has eight holes (21mm wide and 30mm deep), and accepts our 3mL or 5mL micro reaction vessels. Block 2 has twelve holes (17mm wide and 24mm deep), and accepts our 0.1mL to 2mL micro reaction vessels.

DESCRIPTION	CAT. NO.	PRICE
Block Heater (without block), 110VAC	33315	
Block Heater (without block), 220VAC■	33318-U	
Block 1, 8-hole	33316	
Block 2, 12-hole	33317-U	

■ CE Approved

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Syringes
Autosampler Syringes

Hamilton Syringes for Agilent/HP 7673 and 7683 Autosamplers

Hamilton autosampler syringes are available in three different needle gauge styles to suit your particular application. These needles are constructed of narrow-bore stainless steel to minimize liquid dead volume, and have a special conical point that reduces the force needed to penetrate the autosampler septum.

- 23s gauge needles for standard injections.
- 26s gauge needles for on-column and split/splitless injections.
- 23s-26s dual gauge needles allow you to perform all your applications without the need to change syringes.

Hamilton Microliter Syringes

Glass barrel with fitted stainless steel plunger.

		NEEDLE SPECIFICATIONS						REPLACEMENT NEEDLES		
CAPACITY	MODEL	GAUGE	LENGTH	PT.	AGILENT EQUIV.	CAT. NO.	PRICE	QTY.	CAT. NO.	PRICE
FIXED NEEDLE SYRINGES										
5µL	75 ASN	23s	43mm	#1	9301-0892	21311		—	—	—
5µL	75 ASN, 6 pk.	23s	43mm	#1	5182-0875	21315		—	—	—
5µL	75 ASN	26s	43mm	#1	5183-4728	21310-U		—	—	—
5µL	75 ASN, 6 pk.	26s	43mm	#1	5183-4728	21314		—	—	—
5µL	75 ASN	23s-26s	43mm	#1	5181-1273	24570-U		—	—	—
5µL	75 ASN, 6 pk.	26s-26s	43mm	#1	5181-8810	24571		—	—	—
10µL	701 ASN	23s	43mm	#1	9301-0713	21313		—	—	—
10µL	701 ASN, 6 pk.	23s	43mm	#1	9301-0725	21317		—	—	—
10µL	701 ASN	26s	43mm	#1	9301-0714	21312		—	—	—
10µL	701 ASN, 6 pk.	26s	43mm	#1	5183-4729	21316		—	—	—
10µL	701 ASN	23s-26s	43mm	#1	5181-1267	24573		—	—	—
10µL	701 ASN, 6 pk.	23s-26s	43mm	#1	5181-3360	24574		—	—	—
REMOVABLE NEEDLE SYRINGES										
5µL	75 ASRN	23s	43mm	#1	5182-0834	21321		3	21327-U	
5µL	75 ASRN	26s	43mm	#1	—	21320-U		3	21326	
5µL	75 ASRN	23s-26s	43mm	#1	5182-0835	24572		3	24582	
10µL	701 ASRN	23s	43mm	#1	5181-8806	21323-U		3	21327-U	
10µL	701 ASRN	26s	43mm	#1	—	21322-U		3	21326	
10µL	701 ASRN	23s-26s	43mm	#1	5181-3321	24575		3	24582	

Hamilton Modified Microliter Syringes

Sample is contained in the needle.

		NEEDLE SPECIFICATIONS						REPLACEMENT NEEDLES		
CAPACITY	MODEL	GAUGE	LENGTH	PT.	AGILENT EQUIV.	CAT. NO.	PRICE	QTY.	CAT. NO.	PRICE
KNURLED HUB SYRINGES WITH REMOVABLE NEEDLE										
0.5µL	7000.5 ASRN	23s	43mm	#1	—	26214		—	—	—
0.5µL	7000.5 ASRN	26s	43mm	#1	—	26215		—	—	—
1µL	7001 ASRN	23s	43mm	#1	—	26216		—	—	—
1µL	7001 ASRN	26s	43mm	#1	—	26217		—	—	—

Hamilton Microliter Syringes – Special Needle*

Glass barrel with fitted stainless steel plunger. The needle has a special 22° bevel.

CAPACITY	MODEL	GAUGE	LENGTH	PT.	CAT. NO.	PRICE
FIXED NEEDLE SYRINGES						
5µL	75 ASN	23s	43mm	#2	26714	
5µL	75 ASN	26s	43mm	#2	26721	
10µL	701 ASN	23s	43mm	#2	26715	
10µL	701 ASN	26s	43mm	#2	26722	

* Do not use these syringes with Merlin Microseal septa.

Repair Kit for Hamilton 7000.5 ASRN Syringes

Needle, plunger wire, ferrule, and instruction sheet. This Repair Kit is for Supelco Cat. No. 26215.

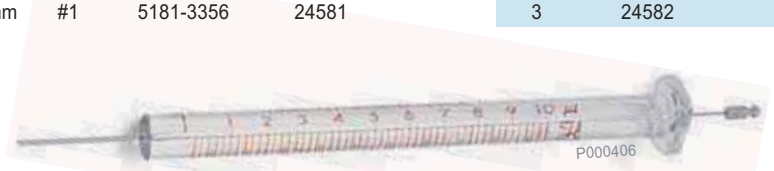
DESCRIPTION	CAT. NO.	PRICE
26s Gauge Kit for 7000.5 ASRN	26747-U	

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Hamilton Gastight Syringes

Glass barrel with a Teflon-tipped plunger seal.

CAPACITY	MODEL	NEEDLE SPECIFICATIONS GAUGE	LENGTH	PT.	AGILENT EQUIV.	CAT. NO.	PRICE	REPLACEMENT NEEDLES QTY.	CAT. NO.	PRICE
FIXED NEEDLE SYRINGES										
5µL	175 ASN	23s	43mm	#1	—	26716		—	—	—
5µL	175 ASN, 6 pk.	23s	43mm	#1	—	26700-U		—	—	—
5µL	175 ASN, 6 pk.	23s-26s	43mm	#1	—	24577		—	—	—
10µL	1701 ASN	23s	43mm	#1	5181-8809	26719		—	—	—
10µL	1701 ASN, 6 pk.	23s	43mm	#1	—	26701		—	—	—
10µL	1701 ASN	23s-26s	43mm	#1	5181-3354	24579		—	—	—
10µL	1701 ASN, 6 pk.	23s-26s	43mm	#1	5181-3361	24580		—	—	—
REMOVABLE NEEDLE SYRINGES										
5µL	175 ASRN	23s	43mm	#1	—	26718		3	21327-U	
5µL	175 ASRN	23s-26s	43mm	#1	—	24578		3	24582	
10µL	1701 ASRN	23s	43mm	#1	5181-8813	21325-U		3	21327-U	
10µL	1701 ASRN	26s	43mm	#1	—	21324		3	21326	
10µL	1701 ASRN	23s-26s	43mm	#1	5181-3356	24581		3	24582	



SGE Syringes for Agilent/HP 7673 and 7683 Autosamplers

SGE syringes are designed and tested to meet critical autosampler specifications. These syringes are designed with a unique pu
eliminate bending and seizing. The needle point style withstands multiple and fast septum injections, making it one of the best
free autosampler syringes available.

CAPACITY	MODEL	NEEDLE SPECIFICATIONS GAUGE	LENGTH	PT.	CAT. NO.	PRICE	REPLACEMENT NEEDLES QTY.	CAT. NO.	PRICE
STANDARD SYRINGE, FIXED NEEDLE									
5µL	5F-HP-0.47	26	42mm	#1	21910		—	—	—
5µL	5F-HP-0.63	23	42mm	#1	21542		—	—	—
5µL	SK-5F-HP-0.63, 6 pack	23	42mm	#1	21911		—	—	—
5µL	5F-HP-0.63/0.47	23s-26s	42mm	#1	26887-U		—	—	—
10µL	10F-HP-0.47	26	42mm	#1	21541		—	—	—
10µL	SK-10F-HP-0.47, 6 pack	26	42mm	#1	21912		—	—	—
10µL	10F-HP-0.63	23	42mm	#1	21543		—	—	—
10µL	SK-10F-HP-0.63, 6 pack	23	42mm	#1	21544		—	—	—
10µL	10F-HP-0.63/0.47	23s-26s	42mm	#1	26889-U		—	—	—
STANDARD SYRINGE, REMOVABLE NEEDLE									
0.5µL	0.5BR-HP-0.47	26	42mm	#1	24402		1	24426	
0.5µL	0.5BR-HP-0.63	23	42mm	#1	24403		1	24427	
10µL	10R-HP-0.47	26	42mm	#1	24417		2	24440-U	
10µL	10R-HP-0.63	23	42mm	#1	24416		2	24439	
25µL	25R-HP-0.63	23	42mm	#1	509701		2	509728	
GAS TIGHT SYRINGE, FIXED TAPERED NEEDLE									
10µL	10R-HP-GT-0.47	26	42mm	#1	509671		—	—	—
10µL	10F-HP-GT-0.63/0.47	23s-26s	42mm	#1	26890-U		—	—	—
10µL	10F-HP-GT-0.63/0.47, 6 pk.	23s-26s	42mm	#1	26891-U		—	—	—
25µL	25F-HP-GT-0.63/0.47	23s-26s	42mm	#1	26892-U		—	—	—
50µL	50F-HP-GT-0.63/0.47	23s-26s	42mm	#1	26893-U		—	—	—
100µL	100F-HP-GT-0.63/0.47	23s-26s	42mm	#1	26894-U		—	—	—
SUPERFLEX SYRINGE, FIXED NEEDLE									
10µL	10FX-HP-0.47	26	42mm	#1	23957-U		—	—	—
10µL	10FX-HP-0.63	23	42mm	#1	23956		—	—	—
10µL	SK-10FX-HP-0.47, 6 pack	26	42mm	#1	23971		—	—	—
10µL	SK-10FX-HP-0.63, 6 pack	23	42mm	#1	23972		—	—	—
SUPERFLEX SYRINGE, REMOVABLE NEEDLE									
5µL	5RX-HP-0.47	26	42mm	#1	23963		2	23977	
5µL	5RX-HP-0.63	23	42mm	#1	23962		—	—	—
10µL	10RX-HP-0.47	23	42mm	#1	23959		2	24440-U	
10µL	10RX-HP-0.63	26	42mm	#1	23958		2	24439	

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Syringes
Autosampler Syringes

Hamilton Syringes for Agilent/HP 7670, 7671, and 7672 Autosamplers

		NEEDLE SPECIFICATIONS					REPLACEMENT NEEDLES		
CAPACITY	MODEL	GAUGE	LENGTH	PT.	CAT. NO.	PRICE	QTY.	CAT. NO.	PRICE
MICROLITER SYRINGE									
10µL	701N	26s	43mm	#2	20734		—	—	—
10µL	701N, 6 pk.	26s	43mm	#2	20779		—	—	—
10µL	701RN-HP	26s	43mm	#2	21357		3	20760-U	
1µL	700 1KH	25s	70mm	#2	20750		—	—	—
GASTIGHT SYRINGE (WITH TEFLON-TIPPED PLUNGER)									
10µL	1701 N	26s	43mm	#2	20972		—	—	—
10µL	1701 RN-HP	26s	43mm	#2	26727		3	20760-U	

SGE Syringes for Agilent/HP 7670, 7671, and 7672 Autosamplers

		NEEDLE SPECIFICATIONS					REPLACEMENT NEEDLES		
CAPACITY	MODEL	GAUGE	LENGTH	PT.	CAT. NO.	PRICE	QTY.	CAT. NO.	PRICE
1µL	1BR-FV-56	23	56mm	#2	24409		1	24433	

Hamilton Syringes for Perkin-Elmer Integral 4000 HPLC Autosampler

		NEEDLE SPECIFICATIONS					REPLACEMENT NEEDLES		
CAPACITY	MODEL	GAUGE	LENGTH	PT.	CAT. NO.	PRICE	QTY.	CAT. NO.	PRICE
100µL	1710 T/PE	—	—	—	24525		—	—	—
250µL	1725 T/PE	—	—	—	24526-U		—	—	—
500µL	1750 T/PE	—	—	—	24527		—	—	—

Hamilton Syringes for Perkin-Elmer GC Autosystem

		NEEDLE SPECIFICATIONS					REPLACEMENT NEEDLES		
CAPACITY	MODEL	GAUGE	LENGTH	PT.	CAT. NO.	PRICE	QTY.	CAT. NO.	PRICE
MICROLITER SYRINGE, FIXED NEEDLE									
5µL	75 ASN/PE	26s	70mm	#3	24522		—	—	—
5µL	75 ASN/PE	23s	70mm	#3	24523		—	—	—
MICROLITER SYRINGE, REMOVABLE NEEDLE									
0.5µL	7000.5 ASRN/PE	26s	70mm	#3	24520-U		—	—	—
0.5µL	7000.5 ASRN/PE	23s	70mm	#3	24521		—	—	—

SGE Syringes for Perkin-Elmer AS100, AS2000, and AS3000 GC Autosystems

		NEEDLE SPECIFICATIONS					REPLACEMENT NEEDLES		
CAPACITY	MODEL	GAUGE	LENGTH	PT.	CAT. NO.	PRICE	QTY.	CAT. NO.	PRICE
STANDARD SYRINGE, REMOVABLE NEEDLE									
0.5µL	0.5BR-PE-0.47	26	70mm	#1	24406		—	—	—
0.5µL	0.5BR-PE-0.63	23	70mm	#1	24407		1	24431	
STANDARD SYRINGE, FIXED NEEDLE									
5µL	5F-PE-0.47	26	70mm	#1	509736		—	—	—
5µL	5F-PE-0.63	23	70mm	#1	509744		—	—	—
GAS TIGHT SYRINGE, FIXED NEEDLE									
5µL	5F-PE-GT-0.47	26	70mm	#1	21930-U		—	—	—
5µL	5F-PE-GT-0.63	23	70mm	#1	21929-U		—	—	—

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Hamilton Syringes for CTC/Leap Technologies Autosamplers

CAPACITY	MODEL	GAUGE	LENGTH	PT.	CAT. NO.	PRICE
GC SAMPLING: A200S, PAL INSTRUMENTS						
Modified Microliter						
1.2µL	7701.2	26p	51mm	#1	28617-U	
Microliter Syringe, Fixed Needle						
5µL	75N	26s	51mm	#1	28613-U	
10µL	701N	26s	51mm	#2	28614-U	
10µL	701N	26s	51mm	#1	28615-U	
Gastight Syringe, Fixed Needle						
25µL	1702N	26s	51mm	#1	28649-U	
100µL	1710N	26s	51mm	#1	28651-U	
250µL	1725N	26s	51mm	#1	28652-U	
500µL	1750N	26s	51mm	#1	28653-U	
GC HEADSPACE SAMPLING: COMBI PAL						
Gastight Syringe						
1mL	1000LTN	23	56mm	#5	28621-U	
1mL	1001LTN	26	56mm	#5	28622-U	
2.5mL	1002LTN	23	56mm	#5	28626-U	
2.5mL	1002LTN	26	56mm	#5	28627-U	
5mL	1005LTN	23	56mm	#5	28628-U	
5mL	1005LTN	26	56mm	#5	28629-U	

CAPACITY	MODEL	GAUGE	LENGTH	PT.	CAT. NO.	PRICE
HPLC SAMPLING: HTS PAL INSTRUMENTS						
Microliter Syringe, Fixed Needle						
10µL	701N	22s	51mm	#3	28618-U	
Gastight Syringe						
10µL	1701N	22s	51mm	#3	28632-U	
25µL	1702N	22s	51mm	#3	28633-U	
100µL	1710N	22s	51mm	#3	28634-U	
100µL	1710N	22	51mm	#3	28635-U	
250µL	1725N	22	51mm	#3	28636-U	
1mL	1001LTN	22	56mm	#3	28637-U	
2.5mL	1002LTN	22	56mm	#3	28638-U	
5mL	1005LTN	22	56mm	#3	28639-U	

Replacement Plungers

MODEL	DESCRIPTION	CAT. NO.	PRICE
1701CTC	for 10µL CTC Syringe	28641-U	
1702CTC	for 25µL CTC Syringe	28642-U	
1710CTC	for 100µL CTC Syringe	28643-U	
1725CTC	for 250µL CTC Syringe	28644-U	
1750CTC	for 500µL CTC Syringe	28645-U	
1001CTC	for 1mL CTC Syringe	28646-U	
1002CTC	for 2.5mL CTC Syringe	28647-U	
1005CTC	for 5mL CTC Syringe	28648-U	

SGE Syringes for Other Autosamplers

		NEEDLE SPECIFICATIONS					REPLACEMENT NEEDLES		
CAPACITY	MODEL	GAUGE	LENGTH	PT.	CAT. NO.	PRICE	QTY.	CAT. NO.	PRICE
SYRINGES FOR GENERAL USE									
SuperfleX Syringe, fixed needle									
10µL	10FX, 6 pack	26	50mm	#2	23966		—	—	—
SuperfleX Syringe, removable needle									
10µL	10RX	26	50mm	#2	23967		5	24437	
SYRINGE FOR PHILLIPS/UNICAM S8 AND 4700 GC AUTOSYSTEM									
1µL	1BR-7	23	70mm	#1	24408		1	24432	
SYRINGES FOR SHIMADZU AOC14, AOC17 AND AOC20 GC AUTOSAMPLERS									
10µL	10R-S-0.47	26			24418		—	—	—
10µL	10R-S-0.63	23			24419		2	24442	
SYRINGES FOR SHIMADZU AOC9 GC AUTOSAMPLER									
5µL	0.5BR-S(9)-0.47	26	50mm	#1	509752		—	—	—
10µL	0.5BR-S(9)-0.63				509760		—	—	—
SYRINGE FOR VARIAN 8000 GC AUTOSAMPLER									
10µL	10R-VA80-11	25	50mm	#6 ■	24420-U		2	24443	
SYRINGE FOR VARIAN 8035, 8100, AND 8200 GC AUTOSAMPLERS									
1µL	1BR-VA8X*	26	51mm	#1	24410-U		1	24434	
10µL	10R-VA8X-11	25	53mm	#5	24421		See needles below		
REPLACEMENT NEEDLES AND PLUNGERS									
For 10R-VA8X, 8035: Beveled tip, 25 gauge, 53mm length, point #2							2	24444	
For 10R-VA8X,8035: On-column, domed tip, 105mm length, 0.17mm OD							2	24446	
For 10R-VA8X, 8100, 8200: Side hole, 25 gauge, 53mm length, point #5							1	24445	
Spare plungers for Varian 10µL Syringes							1	21924	

■ Domed tip.

* Not suitable for Varian 8200 GC Autosampler.

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Syringes
GC Syringes

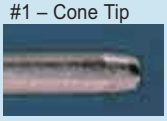


DESCRIPTION OF GAUGE SIZES

Gauge	OD x ID	Length	Dead Volume
26s	0.019 x 0.005 in.	2”	0.52µL
26	0.018 x 0.010 in.	2”	2.5µL
25s	0.020 x 0.006 in.	1.97”	1.26µL
22s	0.028 x 0.006 in.	2”	0.9µL
22	0.028 x 0.016 in.	2”	6.7µL

SPECIFICATIONS FOR SYRINGE NEEDLES

DESCRIPTION OF POINT STYLES

Point Style	General Information
#1 – Cone Tip 	Recommended for use with pre-drilled septa. The shape of this needle has been developed for multi-injections on the Agilent/HP 7673A autosampler.
#2 – Bevel Tip 	The bevel tip (22° on Hamilton syringes, 20° on SGE syringes) is designed for optimum septum penetration and to prevent septum coring.
#3 – 90° Blunt Tip 	The 90° blunt tip has chamfered and polished edges that eliminate damage to the valve’s rotor seal and stator face. This style also can be used for pipetting of liquids.
#5 – Cone Tip, Side-Port Hole 	Liquid samples can be filled and dispensed through the side hole, and septum damage is minimized by the solid domed tip.

9950106, 107, 109, 108

SELECTING HAMILTON SYRINGES

IF YOU WANT REPRODUCIBLE INJECTIONS AT AN ECONOMICAL PRICE:

Choose a fixed needle syringe (N or LTN suffix). N denotes an epoxy-cemented 304 stainless steel needle inserted in the syringe barrel to a depth corresponding exactly to the zero graduation. LTN denotes a cemented Luer tip needle. Fixed needle syringes should not be heated above 50°C.

IF YOU LIKE THE SIMPLICITY OF A FIXED NEEDLE SYRINGE, BUT WANT TO REPLACE DAMAGED NEEDLES, OR CHANGE GAUGES TO SUIT YOUR APPLICATIONS:

Select a syringe with a removable needle (RN). RN syringes allow easy replacement of damaged needles in the field. The needle seats to the zero graduation mark, providing the same characteristics as cemented needles. RN syringes should not be heated above 115°C.

IF YOU NEED A KNURLED HUB:

A knurled hub (KH) syringe creates a leak-tight seal between barrel and needle and may be retightened to compensate for wear. The male Luer accommodates a spacer for defined depth insertions. Exclusive to Series 7000 syringes.

IF YOU WANT AN AUTOCLAVABLE SYRINGE WITH EASY, FAST NEEDLE REPLACEMENT:

Choose a syringe with a Luer tip (LT). LT denotes a ground glass Luer tip suitable for mounting chromatographic and Teflon needles. Order needles separately. Metal hubbed needles are not recommended. LT syringes can be autoclaved at 121°C. Remove the plunger during sterilization.

IF YOU LIKE THE LUER-TYPE NEEDLE ATTACHMENT, BUT NEED THE SECURITY OF A LOCKED NEEDLE ATTACHMENT:

It is available with Teflon Luer lock syringes (TLL). Teflon Luer lock has a screwable Teflon center male Luer to hold your needle tightly in place. TLL used with 1000 Series provides an essentially inert syringe. Order needles separately. Metal or PCTFE hubbed needles can be used. Syringes with TLL connections should not be heated above 50°C.

IF YOU HAVE PROBLEMS WITH BENT PLUNGERS:

Plunger guides (WG suffix) reduce the expense of replacing or repairing syringes with bent plungers. Especially useful on syringes with small diameter plungers.

IF YOU REQUIRE PRECISE CONTROL OF SAMPLE SIZES:

Chaney adapters (CH suffix) ensure consistent sample delivery. You will know the sample size is right every time.

NOTE:

Hamilton uses the most chemically resistant adhesive available to cement the needles into these syringes. Prolonged contact with some solvents, however, can cause the adhesive to deteriorate. After making your injections, thoroughly rinse the syringe with distilled water and allow it to air dry. Do not soak your syringe with any solvent for more than three minutes. In cases where prolonged use of strong solvents is necessary, you may wish to use an RN syringe.

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Syringes
Hamilton Microliter Syringes

600 Series

CAPACITY	MODEL	GAUGE	LENGTH	PT.	CAT. NO.	PRICE
RNR (REMOVABLE NEEDLE)						
2.5µL	62RNR	22s	50mm	#3	26702 *	
5.0µL	65RNR	22s	50mm	#3	26703 *	

700 Series

CAPACITY	MODEL	GAUGE	LENGTH	PT.	CAT. NO.	PRICE
N (CEMENTED NEEDLE)						
5µL	75	26s	2”	#2	26200-U	
10µL	701	26s	2”	#2	20734	
25µL	702	22s	2”	#2	20735	
50µL	705	22s	2”	#2	20736	
100µL	710	22s	2”	#2	20737	
250µL	725	22s	2”	#2	20738	
500µL	750	22	2”	#2	20739	
SN (SPECIAL NEEDLE)						
10µL	701	26s	2”	#3	20682	
10µL	701	22s	2”	#3	58380-U *	
10µL	701	26s	3”	#2 **	21572	
10µL	701	26s	4”	#2 **	21573	
10µL	701	26s	6”	#2 **	21574	
25µL	702	22s	2”	#3	58381 *	
50µL	705	22s	2”	#3	58382 *	
100µL	710	22s	2”	#3	58383 *	
250µL	725	22	2”	#3	58384 *	
NWG (CEMENTED NEEDLE WITH GUIDE)						
10µL	701	26s	2”	#2	20753	
25µL	702	22s	2”	#2	20754	
NCH (CEMENTED NEEDLE WITH CHANEY ADAPTER)						
10µL	701	26s	2”	#2	20747	
100µL	710	22s	2”	#2	24541-U	
250µL	725	22s	2”	#2	24542	
RN (REMOVABLE NEEDLE)						
5µL	75	26s	2”	#2	20919	
10µL	701	26s	2”	#2	20697	
25µL	702	22s	2”	#2	20787	
50µL	705	22s	2”	#2	20788	
100µL	710	22s	2”	#2	20790-U	
250µL	725	22s	2”	#2	24538-U	
500µL	750	22s	2”	#2	24539	
RNWG (REMOVABLE NEEDLE WITH GUIDE)						
10µL	701	26s	2”	#2	20698	
RNCH (REMOVABLE NEEDLE WITH CHANEY ADAPTER)						
10µL	701	26s	2”	#2	20699	
25µL	702	22s	2”	#2	24543	
SN (USE WITH MERLIN MICROSEAL, MANUAL INJECTION)						
10µL	701	23s	1.71”	#1	26228	
LT (LUER TIP)* **						
10µL	701	—	—	—	24530	
25µL	702	—	—	—	24531	
50µL	705	—	—	—	20701	
100µL	710	—	—	—	20702	
250µL	725	—	—	—	20703	
500µL	750	—	—	—	20704	
Npt5 (CEMENTED NEEDLE)						
10µL	701	26s	—	#5	24532	
25µL	702	22s	—	#5	24533-U	
50µL	705	22s	—	#5	24534-U	
100µL	710	22s	—	#5	24535	
250µL	725	22s	—	#5	24536	
500µL	750	22	—	#5	24537	

* For Rheodyne injectors.
** Electrotaper.
*** Not supplied with needle.

NEEDLE TYPE

N (Cemented Needle)



SN (Special Needle)



NWG (Cemented Needle with Guide)



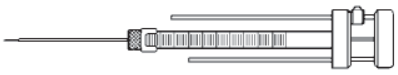
NCH (Cemented Needle with Chaney Adapter)



RN (Removable Needle)



RNWG (Removable Needle with Guide)



RNCH (Removable Needle with Chaney Adapter)



LT (Luer Tip)



NPT5 (Cemented Needle Point #5)



713-0583, 0585, 713-0589, 0590, 0584, 0592, 794-0823, 713-0585, 794-0824

SAVE When You Order in Six Packs



700 Series Six Packs

The most popular syringes are available in convenient multi-unit packages, at considerable cost-savings. Accurate to ±1%. Temperature limit: 50° C for cemented needles, 115° C for removable needle.

10µL capacity, 26s gauge, 50mm length, point style #2, in packs of 6.

MODEL	CAT. NO.	PRICE
701N	20779	
701RN	20793	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Syringes
Hamilton Microliter Syringes

800 Series

- Same quality performance as 700 series, with additional benefits
- The extended metal handle is removable and field repairable
- The plunger stem resists bending
- Accurate to within ±1% of the total volume
- Temperature limit: 50°C for cemented needles, 115°C for removable needle

CAPACITY	MODEL	GAUGE	LENGTH	PT.	CAT. NO.	PRICE
N (CEMENTED NEEDLE)						
5µL	85	26s	2"	#2	20835-U	
10µL	801	26s	2"	#2	20795-U	
25µL	802	22s	2"	#2	21492	
50µL	805	22s	2"	#2	24544	
100µL	810	22s	2"	#2	21497-U	
250µL	825	22s	2"	#2	24545-U	
RN (REMOVABLE NEEDLE)						
5µL	85	26s	2"	#2	26201	
10µL	801	26s	2"	#2	20797	
25µL	802	22s	2"	#2	21493	
50µL	805	22s	2"	#2	21496	
100µL	810	22s	2"	#2	21498	
250µL	825	22s	2"	#2	24546	
RN MULTIPACK (5 SYRINGE SIZES)						
10-250µL	800 series	26s	2"	#2	21489	
WATERS RN SYRINGES						
10µL	801	25s	1.97"	#3	58390-U	
25µL	802	25s	1.97"	#3	58391	
50µL	805	25s	1.97"	#3	58392	
100µL	810	25s	1.97"	#3	58393	
250µL	825	25s	1.97"	#3	58394	



Replacement Barrel Assemblies For 800 Series Syringes

CAPACITY	MODEL	CAT. NO.	PRICE
5µL	85N	20836	
10µL	801N	20837	
10µL	801RN	20838-U	

NEEDLE TYPE
N (Cemented Needle)

RN (Removable Needle)

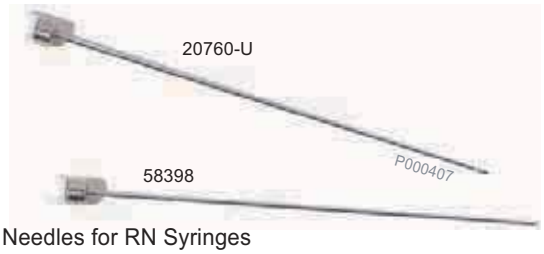
7940704, 7940705



900 Series

Economical version of 800 series syringes.

CAPACITY	MODEL	GAUGE	LENGTH	PT.	CAT. NO.	PRICE
N (CEMENTED NEEDLE)						
5µL	95	26s	2"	#2	20906-U	
10µL	901	26s	2"	#2	20908-U	
RN (REMOVABLE NEEDLE)						
5µL	95	26s	2"	#2	20907-U	
10µL	901	26s	2"	#2	20909-U	



Needles for RN Syringes

CAPACITY	GAUGE	LENGTH	PT.	CAT. NO.	PRICE
POINT #2 - BEVEL TIP					
2.5µL-100µL	26s	2"	#3	20760-U	
2.5µL-100µL	22s	2"	#3	20761	
250µL-10mL	22s	2"	#3	20798	
250µL-10mL	22	2"	#3	20799	
POINT #3 - BLUNT TIP					
2.5µL-100µL	25s	1.97"	#3	58398	
250µL-10mL	25s	1.97"	#3	58399	

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1000 Series Gastight

- For larger volumes
- Teflon plunger tip gives an inert, leak-tight seal for corrosive gases and liquids, radioactive materials, and sterile solutions
- Accurate to within ±1% of the total volume
- Temperature limit 115°C for removable needle

VOLUME	MODEL	GAUGE	LENGTH	PT.	CAT. NO.	PRICE
RN (REMOVABLE NEEDLE)						
1mL	1001	22	2”	#2	22192-U	
2.5mL	1002	22	2”	#2	22193-U	
5.0mL	1005	22	2”	#2	22194-U	
10.mL	1010	22	2”	#2	22195	
LT (LUER TIP)*						
1.0mL	1001	—	—	—	20720	
1.25mL	1001.25	—	—	—	24588	
2.5mL	1002	—	—	—	20721	
5.0mL	1005	—	—	—	20722	
10.0mL	1010	—	—	—	20723	
LTN (FIXED NEEDLE)**						
1.0mL	1001	22	2”	#2	20740-U	
1.25mL	1001.25	22	2”	#2	24589	
2.5mL	1002	22	2”	#2	20691	
5.0mL	1005	22	2”	#2	20692	
10.0mL	1010	22	2”	#2	20693	
LTNpt5 (FIXED NEEDLE), SIDE PORT**						
1.0mL	1001	22	2”	#5	20709	
2.5mL	1002	22	2”	#5	20710-U	
5.0mL	1005	22	2”	#5	24590	
10.0mL	1010	22	2”	#5	24591	
TLL (TEFLON LUER LOCK)*						
1.0mL	1001	—	2”	#2	20997	
1.0mL w/slots	1001	—	2”	#2	26208	
2.5mL	1002	—	2”	#2	20998	
2.5mL w/slots	1002	—	2”	#2	26209	
5.0mL	1005	—	2”	#2	20999	
5.0mL w/slots	1005	—	2”	#2	26210-U	
10.0mL	1010	—	2”	#2	21000-U	
10.0mL w/slots	1010	—	2”	#2	26211-U	
25.0mL	1025	—	2”	#2	20683	
25.0mL w/slots	1025	—	2”	#2	26212	
50.0mL	1050	—	2”	#2	20707	
50.0mL w/slots	1050	—	2”	#2	26213	
100.0mL	1100	—	2”	#2	21967	

*Not supplied with needle.

** LT style with cemented needle.

NEEDLE TYPE

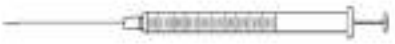
RN (Removable Needle)



LT (Luer Tip)*



LTN (Fixed Needle)**



LTNpt5 (Fixed Needle Point #5)**



TLL (Teflon Luer Lock)* – 1mL to 10mL



TLL (Teflon Luer Lock)* – 25mL to 100mL



7130584, 0585, 0587, 0587, 0586, 7940706



Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Syringes
Hamilton Gastight Syringes

Sample Lock Syringes (SL)

- Twist valve locks the sample in the syringe
- Positive rear plunger stop eliminates sample loss and plunger blowout at high pressures
- Connects to either male or female Luer fittings
- Internal standards can be added through the valve port into the sample contained in the syringe



Sample Lock Syringes

VOLUME	MODEL	GAUGE	LENGTH	PT.	CAT. NO.	PRICE
SL (SAMPLE LOCK)						
50µL	1705SL	22s	2”	#2	26280-U	
100µL	1710SL	22s	2”	#2	26281	
250µL	1725SL	22s	2”	#2	26282	
500µL	1750SL	22	2”	#2	26283	
1.0mL	1001SL	22	2”	#2	26284	
2.5mL	1002SL	22	2”	#2	26285	
5.0mL	1005SL	22	2”	#2	26286	
10.0mL	1010SL	22	2”	#2	26287	
25.0mL	1025SL	22	2”	#2	26288	
50.0mL	1050SL	22	2”	#2	26289	
100.0mL	1100SL	22	2”	#2	26290-U	

Sample Lock Syringe Replacement Needles / Plunger Assemblies

		REPLACEMENT NEEDLE		PLUNGER ASSY.*	
VOLUME	MODEL	CAT. NO	PRICE	CAT. NO.	PRICE
50µL	1705SL	20798		26152-U	
100µL	1710SL	20798		26154	
250µL	1725SL	20798		—	—
500µL	1750SL	20799		—	—
1.0mL	1001SL	20799		—	—
2.5mL	1002SL	20799		—	—
5.0mL	1005SL	20799		—	—
10.0mL	1010SL	20799		—	—
25.0mL	1025SL	20799		—	—
50.0mL	1050SL	20799		—	—
100.0mL	1100SL	20799		—	—

* PLEASE NOTEPlunger Assy. for sample lock syringes are not the same as Plunger Assy. for other 1000 and 1700 series syringes.

Luer Fittings for Sample Lock Syringes

DESCRIPTION	CAT. NO.	PRICE
Male Luer/Removable Needle Hub	26292	
 Accepts female Luer		
7950469		
Male Luer Lock/Removable Needle Hub	26293	
 Accepts female Luer or female Luer lock		
7950470		

1700 Series Gastight Syringes

VOLUME	MODEL	GAUGE	LENGTH	PT.	CAT. NO.	PRICE
N (CEMENTED NEEDLE)						
10µL	1701	26s	2”	#2	20972	
25µL	1702	22s	2”	#2	20973	
50µL	1705	22s	2”	#2	20687	
100µL	1710	22s	2”	#2	20688	
250µL	1725	22s	2”	#2	20689	
LTN (CEMENTED NEEDLE)**						
500µL	1750	22	2”	#2	20690-U	
Npt5 (CEMENTED NEEDLE POINT #5)						
10µL	1701	26s	2”	#5	24585	
25µL	1702	22s	2”	#5	24586	
250µL	1725	22s	2”	#5	20705	
500µL	1750	22	2”	#5	20708	
RN (REMOVABLE NEEDLE)						
10µL	1701	26s	2”	#2	20780-U	
25µL	1702	22s	2”	#2	20781	
50µL	1705	22s	2”	#2	20782	
100µL	1710	22s	2”	#2	20783	
250µL	1725	22s	2”	#2	20784	
500µL	1750	22	2”	#2	20785-U	
LT (LUER TIP)***						
10µL	1701	—	—	—	20976	
25µL	1702	—	—	—	20977	
50µL	1705	—	—	—	20715	
100µL	1710	—	—	—	20716	
250µL	1725	—	—	—	20717	
500µL	1750	—	—	—	20714	
TLL (TEFLON LUER LOCK)***						
50µL	1705	—	—	—	26202	
50µL ****	1705	—	—	—	26204	
100µL	1710	—	—	—	26203	
100µL ****	1710	—	—	—	26205	
250µL	1725	—	—	—	20915	
250µL ****	1725	—	—	—	26206	
500µL	1750	—	—	—	20916	
500µL ****	1750	—	—	—	26207	

** LT style with cemented needle.
*** Not supplied with needle.
**** with slots

NEEDLE TYPE
N (Cemented Needle)

Npt5 (Cemented Needle Point #5), Side port

RN (Removable Needle)

LT (Luer Tip)

TLL (Teflon Luer Lock)

7130583, 7940824, 7130584,G000522, 7130586, 7130585

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Syringes
Hamilton Gastight Syringes

1800 Series Gastight

- Ideal for corrosive, radioactive, or sterile materials
- Removable handle minimizes heat transfer from hand to sample, making the syringe easy to hold
- Accurate and reproducible to ±1%
- Field repairable



VOLUME	MODEL	GAUGE	LENGTH	PT.	CAT. NO.	PRICE
N (CEMENTED NEEDLE)						
10µL	1801	26s	2”	#2	21390	
25µL	1802	22s	2”	#2	21391	
50µL	1805	22s	2”	#2	21392	
100µL	1810	22s	2”	#2	21393	
250µL	1825	22s	2”	#2	21394	
RN (REMOVABLE NEEDLE)						
10µL	1801	26s	2”	#2	21395	
25µL	1802	22s	2”	#2	21396	
50µL	1805	22s	2”	#2	21397	
100µL	1810	22s	2”	#2	21398	
250µL	1825	22s	2”	#2	21399	

NEEDLE TYPE

N (Cemented Needle)



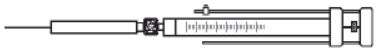
RN (Removable Needle)



KH (Knurled Hub)



KHWG (Knurled Hub with Guide)



KHCH (Knurled Hub with Chaney Adapter)



7940704, 7940705, 7940707, G000523, 7940708

7000 Series Modified Microliter

- Rapid injection of minute volumes
- Eliminates dead volume by placing the sample in the needle
- Leak-proof at injection pressures up to 6000psi

7000 SERIES NEEDLE SPECIFICATIONS					
	Syringe Capacity and Model				
Needle Specifications	0.5µL 7000.5	1µL 7001	1µL 7101	2µL 7002	5µL 7105
Gauge	25	25s	22s	25	24
Length (cm)	7	7	7	7	7
OD (in.)	0.020	0.019	0.028	0.020	0.022
ID (in.)	0.004	0.006	0.006	0.008	0.013
Taper (in.)	none	0.019	none	0.020	none

VOLUME	MODEL	GAUGE	LENGTH	PT.	CAT. NO.	PRICE
KH (KNURLED HUB)						
0.5µL	7000.5	25	70mm	#2	22185-U	
0.5µL	7000.5	25	70mm	#3	22184-U	
1.0µL	7001	25s	70mm	#2	20750	
1.0µL	7001	25s	70mm	#3	20731	
1.0µL	7101	22s	70mm	#2	20979	
1.0µL	7101	22s	70mm	#3	20733	
2.0µL	7002	25	70mm	#2	20751	
2.0µL	7002	25	70mm	#3	20732	
2.0µL	7102	23	70mm	#2	24592	
2.0µL	7102	23	70mm	#3	24593	
5.0µL	7105	24	70mm	#2	20980-U	
5.0µL	7105	24	70mm	#3	20728	
KHWG (KNURLED HUB WITH GUIDE)						
0.5µL	7000.5	25	70mm	#3	24596	
1.0µL	7001	25s	70mm	#3	20944	
1.0µL	7101	22s	70mm	#3	20726	
2.0µL	7002	25	70mm	#3	20744	
2.0µL	7102	23	70mm	#3	24597	
5.0µL	7105	24	70mm	#3	24598	
KHCH (KNURLED HUB WITH CHANEY ADAPTER)						
0.5µL	7000.5	25	70mm	#3	24594	
1.0µL	7001	25s	70mm	#3	20743	
1.0µL	7101	22s	70mm	#3	24595	
5.0µL	7105	24	70mm	#3	20755	

Repair Kits for 7000 Series

Kit includes needle, plunger wire, ferrule, and instructions.

MODEL	CAT. NO.	PRICE
KH (KNURLED HUB) NEEDLE POINT #2		
7001	26733	
7101	26736	
7002	26739	
7105	26745-U	
KH (KNURLED HUB) NEEDLE POINT #3		
7000.5	26729	
7001	26732-U	
7101	26735-U	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Syringes

Hamilton On-Column, Special Purpose Syringes and Accessories

On-Column Injection — Removable Needle, Fused Silica (RNFS) Microliter Syringes

Use the 701RNFS syringes with liquid samples. A Teflon plunger tip makes the 1701RNFS syringes gas tight. Syringes come with a replaceable fused silica needle. Capacity 10µL, 0.17mm OD, 10cm length, point style #3. Use with 0.20mm ID or larger columns.

DESCRIPTION	CAT. NO.	PRICE
REMOVABLE NEEDLE, FUSED SILICA (RNFS) SYRINGES		
701RNFS	21359	
801RNFS	26717	
1701RNFS	21360-U	
1801RNFS	26720-U	
Teflon ferrule, 0.17mm bore diameter	21362	
Spacer/sleeve for RNFS syringes	21365-U	

On-Column Injection — Fixed Needle Microliter Syringes

The fixed needle design of this Hamilton syringe minimizes dead volume. Stainless steel needle, 12.5cm (for Agilent/HP injectors) or 7.5cm (for Carlo Erba injectors) x 0.24mm OD (32ga.), 90° tip. Use with 0.32mm ID or larger columns.

MODEL	CAPACITY	LENGTH	CAT. NO.	PRICE
FIXED NEEDLE SYRINGE FOR AGILENT/HP INJECTORS				
701SN	10µL	12.5cm	21352	
FIXED NEEDLE SYRINGE FOR CARLO ERBA INJECTORS				
701SN	10µL	7.5cm	21351	

On-Column Injection — Modified Microliter Syringes

The 7000.5KHOC Hamilton sample-in-needle syringe has a 0.5µL sample capacity. Replaceable stainless steel needle/plunger assembly; needle is 10cm x 0.23mm OD. Use with 0.25mm ID or larger columns. This syringe is for liquid samples only.

MODEL	CAPACITY	LENGTH	CAT. NO.	PRICE
SAMPLE-IN-NEEDLE, MODIFIED MICROLITER SYRINGE				
7000.5KHOC	0.5µL	10cm	21366	



Hamilton 700 Series Microliter Digital Syringe

The only N.I.S.T. traceable, calibrated syringe device available. Provides constant injection rate. Volume is dispensed within ±0.5% of the syringe volume. Syringe is included.

CAPACITY	MODEL	GAUGE	LENGTH	PT.	CAT. NO.	PRICE
10µL	701N	26s	2"	#2	24452	



Constant Rate Syringe

Eliminates injection variability. Spring-driven plunger delivers sample at the same injection rate, regardless of the operator. Micrometer dials the desired volume. Stainless steel plunger and Teflon sealing tip. Repeatable and resettable accuracy ±1%.

DESCRIPTION	CAT. NO.	PRICE
Constant Rate Syringe, 2-50µL	20713	



Purge and Trap Syringes

This purge and trap version of the SampleLock syringe is designed for analyzing drinking water samples according US EPA purge and trap concentration techniques (EPA methods 502.1, 502.2, 503.1, 524.1, and 524.2).

DESCRIPTION	TEKMAR EQUIV.	CAT. NO.	PRICE
1005SLPT, 5mL		26294	
1005 TLL, 5mL	14-0069-052	20999	

700 Series Microliter Syringes with Electrotaper Needles

These special cemented electrotaper needle syringes are available in the most popular needle gauges, lengths, and point styles of the 700 Series Microliter syringes.

CAPACITY	MODEL	GAUGE	LENGTH	PT.	CAT. NO.	PRICE
10µL	701SN	26s	3"	#2	21572	
10µL	701SN	26s	4"	#2	21573	
10µL	701SN	26s	6"	#2	21574	



Needles for RN Syringes

CAPACITY	GAUGE	LENGTH	QTY.	CAT. NO.	PRICE
POINT #1 — CONE TIP					
5µL-10µL	26s	1.71”	3	21326	
5µL-10µL	23s	1.71”	3	21327-U	
5µL-10µL	23s-26s	1.71”	3	24582	
POINT #2 — BEVEL TIP					
2.5µL-100µL	26s	2”	3	20760-U	
2.5uL-100µL	26	2”	3	20762	
2.5µL-100µL	22s	2”	3	20761	
250µL-10mL	26s	2”	3	23940	
250µL-10mL	26	2”	3	23941	
250µL-10mL	22s	2”	3	20798	
250µL-10mL	22	2”	3	20799	
POINT #3 — BLUNT TIP					
2.5µL-100µL	26s	2”	3	20859	
2.5µL-100µL	25s	1.97”	3	58398*	
2.5µL-100µL	22s	2”	3	58649**	
250µL-10mL	26s	2”	3	26708	
250µL-10mL	26	2”	3	26709	
250µL-10mL	25s	1.97”	3	58399*	
250µL-10mL	22s	2”	3	20862	
250µL-10mL	22	2”	3	58650-U**	
250µL-10mL	16▲	2”	3	26710-U	
POINT #5 — CONE TIP, SIDE-PORT HOLE					
2.5µL-100µL	26s	2”	3	20878	
2.5µL-100µL	22s	2”	3	20879	
250µL-10mL	26s	2”	3	26711	
250µL-10mL	26	2”	3	26712	
250µL-10mL	22s	2”	3	26713	
250µL-10mL	22	2”	3	20880	

* For Waters.
** For Rheodyne.
▲ Polyetherether ketone (PEEK).

Needles for LT and TLL Syringes

MATERIAL	GAUGE	LENGTH	QTY.	CAT. NO.	PRICE
POINT #2 — BEVEL TIP					
Metal	28	2”	6	20757	
Metal	22	2”	6	21746	
Metal	22s	2”	6	21748-U	
KEL-F	28	2”	6	20756	
KEL-F	22s	2”	6	21749	
KEL-F	22	2”	6	21747	
POINT #3 — BLUNT TIP					
Metal	22	2”	6	21741	
KEL-F	22	2”	6	21744*	
POINT #5 – CONE TIP, SIDE PORT					
Metal	22	2”	6	20803	
KEL-F	22s	2”	6	21743	
KEL-F	22	2”	6	21742-U	

* For Rheodyne injector (manufacturer equivalent part no. 7215).

DESCRIPTION OF GAUGE SIZES

Gauge	OD x ID	Length	Dead Volume
26s	0.019 x 0.005 in.	2”	0.52µL
26	0.018 x 0.010 in.	2”	2.5µL
25s	0.020 x 0.006 in.	1.97”	1.26µL
22s	0.028 x 0.006 in.	2”	0.9µL
22	0.028 x 0.016 in.	2”	6.7µL

SPECIFICATIONS FOR SYRINGE NEEDLES

DESCRIPTION OF POINT STYLES

Point Style	General Information
#1 – Cone Tip 	Recommended for use with pre-drilled septa. The shape of this needle has been developed for multi-injections on the Agilent/HP 7673A autosampler.
#2 – Bevel Tip 	The bevel tip (22° on Hamilton syringes, 20° on SGE syringes) is designed for optimum septum penetration and to prevent septum coring.
#3 – 90° Blunt Tip 	The 90° blunt tip has chamfered and polished edges that eliminate damage to the valve’s rotor seal and stator face. This style also can be used for pipetting of liquids.
#5 – Cone Tip, Side-Port Hole 	Liquid samples can be filled and dispensed through the side hole, and septum damage is minimized by the solid domed tip.

9950106, 107, 109, 108



Needle Cleaning Kit

Formulated specifically for cleaning syringes. This kit includes 70cc bottle (makes 700cc of cleaning solution), ten wires in each of five sizes (0.00350" to 0.01207" OD), and instructions.

DESCRIPTION	CAT. NO.	PRICE
Needle Cleaning Kit	21578	
Replacement Syringe Cleaning Solution	20742	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Syringes

Accessories for Hamilton Syringes



Plunger Tips

For field repair of Hamilton Series 1000, 1700, and 1800 syringes. These plungers do not fit Sample Lock syringes.

SYRINGE MODEL	CAT. NO.	PRICE
PLUNGER ASSEMBLIES WITH TIPS		
1001-TLL/TLL w/slot	26160-U	
1001 LT-N-LTN-RN	26159	
1002 LT-LTN-RN-TLL	26161	
1005, all▲	26162	
1010-LT-LTN-RN-TLL	26163	
1025-LT-LTN-RN-TLL	26164	
1701, all▲	21343	
1702 (C, LT, N, or RN)	26150	
1705 (LT, RN, or TLL)	26152-U	
1710 (C, LT, N, RN, or TLL)	26154	
1725 (LT, N, RN, or TLL)	26156	
1750 (LT, LTN, RN, or TLL)	26158-U	
1801	27383	
1802-N-RN	26151	
1805-N-RN	26153	
1810-N-RN	26155-U	
1825-N-RN	26157	
TEFLON PLUNGER TIPS (PACKS OF 5)		
1001N, LT, RN	21732	
1005N, all▲	20674	
1705N, LT, TLL	20672	
1710N, LT, TLL	20673	
1750N, LT	21731	
1702/1802, all▲	21335-U	
1705/1805 RN	21336	
1710/1810 RN	21337	
1725/1825 RN/TLL	21338	
1750 RN/TLL	21339	

▲All = LT, N, TLL, RN.



Replacement Barrel Assemblies for 800 Series Syringes

CAPACITY	MODEL	CAT. NO.	PRICE
5µL	85N	20836	
10µL	801N	20837	
10µL	801RN	20838-U	
25µL	802RN	22174	

Luer Fittings for Sample Lock Syringes

DESCRIPTION	CAT. NO.	PRICE
Male Luer/Removable Needle Hub Accepts female Luer	26292	
Male Luer Lock/Removable Needle Hub Accepts female Luer or female Luer lock	26293	







Plunger Guides

DESCRIPTION	CAT. NO.	PRICE
For 75 and 701 syringes	20765	
For 702, 705, 710, 750, 1702, 1705, 1710, 1725, 1750, and 7000 syringes	26707	

Chaney Adapters

Recommended for sample reproducibility.

DESCRIPTION	CAT. NO.	PRICE
For 75, 701, and 1701 syringes	26704	
For 702, 705, 710, 750, 1702, 1705, 1710, 1725, 1750, and 7000 syringes with round thumb button	21350-U	



Repeating Dispenser

Accurately divides samples. Discharges 1/50th the syringe's capacity at each push of the button. Fits all 10µL-2.5mL Hamilton syringes. Order syringe separately.

DESCRIPTION	CAT. NO.	PRICE
PB600-1	20943	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Syringes
SGE Microliter Syringes



Microvolume Syringes

A sample as small as 0.1µL is contained in the needle.

		NEEDLE SPECIFICATIONS					REPLACEMENT NEEDLES		
CAPACITY	MODEL	GAUGE	LENGTH	OD	PT.	CAT. NO. PRICE	QTY.	CAT. NO.	PRICE
0.5µL	0.5BNR-5	23	50mm	0.63mm	#1	24400	1	24424	
0.5µL	0.5BR-7	23	70mm	0.63mm	#1	24401	1	24425	
0.5µL	0.5BNR-5BV	23	50mm	0.63mm	#2	509140	—	—	—
0.5µL	0.5BNR-OC-5/0.47	26	50mm	0.47mm	#1	509167	1	509175	
0.5µL	0.5BR-OC-7/0.47	26	70mm	0.47mm	#1	509205	1	509213	
1µL	1BR-7	23	70mm	0.63mm	#1	24408	1	24432	
1µL	1BR-5	23	50mm	0.63mm	#1	509221	1	509248	
1µL	1BR-7BV	23	70mm	0.63mm	#2	509256	1	509264	
1µL	1BNR-OC-7/0.47	26	70mm	0.47mm	#1	509272	1	509280	
5µL	5BR-7	23	70mm	0.63mm	#1	24411	1	24435	
5µL	5BR-7BV	23	70mm	0.63mm	#2	509310	—	—	—

Plunger Protection Syringes

		NEEDLE SPECIFICATIONS						REPLACEMENT NEEDLES		
CAPACITY	MODEL	GAUGE	LENGTH	OD	PT.	QTY.	CAT. NO. PRICE	QTY.	CAT. NO.	PRICE
FIXED NEEDLE SYRINGES										
5µL	5F	26	50mm	0.47mm	#2	1	26235-U	—	—	—
10µL	10F	26	50mm	0.47mm	#2	1	21933-U	—	—	—
10µL	10F	26	50mm	0.47mm	#2	6	21934-U	—	—	—
10µL	10F	26	50mm	0.5mm	#2	10	26239	—	—	—
25µL	25F	25	50mm	0.5mm	#2	1	26248	—	—	—
50µL	50F	25	50mm	0.5mm	#2	1	26249-U	—	—	—
100µL	100F	25	50mm	0.5mm	#2	1	26250-U	—	—	—
250µL	250F	25	50mm	0.5mm	#2	1	26251-U	—	—	—
500µL	500F	25	50mm	0.5mm	#2	1	26252	—	—	—
REMOVABLE NEEDLE SYRINGES										
5µL	5R	26	50mm	0.47mm	#2	1	26236	5	24436	
10µL	10R	26	50mm	0.47mm	#2	1	24413	5	24437	
50µL	50R	25	50mm	0.5mm	#2	1	26253-U	5	24447	
100µL	100R	25	50mm	0.5mm	#2	1	24423	5	24447	

Guided Plunger Syringes

		NEEDLE SPECIFICATIONS						REPLACEMENT NEEDLES		
CAPACITY	MODEL	GAUGE	LENGTH	OD	PT.	QTY.	CAT. NO. PRICE	QTY.	CAT. NO.	PRICE
FIXED NEEDLE SYRINGES										
10µL	10F-GP	26	50mm	0.47mm	#2	1	26240-U	—	—	—
5µL	5F-GP	26	50mm	0.47mm	#2	1	21521	—	—	—
REMOVABLE NEEDLE SYRINGES										
5µL	5R-GP	26	50mm	0.47mm	#2	1	24412	5	24436	
10µL	10R-GP	26	50mm	0.47mm	#2	1	24414	5	24437	



Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Syringes
SGE Gas Tight Syringes

Gas Tight Syringes

Gas Tight syringes are constructed of borosilicate glass, Teflon plunger tips, and KEL-F Luer cones where applicable. An interf between the plunger tip and the barrel enhances the gas sealing properties of the syringe. Plungers are interchangeable and Syri autoclaved, but the plunger should be removed.

- Maximum inertness for liquid or gas samples
- Suitable for manual dispenser/diluter applications
- High accuracy of dispensed volume
- Wide variety of terminations

		NEEDLE SPECIFICATIONS					REPLACEMENT NEEDLES		
CAPACITY	MODEL	GAUGE	LENGTH	POINT	CAT. NO.	PRICE	QTY.	CAT. NO.	PRICE
FIXED NEEDLE SYRINGES									
10µL	10F-GT	26	50mm	#2	26256		—	—	—
25µL	25F-GT	25	50mm	#2	26257		—	—	—
50µL	50F-GT	25	50mm	#2	26258-U		—	—	—
100µL	100F-GT	25	50mm	#2	26259		—	—	—
250µL	250F-GT	25	50mm	#2	26260-U		—	—	—
500µL	500F-GT	25	50mm	#2	26261		—	—	—
REMOVABLE NEEDLE SYRINGES									
10µL	10R-GT	26	50mm	#2	26237		5	24437	
25µL	25R-GT	25	50mm	#2	26262		5	24447	
50µL	50R-GT	25	50mm	#2	26263		5	24447	
100µL	100R-GT	25	50mm	#2	26264		5	24447	
250µL	250R-GT	25	50mm	#2	26265		5	24447	
500µL	500R-GT	25	50mm	#2	26266		5	24447	
1mL	1MR-GT	23	50mm	#2	509388		—	—	—
2.5mL	2.5MR-GT	23	50mm	#2	509396		—	—	—
5mL	5MR-GT	23	50mm	#2	509418		—	—	—
10mL	10MR-GT	23	50mm	#2	509426		—	—	—

Gas Tight Syringes, Luer Lock

VOLUME	MODEL	CAT. NO.	PRICE
LUER LOCK SYRINGES (WITHOUT NEEDLE)			
50µL	50F-LL-GT	509450	
100µL	100F-LL-GT	509469	
250µL	250F-LL-GT	509477	
500µL	500F-LL-GT	509485	
1mL	1MF-LL-GT	21964	
2.5mL	2.5MF-LL-GT	509493	
5mL	5MR-LL-GT	21965-U	
10mL	10MR-LL-GT	509507	
25mL	25MDR-LL-GT	509515	
50mL	5MR-LL-GT	21532	
100mL	10MR-LL-GT	21533	



21533

21965-U

Needles for Luer Lock Syringes

LENGTH	POINT	QTY.	CAT. NO.	PRICE
23 GAUGE				
50mm	#2	5	26270-U	
50mm	#5	2	26271	
70mm	#2	5	26272	
115mm	#2	5	26273-U	
22 GAUGE				
51mm	#3	2	26274	



26270-U

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

SuperfleX Syringes

Made from elastic alloy plunger that will not bend or kink.

CAPACITY	MODEL	NEEDLE SPECIFICATIONS GAUGE	LENGTH	OD	POINT	CAT. NO.	PRICE	REPLACEMENT NEEDLES QTY.	CAT. NO.	PRICE
FIXED NEEDLE SYRINGES										
5µL	5FX	26	50mm	0.47mm	#2	23950-U		—	—	—
10µL	10FX	26	50mm	0.47mm	#2	23944		—	—	—
10µL	10FX, 6 pk.	26	50mm	0.47mm	#2	23966		—	—	—
5µL	5FX-5C	26	50mm	0.47mm	#1	26242		—	—	—
10µL	10FX-5C	26	50mm	0.47mm	#1	26243		—	—	—
10µL	10FX-5/0.63C, 6 pk.	23	50mm	0.63mm	#1	26247		—	—	—
REMOVABLE NEEDLE SYRINGES										
5µL	5RX	26	50mm	0.47mm	#2	23953-U		5	24436	
10µL	10RX	26	50mm	0.47mm	#2	23947		5	24437	
10µL	10RX-5/0.63	26	50mm	0.47mm	#1	26245-U		2	26246	



Headspace Syringes and Probe

- Fitted with valve and special Luer probe with side hole
- Needle valve in hub allows gas sample to be stored in syringe during transfer to lab
- Recommended for soil headspace extraction
- Probe is removable and replaced with needle during injection in GC

DESCRIPTION	MODEL	CAT. NO.	PRICE
Syringe, 5mL	5MAX-HASV	23984	
Syringe, 10mL	10MAX-HASV	23986	
Probe	MAH-P	23985	

Syringes with Removable Needle Valve

CAPACITY	MODEL	CAT. NO.	PRICE
100µL	100R-V-GT	509531	
250µL	250R-V-GT	509558	

Syringes Fitted with Luer Lock Valve (Cat. No. 509353)

CAPACITY	MODEL	CAT. NO.	PRICE
1mL	1MDR-VLL-GT	509590	
5mL	5MDR-VLLMA-GT	509612	
10mL	10MDR-VLLMA-GT	509620	
25mL	25MDR-VLLMA-GT	509639	
100mL	100MDR-VLLMA-GT	509655	

Syringe Valves

DESCRIPTION	SYRINGE CAPACITY	CAT. NO.	PRICE
Valve (no Luer lock)	25µL-2.5mL	509337	
Valve with Luer lock	25µL-2.5mL	509345	
Valve with Luer lock	5mL-100mL	509353	
Valve, push button, LL/LT	any Luer lock	509361	



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Syringes
Valco Syringes

VICI Precision Sampling Syringes



P000433

Series A – Removable Needle. This Pressure-Lok syringe allows storage of sample within the syringe. Rotary valve in the needle hub allows for sample pre-pressurization prior to injection.



P000433

Series A-2 – Removable Needle. An economically priced general purpose syringe, it is leak-tight to 250psi for both gas and liquids.



P000433

Series C – Removable Needle. A heavy duty gas syringe, it features a positive rear plunger stop and a special low-dead volume, removable needle. No sample storage capacity.



P000433

Series D – Removable Needle. This standard gas sampling syringe is well-suited for routine laboratory applications. It is leak tight to 250psi and comes with a special low-dead volume, removable needle.



9130435

Magnum Series – Removable Needle. This Pressure-Lok series syringe allows sampling and storage of samples up to 500mL. A low-dead volume, removable needle is used, and a rotary valve allows on-site sampling for later analysis. It is ideal for collection, trace analysis and sample concentration of environmental contaminants.

CAPACITY	CAT. NO.	PRICE
SERIES A – REMOVABLE NEEDLE		
0.10mL	22261	
0.25mL	22262	
0.50mL	22263	
1mL	22264	
2mL	22265	
5mL	22266	
10mL	22267	
SERIES A-2 – REMOVABLE NEEDLE		
25µL	22268	
50µL	22269-U	
0.10mL	22270-U	
0.25mL	22271	
0.50mL	22272	
1mL	22273	
2mL	22274	
5mL	22275	
10mL	22276	
SERIES C – REMOVABLE NEEDLE		
0.10mL	22277	
1mL	22280	
2mL	22281	
5mL	22282	
SERIES D – REMOVABLE NEEDLE		
2mL	22295	
MAGNUM SERIES – REMOVABLE NEEDLE		
50mL	21735	
100mL	21736	
500mL	21738	
TEFLON PLUNGER TIPS		
For Series A, A-2, C, and D Pressure-Lok Gas Syringes.*		
500µL, pk. of 2	21950	
1mL, pk. of 2	21951	
2mL, pk. of 2	21952-U	
5mL, pk. of 2	21953-U	

*For 25µL to 250µL syringes, factory repair only.

Replacement Needles

MODEL	POINT STYLE	LENGTH	OD	ID	QTY.	CAT. NO.	PRICE
A	Bevel point, open end	2.25”	0.029”	0.012”	3	20996	
	Side port, taper	2.25”	0.029”	0.012”	3	22288	
A-2, C, D	Bevel point, open end (25-100µL)	2.0”	0.028”	0.005”	3	22298-U	
	Bevel point (100µL-10mL)	2.0”	0.028”	0.012”	3	22299	
	Side port, taper	2.0”	0.028”	0.012”	3	22289	
Magnum	Beveled point, open end	2.0”	0.035”	0.023”	3	21740-U	

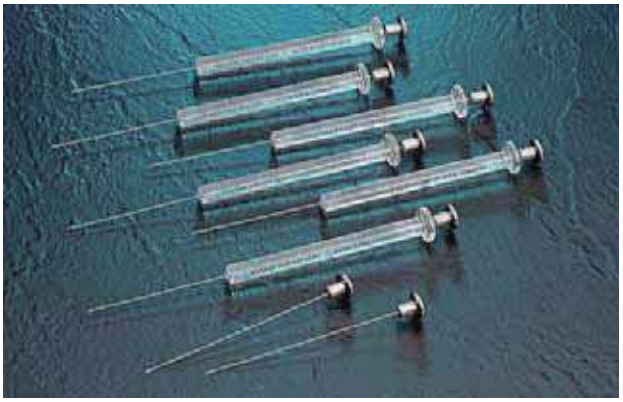
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C-120 – Fixed Needle: A general purpose chromatography syringe with a Teflon-tipped plunger. Leak-tight to 250psi.



C-160 – Fixed Needle:An economically priced general purpose syringe, it is leak-tight to 250psi for both gas and liquids.



C-160FN, Six-Pack Plus – Fixed NeedleSix syringes with replacement plungers, packaged in protective plastic case.

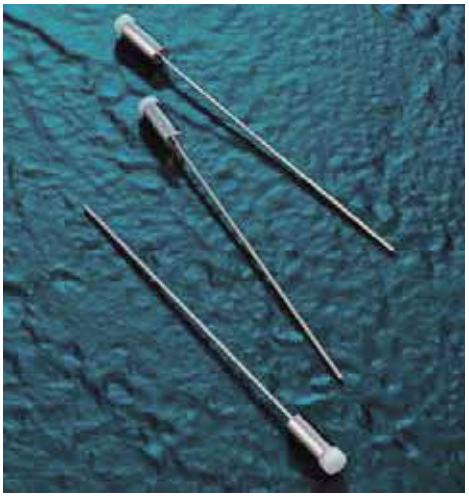


CG-130: This model has a reinforced plunger syringe with an internal guide and special plunger that eliminates bending problems.



D-140 – Removable NeedleA plunger-in-needle design is featured in this GC sample injection syringe. A positive rear stop prevents plunger bending. It fills by retracting the plunger, and features easy maintenance and replaceable parts.

CAPACITY	CAT. NO.	PRICE
C-120 — FIXED NEEDLE		
5µL	20960-U	
10µL	20961	
25µL	20962	
100µL	20964	
C-160 — FIXED NEEDLE		
10µL	20950-U	
25µL	20951-U	
50µL	20952-U	
100µL	20953	
C-160FN, SIX-PACK PLUS – FIXED NEEDLE		
10µL	22213	
CG-130		
Fixed Needle		
5µL	20954	
10µL	20955-U	
Removable Needle		
5µL	20956-U	
10µL	20957-U	
D-140 – REMOVABLE NEEDLE		
2µL	20985	



Replacement Needles for CG-130 Syringes

DESCRIPTION	CAT. NO.	PRICE
0.019” x 0.005” x 2.25” bevel point, pk. of 3	20949	

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Syringes
HPLC Syringes

Glenco Valve Flushing Syringes

Allows you to flush away the last traces of old sample. Use with VISF-1 Valco valve. Capacity of syringe is 1mL.

DESCRIPTION	QTY.	CAT. NO.	PRICE
For Valco VISF-1 injection valve	1	23009	
Replacement needles	2	23013	
Replacement screw hub nut	6	23014	



Hamilton Valve Flushing Syringes

DESCRIPTION	CAT. NO.	PRICE
VALVE FLUSHING SYRINGE, 1mL CAPACITY		
For Rheodyne/SSI/Valco (VISF-2) injection valves	58643	
Replacement Needles, pk. of 3	58650-U	
1010W SYRINGE, 10mL CAPACITY		
For Waters 6000 & 6000A solvent delivery systems	21566	
Tubing Assembly for 1010 Syringe	57687	



SGE Microvolume Syringes for HPLC Valves

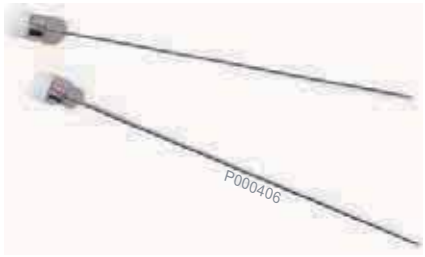
CAPACITY	MODEL	GAUGE	LENGTH	OD	PT.	CAT. NO.	PRICE	QTY.	CAT. NO.	PRICE
FIXED NEEDLE SYRINGES FOR RHEODYNE AND VALCO VALVES										
5µL	5F-LC	22	2”	0.028”	#3	509779		—	—	—
10µL	10F-LC	22	2”	0.028”	#3	509787		—	—	—
25µL	25F-LC	22	2”	0.028”	#3	509795		—	—	—
100µL	100F-LC	22	2”	0.028”	#3	509817		—	—	—
250µL	250F-LC	22	2”	0.028”	#3	509825		—	—	—
500µL	500F-LC	22	2”	0.028”	#3	509833		—	—	—
REMOVABLE NEEDLE SYRINGES FOR RHEODYNE AND VALCO VALVES										
5µL	5R-LC	22	2”	0.028”	#3	509841		5	23975	
10µL	10R-LC	22	2”	0.028”	#3	509868		5	24438-U	
25µL	25R-GT-LC	22	2”	0.028”	#3	509876		5	509949	
50µL	50R-GT-LC	22	2”	0.028”	#3	509884		5	509949	
100µL	100R-GT-LC	22	2”	0.028”	#3	509892		5	509949	
250µL	250R-GT-LT	22	2”	0.028”	#3	509906		5	509949	
500µL	500R-GT-LC	22	2”	0.028”	#3	509914		5	509949	
1mL	1MDR-LC-GT	22	2”	0.028”	#3	509922		5	509957	
2.5mL	2.5MDR-LC-GT	22	2”	0.028”	#3	509930		5	509957	
SUPERFLEX HPLC SYRINGES FOR RHEODYNE AND VALCO VALVES										
5µL	5FX-LC	22	2”	0.028”	#3	23952		—	—	—
10µL	10FX-LC	22	2”	0.028”	#3	23946		—	—	—
SUPERFLEX HPLC SYRINGES FOR WATERS VALVES										
10µL	10RX-LC	25	2”	0.5”	#3	23948		5	24438-U	

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Hamilton HPLC Syringes

CAPACITY	MODEL	NEEDLE SPECIFICATIONS GAUGE	LENGTH	POINT	CAT. NO.	PRICE	REPLACEMENT NEEDLES QTY.	CAT. NO.	PRICE
700 SERIES SYRINGES – FOR RHEODYNE, VALCO VISF-2, ALTEX AND SSI INJECTION VALVES									
10µL	701SNR	22s	2"	#3	58380-U		—	—	—
25µL	702SNR	22s	2"	#3	58381		—	—	—
50µL	705SNR	22s	2"	#3	58382		—	—	—
100µL	710SNR	22s	2"	#3	58383		—	—	—
250µL	725SNR	22	2"	#3	58384		—	—	—
500µL	750SNR	22	2"	#3	26222-U		—	—	—
800 SERIES LC SYRINGES – FOR WATERS U6K LOOP INJECTOR									
10µL	801RNW	25s	5cm	#3	58390-U		1	58398	
25µL	802RNW	25s	5cm	#3	58391		1	58398	
50µL	805RNW	25s	5cm	#3	58392		1	58398	
100µL	810RNW	25s	5cm	#3	58393		1	58398	
250µL	825RNW	25s	5cm	#3	58394		1	58399	
1700 SERIES GASTIGHT SYRINGES – FOR RHEODYNE, VALCO VISF-2, ALTEX AND SSI INJECTION VALVES									
10µL	1701RNR	22s	2”	#3	20885		3	58649	
25µL	1702RNR	22s	2”	#3	20886		3	58649	
50µL	1705RNR	22s	2”	#3	20887		3	58649	
100µL	1710RNR	22s	2”	#3	20888		3	58649	
250µL	1725RNR	22	2”	#3	20889		3	58650-U	
500µL	1750RNR	22	2”	#3	20890-U		3	58650-U	



Needles for RN Syringes

CAPACITY	GAUGE	LENGTH	QTY.	CAT. NO.	PRICE
POINT #3 — BLUNT TIP					
2.5µL-100µL	26s	2”	3	20859	
2.5µL-100µL	25s	1.97”	3	58398*	
2.5µL-100µL	22s	2”	3	58649**	
250µL-10mL	26s	2”	3	26708	
250µL-10mL	26	2”	3	26709	
250µL-10mL	25s	1.97”	3	58399*	
250µL-10mL	22s	2”	3	20862	
250µL-10mL	22	2”	3	58650-U**	
250µL-10mL	16 PEEK▲	2”	3	26710-U	

* For Waters.
** For Rheodyne.
▲ Polyetherether ketone.

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Syringes
Syringes Accessories





Miniature Two-Way Inlet Valve

Meets requirements for US EPA Method 602 for purgeable aromatic compounds

This miniature two-way valve is durable, dependable, and easy to use. The inert plastic components (CTFE body and female Luer connectors, PTFE core) will not interact with ultrapure or corrosive fluids. Its small size (2 in^3/33 cm^3) and weight (1 oz. / 28g) make it unobtrusive. A 0.059" internal passage minimizes sample hold-up.

When used with a Hamilton Teflon Luer Lock (TLL) syringe, the valve is particularly useful for transporting gaseous or liquid samples (e.g., environmental analyses of air or water). Use the valve with the Hamilton fittings included, or with any standard ¼" x 28 threaded fittings (e.g. Cheminert fittings) in flexible tubing systems.

Aluminum housing, stainless steel driver stem, operating range from 10°C to 100°C at pressures to 100psi (7 kg/cm^2).

DESCRIPTION	CAT. NO.	PRICE
Miniature Two-Way Inlet Valve With male and female connectors	20940	
Sample Valve for Tekmar concentrators[1], 14-0036-050*	20971	
Male Luer Connector, 14-0122-016*	20941	
Female Luer Connector, 14-0216-016*	20942-U	

[1] Order Luer connector separately.

* Tekmar equivalent.



Teflon Body Two-Way Valve

This miniature, two-way valve from Hamilton provides flexibility, inertness, and small size for collecting gas samples and transporting or storing them in the original sampling syringe.

Fluid path is made entirely of Teflon to ensure inertness. Can be autoclaved for applications requiring sterility. 100psig maximum pressure. Fits Hamilton Teflon Luer lock (TLL) and other Luer lock syringes.

DESCRIPTION	CAT. NO.	PRICE
Teflon Body Two-Way Valve	20926	



Push Button Valve

A convenient add-on Mininert valve gives your syringe sample storing capability. It features push-button operation and an all-Teflon body with a stainless steel miniature valve stem.

DESCRIPTION	CAT. NO.	PRICE
For TLL syringes (Hamilton and SGE)	22285	
For Series C and D Pressure-Lok syringes (Valco)	22284	

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Syringe Cleaner

Helps rid your chromatogram of ghosts

Cleans Hamilton syringes and other syringes with needles up to 18 gauge (0.049" OD). Just connect the unit to your water aspirator or other vacuum source, insert the needle through the septum and, in 10-30 seconds, you're ready for a new sample. A combination of heat (250°C) and vacuum vaporizes and removes contaminating volatiles in a single operation.

No liquids are required with Hamilton Series 7000 syringes. For Series 700 and other conventional syringes, use a rheostat to lower the temperature (to 50°C or below) and maintain a flow of solvent through the barrel and needle. Instructions are included.

DESCRIPTION	CAT. NO.	PRICE
Hamilton Syringe Cleaner, 120V	20770-U	
Replacement Septa, 5mm, pk. of 100	20712	



Needle Cleaning Kit

Formulated specifically for cleaning syringes. Kit includes 70cc bottle (makes 700cc of cleaning solution), ten wires in each of five sizes (0.00350" to 0.01207" OD), and instructions.

DESCRIPTION	CAT. NO.	PRICE
Needle Cleaning Kit	21578	
Replacement Syringe Cleaning Solution	20742	

Proper Syringe Care Ensures Consistent Injections and Long Syringe Life

Syringes are precision instruments. The care you take in using, handling, and storing them are keys to consistent injections, quality chromatograms, and long syringe life.

- Generally, for consistently accurate injections, the sample size should not be less than 10% or more than 80% of the syringe's capacity.
- Temperatures above 50°C can damage most fixed-needle syringes, due to expansion of the metallic needle.
- Routinely inspect your syringe for damage. Look for hairline cracks, and discard any syringe with a potentially unsafe barrel. The needle tip must be free of barbs. Barbs will tear the septum, creating particles that can clog the needle or deposit in your chromatographic system.
- Never store a syringe without cleaning it. Use caution when cleaning syringes containing epoxy glue or Teflon materials.
  - Epoxy glue is not completely resistive to every solvent. A solvent such as methanol, methylene chloride, acetonitrile, acetone, or butyl amine (and others) can result in a contaminated plunger, adherence of the plunger into the barrel, a loose needle, or a clogged needle.
- If your syringe contains a Teflon tip, be sure to replace the plunger and tip assembly immediately if metal is exposed. The exposed plunger scrapes the glass of the syringe barrel, producing glass fragments that cut grooves in the Teflon tip. These grooves allow sample to leak past the tip. Caustic samples or cleaning solutions that seep under the Teflon tip destroy the shaft adhesive that holds the Teflon tip on the plunger. The tip, when loosened, could slip off during sample aspiration.

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Did you know...



Supelco offers the laboratory supplies to meet your analytical needs.

Tools offered in this section represent decades of experience assembling the most needed items to maintain the chromatography laboratory

The specifications for the tools we offer are those most often encountered when servicing equipment in the analytical lab

Supelco can equip you with virtually any laboratory accessory you need

Laboratory Supplies

TechTip

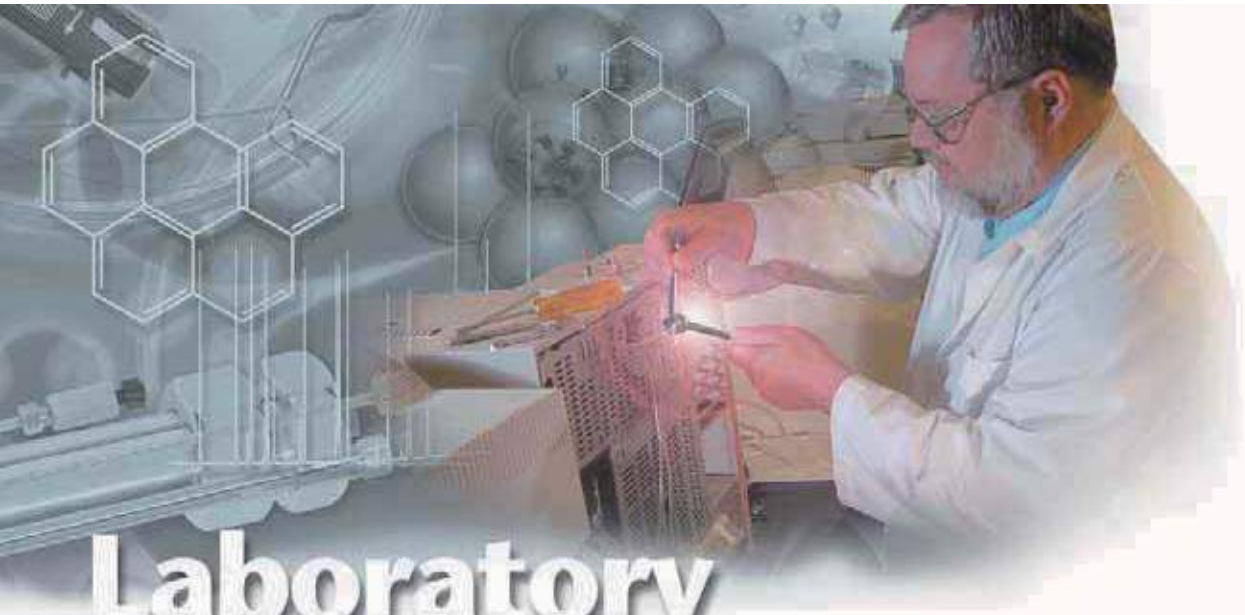
If the humidity in your laboratory is high, your chart recorder may not function properly. This is because the paper in your recorder will swell as it picks up moisture. Even replacing the chart paper with a new roll may not restore recorder function unless the paper is stored under low humidity conditions.

We recommend storing unused chart paper at between 40-55% relative humidity and 70-76 ^{0}F/20-25 ^{0}C (room temperature).

Supelco laboratory supplies include...

- A comprehensive selection of tools including pliers, wrenches, cutting tools & tweezers
- Hard-to-find specialty wrenches designed especially for working on chromatographs
- An extensive selection of chart paper to fit recorders manufactured by leading chromatograph manufacturers
- Magnifiers to assist when viewing detailed chromatograms
- Ultrasonic cleaners to maintain chromatography equipment in optimum working condition

Whatever your laboratory supplies needs, Supelco can help. If you have questions about which products you need to maintain optimal performance of your analytical equipment, contact Supelco's Technical Service group for a quick and easy recommendation.



Laboratory Supplies

Laboratory Supplies 422
Tool Kits 422
Hand Tools 423
Ultrasonic Cleaner 426
Recorder Pens 426
Chart Paper 427



Laboratory Supplies
Tool Kits

Xcelite Tool Kit

This sturdy locking case contains selected, highest quality tools for adjusting or repairing chromatographs and other analytical instruments. There is a specific spot for each tool, plus room in the base for additional tools.

KIT INCLUDES:

PLIERS, WRENCHES, CUTTERS

- 6" straight nose seizer
- adjustable wrench (3/4" opening)
- 5" midget slip joint pliers (1/2" opening)
- 7" utility pliers (1 1/16" opening)
- 6" long-nose pliers
- 4" diagonal pliers
- 5" diagonal pliers
- 5 1/2" needle-nose pliers
- 8" chain-nose pliers
- 6 1/2" electronic snips
- wire stripper
- electrician's knife

INTERCHANGEABLE SCREWDRIVERS, NUTDRIVERS, HANDLES, ETC.

- regular handle (1 1/16 x 4 1/8")
- tee handle (3 1/2 x 1 5/8")
- 4" extension
- nine Allen hex socket screwdrivers: 1/20", 9/64", 7/64", 5/64", 5/32", 3/32", 3/16", 1/16", 1/8"
- two slotted screwblades: 3/16", 1/4"
- two Phillips screwblades: No. 1, No. 2
- reamer (1/8" to 3/8")
- seven hex nutdriver blades: 11/32", 9/32", 7/32", 5/16", 3/16", 3/8", 1/4"

SCREWDRIVERS FOR SLOTTED SCREWS

- 4 1/2" w/pocket clip
- 5 1/4" w/pocket clip
- 6 5/8" regular
- 10 1/2" regular
- 3 1/4" stubby

SCREWDRIVERS FOR PHILLIPS SCREWS

- 3 7/16" No. 1, stubby

NUTDRIVERS

- 7/16" regular, full hollow shaft
- 1/2" regular, full hollow shaft
- 6 1/8" magnetic (1/4" opening)
- 6 1/8" magnetic (5/16" opening)

SOLDERING EQUIPMENT

- Weller soldering iron (110V)
- Rosin core solder

TAPE MEASURE

- 10-foot tape



DESCRIPTION	CAT.NO.	PRICE
Xcelite Tool Kit	20599	

Roomy Tool Box Filled with the Most-Needed Tools

This rugged tool box contains tools you need almost daily in the lab, and is large enough to hold many more. 20 3/4 x 8 3/8 x 8 high (53 x 21 x 20cm).

KIT INCLUDES:

- padlock
- flashlight
- five open-end wrenches:
  - 1/4 x 5/16", 3/8 x 7/16", 1/2 x 9/16", 7/16 x 1/2", 5/8 x 3/4"
- 6" adjustable wrench
- 12" adjustable wrench
- 7½" long-nose pliers
- 7½" slip-joint pliers
- 4" Phillips head screwdriver, No. 1
- 4" Phillips head screwdriver, No. 2
- four flat-blade screwdrivers
- eleven-piece hex key wrench set
- bastard file



DESCRIPTION	CAT.NO.	PRICE
Tool Box and Tools	22913	

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Wrenches

Swagelok Tee Wrench - Made specifically for 1/4" Swagelok union tees and crosses, this wrench allows sure, easy gripping on the fitting body – even in cramped areas. Rugged alloy steel with no-slip vinyl sleeve.

Ratchet Wrench - Gets into tight places. Jaws open to slip around the nut, then close. Convenient to use in a small chromatograph oven or other confined places. 7/16" wrench is for 1/8" Swagelok fittings, 9/16" wrench is for 1/4" Swagelok fittings.

Open End Wrench Set - Forged from extra strong alloy steel, then chrome plated. Four wrenches include the most commonly used sizes: 1/4 x 5/16", 3/8 x 7/16", 7/16 x 1/2", 1/2 x 9/16". Duplicate sizing allows you to tackle two nuts of the same size. Tough snap-seal vinyl pouch.

Adjustable Wrench - For odd-sized fittings. 10" Crescent wrench made from drop-forged, heat-treated alloy steel, with rust-resistant chrome plating. Jaws open to 1 1/8" (2.8cm).

Allen (Hex Key) Wrench Set - For hollow-head set screws. 12 exact-tolerance hexagonal wrenches made of hardened alloy steel with bright plated finish. Sizes: 1/16", 5/64", 3/32", 7/64", 1/8", 9/64", 5/32", 3/16", 7/32", 1/4", 5/16", 3/8". Vinyl pouch.

Hex Key Wrenches - Each wrench folds out of and into the handle like a knife blade. Heat-treated chrome-nickel-steel alloy keys in eleven most popular sizes: 0.050", 1/16", 5/64", 3/32", 1/8", 5/32", 3/16", 7/32", 1/4", 5/16", 3/8".

DESCRIPTION	CAT. NO.	PRICE
Swagelok Tee Wrench	21983-U	
7/16" Ratchet Wrench	20447	
9/16" Ratchet Wrench	20448	
Open End Wrench Set	22442	
Adjustable Wrench	22439-U	
Allen (Hex Key) Wrench Set	22441	
Hex Key Wrenches	22291	



Pliers

Slip Jaw Pliers - A versatile tool. Precision milled, interlocking jaws have 5 positions, open to 1 1/2" (3.8cm); won't slip. Forged carbon steel is heavier at point of stress. 10" pliers; cushion grip.

Needle-Nose Pliers - Serrated jaws and side cutters with specially hardened edges. Drop-forged from tough alloy steel. 6" long; cushion grip.

Straightening Pliers - For 1/16" tubing. Jaws grooved specifically for 1/16" stainless steel tubing. Grips are spring-loaded for easier operation.

DESCRIPTION	CAT. NO.	PRICE
Slip Jaw Pliers	22438-U	
Needle-Nose Pliers	22437	
Straightening Pliers	58646	

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Laboratory Supplies
Hand Tools



Screwdrivers

Fold-Up Screwdriver Set - Six blades fold out of and into the handle like knife blades. 1/8", 3/16", 1/4" flat blades, Phillips No. 1, T-15 star Torx, punch awl.

Screwdriver Kit - Six screwdrivers in one. Three combination blades easily snap in and out of the spring lock in the handle of this handy kit. Blades are flat 3/16", 1/4", 5/16" wide, Phillips No. 1, No. 2, No. 3. The handle can also be used as a 7/16" hex nut driver. Plastic case with clear front.

Jeweler's Screwdrivers Five interchangeable blades connect securely to chuck-type knurled handle with swivel top. Three flat blades: 0.055", 0.070", 0.100"; two Phillips blades: No. 0, No. 1. Vinyl storage pouch.

DESCRIPTION	CAT. NO.	PRICE
Fold-Up Screwdriver Set	22292	
Screwdriver Kit	22436	
Jeweler's Screwdrivers	22440-U	



Tweezers

Stainless Steel Tweezers Perfect for picking up hot injector liners and detector parts or for preventing contamination with finger oils. Also useful for holding ferrules while inserting capillary tubing.

DESCRIPTION	CAT. NO.	PRICE
Stainless Steel Tweezers	22435-U	



Cutting Tools

Scoring Tool - Tungsten carbide tip scores glass capillary tubing.

Heavy-Duty Glass Tubing Knife - 3-edge tungsten carbide blade.

Glass Tubing Cutter - Scores uniformly to ensure clean breaks.

DESCRIPTION	CAT. NO.	PRICE
Scoring Tool	23746	
Heavy-Duty Glass Tubing Knife	20598	
Glass Tubing Cutter	20591-U	
Cutting Wheels for 20591-U, pk. of 5	20592	



Flexible Flashlight

Easily beam light into difficult-to-see-and-reach places – FIDs, GC ovens, LC pumps, etc. Simply bend the durable 8" (20cm) coaxial cable as necessary. Stays flexed in any position. Convenient pocket clip. High-impact case. Comes complete with replaceable batteries.

DESCRIPTION	CAT. NO.	PRICE
Flexible Flashlight	22452	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

22969



Microflame Gas Torch Set

Use this brazing and soldering tool for silver soldering, custom connections, fire polishing. Operates on disposable oxygen and butane cylinders, develops a 2760°C pinpoint flame.

Set contains torch, 6 Micronox cylinders, 3 butane cylinders, 2 flame tips, butane tip, spark lighter, tube of flux, 6 brazing rods, and an instruction book, all in a molded plastic box.

DESCRIPTION	CAT. NO.	PRICE
Microflame Gas Torch Set	22969	
Replacement Micronox Cylinders, pk. of 6	22907	
Replacement Butane Cylinders, pk. of 6	22908	

22754-U



23011



Timepieces

Timer/Clock - Countdown timer and stopwatch functions – counts up or down from 1 sec. to 24 hours. Alarm sounds for 60 seconds, shuts off automatically. Operates on 1.5V battery (included). Clips onto pocket.

LCD Digital Stopwatch - Shows time of day, 1/100 second timing, split (lap) times, day, date and month, time in/out, two finishing times. Night light. 0.003% accuracy; includes battery.

DESCRIPTION	CAT. NO.	PRICE
Timer/Clock	22754-U	
LCD Digital Stopwatch	23011	

Illuminated Magnifiers

- Shadow-free light helps you see better
- Convenient and portable
- Manufactured by Bausch & Lomb



Compact Lighted Magnifier- Ideal for low-level magnification of data sheets, maps, etc. Large (2 x 2"/ 50.8 x 50.8cm) 2X lens retracts into a pocket-sized storage case. Includes two AAA batteries.

Lenscope Illuminated Magnifier- This magnifier is for close inspection of chromatograms, needle tips, electronic circuits, etc. The clear, distortion-free image is provided by a highly corrected, 10X Hastings triplet lens – probably the best magnifying lens available. Features a comfortable handle and two angled illumination lights (45° and 90° from viewing angle). Includes hinged storage case. Requires two AA batteries.

Coddington Magnifier- Second only to the Hastings triplet in image quality. The 20X image is provided by a single thick lens (rather than a three-component lens). Swing-away nickel-plated caseNo built-in illumination source.

DESCRIPTION	CAT. NO.	PRICE
ILLUMINATED MAGNIFIERS		
Compact Lighted Magnifier	23141	
Lenscope Illuminated Magnifier	23135	
Coddington Magnifier	23139	
SCALE FOR LENSCOPE MAGNIFIER		
Protractor S (360° in 1° intervals)	23138	

20352



Septum Pullers

Hook Septum Puller - Great for removing soft silicone septa and graphite ferrules from 1/4" Swagelok nuts. Has dozens of other uses around the lab.

Screw Septum Puller -Perfect for removing soft silicone septa and harder high temperature septa such as Pyrosep S-1.

DESCRIPTION	CAT. NO.	PRICE
Hook Septum Puller	20352	
Screw Septum Puller	20353	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Laboratory Supplies
Hand Tools, Ultrasonic Cleaner, Recorder Pens

Ultrasonic Cleaner

SPECIFICATIONS	
Tank Size:	5½ x 6 x 4 in. (14 x 15 x 10cm)
Overall Size:	7½ x 8 ½ x 9 in. (19 x 22 x 23cm)
Weight:	7 lbs. (3.2kg)



22326

Ultrasonic cleaning is fast, effective and safe. The Branson ultrasonic cleaner has more power than most comparable models. It ensures faster, more thorough cleaning of dirt, protein residue, and other debris from your glassware, fittings, syringes, needles, and other apparatus. It also is useful for ultrasonic digestion of environmental samples. Bransonic cleaners are used routinely to clean electronics components, contact lenses, and gemstones – you can be sure they'll safely clean your glassware and system components. Recessed cleaning tank is enclosed in durable, solvent and impact resistant plastic. ½ gallon (1.8 liter) capacity.

DESCRIPTION	CAT. NO.	PRICE
BRANSONIC ULTRASONIC CLEANER		
110VAC	22326	
220VAC[1]	22336	
CLEANING SOLUTION		
900mL	22335	

[1] CE approved.


22434

Mirror with Rotating Head

Ideal for examining inside of injection and detector fittings for ferrule or column fragments. Rotating head allows wide range of movement.

DESCRIPTION	CAT. NO.	PRICE
Mirror with Rotating Head	22434	


20808-U

Teflon Tape

Lubricate threads and eliminate leaks when making threaded pipe connections.

DESCRIPTION	CAT. NO.	PRICE
Teflon Tape	20808-U	



Agilent/HP JetPaper Print Cartridge

Fits Agilent/HP 3396A integrator, QuietJet, ThinkJet, and QuietJet Plus printers (Agilent/HP part no. 92261A). One cartridge prints 600,000 characters. Black ink.

DESCRIPTION	CAT. NO.	PRICE
Agilent/HP JetPaper Print Cartridge	22775	

Recorder Pens – Eliminate time-consuming pen cleaning. Will not clog or skip.

	RECORDER MODEL	APPROX. NIB LENGTH	INK COLOR	QTY.	CAT. NO.	PRICE
AGILENT/HP RECORDERS						
	7123, 7143	1/8" (4mm)	black	3	22757-U	
HOUSTON INSTRUMENTS RECORDERS						
	5110, 5210 (1- and 2-pen)	3/8" (10mm)	red blue	4 4	22938 22939	
KIPP & ZONEN RECORDERS						
	BD 7, 8, 9, 10, 11, 12, 14, 14D, 30, 31, 40, 41	1/4" (7mm)	black	6	22752-U	
LINEAR INSTRUMENTS RECORDERS						
	112, 152, 160, 161, 212, 222, 252 252A, 254, 255-14, 260, 264	1/4" (7mm)	black	5	22770-U	
	140, 141, 142, 143, 232, 255, 282 285, 285-14, 291, 294, 355, 361, 385 395, 412, 422, 432, 455, 456, 485, 486	1/4" (7mm)	black	5	22774	

P000350, 349,344,348,346

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

These quality papers are tested for pressure sensitivity, response to electrical stimulus, and other traits.

- All papers have a smooth, clean surface and uniform coating – no creases, wrinkles, or moisture welts – and are low in abrasive
- These papers will not shrink or expand between 40-55% relative humidity and 70-76°F (20-25°C).

Chart Paper for Many Recorders

RECORDER MODEL	CHART TYPE	MFR.'S CHART NO.	SINGLE ROLL/PAD CAT. NO.	PRICE	BOXED IN QUANTITY QTY.	CAT. NO.	PRIC
AGILENT/HP RECORDERS							
1080, 3380, 3388A, 5380, 5880	Z-fold blank, blue Z-fold blank, black	5080-8735 9270-0658	22870 22887		10 10	22885-U 22888	
85B, 3390, 3390A, 3392A	blank, blue, 107mm x 400' roll (82931A) blank, black, 107mm x 400' roll (82954A)	5080-8800 9270-1134	22337[1] 22355-U[1]		10 10	22346 22356	
3394, 3395, 339 6	blank roll Z-fold JetPaper, 500 sheets	5181-1219 5062-3561	22350-U —	 —	4 5	22357 22896	
HOUSTON INSTRUMENTS RECORDERS							
B-5000 Series	0–10English	EC-100	22934[2]		—	—	—
KIPP & ZONEN RECORDERS							
BD 40/41	0–100 (230mm x 66')	XR-9	—	—	25	22802	
BD 111/112	100-0 English (230m m x 66')	XR-18	23609		—	—	—
LINEAR INSTRUMENTS RECORDERS							
250, 254, 255, 261, 285, 291, 361, 391, 400, 456, 486, 555, 561, 585, 591, 595, 1800, 1801 1802, 2500	0100-0025	—	—	—	25	22347	
1200, 1201, 1202, 1210, 2020, 2030	0100-0026	—	—	—	25	22349	
PERKIN-ELMER RECORDERS							
056	0–100 double scale metric	056-7300	22854		—	—	—
Sigma Series (except Sigma 15)	Z-fold blank, blue Z-fold blank, black	332-1910/30/31 —	22870 22887		10 10	22885-U 22888	
Sigma 15	Z-fold, black	—	22368		10	22371	
LCI-100, GP100	blank	N625-1026/27	—	—	25	22856	
R100	0–100 English(274mm x 85')	C005-0610	23613		—	—	—
EX-800, FX-85 PR-100/110/	Z-fold JetPaper, 500 sheets	0944-1006	—	—	5	22896	
SHIMADZU RECORDERS							
C-R3A	black thermal (8 3/16" x 167')	221-25412-00	—	—	10	22851	
C-R5A	black thermal (208mm x 148')	223-02037-81	—	—	10	22838	
C-R4A	black thermal (255mm x 148')	223-02000-12	23615		25	23616	
C-R1A, C-R1B	black thermal (83/16" x 170')	S221-13391-01	23617		—	—	—
CR501	blank (208mm x 168')	223-02037-02	—	—	10	23604	
SPECTRA PHYSICS RECORDERS							
4270, 4290	blank (9.3" x 165')	A-2157-010	22374		25	22375	
4400	Z-fold JetPaper, 500 sheets	4000-010	—	—	5	22896	
VARIAN RECORDERS							
3000	black thermal, blank (4.33" x 150')	03-917650-01	—	—	12	22891	
4270, 4290	blank (9.3" x 165')	00-997140-01	22374		25	22375	
4400	Z-fold JetPaper, 500 sheets	00-997325-00	—	—	5	22896	
VARIAN VISTA RECORDERS							
Vista 401/402	Z-fold, black	0390636200	22368		10	22371	
WATERS RECORDERS							
—	Z-fold, blue	74701	22870		10	22885-U	
—	Z-fold blank, black	74703	22887		10	22888	
746	Z-fold JetPaper, 500 sheets	87137	—	—	5	22896	
5200	8.3" W x 11.8" L, 1000 sheets	3725-010 (31220)	22805		—	—	—

[1] 2 rolls [2] 4 rolls

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Laboratory Supplies

SUPELCO

Did you know...



We have the facilities, expertise, and documente processes to meet any proj requirement.

- Supelco is your source for media sample quantities needed for lab and pilot-scale development efforts
- Supelco offers a full line of off-the-self media from all major manufacturers including Dow Chemical, Rohm & Haas, Mitsubishi Chemical, Amersham-Biosciences, Sigma-Aldrich, and Tosoh Biosep
- Supelco offers media prepackaged, in custom packaged quantities, or processed to unique customer requirements

Resins & Media

Supelco media processing capabilities include...

- Cleaning
- Pre-wetting
- Blending & Drying
- Ion-exchange
- Sanitizing & Sterilizing
- QC testing including Certificate of Analysis
- Custom Packaging (clean room)

Contact us about customizing media to meet your separation or purification requirements. Whether testing and packaging client-provided material or sanitizing custom prepared media under clean-room conditions, Supelco is the solution.

TechTip

Resins can change in volume drastically when wetted. Aqueous or organic solvents may cause significant (50-100%) swelling. The effect is greater with weakly ionic resins. Please note that...

Excessive swelling can occur...

on wetting a dry resin.

when exchanging forms.

during elution when separating analytes.

Always allow room for swelling ahead of time when working with a resin. If you are unsure about how much swelling will occur with a resin you are using, contact Supelco Technical Service to learn more.



Resins & Media

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Resins
Rezorian and Porozorb Cartridges



P000619

Rezorian A161 Cartridges

Disposable Rezorian A161 Luer lock syringe-tip cartridges offer convenience and expedience for isolating, purifying, and concentrating biomolecules from aqueous samples. Packed with high performance, macroreticular, hydrophobic adsorbent resin (Table 1), Rezorian A161 cartridges are specially tailored for biomolecular pharmaceutical separations. We can custom prepare Rezorian cartridges with a variety of resins - please inquire.

TABLE 1. RESIN CHARACTERISTICS: REZORIAN CARTRIDGES

Particle Description:	spherical styrene divinylbenzene, reagent grade
Mean Particle Size:	120µm
Mean Pore Diameter:	110-175Å
Surface Area:	800-950m²/g

DESCRIPTION	QTY.	CAT. NO.	PRICE
Rezorian A161 Cartridges, 1mL	6	57610-U	
Rezorian A161 Cartridges, 5mL	6	57611	

RELATED INFORMATION

For additional information, request the following free literature by phone or fax, or see our website.

No.	Subject
T111871	Porozorb cartridges (purifying biological preparations)
T494015	Rezorian cartridges
T394001	Rezorian cartridges (concentrating ethidium bromide)
T394022	Rezorian cartridges (concentrating ethidium bromide)



P000620

Sterile Porozorb Cartridges

Analysts processing protein or other biological preparations, sterile pharmaceuticals, foods, or beverages must separate wanted products from unwanted process components. Produced using validated processes, Porozorb cartridges are sterile, endotoxin-free, ready-to-use adsorbent cartridges that effectively remove detergents (Triton X-100, sodium dodecyl sulfate, Tween, etc.) or other nonpolar, hydrophobic materials from such preparations. They are appropriate for analytical scale to process scale purification schemes.

A certificate of analysis accompanies each Porozorb cartridge. Cartridges are tested for Sterility and Endotoxin by an accredited test lab following modified USP guidelines. The cartridges can be rinsed with cleaning agents (e.g., most weak acids and bases) or autoclaved at 121°C. The polycarbonate cartridge can accept 50% organic solutions during analysis, but must be stored in aqueous solutions.

CHARACTERISTICS OF POROZORB CARTRIDGES[1]	
Particle Description:	spherical styrene/divinylbenzene, cleaned
Mean Particle Size:	500µm
Mean Pore Diameter:	40Å
Cartridge Dimensions: [1]	6.55 x 8cm (250mL) 26.20 x 8cm (1000mL) 42.04cm x 12.71cm (4000mL)
Nipple Connections:	3/16" ID, 1/4" OD
Shell:	clear polycarbonate
Retaining Screens:	stainless steel, 50x250 mesh, highest quality
Gaskets:	Melrath medical grade
Maximum Pressure:	30psi (2.1kg/cm²)
Sterility:	shipped sterile and endotoxin-free

[1] We can make other Porozorb cartridges on request.

CARTRIDGE	VOLUME	CAT. NO.	PRICE
POROZORB CARTIDGES			
Porozorb 254	250mL	57500	
Porozorb 1004	1000mL	57502	
Porozorb 4004	4000mL	57513-U	

NOTE: Porozorb cartridges are not for clinical or diagnostic use.

Due to shelf life limitations, Porozorb cartridges are made on receipt of an order. Expect 2-4 week delivery times.

See Legally Speaking in the index.

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Activated Alumina

Highly porous in nature, aluminas can be effective desiccants and have numerous applications in catalysis. We offer four types of activated alumina (Al_2O_3) designed for column chromatography: acidic, weakly acidic, basic, and neutral. All grades have a Brockmann activity of I. Prepare Brockmann II-V grades simply by adding the appropriate amount of water to the Brockmann I grade. Shake the material well to disintegrate lumps and allow it to equilibrate in a closed vessel overnight.

Applications

- Neutral alumina can be used for removing impurities from natural alkaloids, vitamins, antibiotics, glycosides, and synthetic hormones, and for drying and purifying solvents.
- Basic alumina can be used for removing peroxides from ethers and hydrocarbons, extracting polar compounds (such as alcohols), drying solvents (diethylether, benzene, chloroform), separating xylenes, or in dioxin analyses (EPA Method 161[1]) or pesticide analyses.
- Acidic alumina is useful for adsorbing polar compounds (such as vitamins), inorganic cations, water-soluble dyes, morphine, fatty acids, plant waxes, and in dioxin analyses (EPA Method 161[1]).



Activated Alumina

TYPE	WEIGHT	CAT. NO.	PRICE
Neutral	5g	199974-5G	
	100g	199974-100G	
	1000g	199974-1KG	
	5000g	199974-5KG	
Basic	5g	199443-5G	
	100g	199443-100G	
	1000g	199443-1KG	
	5000g	199443-5KG	
Acidic	100g	199966-100G	
	1000g	199966-1KG	
	5000g	199966-5KG	
Weakly acidic	250g	267740-250G	
	1000g	267740-1KG	
	5000g	267740-5KG	

Celite Filter Aid

Reagent-grade Celite 545 AW. Acid-washed, high-purity flux-calcined diatomaceous silica, especially prepared for chromatography and other laboratory applications.

DESCRIPTION	QTY.	CAT. NO.	PRICE
Celite 545 AW	454g	20199-U	

TYPICAL PARTICLE SIZE DISTRIBUTION FOR ACTIVATED ALUMINA (ALL GRADES)

Sieve Opening (mm)	Mesh Size	% Retained
0.25	60	≤0.1
0.20	~75	2-5
0.15	100	15-20
0.10	~150	55-65
0.07	~210	72-85
0.04	~360	95-98

AMOUNT OF WATER TO BE ADDED TO BROCKMANN I GRADE		APPROX. WATER CONTENT (%, KARL FISCHER METHOD)
For grade II:	3%	4 - 4.5
For grade III:	6%	7 - 7.5
For grade IV:	10%	11 - 11.5
For grade V:	15%	16 - 16.5

CHARACTERISTICS OF STANDARD GRADES OF ACTIVATED ALUMINA (BROCKMANN NO. 1)

Particle Size (mesh):	~150
Pore Diameter (Å):	58
Surface Area (m^2/g):	155
Water (%):	~1.5
Na_2O (%):	0.4
Fe_2O_3 (% max.):	0.02
SiO_2 (% max.):	0.02

CAT. NO.	GRADE	TYPE	pH	Cl^- (meq/g)
199974	507-C-I	neutral	7.5±0.5	0.03
199443	5016-A-I	basic	9.5±0.5	—
199966	504-C-I	acidic	4.5±0.5	0.14
267740	506-C-I	weakly acidic	6.0±0.5	0.06

[1] 5% stirred aqueous suspension.

HELPFUL HINTS

For aluminas in solid phase extraction tubes refer to the Sample Preparation section of this catalog.

Resins
Adsorption Media

Ambersorb: High Performance Separations

Ambersorb synthetic carbonaceous adsorbents can be used in a diverse range of liquid or vapor phase separation applications, including:

- Wastewater treatment
- High value separations
- Vapor phase treatment of toxic air emissions
- Catalysts/catalyst supports
- Ultrapure water preparation

Ambersorb adsorbents are available from Supelco in research-scale quantities, up to 1000g.

Unique physical structure makes Ambersorb resins ideal for bulk-scale separation applications:

- High macro- and mesoporosity allows fast mass transfer of a compound to the micropores
- Unique pore size distribution and surface chemistry provide excellent adsorption capacity
- Easy regeneration in situ
- Excellent physical integrity eliminates concern about dusting or attrition

Ambersorb Carbonaceous Adsorbents

DESCRIPTION	QTY.	CAT. NO.	PRICE
Ambersorb 563	100g	10430-U	
Ambersorb 572	100g	10432-U	

Combigel XE-305

Underivatized polystyrene, mesh size 50-100 – our answer to Amberlite XE-305. Unique swelling properties; combinatorial chemistry support.

See our combinatorial chemistry reaction vessels, vacuum manifolds, and accessories in the Sample Preparation section.

DESCRIPTION	CAT. NO.	PRICE
COMBIGEL XE-305		
50g	502537B	

Lipophilic Sephadex

Lipophilic Sephadex LH-20 is a hydroxypropylated derivative of Sephadex G-25. It is used in gel permeation, normal phase partition, and adsorption chromatography of, e.g., lipids, steroids, fatty acids, hormones, and vitamins. It also is used for adsorption chromatography.

Dry Bead Diameter:	25-100µm
Swelling Ratio:	1g swells to approx. 4mL (water, methanol)
pH Range:	2-13
Storage:	room temp.

DESCRIPTION	CAT. NO.	PRICE
LIPOPHILIC SEPHADEX		
10g	LH20100-10G	
50g	LH20100-50G	
100g	LH20100-100G	
500g	LH20100-500G	

TABLE 1. AMBERSORB 563 ADSORBENT HAS HIGH CAPACITY FOR DICHLOROMETHANE — UNDER DRY OR HUMID CONDITIONS

Kinetic Saturation Capacity					
Dry Air		90% Relative Humidity		Preconditioned 90% Relative Humidity	
mg/g	mg/mL	mg/g	mg/mL	mg/g	mg/mL
83 ± 18	48 ± 14	52 ± 5	30 ± 4	43 ± 4	27 ± 2

TABLE 2. TYPICAL PROPERTIES OF AMBERSORB CARBONACEOUS ADSORBENTS

Adsorbent	Hydrophobicity [1]	Surface Area (m^2/g)	Porosity (mL/g) Micropores <20Å	Mesopores 20-500Å	Macropores >500Å	Bulk Density (g/cc)	Ash (%)	Water Adsorption [2] (g/g)	Mesh Size
Ambersorb 563	high	550	0.23	0.14	0.23	0.53	<0.05	0.12	20-50
Ambersorb 572	low	1100	0.41	0.19	0.24	0.49	<0.05	0.31	20-50

[1] Based on adsorption of trichloroethylene from water.
[2] Isotherm at 94% relative humidity.

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Florisil: Magnesium Silicate Adsorbents

Florisil adsorbents are used in preparative and analytical chromatography, and are available in pesticide-residue (PR) and stan grades, in powdered and hard granular forms. All grades have a surface area of 300 m^2/g, pH 8.5 and have been activated.

PR grade 60/100 Florisil is specially tested for separating chlorinated pesticides, as described by Mills (1,2). Lots of PR es consistent results for column cleanup and separation of chlorinated pesticide residues, prior to gas or thin layer chromatography. Each batch meet performance characteristics described in Changes of Official Methods of Analysis of AOAC, Chapter 24, 208(h), Vol 49, p 233, 1966. Packaged in glass containers.

Applications

- Isolation of steroids, sex hormones, and related compounds
- Isolation of antibiotics and alkaloids
- Lipid separation
- Vitamin assay
- Purification of pharmaceuticals
- Separation of nitrogen compounds from hydrocarbons
- Separation of aliphatic/aromatic mixtures
- Liquid partition chromatography
- Decolorization
- Catalysis
- Sample cleanup for PCBs and pesticides analysis



Sample Handling

The US Environmental Protection Agency (EPA) Contract Laboratory Program (CLP) method for monitoring pesticides in water, sediment, and soil samples from hazardous waste sites specifies use of Florisil solid phase extraction (SPE) cartridges without or Teflon frits for sample cleanup. This mandatory cleanup procedure significantly reduces matrix interferences caused by polar compounds. Our ENVI-Florisil SPE tubes fulfill the pesticide recovery requirements of the EPA CLP pesticide method. A 6mL Supelclean LC-Florisil SPE tube allows quantification of PCBs in transformer oil at concentrations of 5 to 500ppm. Also available ORBO-60 tubes, which meet NIOSH 5503 requirements for monitoring airborne PCBs. For more information, request T394028.

Florisil Adsorbents

GRADE	FORM	MESH SIZE	PARTICLE SIZE (µm)	QTY.	CAT. NO.	PRIC
Standard	Granular	16-30	595-1190	100g 500g	343994-100G 343994-500G	
Standard	Granular	30-60	250-595	250g 1000g	288691-250G 288691-1KG	
PR	Coarse powder	60-100	149-250	900mL	20280-U	
Standard	Coarse powder	60-100	149-250	250g 1000g	220744-250G 220744-1KG	
Standard	Fine powder	100-200	74-149	454g	20281	
Standard	Fine powder	<200	<74	250g 1000g	288705-250G 288705-1KG	

RELATED INFORMATION

Mills, P.A., J. Assoc. Off. Anal. Chem. 42: 734 (1959).
Mills, P.A., J. Assoc. Off. Anal. Chem. 44: 171 (1961).
References not available from Supelco.

HELPFUL HINTS

For Florisil adsorbent in solid phase extraction tubes refer to the Sampling Preparation section of this catalog.

Resins
Adsorption Media

Supelco offers a comprehensive range of silica gels, including Davisil and E. Merck products. These materials are used for all types of low pressure, medium pressure, and flash column chromatography. They can be applied to the cleanup and purification of a wide range of synthetic and natural compounds.

The Aldrich Catalog/Handbook (available on request) lists a wide selection of silica gels and silicic acids for non-chromatographic purposes.

Davisil Silica

Davisil silica gels are available in various particle and pore sizes for preparative column chromatography. They have been processed to minimize or eliminate impurities such as minor metallic oxides, which can modify the surface nature and unpredictably affect adsorption processes.

- Davisil 923 silica meets ASTM D-1319-70 specifications for hydrocarbon analysis. Low metal oxides content minimizes olefin polymerization.
- Davisil 12 silica is recommended for ASTM Method D-2007 (rubber extender/processing oils).

PHYSICAL CHARACTERISTICS OF DAVISIL SILICA GELS

Pore Diameter (Å)	Surface Area (m^2/g)	Pore Volume (mL/g)	pH (5% slurry)
22	800	0.43	3.8
30	550	0.43	5.5
60	500	0.75	6.5
150	300	1.10	7.0
300	150-170	1.1-1.2	7.0
500	75-85	1.1-1.2	7.0

TYPICAL ELEMENTAL ANALYSIS FOR DAVISIL SILICAS:

Na (as Na_2O):	600ppm
Fe (as Fe_2O_3):	<100ppm
C:	<100ppm
heavy metals:	<5ppm

Davisil Silica Gels

GRADE	MESH SIZE	PARTICLE SIZE (µm)	PORE SIZE (Å)	QTY.	CAT. NO.	PRI
12	28-200	75-650	22	250g 1kg 5kg	214396-250G 214396-1KG 214396-5KG	
62	60-200	75-250	150	100g 500g 2.5kg	243981-100G 243981-500G 243981-2.5KG	
633	200-425	35-75	60	100g 1kg 10kg	236772-100G 236772-1KG 236772-10KG	
634	100-200	75-150	60	100g 1kg 10kg	236780-100G 236780-1KG 236780-10KG	
635	60-100	150-250	60	100g 1kg 10kg	236799-100G 236799-1KG 236799-10KG	
636	35-60	250-500	60	100g 1kg	236802-100G 236802-1KG	
643	200-425	35-70	150	100g 1kg	236810-100G 236810-1KG	
644	100-200	75-150	150	100g 1kg	236829-100G 236829-1KG	
645	60-100	150-250	150	100g 1kg	236837-100G 236837-1KG	
646	35-60	250-500	150	100g 1kg	236845-100G 236845-1KG	
653XWP	230-400	35-70	300	100g	13660	
663XWP	230-400	35-70	500	100g	13662	
923	100-200	75-150	30	250g 1kg	214477-250G 214477-1KG	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

E. Merck Silica Gel

Merck silica gel 40, silica gel 60, and silica gel 100 are widely used for column chromatography. They are very pure, containing less than 0.02% iron and less than 0.02% chloride. Silica gel 60 (extra pure) contains less than 0.0005% each of Cd, Cu, Pb, Pd, and Zn, and <0.008% Cl, <0.002% Fe, <0.004% NO_3, and <0.003% SO_4. Merck silica number 9385 is widely used for purification of organic synthesis products by gas-pressurized liquid chromatography.

DESCRIPTION	E. MERCK NUMBER	PARTICLE SIZE (µm)	SURFACE AREA (m^2/g)	PORE SIZE (Å)	pH (±0.5)	QTY.	CAT. NO.	PRICE
Silica gel 40	10180	63-200	750	40	5.5	100g 1kg 5kg	403563-100G 403563-1KG 403563-5KG	
Silica gel 40	10181	200-500	750	40	5.5	100g 500g 2kg	242179-100G 242179-500G 242179-2KG	
Silica gel 60	15111	15-40	550	60	7.0	50g 100g 1kg	S9258-50G S9258-100G S9258-1KG	
Silica gel 60	9385	40-63	550	60	7.0	100g 1kg 5kg 25kg	227196-100G 227196-1KG 227196-5KG 227196-25KG	
Silica gel 60	7734	63-200	550	60	7.0	100g 1kg 5kg	391484-100G 391484-1KG 391484-5KG	
Silica gel 60 (extra pure)	7754	63-200	550	60	7.0	25g 100g 500g	403598-25G 403598-100G 403598-500G	
Silica gel 100	10184	63-200	300	100	7.0-7.5	100g 1kg 5kg	403601-100G 403601-1KG 403601-5KG	

Modified Silica Gels

Chemically bonding organosilanes to silica dramatically alters the surface polarity, producing chromatographic media with separation properties complementary to "bare" silica. Characteristics in the table below represent nominal values for base silica. SUPELCOSIL A is a cleaned, sized, and activated irregular-particle silica gel for clean-up of synthetic organic reaction mixtures, dioxin (US EPA Method 1613), and other extraction procedures. It also is suitable for analyses of amino acids, aromatic hydrocarbons, peroxide acids, and steroids, fatty acids and lipids.

Sigma-Aldrich and Supelco Bonded Phase Silicas

DESCRIPTION	PARTICLE SIZE (µm)	SURFACE AREA (m^2/g)	PORE SIZE (Å)	QTY.	CAT. NO.	PRICE
3-Aminopropyl	40-63	550	60	10g 50g	364258-10G 364258-50G	
3-Chloropropyl	40-63	550	60	10g 50g	364266-10G 364266-50G	
Octyl	40-63	550	60	5g 25g	385441-5G 385441-25G	
Octadecyl	40-63	550	60	25g 100g	377635-25G 377635-100G	
SUPELCOSIL A (100-200 mesh)	75-150	500	60	100g 500g	13650-U 13651-U	
Supelprep ABZ+Plus[1]	12	190-210	110-130	100g	54350-U	

[1] A highly deactivated reversed phase material that possesses an embedded polar (amide) group.

Resins
Adsorption Media

Polymeric Adsorbent Resins — Summary of Characteristics

RESIN	CHEMICAL NATURE	APPROX. PORE VOLUME (mL/g)	TRUE WET DENSITY (g/mL)	SKELETAL DENSITY (g/mL)	MEAN SURFACE AREA (m^2/g)	MEAN PORE DIAM. (Å)	MESH SIZE	SWELLING IN TOLUENE (%)
AMBERLITE/AMBERCHROM ADSORBENTS								
XAD-2	polyaromatic	0.65	1.02	1.08	300	90	20-60	—
XAD-4	polyaromatic	0.98	1.02	1.08	725	40	20-60	—
XAD-7HP	acrylic ester	1.14	1.05	1.24	450	90	20-60	—
XAD-16	polyaromatic	1.82	1.02	1.08	800	100	20-60	—
XAD-16HP	polyaromatic	1.82	1.02	1.08	800	100	20-60	—
XAD-1180	polyaromatic	1.68	1.01	1.04	500	300	20-60	—
CG-71m[1]	polymethacrylate	1.17	—	1.28	500	250	50-100µm	—
CG-71c[1]	polymethacrylate	1.17	—	1.28	500	250	80-160µm	—
CG-161m[1]	polyaromatic	1.45	—	1.08	900	150	50-100µm	—
CG-161c[1]	polyaromatic	1.45	—	1.08	900	150	80-160µm	—
CG-300s[1]	polyaromatic	1.66	—	1.08	700	300	20-50µm	—
CG-300m[1]	polyaromatic	1.66	—	1.08	700	300	50-100µm	—
CG-300c[1]	polyaromatic	1.66	—	1.08	700	300	80-160µm	—
CG-1000s[1]	polyaromatic	1.66	—	1.08	250	1000	20-50µm	—
DIAION/MCI GEL/SEPABEADS ADSORBENTS								
Relite EXC04	sulfonated copolymer	0.60	—	—	200	—	20-50	—
HP20	polyaromatic	1.30	1.01	—	500	260	20-60	30[4]
HP20S	polyaromatic	1.30	1.01	—	500	260	150-300µm	30[4]
HP20SS	polyaromatic	1.30	1.01	—	500	260	75-150µm	30[4]
SP20SS	polyaromatic	1.30	1.01	—	500	260	50-100µm	30[4]
SP70	polyaromatic	1.10	1.01	—	700	65	250-850µm	—
SP825L	polyaromatic	1.40	1.01	—	1000	90-125	20-60	19[5]
SP850	polyaromatic	1.20	1.01	—	1000	38	20-60	19[5]
HP2MG	polymethacrylate	1.20	1.09	—	500	170	25-50	5
SP207	brominated styrenic	1.10	1.18	—	650	105	20-60	18[6]
CHP20P[2]	polyaromatic	1.30	1.01	—	500	400-600	75-150µm	—
DOWEX ADSORBENTS								
Styrene-DVB	polyaromatic[3]	—	—	—	—	—	18-100	—
Styrene-DVB	polyaromatic[3]	—	—	—	—	—	18-50	—
L-285	functionalized	—	—	1.04	800	25	20-50	—
L-323	polyaromatic	1.18	—	1.04	650	100	16-50	—
L-493	polyaromatic	1.16	—	—	1100	46	20-50	—
V-493	polyaromatic	1.16	—	—	1100	46	20-50	—
V-502	polyaromatic	0.94	—	0.40	1080	34	1500µm	—
SD-2	aminated copolymer	—	—	—	800	50	18-50	—
DUOLITE ADSORBENTS								
XAD-761	methylol	0.43	1.11	1.24	300	600	16-50	—
SUPELITE AND SUPELPAK ADSORBENTS								
Supelite DAX-8	acrylic ester	0.79	1.09	1.23	160	225	40-60	—
Supelpak-2	polyaromatic	0.65	1.02	1.07	300	90	20-60	—
Supelpak-2B	polyaromatic	0.65	1.02	1.07	300	90	20-60	—

[1] Amberchrom resin (suspension in 20% ethanol in water)
[2] MCI GEL resin
[3] Physical parameters in this table do not apply to these nonfunctionalized copolymer materials.
[4] In methanol 26%; in acetone 32%.
[5] In methanol 16%; in acetone 15%; in isopropanol 17%; in butyl acetate 17%.
[6] In methanol 15%; in acetone 15%; in isopropanol 17%; in butyl acetate 18%.

HELPFUL HINTS

Numerous Dow, Misubishi, and Rohm & Haas resins are available in the Supelco warehouse but not listed here. If a resin you need is not listed here, please contact your local Sigma-Aldrich representative with your requirements.

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Adsorbent Resins

DESCRIPTION	QTY.	CAT. NO.	PRICE
AMBERLITE RESINS			
Amberlite XAD-2 Polyaromatic Applications: Hydrophobic compounds up to 20,000 MW; phenol, organic removal; surfactants; aroma compounds; catalyst; metals; antibiotic recovery. For clean US EPA versions see Supelpak-2 and -2B.	100g 500g	20275 10357	
Amberlite XAD-4 Polyaromatic Applications: Small hydrophobic compounds; surfactants; pharmaceutical manufacturing; phenol, chlorinated organics, pesticide removal and recovery; organic removal from aqueous food streams.	100g 500g	20276 10358	
Amberlite XAD-7HP High performance version of XAD-7 (no longer available) Acrylic ester (moderate polarity) Applications: Compounds up to 60,000 MW; insulin recovery; fulvic and humic compounds; dry waste; organic removal and recovery; antibiotic recovery.	100g 500g	13361-U 13362-U	
Amberlite XAD-8 See Supelite DAX-8.			
Amberlite XAD-16 Polyaromatic Applications: Hydrophobic compounds up to 40,000 MW; antibiotics; pharmaceutical manufacturing; surfactants; bitters; separation of large organic molecules (especially proteins). More efficient than XAD-2.	100g 500g	10347 10345	
Amberlite XAD-16HP Same as XAD-16, but specially cleaned to meet FDA 21 CFR 173.65 for removal of organic substances from aqueous foods, except carbonated beverages. Meets requirements of FDA Food Additive Regulation 21 CFR 173.25.	100g 1000g	13355-U 13357-U	
Amberlite XAD-1180 Polyaromatic (less polar than XAD-4) Applications: Hydrophobic compounds; gallium; myxovirescins; phosphoric acid; riboflavin salts; antibiotic, vitamin, amino acid, and enzyme purification.	100g 500g	10377 10378	
AMBERCHROM RESINS			
Amberchrom CG-71 Polymethacrylate (moderate polarity) Applications: Amino acid separations (e.g., aspartame from phenylalanine); insulin recovery; peptides; aromatics.	m 100mL c 100mL	10367 10366	
Amberchrom CG-161 Polyaromatic Applications: Hydrophobic compounds; organics (e.g., phenol); surfactants; ethidium bromide; antibiotics; peptide and amino acid separations; small proteins.	m 100mL c 100mL	10369 10370-U	
Amberchrom CG-300 Polyaromatic Applications: Hydrophobic compounds; surfactants; medium-sized proteins; large peptides; antibiotics.	s 100mL m 100mL c 100mL	13908 13909-U 13910-U	

DESCRIPTION	QTY.	CAT. NO.	PRICE
AMBERCHROM RESINS(CONT'D)			
Amberchrom CG-1000 Polyaromatic Applications: Hydrophobic compounds; bulky surfactants; large proteins; antibiotics.	s 100mL	13911	
DIAION/SEPABEADS RESINS (MITSUBISHI)			
HP20 Polyaromatic Particle Size: 250-850µm Applications : Hydrophobic compounds; desalting; antibiotics; biomolecules. Broad application base.	100g 500g 1000g	13605 13606 13607	
HP20SS Polyaromatic (small particle version of HP20) Particle Size: 75-150µm Applications: Hydrophobic compounds; biomolecules from fermentation broths; rapid kinetics for large molecules; nonaqueous applications; industrial fractionation of small biomolecules.	100g 1000g	13613-U 13615-U	
SP20SS Polyaromatic. Particle Size: 50-100µm (fines removed) Applications : Small and medium proteins; hydrophobic compounds; chromatographic separations of peptides, amino acids; reversed phase	100g 500g 1000g	13617-U 13618-U 13619-U	
SP70 Polyaromatic Particle Size: 250-850µm. Applications: debittering juices and related food products; high capacity for naringen; precleaned. Meets requirements of FDA Food Additive Regulation 21 CFR 173.25.	1000g	13962-U	
SP825L Polyaromatic Particle Size: 250-600µm (fines removed) Applications: Antibiotics; organics; decolorization. High capacity for small molecules.	1000g	13883	
SP850 Polyaromatic Particle Size: 250-850µm Applications: Antibiotics; organics; hydrophobic compounds; adsorbing large quantities of small molecules.	100g 1000g	13597-U 13599	
HP2MG Polymethacrylic (intermediate polarity) Particle Size: 300-700µm. Applications: Hydrophobic compounds; antibiotics; aliphatics; color bodies; broad spectrum adsorption of small and large molecules.	100g 1000g	13601 13603	
SP207 Brominated polyaromatic Particle size: 250-800µm Applications: Upflow fluidized bed applications; strongly hydrophobic, high density, large capacity; more hydrophobic than styrene/DVB polymers.	1000g	13623-U	
MCI GEL CHP20P Polyaromatic Particle Size: 75-150µm Applications: Biopharmaceuticals; aromatic compounds; peptides; steroids; desalting; reversed phase applications. Good for nonaqueous use.	100g 500g	13629-U 13630-U	

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Resins & Media
SUPELCO

Resins
Adsorption Media

DESCRIPTION	QTY.	CAT. NO.	PRICE
DOWEX RESINS			
Styrene-DVB Polyaromatic Applications: hydrophobic compounds; filtering aids; drilling muds; synthetic starting material. Mesh Size: 18-100	1000g	13390	
Optipore L-285 (formerly XUS-40285) Hydrophilic functionalized polyaromatic Applications: Surfactants; hydrophobic compounds; good for very hydrophobic proteins; decolorization.	1000g	13479-U	
Optipore L-323 (formerly XUS-40323) Polyaromatic (macroporous) Applications: Adsorption of soluble organics from polar solvents; aliphatic alcohols, glycols, glycerine from hydroxylic solvents; steroids; emulsifiers; surfactants; color compounds.	1000g	13475-U	
Optipore L-493 (formerly XUS-43493.00) Polyaromatic (more hydrophobic than activated carbon) Applications: Hydrophobic compounds; non-catalytic activity; liquid applications; phenol. Very high capacity for organics.	100g 500g 5kg 1 cubic foot	573698-100G 573698-500G 573698-5KG 573698-1FT3	
Optipore V-493 (dry) (formerly XUS-43493.01) Polyaromatic (more hydrophobic than activated carbon) Applications: Vapor applications; volatile organics and hazardous air pollutants; non-catalytic activity.	100g 500g 1000g	13485-U 13486 13487	
Optipore V-502 (dry) (formerly XU-43502.01) Polyaromatic Applications: Vapor applications; volatile organics and hazardous air pollutants. Low pressure drop. Large particle size version of Optipore V-493.	1000g	13678	
SD-2 Macroporous styrene divinylbenzene copolymer. Adsorbent. Ionic Form: free base. Applications: Decolorization, taste and odor removal in sweetener applications. Meets requirements of FDA Food Additive Regulation 21 CFR 173.25	100g 1000g	14043-U 14045-U	

DESCRIPTION	QTY.	CAT. NO.	PRICE
DUOLITE RESINS			
XAD-761 (previously known as S-761) Phenol-formaldehyde with methylol functionality (hydrophilic, highly porous) Mesh Size: 16-50 Applications: Removal of proteins; removal of high MW colorants; organic impurities; pharmaceuticals.	500g	10356	
SUPELITE AND SUPELPAK RESINS			
Supelite DAX-8 Acrylic ester (moderate polarity) Applications: compounds up to 150,000 MW; treatment of paper pulp mill wastes; alcohols; surfactants; decolorization, fulvic and humic compounds; organic removal.	100g	20278	
Supelpak-2 (a purified form of Amberlite XAD-2) Polyaromatic Applications: Air sampling. Meets US EPA-recommended criteria for purity, as outlined in Level I Environmental Assessment Procedures Manual.	100g 1000g	20279 21130-U	
Supelpak-2B (a purified form of Amberlite XAD-2) Polyaromatic Applications: PCBs from water. Specially cleaned to meet EPA requirements for determining PCBs in water according to the Great Lakes National Program Office (GLNPO).	100g	13670	

HELPFUL HINTS

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Amersham Pharmacia Biotech HiTrap Cartridges

- Affinity
- Gel Filtration
- HIC
- Ion Exchange

HiTrap Affinity Cartridges

HiTrap adapters and instruction manual included.

AFFINITY	QTY.	CAT. NO.	PRICE
NHS-activated, 1mL	5	54830	
NHS-activated, 5mL	1	54831	
Blue, 1mL	5	54832	
Blue, 5mL	1	54833	
Chelating, 1mL	5	54834	
Chelating, 5mL	1	54835	
Heparin, 1mL	5	54836	
Heparin, 5mL	1	54837	
Protein A, 1mL	5	54838	
Protein A, 5mL	1	54839	
Protein G, 1mL	5	54840-U	
Protein G, 5mL	1	54841	
MAbTrap G II Kit[1]		54842	

[1] For fast, effective purification of monoclonal and polyclonal IgG from ascites fluid, serum, or cell culture media, via syringe or pump. Sufficient materials for 20 purifications. Contents: 1mL HiTrap protein G column, 50mL 10X binding buffer concentrate (0.05% sodium azide preservative), 15mL 10X elution buffer concentrate (0.05% sodium azide), 25mL neutralizing buffer (0.05% sodium azide), luer adapter, domed nut, syringe, instructions.



HiTrap Gel Filtration (Sephadex G-25) Cartidges

HiTrap adapters and instruction manual included.

DESCRIPTION	QTY.	CAT. NO.	PRICE
HiTrap Desalting Column	5	54822	

HiTrap HIC Cartridges

Includes 1 each of five 1mL cartridges: Phenyl Sepharose High Performance, Phenyl Sepharose 6 Fast Flow (low salt), Phenyl Sepharose 6 Fast Flow (high salt), Butyl Sepharose 4 Fast Flow, Octyl Sepharose 4 Fast Flow, plus luer adapters, tubing connectors, domed nuts, and instructions.

DESCRIPTION	CAT. NO.	PRICE
HiTrap HIC Test Kit	54814	

HiTrap Ion Exchange Cartridges

Domed nuts, adapters, and instructions included.

DESCRIPTION	QTY.	CAT. NO.	PRICE
HiTrap Q, 1mL	5	54815	
HiTrap Q, 5mL	5	54816	
HiTrap SP, 1mL	5	54817	
HiTrap SP, 5mL	5	54818	

HELPFUL HINTS

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RELATED INFORMATION

For additional information, request the following free literature by phone or fax, or see our website.

No.	Subject
T497080	HiTrap cartridges
T496127	HiTrap desalting columns

Resins
Affinity Media

Toyopearl Affinity Resins

These materials, consisting of 40-90µm hydrophilic polymer particles with 1000Å pores, can be used to rapidly separate and purify a wide variety of large biomolecules, such as enzymes and other proteins. Toyopearl resins feature:

- High resolving ability
- Chemical resistance (0.5M NaOH or 0.5M HCl)
- Wide pH range: 2-12
- Mechanical stability to 7kg/cm^2 (7bar/100psi)

CHARACTERISTICS OF TOYOPEARL AFFINITY RESINS			
Resin	Coupling Group	Density (µmol/mL)	Applications/Coupling Chemistries
REACTIVE RESINS			
Formyl-650M	aldehyde	60	couple to enzymes via primary amines; coupling agent: $NaCNBH_4$; optimal binding pH: 6.9-9.0
Amino-650M	amine	90	couple ligands via carboxylate or aldehyde groups; coupling agent: carbodiimide or $NaCNBH_4$; optimal binding pH: 4.5-6.0
ACTIVATED RESINS			
Tresyl-650M	tresyl	20	highly reactive to amine/thiol groups; no coupling agent required; optimal binding pH: 7-9
Epoxy-650M	epoxide	800	immobilization of protein or low MW ligands (e.g., glutathione, glycine)
GROUP SPECIFIC RESINS			
Chelate-650M	iminodiacetic	35	for creating a metal bearing resin or IMAC (Ca^{+2}, Ni^{+2}, Zn^{+2}, Co^{+2}) to bind to histidine acid, free cysteines of peptides or proteins, growth factors, tissue plasminogen activator, etc.
Heparin-650M	heparin	—	purification of coagulation factors, lipoproteins, growth factors, enzymes active in nucleic acid metabolism

Toyopearl Packings for Affinity Chromatography

TOYOPEARL PACKING	QUANTITY	CAT. NO.	PRICE
Toyopearl AF-Chelate-650M	25mL	814475	
Toyopearl AF-Heparin-650M	10mL	814473	
Toyopearl AF-Tresyl-650M	5g	814471	
Toyopearl AF-Amino-650M	25mL	808002	
Toyopearl AF-Epoxy-650M	10g	808000	
Toyopearl AF-Formyl-650M	25mL	808004	

HELPFUL HINTS

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Sephacryl

Crosslinked allyl dextran-N,N' -methylenebisacrylamide copolymer for gel filtration. HR grades are smaller particles with narrower size distributions, for more efficient separations and faster flow. Supplied swollen, suspended in 20% aqueous ethanol.

Autoclavable, stable to 0.2M NaOH. Store at 0-5°C.

QUANTITY	CAT. NO.	PRICE
S-100 HR, 1K-100K (PROTEINS)[1]		
100mL	S100HR-100ML	
250mL	S100HR-250ML	
750mL	S100HR-750ML	
S-200 HR, 5K-250K (PROTEINS)[1]		
100mL	S200HR-100ML	
250mL	S200HR-250ML	
750mL	S200HR-750ML	
S-300 HR, 10K-1500K (PROTEINS)[1]		
100mL	S300HR-100ML	
250mL	S300HR-250ML	
750mL	S300HR-750ML	
S-400 HR, 20K-8000K (PROTEINS)[1]		
100mL	S400HR-100ML	
250mL	S400HR-250ML	
750mL	S400HR-750ML	
S-500 HR, 40K-20,000K (DEXTRANS)[1]		
100mL	S500HR-100ML	
250mL	S500HR-250ML	
750mL	S500HR-750ML	

Sephadex

For purifying proteins and peptides by GFC with aqueous solvents. Dextran media with low exclusion limits are commonly used in rapid desalting procedures and in concentrating solutions of macromolecules.

Autoclavable, stable to 0.2M NaOH.

QUANTITY	CAT. NO.	PRICE
G-10, <700[1]		
10g	G10120-10G	
50g	G10120-50G	
100g	G10120-100G	
500g	G10120-500G	
G-15, <1500[1]		
10g	G15120-10G	
50g	G15120-50G	
100g	G15120-100G	
G-25, 1K-5K (PROTEINS)[1]		
Coarse		
10g	G25300-10G	
50g	G25300-50G	
100g	G25300-100G	
500g	G25300-500G	
Medium		
10g	G25150-10G	
50g	G25150-50G	
100g	G25150-100G	
500g	G25150-500G	

[1] Fractionation Range.

Sephadex (cont'd)

QUANTITY	CAT. NO.	PRICE
G-25, 1K-5K (PROTEINS)[1]		
Fine		
10g	G2580-10G	
50g	G2580-50G	
100g	G2580-100G	
500g	G2580-500G	
Superfine		
10g	G2550-10G	
50g	G2550-50G	
100g	G2550-100G	
G-50, 1.5K-30K (PROTEINS)[1]		
Coarse		
10g	G50300-10G	
50g	G50300-50G	
100g	G50300-100G	
Medium		
10g	G50150-10G	
50g	G50150-50G	
100g	G50150-100G	
500g	G50150-500G	
Fine		
10g	G5080-10G	
50g	G5080-50G	
100g	G5080-100G	
500g	G5080-500G	
Superfine		
10g	G5050-10G	
50g	G5050-50G	
100g	G5050-100G	
G-75, 3K-80K (PROTEINS)[1]		
10g	G75120-10G	
50g	G75120-50G	
100g	G75120-100G	
500g	G75120-500G	
Superfine		
10g	G7550-10G	
50g	G7550-50G	
100g	G7550-100G	
G-100, 4K-150K (PROTEINS)[1]		
10g	G100120-10G	
50g	G100120-50G	
100g	G100120-100G	
500g	G100120-500G	
Superfine		
10g	G10050-10G	
50g	G10050-50G	
100g	G10050-100G	

Books on Gel Filtration

DESCRIPTION	CAT. NO.	PRICE
Gel Filtration Chromatography	23578	

RELATED INFORMATION

For a more complete discussion of our GFC media, request a copy of Bulletin T194881.

Resins
Gel Filtration Media

Sepharose

Beaded agarose for fractionating molecules of high molecular weight. Crosslinked (CL) beaded agarose is more resistant to denaturing conditions and thus offers more versatility in the choice of sample buffer and eluent. Supplied swollen.

The approximate % agarose concentration is indicated by the first digit of the catalog number, e.g.: "6" in 6B-100.

Sepharose media should not be exposed to temperatures above 40°C.

Stable to 0.5M NaOH. Store at 0-5°C.

QUANTITY	CAT. NO.	PRICE
6B, 10K-4000K (PROTEINS)[1]		
100mL	6B100-100ML	
500mL	6B100-500ML	
1liter	6B100-1L	
CL-6B, 10K-4000K (PROTEINS)[1]		
100mL	CL6B200-100ML	
500mL	CL6B200-500ML	
1liter	CL6B200-1L	
4B, 60K-20,000K (PROTEINS)[1]		
100mL	4B200-100ML	
500mL	4B200-500ML	
1liter	4B200-1L	
CL-4B, 60K-20,000K (PROTEINS)[1]		
100mL	CL4B200-100ML	
500mL	CL4B200-500ML	
1liter	CL4B200-1L	
2B, 70K-40,000K (PROTEINS)[1]		
100mL	2B300-100ML	
500mL	2B300-500ML	
1liter	2B300-1L	
CL-2B70K-40,000K (PROTEINS)[1]		
100mL	CL2B300-100ML	
500mL	CL2B300-500ML	
1liter	CL2B300-1L	

Superdex

A composite matrix of dextran and highly crosslinked porous agarose, Superdex media combine the high selectivity of a Sephadex matrix with the chemical and physical stability of crosslinked agarose. Optimized for high resolution preparative separations. Supplied in 20% ethanol. Also available as a 13µm bead, packed in FPLC columns (see the Biopolymer Columns section).

Store at 0-5°C.

QUANTITY	CAT. NO.	PRICE
SUPERDEX 30 PREP GRADE, <10K (PROTEINS)		
25mL	S2792-25ML	
100mL	S2792-100ML	
SUPERDEX 75 PREP GRADE, 3K-70K (PROTEINS)		
25mL	S6657-25ML	
100mL	S6657-100ML	
SUPERDEX 200 PREP GRADE, 10K-600K (PROTEINS)		
100mL	S6782-100ML	

Toyopearl Size Exclusion Packings [2]

Toyopearl packings for size exclusion/gel filtration chromatography offer important features:

- High mechanical strength – use at high flow rates
- Stability in organic solvents
- Can be packed by hydrostatic pressure or pump (5-7 bar)
- pH range 2-12
- Can be autoclaved

Toyopearl media fractionate mixtures of proteins and other large molecular weight compounds over a wide size range. You can use these packings for such diverse analyses as separating RNA from protein, resolving oligosaccharides by degree of polymerization, and isolating agglutinin while maintaining a high hemagglutination titer. Toyopearl HW-40 gel, in particular, can be used very effectively with organic solvents.

TOYOPEARL PACKING	PARTICLE SIZE (µm)	QUANTITY (mL)	CAT. NO.	PRICE
HW-40C	50-100	500	807449	
HW-40F	30-60	500	807448	
HW-40S	20-40	250	807451	
HW-50F	30-60	500	807453	
HW-50S	20-40	250	807455	
HW-55F	30-60	500	807457	
HW-55S	20-40	250	807459	
HW-65F	30-60	500	807465	
HW-65S	20-40	250	807467	
HW-75F	30-60	500	807469	

Toyopearl Size Exclusion LABPAK Sample Kits

LABPAK samplers enable you to try several Toyopearl resins to determine which works best for your particular application.

RESIN	PARTICLE SIZE (µm)	MW RANGE (GLOBULAR PROTEINS)[2]	CAT. NO.	PRICE
SECPAK LMW Sampler (150mL each resin)			843300	
HW-40F	30-60	100-10,000		
HW-50F	30-60	500-80,000		
HW-55F	30-60	1-700 x 10^3		
SECPAK HMW Sampler (150mL each resin)			843310	
HW-55F	30-60	1-700 x 10^3		
HW-65F	30-60	40-5000 x 10^3		
HW-75F	30-60	500-50,000 x 10^3		
SECPAK HP Sampler (120mL each resin)			843350	
HW-40S	20-40	100-10,000		
HW-50S	20-40	500-80,000		
HW-55S	20-40	1-700 x 10^3		
HW-65S	20-40	40-5000 x 10^3		

HELPFUL HINTS

Numerous Dow, Misubishi, and Rohm & Haas resins are available in the Supelco warehouse but not listed here. If a resin you need is not listed here, please contact your local Sigma-Aldrich representative with your requirements.

[1] Fractionation Range.

[2] Ranges for dextrans: HW-40: 100-7000; HW-50: 500-20,000; HW-55: 1000-200,000; HW-65: 10,000-1,000,000; HW-75: 100,000-10,000,00 0.

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Sepharose Hydrophobic Interaction Media

Long-term pH stability: 3-13 (3-12 for Octyl Sepharose CL-4B and Phenyl Sepharose CL-4B).

MEAN PARTICLE SIZE (µm)	LIGAND DENSITY (µmol/mL DRY GEL)	QTY.	CAT. NO.	PRICE
Phenyl Sepharose High Performance (6% crosslinked agarose)				
34	25	10mL	P2209-10ML	
		50mL	P2209-50ML	
Phenyl Sepharose 6 Fast Flow, low sub (6% crosslinked agarose)				
45-165	20	50mL	P2334-50ML	
		200mL	P2334-200ML	
Phenyl Sepharose 6 Fast Flow, high sub (6% crosslinked agarose)				
45-165	40	50mL	P2459-50ML	
		200mL	P2459-200ML	
Butyl Sepharose 4 Fast Flow (4% crosslinked agarose)				
		10mL	B9041-10ML	
45-165	50	50mL	B9041-50ML	
Octyl Sepharose 4 Fast Flow (4% crosslinked agarose)				
		10mL	O0511-10ML	
45-165	5	200mL	O0511-200ML	
Octyl Sepharose CL-4B (4% crosslinked agarose)				
45-165	40	50mL	O6001-50ML	
		200mL	O6001-200ML	
Phenyl Sepharose CL-4B (4% crosslinked agarose)				
		10mL	P7892-10ML	
45-165	40	50mL	P7892-50ML	
		200mL	P7892-200ML	

HELPFUL HINTS

Numerous Dow, Misubishi, and Rohm & Haas resins are available in the Supelco warehouse but not listed here. If a resin you need is not listed here, please contact your local Sigma-Aldrich representative with your requirements.

Toyopearl Hydrophobic Interaction Media

Toyopearl HIC media offer these advantages:

- Strong affinity for water-soluble proteins
- High recovery of mass and activity
- High sample capacity – up to 2-4 times that of conventional gels
- Fluctuating salt concentrations will not change bed volume
- Mechanical stability to 7kg/cm^2 (7bar/100psi)
- pH range 2-12
- Clean in place with 0.5M NaOH
- Autoclavable

Toyopearl media offer high yield recovery of proteins, using various aqueous eluants. The resins have an exclusion limit of 5 x 10^6 Dalton. The large pore size, 1000Å, enables these packings to separate very large proteins by a hydrophobic interaction mechanism, without size exclusion effects.

100mL bottle

TOYOPEARL MEDIUM	PARTICLE SIZE (µm)	CAT. NO.	PRICE
Butyl-650C	60-150	807478	
Butyl-650M	40-90	807477	
Butyl-650S	20-50	807476	
Phenyl-650M	40-90	814478	
Phenyl-650S	20-50	814477	
Ether-650M	40-90	816173	

Toyopearl Hydrophobic Interaction LABPAK Sampler Kits

LABPAK kits enable you to try several Toyopearl resins to determine which works best for your particular application.

KIT	PARTICLE SIZE (µm)	HYDROPHOBICITY	CAT. NO.	PRICE
HICPAK SAMPLER				
50mL each resin			843100	
Ether-650M	40-90	weak		
Phenyl-650M	40-90	medium		
Butyl-650M	40-90	strong		
HICPAK HP SAMPLER				
25mL each resin			843150	
Ether-650S	20-50	weak		
Phenyl-650S	20-50	medium		
Butyl-650S	20-50	strong		

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Resins
Anion Exchange Media

Strong Anion Exchangers on Polystyrene (Type I and Type II)

EXCHANGER	CROSS LINK (%)	MATRIX[1]	MESH	IONIC FORM	MOISTURE (Approx. %)	MAX. OP. TEMP. (°C) [2]	TOTAL EXCHANGE CAPACITY meq/mL	TOTAL EXCHANGE CAPACITY meq/g	pH RANGE
AMBERLITE STRONG ANION EXCHANGERS, TYPE I (QUATERNARY AMMONIUM)									
IRA-900 Cl	—	Mr	16-50	Cl	60	60/77	1.0	4.2	0-14
IRA-958 Cl	—	Mr	16-50	Cl	69	38/77	0.80	4.1	0-14
IRA-400 Cl	8	G	16-50	Cl	45	60/77	1.4	3.8	0-14
IRA-400 OH	8	G	16-50	OH	45	60/77	1.2	4.0	0-14
IRA-402 Cl	6	G	16-50	Cl	53	60/77	1.2	4.1	0-14
IRA-458 Cl	—	G	16-50	Cl	58	38/60	1.2	4.4	0-14
4200 (Cl)[3]	—	G	625µm	Cl	53	50	1.2	3.7	0-14
IRN78	8	G	16-50	OH	≤60	60	1.1	4.0	0-14
A26	—	MR	16-45	OH	69	60/90	0.95	4.2	0-14
DIAION STRONG ANION EXCHANGERS, TYPE I (QUATERNARY ALKYLAMINE)									
HPA25	—	HP	30-70	Cl	63	70/90	0.6	2.4	0-14
NSA100	—	G	16-50	Cl	41	60/80	1.3	3.4	0-14
PA306S	3	P	40-100	Cl	71	60/80	0.8	4.2	0-14
PA308	4	P	16-50	Cl	62	60/77	1.0	4.0	0-14
PA312	6	P	16-50	Cl	52	60/77	1.2	3.7	0-14
PA316	8	P	16-50	Cl	47	60/80	1.3	—	0-14
SA10A	—	G	16-50	Cl	45	60/77	1.3	3.4	0-14
SA11A	—	G	16-50	Cl	50	60/77	0.8	2.6	0-14
SA12A	—	G	16-50	Cl	52	60/80	1.3	—	0-14
DOWEX STRONG ANION EXCHANGERS, TYPE I (TRIMETHYLBENZYL AMMONIUM)									
1x2	2	G	16-100	Cl	75	66/99	0.7	4.2	0-14
1x2	2	G	50-100	Cl	70	66/99	0.7	3.5	0-14
1x2	2	G	100-200	Cl	75	66/99	0.6	3.5	0-14
1x2	2	G	200-400	Cl	75	66/99	0.6	3.5	0-14
1x4	4	G	20-50	Cl	≥50	66/99	1.0	3.5	0-14
1x4	4	G	50-100	Cl	≥50	66/99	1.0	3.5	0-14
1x4	4	G	100-200	Cl	59	66/99	1.0	3.5	0-14
1x4	4	G	200-400	Cl	59	66/99	1.0	3.5	0-14
1x8	8	G	50-100	Cl	46	66/99	1.2	3.5	0-14
1x8	8	G	100-200	Cl	42	66/99	1.2	3.5	0-14
1x8	8	G	200-400	Cl	42	66/99	1.2	3.5	0-14
11[4]	—	G	640µm	Cl	52	60	1.2	3.6	0-14
550A[5]	—	G	550µm	OH	47(Cl)	60	1.2	3.4	0-14
550A UPW[5]	—	G	550µm	OH	47(Cl)	60	1.2	3.4	0-14
MSA[4]	—	Mp	640µm	Cl	60	60/99	1.0	4.0	0-14
SBR-C	8	G	16-45	Cl	46	66/99	1.4	3.7	0-14
SBR LC NG	8	G	16-50	OH	≤60	60	1.1	–	0-14
SBR-P-C	8	G	16-45	OH	54	66/99	1.2	4.0	0-14
21K	—	G	16-30	Cl	54	60/100	1.2	3.8	0-14
A[4]	—	G	610µm	OH	66	60/100	1.0	—	0-14
A[4]	—	G	575µm	Cl	57	60	1.2	4.0	0-14
21K XLT	—	G	16-20	Cl	55	60/100	1.2	3.8	0-14
AMBERLITE STRONG ANION EXCHANGERS, TYPE II (DIMETHYLETHANOLAMINE)									
IRA-910 Cl	—	Mr	16-50	Cl	52	40/77	1.0	3.8	0-14
IRA-410 Cl	—	G	20-50	Cl	42	40/77	1.4	3.4	0-14
DIAION STRONG ANION EXCHANGERS,TYPE II (QUATERNARY ALKYLALKANOLAMINE)									
PA408	4	P	16-50	Cl	59	40/60	0.9	3.3	0-14
PA412	6	P	16-50	Cl	49	40/60	1.1	—	0-14
PA418	9	P	16-50	Cl	41	40/60	1.3	3.3	0-14
SA20A	—	G	16-50	Cl	42	40/60	1.3	3.2	0-14
SA21A	low	G	16-50	Cl	60	40/60	0.8	3.1	0-14
DOWEX STRONG ANION EXCHANGERS, TYPE II (DIMETHYLETHANOLBENZYL AMMONIUM)									
2x8	8	G	50-100	Cl	<38	66/99	1.2	—	0-14
2x8	8	G	100-200	Cl	37	66/99	1.2	—	0-14
2x8	8	G	200-400	Cl	37	66/99	1.2	—	0-14
22	—	Mp	16-50	Cl	52	46	1.2	—	0-14
A2[4]	—	G	550µm	Cl	42	35/79	1.3	3.2	0-14

[1] G = gel; Mr = macroreticular; Mp = macroporous; HP = highly porous; P = porous

[2] OH/Cl form

[3] Amberjet exchanger

[4] Marathon exchanger

[5] Monosphere exchanger

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Weak Anion Exchangers on Polystyrene

EXCHANGER	CROSS LINK (%)	MATRIX[1]	MESH	IONIC FORM	MOISTURE (Approx. %)	MAX. OP. TEMP. (°C) [2]	TOTAL EXCHANGE CAPACITY meq/mL	TOTAL EXCHANGE CAPACITY meq/g	pH RANGE
AMBERLITE WEAK ANION EXCHANGERS (POLYAMINE)									
IRA-67	—	G	16-50	FB[3]	60	60	1.6	5.6	0-7
IRA-95	—	Mr	16-50	FB58	100	1.3	4.7	0-7	
IRA-96	—	Mr	16-50	FB60	100	1.6	5.6	0-7	
IRA-743	—	—	16-50	FB58	100	0.6	—	0-10	
DIAION WEAK ANION EXCHANGERS (ALKYLAMINE)									
WA10	—	G	16-50	FB66	60	1.2	—	0-9	
WA21J	—	HP	16-50	FB46	100	2.0	5.8	0-9	
WA30	—	HP	16-50	FB49	100	1.5	3.0	0-9	
CRB02	—	HP	16-50	FB55	60/79	0.8	2.7	0-14	
DOWEX WEAK ANION EXCHANGERS (POLYAMINE)									
66	—	Mp	16-50	FB45	60	1.4	4.0	0-7	
66	—	Mp	550µm	FB45	60	1.4	4.0	0-7	
77	—	Mp	550µm	FB45	60	1.7	4.8	0-7	
WBA[4]	—	Mp	400µm	FB54	60/93 [5]	1.25	4.2	0-7	
WBA-2[4]	—	Mp	550µm	FB45	60	1.7	4.8	0-7	
M-43	—	Mp	16-50	FB≤45	60	1.55	—	0-14	
DUOLITE WEAK ANION EXCHANGERS (POLYAMINE)									
A-7	—	Mr	16-50	FB56	40	2.2	13.9	0-6	

[1] G = gel; Mr = macroreticular; Mp = macroporous; HP = highly porous; P = porous
[2] OH/Cl form
[3] free base
[4] Marathon exchanger
[5] FB/HCl

Comparable Anion Exchangers on Polystyrene

AMBERLITE	DIAION	DOWEX
STRONG TYPE I		
IRA-900	PA308/PA312	11/MSA
IRA-904[6]	PA308	11/MSA
IRA-938[6]		
IRA-958		
IRA-400	SA10A	SBR
IRA-400(OH)	SA10A	SBR
IRA-401S	SA11A	1x4
IRA-402, IRA-404	SA12A	11/SBR-P
IRA-420C[6]	SA10A	11/21K/SBR/SBR-P
IRA-458		
IRA-420C[6]	SA10AS	
Amberjet 4200		550A, G-55[6], N-196[6]
STRONG TYPE II		
IRA-910	PA418	MSA-2, 22
IRA-410/416[6]	SA20A[6]	SAR, A2
WEAK		
IRA-67[7]	WA103[6]	
IRA-93, IRA-95	WA30	66/MWA-1[6]
IRA-94S, IRA-96	WA30	N-283[6]

[6] Not available. Substitute WA10.
[7] Formerly IRA-68.

HELPFUL HINTS

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Resins
Anion Exchange Media

Amberlite Strong Anion Exchangers, Type I

Functional Group: quaternary ammonium
Effective pH Range:0-14.
Meet requirements of FDA Food Additive Regulation 21 CFR 173.25.

QTY.	CAT. NO.	PRICE
IRA900 Polystyrene, macroreticular Form: chloride Applications: decolorizing intermediate to light solutions; heparin at neutral pH; metal ions; hydrogen peroxide		
500g	10381-U	
IRA958 Polystyrene, macroreticular Form: chloride Applications: removal of color and organics; cane sugar treatment; metal complexes; citric acid (resistant to organic fouling)		
500g	10337	
IRA400 Polystyrene, gel Crosslinkage: 8% Form: chloride Applications: usually used for treatment of waters that are essentially free of organic material; deionization including silica reduction; deoxygenating; removal of amino acids at high pH; separation of kanamycin A&B		
500g	10326	
IRA400 Polystyrene, gel Crosslinkage: 8% Form: hydroxide Applications: same as for IRA400Cl		
500g	501980	
IRA402 Polystyrene, gel Crosslinkage: 6% Form: chloride Applications: water conditioning; removal of weakly acidic contaminants (chemically the same as IRA-400, but with lower crosslinkage to give better diffusion rates with large organics)		
500g	10328	
IRA458 Polystyrene, gel Form: chloride Applications: treatment of water which produces severe fouling with other resins; metals and metal salts/ complexes; biuret; (hydrophilic structure is more resistant to organic fouling)		
500g	10330	
IRN78 Polystyrene, gel, Nuclear Grade Form: hydroxide, minimum of 95% exchange sites Applications: Water treatment, RAD waste, decontamination, useful for boron thermal regeneration.		
500g	10343	

Amberlite Strong Anion Exchangers, Type II

Functional Group: dimethylethanolamine
Effective pH Range:0-14.
Meet requirements of FDA Food Additive Regulation 21 CFR 173.25.

QTY.	CAT. NO.	PRICE
IRA410 Polystyrene, gel Form: chloride Applications: higher regeneration efficiency; water conditioning; iodine ions; neutralization of solutions; xanthan and xanthene dyes		
500g	10329	
IRA910 Polystyrene, macroreticular Form: chloride Applications: improved regeneration efficiency; water conditioning and deionization; removal of sulfuric acid and color		
500g	10334-U	

HELPFUL HINTS

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Diaion Strong Anion Exchangers, Type I

Functional Group: quaternary alkylamine
Effective pH Range:0-14.
Meet requirements of FDA Food Additive Regulation 21 CFR 173.25.

QTY.	CAT. NO.	PRICE
HPA25 Polystyrene, highly porous Form: chloride Applications: large organics; enzyme immobilization; demineralization; deashing (highest porosity Type I strong anion exchanger available)		
1000g	13491-U	
PA308 Polystyrene, porous Crosslinkage: 4% Form: chloride Applications: deionization of water; catalyst; separation of amino acids; recovery of metals; sugar refining; decolorization; formalin refining		
1000g	13495	
PA312 Polystyrene, porous Crosslinkage: 6% Form: chloride Applications: deioniz-ation of water; catalyst; separation of amino acids; recovery of metals; sugar refining; decolorization; formalin refining		
1000g	13499	

Dowex Strong Anion Exchangers, Type I

Functional Group: trimethylbenzyl ammonium
Effective pH Range:0-14
Meet requirements of FDA Food Additive Regulation 21 CFR 173.25 (unless otherwise noted).

QTY.	CAT. NO.	PRICE
1X2		
Polystyrene, gel Crosslinkage: 2% Form: chloride Applications: food & drug processing Manufactured under cGMP		
Mesh Size: 16-100		
1000g	13367	
Mesh Size: 50-100		
100g	44290-100G	
500g	44290-500G	
2500g	44290-2.5KG	
1 cubic foot	44290-1FT3	
Mesh Size: 100-200		
100g	217387-100G	
500g	217387-500G	
2500g	217387-2.5KG	
1 cubic foot	217387-1FT3	
Mesh Size: 200-400		
100g	217395-100G	
500g	217395-500G	
2500g	217395-2.5KG	
1 cubic foot	217395-1FT3	
1X4		
Polystyrene, gel Crosslinkage: 4% Form: chloride		
Mesh Size: 20-50		
100g	428612-100G	
500g	428612-500G	
1 cubic foot	428612-1FT3	
Mesh Size: 50-100		
100g	44310-100G	
500g	44310-500G	
1 cubic foot	44310-1FT3	
Mesh Size: 100-200		
100g	428590-100G	
500g	428590-500G	
1 cubic foot	428590-1FT3	
Mesh Size: 200-400		
100g	428604-100G	
500g	428604-500G	
1 cubic foot	428604-1FT3	

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Dowex Strong Anion Exchangers, Type I (cont'd)

QTY.	CAT. NO.	PRICE
1X8		
Polystyrene, gel Crosslinkage: 8% Form: chloride		
Mesh Size: 50-100		
100g	217417-100G	
500g	217417-500G	
2500g	217417-2.5KG	
1 cubic foot	217417-1FT3	
Mesh Size: 100-200		
100g	217425-100G	
500g	217425-500G	
2500g	217425-2.5KG	
1 cubic foot	217425-1FT3	
Mesh Size: 200-400		
100g	44340-100G	
500g	44340-500G	
2500g	44340-2.5KG	
1 cubic foot	44340-1FT3	
Marathon 11 (previously known as Dowex 11) Polystyrene, gel Form: chloride Applications: specifically suited for demineralization of high organic waters; removal of organic material and color bodies; low silica leakage		
1000g	13435	
Monosphere 550A Polystyrene, gel, Monodispersed Form: hydroxide Particle Size: 550µm Applications: high efficiency and capacity for mixed-bed applications; condensate polishing		
250g	436607-250G	
1000g	436607-1KG	
1 cubic foot	436607-1FT3	
Marathon MSA (previously known as MSA-1) Polystyrene, macroporous Form: chloride Applications: removal of organic impurities with minimum organic fouling; deionization; silica removal; condensate polishing		
500g	MSA1-500G	
SBR-C Polystyrene, gel Form: chloride Applications: narrower particle size distribution suited to deep-bed condensate polishing; good for mixed-bed applications; demineralization		
100g	573701-100G	
500g	573701-500G	
5000g	573701-5KG	[^573701-5KG]
1 cubic foot	573701-1FT3	
SBR LC NG Polystyrene, gel, Nuclear Grade Form: hydroxide, minimum of 95% exchange sites Applications: Water treatment, CVCS and radwaste demineralizers, reactor coolant treatment; useful for boric acid recovery		
100g	14035-U	
1000g	14036-U	
2500g	14037-U	
5000g	14038-U	
Dowex 21K Polystyrene, gel Form: chloride Applications: mining grade material Does not meet FDA 21 CFR 173.25		
250g	436658-250G	
Marathon A Polystyrene, macroporous, monodispersed Form: chloride Particle Size: 575µm Applications: demineralization; water with high concentration of weak ions (silica, CO_2); organics-laden feed waters		
250g	433942-250G	
1000g	433942-1KG	

HELPFUL HINTS

Numerous Dow, Misubishi, and Rohm & Haas resins are available in the Supelco warehouse but not listed here. If a resin you need is not listed here, please contact your local Sigma-Aldrich representative with your requirements.

Dowex Strong Anion Exchangers, Type II

Functional Group: dimethylethanolbenzyl ammonium
Effective pH Range:0-14
Meet requirements of FDA Food Additive Regulation 21 CFR 173.25

QTY.	CAT. NO.	PRICE
2X8		
Styrene-divinylbenzene, gel Crosslinkage: 8% Form: chloride		
Mesh Size: 50-100		
100g	428620-100G	
500g	428620-500G	
1 cubic foot	428620-1FT3	
Mesh Size: 100-200		
100g	428639-100G	
500g	428639-500G	
2500g	428639-2.5KG	
1 cubic foot	428639-1FT3	
Mesh Size: 200-400		
100g	428647-100G	
500g	428647-500G	
5000g	428647-5KG	
1 cubic foot	428647-1FT3	
22 Styrene-divinylbenzene, macroporous Form: chloride Applications: deashing and mixed bed polishing of high fructose corn syrups		
250g	436623-250G	
1000g	436623-1KG	
Marathon A2 Styrene-divinylbenzene, gel, monodispersed Form: chloride Particle Size: 550µm Applications: demineralization; well suited for water with high concentration of mineral acids (chlorides, sulfates) and low concentration of silica and CO_2 (<25%)		
250g	433934-250G	
1000g	433934-1KG	

Amberlite Weak Anion Exchangers

Functional Group: polyamine
Meet requirements of FDA Food Additive Regulation 21 CFR 173.25 (unless otherwise noted).

QTY.	CAT. NO.	PRICE
IRA67 (also known as IRA-68) Acrylic, gel Form: free base Applications: unusually high capacity for large organics; deacidification, deionization of process liquors; isolation of acidic natural products; novabiacin and cephalosporins; separation of neutral and acidic amino acids below pH 10; removal of heparinic acid at low pH; citric acid; demineralization of cheese whey		
500g	10331	
IRA95 Styrenic, macroreticular Form: free base Applications: exceptional resistance to organic fouling; deacidification, deionization of water where removal of strong mineral and organic acids is desired; deionization of process liquors; removal of heparinic acid at low pH; heavy metals		
1000g	10425	
IRA96 Styrenic, macroreticular Form: free base Applications: deionization; chromate recovery; formaldehyde deacidification; ammonium nitrate removal and recovery Does not meet FDA Food Additive Regulation 21 CFR 173.25.		
100g	A8709-100G	
500g	A8709-500G	
1000g	A8709-1KG	
IRA743 Styrenic, macroreticular Form: free base Applications: borate-specific weak anion exchanger		
100g	IRA743-100G	
250g	216445-250G	
500g	IRA743-500G	
1000g	216445-1KG	

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Resins
Anion Exchange Media

Diaion Weak Anion Echangers

QTY.	CAT. NO.	PRICE
WA10 Acrylic, gel Functional Group: tertiary amine Form: free base Applications: pretreatment of starch hydrolysates containing high levels of minerals; treatment of fluids containing troublesome foulants; purification of dextrose, beet sugar solutions, or formaldehyde		
1000g	13944-U	
WA21J Styrenic, highly porous Functional Group: Primary and Secondary Amine Form: free base Reverse Swelling: ($OH^- \rightarrow Cl^-$) 30% Applications: removal of strong mineral acids from water; treatment of organic solvents; rigorous industrial applications. Meets requirements of FDA Food Additive Regulation 21 CFR 173.25.		
1000g	13895	
WA30 Styrenic, highly porous Functional Group: alkylamine Form: free base Reverse Swelling: ($OH^- \rightarrow Cl^-$) 30% Applications: best in class for high MW organic acids; strong decolorization capability; water treatment; pretreatment of corn syrup, beet sugar and dextrose; refining of formalin, glycerine, and enzymes; catalyst Meets requirements of FDA Food Additive Regulation 21 CFR 173.25.		
100g	13541	
1000g	13543	
CRB02 Styrenic, highly porous Functional Group: glucamine Form: free base Applications: high selectivity for borate ion; useful for low levels at high flow rates		
1000g	13959-U	

Dowex Weak Anion Exchangers

Functional Group: polyamine

Meet requirements of FDA Food Additive Regulation 21 CFR 173.25.

QTY.	CAT. NO.	PRICE
66 Styrenic, macroporous Form: free base Applications: deashing and mixed bed polishing of high fructose corn syrups		
250g	436674-250G	
1000g	436674-1KG	
Monosphere 66 Styrenic, macroporous, monodispersed Form: free base Particle Size: 550µm Applications: same as for Dowex 66.		
1000g	13705	
Monosphere 77 Styrenic, macroporous, monodispersed Form: free base Particle Size: 550µm Applications: deashing and mixed bed polishing of high fructose corn syrups		
1000g	502529D	
Marathon WBA (Replacement for MWA1) Styrenic, macroporous, monodispersed Form: free base Particle Size: 400µm Applications: demineralization; well suited for combined use with strong base anion resins for water with high concentration of mineral anions or high organic fouling potential		
250g	436666-250G	
1000g	436666-1KG	
Dowex M-43 Styrenic, macroporous Functional Group: dimethylamine Form: free base Applications: acts like an acid absorber, capable of removing both mineral and organic acids; nothing released back into solution that will make a sludge or change the process stream.		
100g	14031-U	
1000g	14032-U	
2500g	14033-U	
5000g	14034-U	

Duolite Weak Anion Exchanger

QTY.	CAT. NO.	PRICE
A-7 Phenol-formaldehyde, macroreticular Functional Group: polyamine Form: free base Reverse Swelling: ($OH^- \rightarrow Cl^-$) 23-28% Applications: sugar deionization; removal of high molecular weight colorants (e.g., wine processing); organic acids; lactose; metal ions (high porosity, hydrophilic)		
500g	10348	

HELPFUL HINTS

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Strong Cation Exchangers on Polystyrene

EXCHANGER	CROSS LINK (%)	MATRIX[1]	MESH	IONIC FORM	MOISTURE (Approx. %)	MAX. OP. TEMP. (°C) [2]	TOTAL EXCHANGE meq/mL	CAPACITY meq/g	pH RANGE
AMBERLITE STRONG CATION EXCHANGERS (SULFONIC ACID)									
200C	20	Mr	16-50	Na	48	150	1.7	4.2	0-14
IR120 H	8	G	16-50	H	45	121	1.9	4.4	0-14
IR122 Na	10	G	16-50	Na	40	121	2.1	4.4	0-14
15[2]	—	Mr	16-50	H	<1	120	1.8	4.7	0-14
1200 H[3]	—	G	650µm	H	52	120	1.8	4.7	0-14
IRN77	8	G	16-50	H	≤55	121	1.8	5.0	0-14
DIAION STRONG CATION EXCHANGERS (SULFONIC ACID)									
EXC04	—	HP	16-50	H	55	120	1.2	—	0-14
HPK25	—	HP	16-50	Na	42	125	1.8	3.9	0-14
PK208	4	P	16-50	Na	63	120	1.2	4.3	0-14
PK212	6	P	16-50	Na	55	120	1.5	—	0-14
PK216	8	P	16-50	Na	49	120	1.75	—	0-14
PK220L	10	P	16-40	Na	44	120	1.9	—	0-14
PK228L	14	P	16-50	Na	40	120	2.0	4.2	0-14
RCP160M	—	HP	25-60	H	50	120	1.5	4.5	0-14
SK1B	8	G	16-50	Na	46	120	1.9	3.6	0-14
SK1BS	8	G	150-350µm	Na	46	120	1.9	4.0	0-14
SK104	4	G	16-50	Na	62	120	1.2	4.0	0-14
SK110	10	G	16-50	Na	40	120	2.0	—	0-14
SK112	12	G	16-50	Na	37	120	2.1	3.9	0-14
SK116	16	G	16-50	Na	32	120	2.1	3.6	0-14
UBK510L	4	G	300-360µm	Na	40	120	1.9	—	0-14
UBK555	8	G	200-240µm	Ca	44	120	2.0	—	0-14
DOWEX STRONG CATION EXCHANGERS (SULFONIC ACID)									
50Wx2	2	G	50-100	H	78	150	0.6	4.8	0-14
50Wx2	2	G	100-200	H	78	150	0.6	4.8	0-14
50Wx2	2	G	200-400	H	78	150	0.6	4.8	0-14
50Wx4	4	G	50-100	H	68	150	1.1	4.8	0-14
50Wx4	4	G	100-200	H	68	150	1.1	4.8	0-14
50Wx4	4	G	200-400	H	68	150	1.1	4.8	0-14
50Wx8	8	G	50-100	H	53	150	1.7	4.8	0-14
50Wx8	8	G	100-200	H	54	150	1.7	4.8	0-14
50Wx8	8	G	200-400	H	54	150	1.7	4.8	0-14
DR-2030	—	Mp	30-60	H	3	150	1.7	4.7	0-14
HCR-W2	8	G	16-40	H	52	150	1.8	4.8	0-14
HCR-W2	8	G	16-40	Na	46	150	2.0	3.7	0-14
HGR-W2	10	G	16-40	H	40	150	2.2	4.2	0-14
MSC[4]	—	Mp	520µm	H	47	150	1.7	4.5	0-14
MSC[4]	—	Mp	550µm	Na	47	150	1.7	4.5	0-14
650C[5]	—	G	650µm	H	48	150	1.9	4.6	0-14
650C UPW[6]	—	G	650µm	H	48	150	1.9	4.6	0-14
G-26	—	G	650µm	H	48	150	1.9	4.6	0-14
88	—	Mp	16-40	Na	45	43	1.8	3.8	0-14
88[5]	—	Mp	550µm	Na	45	43	1.8	3.8	0-14
M-31	—	Mp	16-40	H	52	150	1.7	4.7	0-14
M-31[5]	—	Mp	475µm	H	52	150	1.7	4.7	0-14
99K/320[5]	—	G	320µm	K	59	150	1.5	4.5	0-14
99K/350[5]	—	G	350µm	K	59	150	1.5	4.5	0-14
99Ca/320[5]	6%	G	320µm	Ca	59	150	1.5	4.5	0-14
99Ca/350[5]	—	G	350µm	Ca	59	150	1.5	4.5	0-14
Marathon C[4]	8%	G	550µm	H	53	150	1.8	5.6	0-14
N-406	—	G	650µm	H	49	150	1.9	—	0-14

[1] G = gel; Mr = macroreticular; Mp = macroporous; HP = highly porous; P = porous
[2] Amberlyst exchanger
[3] Amberjet exchanger
[4] Marathon exchanger
[5] Monosphere exchanger

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Resins
Cation Exchange Media

Comparable Strongly Acidic Cation Exchangers on Polystyrene

AMBERLITE	DIAION	DOWEX
200/252 [1]	PK228/PK216	
IR-118H[1], 31[1]		
IR-120 (H)	SK1B	HCR-S, HCR-W2
IR-122	SK110 SK104	HGR-W2 50Wx4
IR-124[1]	SK112L SK116	50Wx12[1] 50Wx16[1]
Amberjet 1200		G-26, 650C N-437[1], N-406

[1] Not available.

Amberlite Strong Cation Exchangers

Functional Group: sulfonic acid
Effective pH Range:0-14

QTY.	CAT. NO.	PRICE
Amberlite 200 Polystyrene, macroreticular Crosslinkage: 20% Form: sodium Applications: water conditioning; removal of heavy metals; decalcification of blood and extracorporeal transfusion (superior resistance to oxidation). Meets requirements of FDA Food Additive Regulation 21 CFR 173.25.		
1000g	06458-1KG	
IR120 Polystyrene, gel Crosslinkage: 8% Form: hydrogen Applications: wide variety of chemical process applications; removal of amino acids at low pH; USP potassium methods. Meets requirements of FDA Food Additive Regulation 21 CFR 173.25.		
500g	10322	
Amberlyst 15 (dry) Polystyrene, macroreticular Form: hydrogen Swelling (dry to solvent saturated, %) hexane: 10-15 toluene: 10-15 ethylene dichloride: 15-20 ethylene acetate: 30-40 ethylene alcohol: (95%) 60-70 water: 60-70 Applications: heterogeneous acid catalysis		
100g	10389	
Amberlite IRN77 Polystyrene, gel, Nuclear Grade Form: hydrogen , minimum of 99% exchange sites Applications: water treatment, RAD waste treatment; decontamination		
500g	10342	

HELPFUL HINTS

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Diaion Strong Cation Exchangers

Functional Group: sulfonic acid
Effective pH Range:0-14

Meet requirements of FDA Food Additive Regulation 21 CFR 173.25.

QTY.	CAT. NO.	PRICE
PK228L Polystyrene, porous Crosslinkage: 14% Form: sodium Applications: decolorization; softening and deionization of water; recovery and separation of metals; refining of chemicals, sugar and dextrose; catalyst; separation of amino acids (good stability against organic fouling and oxidation)		
1000g	13563	
SK116 Polystyrene, gel Crosslinkage: 16% Form: sodium Applications: pharmaceutical separations; size exclusion (good stability against oxidation)		
100g	13581	
UBK555 Polystyrene, gel Crosslinkage: 8% Form: calcium Particle Size: 200-240µm Applications: fructose/glucose chromatographic separation		
1000g	13968-U	

Dowex Strong Cation Exchangers

Functional Group: sulfonic acid
Effective pH Range:0-14

Meet requirements of FDA Food Additive Regulation 21 CFR 173.25 (unless otherwise noted).

QTY.	CAT. NO.	PRICE
50WX2		
Polystyrene, gel Crosslinkage: 2% Form: hydrogen		
Mesh Size: 50-100		
100g	217441-100G	
500g	217441-500G	
2500g	217441-2.5KG	
1 cubic foot	217441-1FT3	
Mesh Size: 100-200		
100g	217468-100G	
500g	217468-500G	
2500g	217468-2.5KG	
1 cubic foot	217468-1FT3	
Mesh Size: 200-400		
100g	217476-100G	
500g	217476-500G	
2500g	217476-2.5KG	
1 cubic foot	217476-1FT3	
50WX4		
Polystyrene, gel Crosslinkage: 4% Form: hydrogen		
Mesh Size: 50-100		
100g	428663-100G	
500g	428663-500G	
2500g	428663-2.5KG	
1 cubic foot	428663-1FT3	
Mesh Size: 100-200		
100g	422096-100G	
500g	422096-500G	
2500g	422096-2.5KG	
1 cubic foot	422096-1FT3	
Mesh Size: 200-400		
100g	217484-100G	
500g	217484-500G	
2500g	217484-2.5KG	
1 cubic foot	217484-1FT3	

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Dowex Strong Cation Exchangers (cont'd)

QTY.	CAT. NO.	PRICE
50WX8		
Polystyrene, gel Crosslinkage: 8% Form: hydrogen Mesh Size: 50-100		
100g	217492-100G	
500g	217492-500G	
2500g	217492-2.5KG	
1 cubic foot	217492-1FT3	
Mesh Size: 100-200		
100g	217506-100G	
500g	217506-500G	
2500g	217506-2.5KG	
1 cubic foot	217506-1FT3	
Mesh Size: 200-400		
100g	217514-100G	
500g	217514-500G	
2500g	217514-2.5KG	
1 cubic foot	217514-1FT3	
DR-2030 (dry, made from Dowex M-31) Polystyrene, macroporous Form: hydrogen Applications: catalyst Does not meet FDA Food Additive Regulation 21 CFR 173.25		
100g	446483-100G	
500g	446483-500G	
5000g	446483-5KG	
1 cubic foot	446483-1FT3	
HCR-W2 Polystyrene, gel Crosslinkage: 8% Form: hydrogen		
1000g	I8880-1KG	
HCR-W2 Polystyrene, gel Crosslinkage: 8% Form: sodium Applications: mixed-bed applications; condensate polishing; demineralization; organic solvent desiccants; water softening (sodium form has high capacity for most organic liquids)		
1000g	13443	
Marathon C Polystyrene, gel. monodispersed Particle Size: 550µm Form: hydrogen Applications: demineralization		
1000g	433950-1KG	
Marathon MSC (previously known as MSC-1) Polystyrene, macroporous, monodispersed Particle Size: 520µm Form: hydrogen Applications: Water demineralization		
2500g	MSC1-2.5KG	
Monosphere 650C Polystyrene, gel Particle Size: 650µm Form: hydrogen Applications: mixed-bed applications; condensate polishing; sugar applications (Monosphere 650C material)		
1000g	13471-U	
Monosphere 650C UPW (purified 650C) Polystyrene, gel. Form: hydrogen Applications: demineralization for ultrapure water		
1000g	13340-U	
G-26 (same material as 650C, but mining grade) Polystyrene, gel Form: hydrogen Applications: chemical processing; mining. Does not meet FDA Food Additive Regulation 21 CFR 173.25		
100g	573663-100G	
500g	573663-500G	
5000g	573663-5KG	
1 cubic foot	573663-1FT3	

Dowex Strong Cation Exchangers (cont'd)

QTY.	CAT. NO.	PRICE
88 Polystyrene, macroporous Particle Size: 16-40 mesh Form: sodium Applications: deashing and mixed bed polishing of high fructose corn syrups		
1000g	436682-1KG	
2500g	436682-2.5KG	
Monosphere 88 Polystyrene, macroporous, monodispersed Particle Size: 550µm Form: sodium Applications: same as for Dowex 88.		
1000g	13709	
M-31 Polystyrene, macroporous Form: hydrogen Particle Size: 16-40 mesh Applications: catalyst Does not meet FDA Food Additive Regulation 21 CFR 173.25		
100g	573671-100G	
500g	573671-500G	
5000g	573671-5KG	
1 cubic foot	573671-1FT3	
Monosphere M-31 Polystyrene, macroporous, monodispersed Particle Size: 475µm Form: hydrogen Particle Size: 475µm Applications: same as for Dowex M-31 Does not meet FDA Food Additive Regulation 21 CFR 173.25		
1000g	13697	
Monosphere 99K/320 Polystyrene, gel, monodispersed Particle Size: 320µm Form: potassium Applications: chromatographic separations; sucrose recovery from beet and cane molasses (molasses desugarization or ion exclusion); separation of salts from polar organics; bulk deashing of process streams via ion exclusion chromatography; size exclusion separations of mono-, di-, and trisaccharides and other polar organics; betaine purification/recovery; basic amino acid recovery from sugar syrups and fractionation of basic amino acids; refining of polysaccharides to eliminate monosaccharides and low DP oligosaccharides		
1000g	13713	
Monosphere 99K/350 Polystyrene, gel, monodispersed Particle Size: 350µm Form: potassium Applications: same as for Monosphere 99K/320, but for high flow rate or deep bed applications where minimizing pressure drop is desired		
1000g	13717	
Monosphere 99Ca/320 Polystyrene, gel, monodispersed Particle Size: 320µm Form: calcium Applications: chromatographic separation of sugars, including specialty sugars and sugar alcohols; major industrial use is for separation of fructose from 42% high fructose corn syrup		
1000g	13721	

HELPFUL HINTS

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Resins
Cation Exchange Media

Weak Cation Exchangers on Polyacrylic Copolymer

EXCHANGER	CROSS LINK (%)	MATRIX[1]	MESH	IONIC FORM	MOISTURE (Approx. %)	MAX. OP. TEMP. (°C) [2]	TOTAL EXCHANGE meq/mL	CAPACITY meq/g	pH RANGE
AMBERLITE WEAK CATION EXCHANGERS (CARBOXYLIC ACID)									
CG-50 Type I	4	Mr	100-200	H	10	120	3.5	10.0	5-14
IRC50	4	Mr	16-50	H	48	100	3.5	10.0	5-14
IRC76	—	Mr	16-50	H	56	120	4.0	11.0	5-14
IRC86	—	G	16-50	H	50	120	4.2	10.7	4-14
DIAION WEAK CATION EXCHANGERS (CARBOXYLIC ACID)									
CWK30/S	—	P	30-60	H	49	120	4.5	—	4-14
WK10	—	P	16-50	H	56	150	2.5	—	5-14
WK11	—	P	16-50	H	48	150	2.9	—	5-14
WK40	—	HP	16-50	H	46	200	4.4	10.2	4-14
WK100	—	HP	16-50	H	49	120	2.8	9.0	4-14
WT01S	—	HP	100 -200µm	H	50	120	3.0	9.0	4-14
DOWEX WEAK CATION EXCHANGER (CARBOXYLIC ACID)									
MAC-3	—	Mp	16-50	H	47	120	3.8	10.8	4-14

Comparable Weakly Acidic Cation Exchangers on Polyacrylic Copolymer

AMBERLITE	DIAION	DOWEX
CG-50 Type I	WT01S	
DP-1[5], IRC-50	WK100	
IRC-76, IRC-84[4]	WK20[5], WK40	CCR-2[2], MWC-1[5]
IRC-84[5], IRC-86	WK20[5], WK40	CCR-3[3], MAC-3

[1] G = gel; Mr = macroreticular; Mp = macroporous; HP = highly porous; P = porous
[2] Amberlyst exchanger
[3] Amberjet exchanger
[4] Marathon exchanger
[5] Not available.

Amberlite Weak Cation Exchangers

Functional Group: carboxylic acid

Meet requirements of FDA Food Additive Regulation 21 CFR 173.25

QTY.	CAT. NO.	PRICE
CG-50 Type I (dry, fine mesh IRC-50) Acrylic, macroreticular Form: hydrogen Particle Size: 75-100µm Applications: cytochrome c isolation and purification; amines; drugs; metal ions; neutralization of solutions; thrombin		
500g	10319	
IRC50 Acrylic, macroreticular Form: hydrogen Particle Size: 300-1200µm Applications: selectively adsorbs organic bases such as antibiotics, alkaloids, peptides, and amino acids; many proteins including higher molecular weights; neutralization of reaction mixtures; good all around use		
500g	10338	
IRC76 Acrylic, macroreticular Form: hydrogen Applications: removal of ions associated with carbonate and bicarbonate alkalinity; deionization; softening		
500g	10340-U	

Diaion Weak Cation Exchangers

Functional Group: carboxylic acid

Meets requirements of FDA Food Additive Regulation 21FT3R 173.25

QTY.	CAT. NO.	PRICE
WT01S Acrylic, highly porous Form: hydrogen Particle Size: 100-200µm Applications: metal recovery; dealkalization; iron removal; refining of sugar; purification of antibiotics, pharmaceuticals, amino acids, etc. (superior kinetics and mechanical strength)		
100g	13593-U	
1000g	13595-U	

Dowex Weak Cation Exchanger

Functional Group: carboxylic acid

QTY.	CAT. NO.	PRICE
MAC-3 Acrylic, macroporous Form: hydrogen Applications: water treatment; dealkalization; purification of antibiotics, pharmaceuticals, amino acids, etc.		
1000g	502545D	

HELPFUL HINTS

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Chelating Resins

EXCHANGER	CROSS LINK (%)	MATRIX[1]	MESH	IONIC FORM	MOISTURE (Approx. %)	MAX. OP. TEMP. (°C) [2]	TOTAL EXCHANGE meq/mL	CAPACITY meq/g	pH RANGE
AMBERLITECHELATING RESIN									
IRC-748	—	Mr	16-50	Na	65	90/70 [2]	1.25	4.4	1.5-14
IRA743	—	Mr	16-50	FB	≤58	100	0.6	—	0-10
DIAION CHELATING RESINS									
CR11	—	HP	16-50	Na	60	120/80[2]	0.35 (Ca)	1.2 (Ca)	4-10
CR20	—	HP	16-50	FB	55	100	0.28 (Ca)	0.91 (Ca)	6-10
CRB02	—	HP	16-50	amine	55	—	0.6	—	—
DOWEX CHELATING RESINS									
M4195	—	Mp	16-50	SO_4	62	60	35g Cu^{+2}/L	—	0-7
DUOLITE CHELATING RESINS									
C467	—	Mp	16-50	Na	62	65	1.0	3.5	1-10
GT73	—	Mp	16-50	H	55	121	1.2	3.9	1-13

[1] Mp = macroporous Mr = macroreticular HP = highly porous
[2] Na/H

Chelating Resins

QTY.	CAT. NO.	PRICE
Amberlite IRC-748 Macroreticular Functional Group: iminodiacetic acid Form: sodium Applications: high affinity for heavy metal cations over alkali or alkaline earth metals; ideal for use in nonaqueous media		
100g	13296-U	
1000g	13297-U	
2500g	13298-U	
5000g	13299-U	
Amberlite IRA743 Macroreticular Form: free base Applications: Removal of borate, boric acid, other boron species from water, highly selective; salts, including bases, do not interfere significantly		
25g	IRA743-25G	
100g	IRA743-100G	
500g	IRA743-500G	
Diaion CR11 Highly porous Functional Group: iminodiacetic acid Form: sodium Applications: metal recovery; wastewater treatment; brine purification		
1000g	13547	
Diaion CRB02 Highly porous Functional Group: glucamine Form: free amine Applications: high selectivity for borate ion; best for low levels, high flow		
1000g	13959-U	
Dowex M4195 Macroporous Functional Group: bis-picolylamine Applications: removal of cobalt, copper, nickel; metal recovery; mining; general hydrometallurgy		
100g	13727-U	
500g	13728-U	
1000g	13729-U	
Duolite C467 Macroporous Functional Group: amino-phosphonic Form: sodium Applications: metallic cations of low mass; removal of hardness from brine; catalyst (resistant to osmotic shock)		
500g	10353	
Duolite GT73 Macroporous Functional Group: thiol Form: hydrogen Applications: removal of mercury, silver, lead, copper, cadmium		
500g	10354	

HELPFUL HINTS

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Resins
Ion Exchange (Mixed Bed) Media

Mixed Bed Resins on Polystyrene

EXCHANGER	CROSS LINK (%)	MATRIX[1]	MESH	IONIC FORM	MOISTURE (Approx. %)	MAX. OP. TEMP. (°C) [2]	TOTAL EXCHANGE meq/mL	CAPACITY meq/g	pH RANGE
AMBERLITE MIXED BED RESINS									
MB-150	—	G	16-50	H, OH	60	60	0.55	2.0	0-14
IRN150	8	G	16-50	H, OH	≤60	60	0.55	2.0	0-14
DIAION MIXED BED RESINS									
SMNUP	—	G	16-50	H, OH	60	60	—	—	0-14
SMT100	—	G	16-50	H, OH	60	60	—	—	0-14
DOWEX MIXED BED RESINS									
MR-3 LC NG	—	G	16-50	H, OH	60	60	1.7	—	0.14
Marathon MR-3	—	G	550-660µm	H, OH	60	60	1.4	—	0-14
MR-3 UPW[4]	—	G	600µm	H, OH	60	60	1.0	—	0-14
MR-450 UPW[4]	—	G	360, 590µm	H, OH	53	60	1.0	—	0-14
11A8 Retardion	—	G	35-80	NA[2]	45	70	NA[2]	NA[2]	0-14
OTHER RESINS									
TMD-8	—	G	16-40	H, OH	—	41	0.55[3]	0.80[3]	0-14

Comparable Mixed Bed Resins on Polystyrene

AMBERLITE	DIAION	DOWEX	OTHER
MB-1[5], MB-150	SMNUP	MR-3	—
MB-3[5]	—	—	TMD-8
IRN150	SMNUP	MR-3	—

[1] G = gel
[2] Not applicable
[3] Indicating; color changes (blue to amber) when capacity is reached.
[4] Monosphere resin
[5] Not available.

Mixed Bed Resins

QTY.	CAT. NO.	PRICE
Amberlite MB-150 Contains Amberlite 440 (OH) and IR-120 (H) resins. Applications: deionization.		
100g	13679	
1000g	13681	
Amberlite IRN150 Nuclear Grade Form: hydrogen and hydroxide, minimum of 99% and 95% exchange sites, respectivelyApplications: primary water chemistry control in once-through systems; useful in industrial water treatment where as-supplied resin must have absolute minimum of ionic and non-ionic contamination.		
500g	10341	
Diaion SMNUP (Mitsubishi) Nuclear Grade, contains Diaion SANUP (OH) and Diaion SKNUP (H) resins Applications: deionization; nuclear grade mixed bed for high quality water purification		
100g	13901	
1000g	13903-U	
MR-3 LC NG Nuclear Grade Form: hydrogen and hydroxide, minimum of 99.7% and 95% exchange sites, respectivelyApplications: low chloride, mixed bed resin for high quality water production in nuclear and industrial applications		
100g	13683-U	
1000g	13684-U	

QTY.	CAT. NO.	PRICE
Marathon MR-3 Form: hydrogen and hydroxide Applications: specially processed resin for mixed bed condensate polishing; useful for in-process demineralization.		
100g	13686-U	
1000g	13687-U	
Monosphere MR-450 UPW Particle Size: 360µm, 590µm Applications: ultrapure water		
1000g	13349-U	
Dowex 11A8 Retardation Form: contains paired anion and cation exchange sites Applications: removal of SDS, other ionic detergents from protein samples; desalting by SEC-type mechanism.		
100g	I6878-100G	
500g	I6878-500G	
TMD-8 A mixture of strong cation and anion resins Indicating resin: color changes from blue to amber when capacity is reached		
25g	M8157-25G	
100g	M8157-100G	
500g	M8157-500G	
1000g	M8157-1KG	

HELPFUL HINTS

Numerous Dow, Misubishi, and Rohm & Haas resins are available in the Supelco warehouse but not listed here. If a resin you need is not listed here, please contact your local Sigma-Aldrich representative with your requirements.

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Nuclear Resins

EXCHANGER	CROSS LINK (%)	MATRIX[1]	MESH	IONIC FORM	MOISTURE (Approx. %)	MAX. OP. TEMP. (°C) [2]	TOTAL EXCHANGE meq/mL	CAPACITY meq/g	pH RANGE
AMBERLITE NUCLEAR RESINS									
IRN-77	—	G	16-50	H[2]	≤55	121	1.8	5.0	0-14
IRN-78	—	G	16-50	OH[3]	≤60	60	1.1	4.0	0-14
IRN-150	—	G	16-50	H, OH	≤60	60	0.55	2.0	0-14
DIAION NUCLEAR RESINS									
SMNUP	—	G	16-50	H, OH	60	60	0.7	—	0-14
DOWEX NUCLEAR RESINS									
SBR LC NG	8	G	16-50	OH	≤60	60	1.1	—	0-14
MR-3 LC NG	—	G	16-50	H, OH	≤60	60	1.7	—	0-14

Comparable Nuclear Resins

AMBERLITE	DIAION	DOWEX
IRN-77	SAN 1[5]	SBR LC NG
IRN-78	SKN 1[5]	
IRN-150	SMN 1[5], SMNUP	MR-3 LC NG

[1] G = gel
[2] Minimum of 99% of exchange sites
[3] Minimum of 95% of exchange sites
[4] High porosity
[5] Not available from Supelco

Nuclear Resins

QTY.	CAT. NO.	PRICE
Amberlite IRN77 Polystyrene, gel, Nuclear Grade Form: hydrogen , minimum of 99% exchange sites Applications: water treatment, RAD waste treatment; decontamination		
500g	10342	
IRN78 Polystyrene, gel, Nuclear Grade Form: hydroxide, minimum of 95% exchange sites Applications: Water treatment, RAD waste, decontamination, useful for boron thermal regeneration.		
500g	10343	
Amberlite IRN150 Nuclear Grade Form: hydrogen and hydroxide, minimum of 99% and 95% exchange sites, respectively Applications: primary water chemistry control in once-through systems; useful in industrial water treatment where as-supplied resin must have absolute minimum of ionic and non-ionic contamination.		
500g	10341	
Diaion SMNUP (Mitsubishi) Nuclear grade, contains Diaion SANUP (OH) and Diaion SKNUP (H) resins Applications: deionization; nuclear grade mixed bed for high quality water purification		
100g	13901	
1000g	13903-U	
SBR LC NG Polystyrene, gel, Nuclear Grade Form: hydroxide, minimum of 95% exchange sites Applications: Water treatment, CVCS and radwaste demineralizers, reactor coolant treatment; useful for boric acid recovery		
100g	14035-U	
1000g	14036-U	
2500g	14037-U	
5000g	14038-U	
MR-3 LC NG Nuclear grade Form: hydrogen and hydroxide, minimum of 99.7% and 95% exchange sites, respectively Applications: low chloride, mixed bed resin for high quality water production in nuclear and industrial applications		
100g	13683-U	
1000g	13684-U	

HELPFUL HINTS

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Resins
Ion Exchange Media

Ion Exchange Media (Toyopearl)

Toyopearl ion exchange resins feature covalently bonded diethylaminoethyl (DEAE), carboxymethyl (CM), sulfopropyl (SP), or trimethylammonium (QAE and Q) groups attached to large pore size methacrylate particles. These materials ensure high resolution for a wide variety of proteins. In addition, they offer several other advantages:

- Sample capacity up to 2-4 times that of conventional gels
- High mechanical strength – you can use high flow rates
- Isocratic or gradient elution (bed volume will not change)
- Easily sanitized with acid, base, or heat

Toyopearl Resins for Ion Exchange Chromatography (all 250mL)

TOYOPEARL RESIN	PARTICLE SIZE (µm)	EXCHANGER TYPE (OPERATING pH)	EXCHANGE CAPACITY (meq/mL GEL)	ADSORPTION CAPACITY (mg/mL GEL)	CAT. NO.	PRICE
DEAE-650C	60-150	weak anion (2-10)	0.10 ±0.02	30 ±5[1]	807988	
DEAE-650M	40-90		0.10 ±0.02	30 ±5[1]	807473	
DEAE-650S	20-50		0.10 ±0.02	30 ±5[1]	807472	
Super Q-650M	40-90	strong anion (2-12)	0.20-0.30	143 [1]	817227	
Super Q-650S	20-50		0.20-0.30	143[1]	817223	
QAE-550C	60-150	strong anion (2-10)	0.37	70 [1]	814026	
CM-650M	40-90	weak cation	0.10 ±0.02	50 ±10 [2]	807475	
SP-650C	60-150	strong cation (3-11)	0.15 ±0.02	55 ±10 [3]	807994	
SP-650M	40-90		0.15 ±0.02	55 ±10 [3]	807997	
SP-550C	60-150		0.15	111[1]	814028	

LABPAK Ion Exchange Resin Kits[4]

LABPAK samplers enable you to try several Toyopearl resins to determine which works best for your particular application. Each kit contains several resins, grouped by separation mechanism.

KIT	RESIN	PARTICLE SIZE (µm)	EXCHANGER TYPE	CAT. NO.	PRICE
AIEXPAK Sampler 100mL each resin				843210	
	DEAE-650M	40-90	weak anion		
	QAE-550C	50-150	strong anion		
	Super Q-650M	40-90	strong anion		

[1] Adsorption capacity measured with: bovine serum albumin
[2] Adsorption capacity measured with: bovine hemoglobin
[3] Adsorption capacity measured with: lysozyme
[4] Exclusion limits (globular proteins): 550 type resins: 700,000 Dalton; 650 type resins: 5,000,000 Dalton.

HELPFUL HINTS

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Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



P000491

Sigma Luer-Lock Glass LC Columns

Borosilicate glass columns

- Luer-Lock inlet and outlet fittings
- Rated for maximum pressure of 15psi (1 bar)
- Fixed polypropylene end caps, polyethylene bed supports

About Polypropylene Components Polypropylene resists strong and weak acids, bases, and alcohols. It has limited resistance to aliphatic hydrocarbons, aldehydes, esters, and ketones, and is not recommended for use with aromatic or halogenated hydrocarbons or strong oxidizing agents.

Non-jacketed. For other styles, refer to the Sigma catalog.

COLUMN ID x BED LENGTH (cm)	VOLUME (mL)	QTY.	CAT. NO.	PRICE
0.7 x 10	4	1	C3669-1EA	
		10	C3669-10EA	
1.0 x 10	8	1	C3794-1EA	
		10	C3794-10EA	
1.0 x 20	16	1	C3919-1EA	
		10	C3919-10EA	
1.5 x 10	18	1	C4169-1EA	
		5	C4169-5EA	
1.5 x 30	53	1	C4294-1EA	
		5	C4294-5EA	
2.5 x 10	49	1	C4669-1EA	
		5	C4669-5EA	
2.5 x 20	98	1	C4794-1EA	
		5	C4794-5EA	
2.5 x 50	245	1	C4919-1EA	
		3	C4919-3EA	

Flow Adapter

Combine one adapter with a Sigma Luer-Lock column to make a column with an adjustable bed volume. PTFE eluant cannula, polyacetal body, Viton O-ring seal and 20µm polyethylene bed support. One replacement bed support included with each adapter.

COLUMN ID (cm)	QTY.	CAT. NO.	PRICE
1.0	1	F8267-1EA	
1.5	1	F8392-1EA	
2.5	1	F8517-1EA	

Reservoir

Tapered for leak-free seal.

COLUMN ID (cm)	VOLUME (mL)	QTY.	CAT. NO.	PRICE
GLASS				
0.7 - 1.5	500	1	R5508-1EA	
0.7 - 1.5	1000	1	R5633-1EA	
POLYPROPYLENE				
0.7 - 1.5	100	12	R5758-12EA	
2.5	700	5	R5883-5EA	

Replacement Bed Supports (Polypropylene)

For use with flow adapter only.

COLUMN ID (cm)	QTY.	CAT. NO.	PRICE
1.0	10	B9775-10EA	
1.5	10	B9900-10EA	
2.5	10	B0151-10EA	

Other Accessories

Luer-Lock Stopcocks -Polycarbonate/acetal on-off control, female Luer-Lock inlet and male Luer-Lock outlet ports. Package of 10.

3-Way Luer-Lock Stopcocks -Nylon. 3-way control with female Luer-Lock inlet and male Luer-Lock outlet ports. Package of 10.

DESCRIPTION	QTY.	CAT. NO.	PRICE
STOPCOCKS			
Luer-Lock	10	S7396-10EA	
Luer-Lock, 3-Way	10	S7521-10EA	
ADAPTERS			
Luer-Lock to 0.038"ID PTFE tubing (1/16"OD) 5'/1.5m of tubing with integral CTFE female Luer-Lock fitting.	5	A7552-5EA	
Luer-Lock to 1/4"-28 threads, polypropylene	10	A7677-10EA	
Luer-Lock to 1/16" ID tubing, polypropylene	10	A7427-10EA	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

LPLC Columns and Accessories

Omnifit Columns & Accessories



P000492

Omnifit Columns and Column Kits [1]

Omnifit glass columns are designed to be packed with resin-based LC packings of 20-200µm particle size. They are constructed of inert materials and can be operated at medium pressures.

Each Omnifit column is made from a continuous piece of precision-bore borosilicate glass, fashioned with extra-deep threaded ends and strain-free fittings. Specially designed scalloped endcaps virtually eliminate rolling and give you an improved grip when you are opening or closing the column. The endpieces also minimize dead volume and reduce turbulence in solvent flow. A 25µm polyethylene frit mounted in the endpiece distributes the sample evenly over the surface of the packing bed, reducing sample dispersion before the sample enters the column.

Kits include the glass column, 2 fixed-length PTFE endfittings with porous 25µm polyethylene frits, Viton O-rings, 2 gripper fittings, 2 support rods for mounting the column, one coupling body, and 2m of 1/16" OD x 0.8mm ID PTFE tubing. Order adjustable endfittings separately.

COLUMN LENGTH x ID (mm)	BED VOL. (mL)	CAT. NO.	PRICE
OMNIFIT COLUMN KITS (INCLUDES ENDFITTINGS)			
50 x 10	1.7	56000	
100 x 10	5.6	56001	
150 x 10	9.5	56002	
250 x 10	17.4	56003	
500 x 10	37.1	56004	
100 x 15	12	56005	
150 x 15	21	56006	
250 x 15	39	56007	
500 x 15	83	56008-U	
100 x 25	35	56009-U	
150 x 25	60	56010	
250 x 25	110	56011-U	
500 x 25	240	56012	
1000 x 25	494	56013-U	
PACKING RESERVOIRS/COLUMNS (NO ENDFITTINGS)			
50 x 10		56014-U	
100 x 10		56015	
150 x 10		56016	
250 x 10		56017	
500 x 10		56018	
150 x 15		56020-U	
250 x 15		56021	
500 x 15		56022	
100 x 25		56023	
150 x 25		56024	
250 x 25		56025-U	
500 x 25		56026	

PRESSURE RATINGS FOR OMNIFIT COLUMNS	
10mm ID:	600psi (42 bar)
15mm ID:	300psi (20 bar)
25mm ID:	150psi (10 bar)

Accessories

COLUMN LENGTH	CAT. NO.	PRICE
ADJUSTABLE ENDFITTINGS[2]		
Adjustable		
10mm	56099	
15mm	56112-U	
25mm	56125	
Fixed[4]		
10mm	56101	
15mm	56114-U	
25mm	56127	
COLUMN CONNECTOR[3]		
10mm	56100-U	
15mm	56113	
25mm	56126	
SUPPORT ROD		
10mm	56143	
25mm	56145-U	
O-RINGS (for sealing between column and end piece)		
Viton (pk. of 10)		
15mm	56122	
Chemraz (each)		
10mm	56111-U	
25mm	56137	
FRITS (PK. OF 20)		
5µm, PTFE		
10mm	56108	
15mm	56121	
25mm	56134	
10µm, PTFE		
10mm	56107	
15mm	56120-U	
25µm, PTFE		
10mm	56103	
25mm	56129	
25µm, Polyethylene		
10mm	56102	
40µm, PTFE		
10mm	56105-U	
15mm	56118	
25mm	56131	
70µm, PTFE		
10mm	56106	
25mm	56132	
100µm, PTFE		
10mm	56104	
25mm	56130-U	

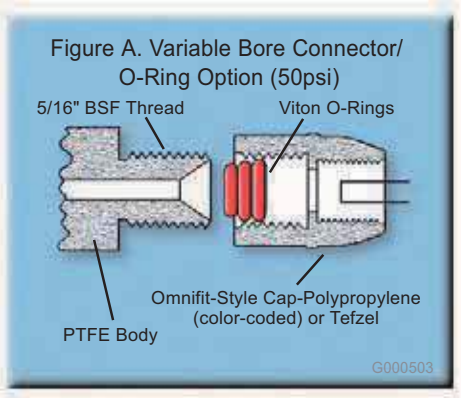
[1] For aqueous mobile phases. Other diameters available as custom orders.

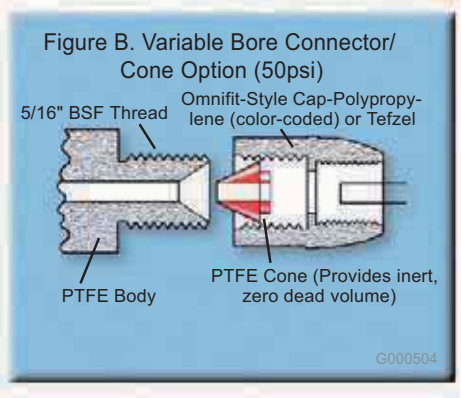
[2] 8cm maximum adjustment.

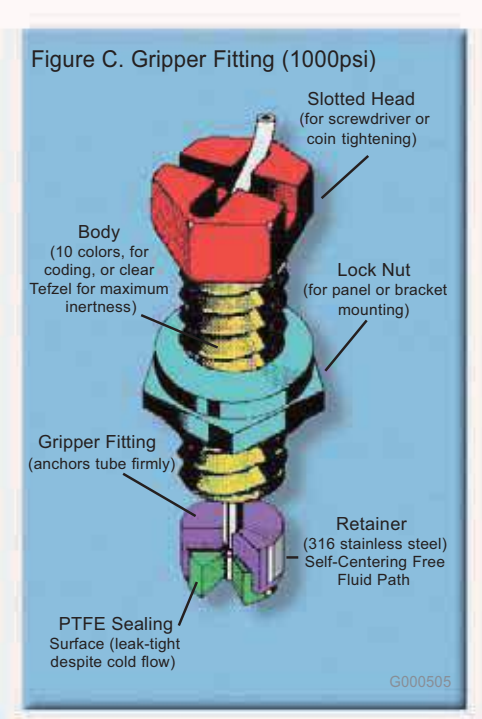
[3] Joins 2 columns of same diameter, 50psi max.

[4] Includes Omnifit-style 1/4-28 cap fittings w/Viton O-ring for column to endfitting seal, Viton O-rings for tubing connector, and 0.5mm bore void-filling PTFE cone.

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco







Information and graphics courtesy of Omnifit.

Connector Options

Variable bore connectors offer a choice of two-way, three-way, and multi-port Omnifit connectors. Most of these connectors are also available with valved ports. These fittings offer the unique advantage of producing a very low dead volume connection with tubing of various diameters, through an O-ring compression system (Figure A), a cone over tubing system (Figure B), or a void-filling cone with a standard gripper, Omnifit, or flangeless tube connector on a threaded 1/4"-28 fitting. All three options use a 1/4-28 tube endfitting (nut). The Teflon valve and connector bodies have 1.5mm flow passages and are supplied with chemical-resistant Tefzel stems.

O-ring option: Up to 3 Viton O-rings are compressed into the body which holds the tube tightly and forms the seal. The O-rings allow maximum flexibility, because they seal on rigid wall tubing of 4mm-11mm diameter (standard variable bore). This is particularly advantageous for changing fluid lines of differing dimensions. Viton is inert to most acids but is attacked by aldehydes and ketones. Typical pressure rating: 50psi (3 bar).

Cone option: A PTFE cone is matched to the tubing OD. This cone is compressed into the fitting, forming the seal. This option gives an all-PTFE fluid path of very low dead volume. PTFE is resistant to most chemicals, including sulfuric acid, sodium hydroxide, and all organic solvents. Typical pressure rating: 50psi (3 bar).

A gripper fitting (Figure C) is a flangeless tube connection that incorporates a PTFE-faced washer pressed into a 316 stainless steel housing. The fitting provides leak-free connection with minimum disturbance to the fluid path, and allows repeated connections/disconnections without deterioration of the sealing face. A gripper fitting will not compress the tubing if overtightened and does not twist the tubing during connection. Pressure rated to 1000psi (68 bar). When using a gripper fitting with an Omnifit-style connector, use a 0.5mm bore cone (Cat. No. 56041) to fill the cone area on the connector.

Gripper Fittings

Gripper Trial Pack includes 2 tube endfittings (nuts), 2 gripper fittings, coupler, 2m PTFE tubing. Gripper fittings are rated to 1000psi.

DESCRIPTION	CAT. NO.	PRICE
GRIPPER TRIAL PACK		
1/16” (0.8mm ID tubing)	57415-U	
GRIPPER FITTINGS		
1/16” (pk. of 10)	57417	
1/8” (pk. of 10)	57418	

[1] Tube endfittings (nuts) not included.

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LPLC Columns and Accessories

Omnifit Accessories

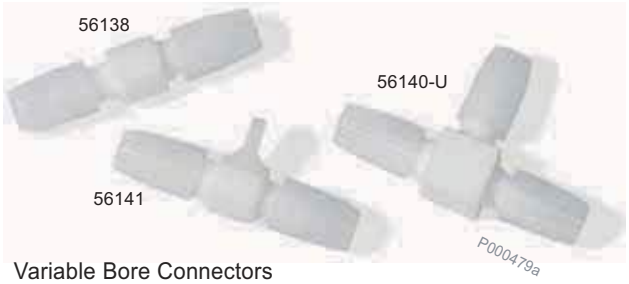


Accessories Kits

Laboratory Kit includes 2 two-way connectors, universal connector, three-way "T" valve, pack of 1/16" tube endfittings, pack of 1/16" gripper fittings, three-way "T" connector, two-way valve, distribution valve, 2 two-way couplings, 20m x 0.8mm ID PTFE tubing.

Valve Kit includes variable large connector, two-way connector, universal connector, two-way connector with valve.

DESCRIPTION	CAT. NO.	PRICE
Laboratory Kit	56028-U	
Valve Kit	56029-U	



Variable Bore Connectors

DESCRIPTION	CAT. NO.	PRICE
STANDARD BORE (1.5mm BORE, 1/16" CONES)		
O-rings and PTFE cones included.		
Two-Way Connectors (pk. of 3)	56030	
Two-Way Connectors (pk. of 20)	56031	
Three-Way "T" Connector	56032	
Two-Way Valve Connectors (pk. of 2)	56033	
Three-Way Valve Connector	56034	
SMALL BORE (0.8mm BORE, 1/32" CONES)		
PTFE cones included.		
Two-Way Connectors (pk. of 3)	56138	
Two-Way Connectors (pk. of 20)	56139	
Three-Way "T" Connector	56140-U	
Two-Way Valve Connectors (pk. of 2)	56141	
Three-Way Valve Connector	56142	



Caps and Cones for Variable Bore Connectors

DESCRIPTION	CAT. NO.	PRICE
CAPS FOR CONNECTORS		
Mixed Colors (pk. of 10)	56035	
CONES, PTFE (PK. OF 4)		
1/32" bore	56036	
1/16" bore	56037	
3/32" bore	56038	
1/8" bore	56039-U	
0.5mm bore	56041	
1.0mm bore	56042	
1.5mm bore	56043-U	
2.5mm bore	56045	
3.0mm bore	56046	
3.5mm bore	56047	
solid (plug)	56049	



Tube Couplers (Female Unions)

Kits include 5 couplers, 10 tube endfittings, and 10 gripper fittings.

DESCRIPTION	CAT. NO.	PRICE
TUBE COUPLER/GRIPPER KITS		
1/16" Tefzel	56055-U	
1/8" Tefzel	56057-U	
TUBE COUPLERS (PK. OF 10)		
1/4-28 to 1/4-28, Tefzel	56051	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

58685



Flangeless Fittings (Omnifit)

Compatible with all fittings having 1/4-28 threads. Use in place of any flange-type fitting used with 1/16" or 1/8" OD plastic tubing. Each inert fitting consists of a Delrin nut and Tefzel ferrule. Use the 1/16" fittings to 1000psi (70kg/cm²) or the 1/8" fittings to 500psi (35kg/cm²).

DESCRIPTION	CAT. NO.	PRICE
1/16" OD TUBING		
Nut and ferrule (5 each)	58685	
Tefzel ferrule (pk. of 10)	56700-U	
1/8" OD TUBING		
Nut and ferrule (5 each)	58686	
Tefzel ferrule (pk. of 10)	56701	



Flangeless Fittings Kit (Omnifit)

Components	Description and (Quantity)	
Flangeless ferrules	1/16" (10)	1/8" (10)
Flangeless nuts	1/16" (10)	1/8" (10)
Unions with fittings	1/16" (2)	1/8" (2)
Tee with fittings	1/16" (1)	1/8" (1)
Cross with fittings	1/16" (1)	1/8" (1)
Unions	metric M6 (2)	standard 1/4-28 (2)
Luer fittings	female (2)	male (2)
Metric adapters	1/4-28 to M6 (2)	

DESCRIPTION	CAT. NO.	PRICE
Flangeless Fittings Kit	58630	



Flangeless Nut Extender Tool (Upchurch)

- Designed for standard head nuts
- Tightens nut in hard-to-reach places.

DESCRIPTION	CAT. NO.	PRICE
Flangeless Nut Extender Tool	55013-U	



Super Flangeless Fittings (Upchurch)

Super Flangeless Fittings are designed to provide significant improvements over standard Flangeless Fittings, holding up to 7000psi (483 bar). The lock ring offers constant, uniform compression on the ferrule while operating as a bearing against the nut. This design allows the nut to spin freely against the ferrule system preventing the tubing from twisting during the tightening process. Packs of 10.

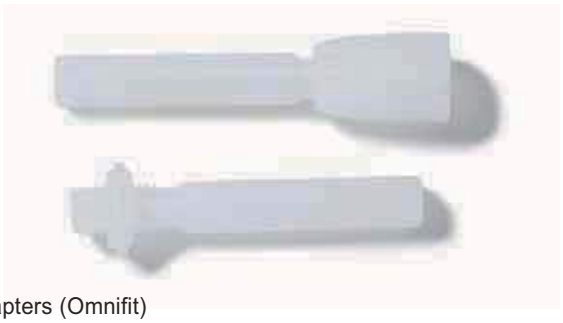
DESCRIPTION	CAT. NO.	PRICE
PEEK Ferrules for 1/16"OD tubing	55008-U	
PEEK Ferrules for 1/8"OD tubing	55009-U	
PEEK Nut (¼"-28) for 1/16"OD tubing	55012-U	
PEEK Nut (¼"-28) for 1/8"OD tubing	55083-U	
SS Frit (2µm) in PEEK Ferrules for 1/16"OD tubing, 5,000psi max.	55014-U	
SS Frit (2µm) in PEEK Ferrules for 1/8"OD tubing, 1,400psi max.	55015-U	



Sealtight Fittings (Upchurch)

Fittings for 1/16"OD tubing. Packs of 10.

DESCRIPTION	CAT. NO.	PRICE
Short Nut, PEEK 10-32, Ferrules	55002-U	
Long Nut, PEEK 10-32, Ferrules	55003-U	
Long Nut, PEEK M-6, Ferrules	55004-U	
Extra Long Nut, PEEK 10-32, Ferrules	55006-U	
PEEK Ferrules	55007-U	



Adapters (Omnifit)

DESCRIPTION	CAT. NO.	PRICE
To connect an Omnifit connector or column endfitting and a Luer fitting or soft tubing		
Omnifit cap to male Luer	56085	
Omnifit cap to female Luer	56087	
Omnifit cap to 1/4" OD pipe stem	56090	
To connect a 1/4-28 female fitting and a Luer fitting or soft tubing		
1/4-28 male to male Luer	56086	
1/4-28 male to 1/4" OD pipe stem	56091	
1/4-28 male to 1/8" OD pipe stem	56093	

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LPLC Columns and Accessories

Omnifit, Upchurch Accessories



Omnifit 1/4-28 Tube Endfittings (Nuts)

Use with gripper fittings. Each endfitting includes a lock nut for panel mounting. Pack of 10.

DESCRIPTION	CAT. NO.	PRICE
1/16" OD TUBING		
Tefzel	56069	
1/8" OD TUBING		
Polypropylene, Mixed Colors[1]	56080-U	
Tefzel	56081	

[1]Also available in pk. of 10 of same color – please inquire.



Omnifit Plugs

Use to close 1/4-28 or Luer connection. Polypropylene. Pack of 2.

DESCRIPTION	CAT. NO.	PRICE
For male Luer	56083	
For female Luer	56084	



Omnifit Septum Injectors

Enable you to use a syringe to make injections onto a low pressure LC system. Both injectors have an Omnifit-style connector for the inlet.

DESCRIPTION	CAT. NO.	PRICE
Injector, 1/4-28 outlet [2]	56096	
Injector, Omnifit variable connector outlet [3]	56097	

[2] Directly connects to Omnifit column endfitting.

[3] Connects in line.

Fittings and Adapters (Upchurch)

DESCRIPTION	CAT. NO.	PRICE
FITTINGS		
Flangeless Nut, M6 for 1/16" tubing (pk. of 10)	55064	



(Order ferrules separately - Cat. No. 56700-U, previous page)

LUER ADAPTERS		
Male Luer to Male 1/4-28, Tefzel (each)	55065-U	



Male Luer to Female 1/4-28, PEEK (each)	55072	



Female Luer to Female 1/4-28, Tefzel (each)	55066	



Female Luer to Female 1/4-28, PEEK (each)	55075	



Male Luer to Female 10-32, PEEK (each)	55073	



Female Luer to Female 10-32, PEEK (each)	55076	



Female Luer to Male 10-32, Tefzel (each)	55082	



Female Luer to Female M6, PEEK (each)	55077	



Female M6 to Male Luer, PEEK (each)	55074	



OTHER ADAPTERS		
10-32 to Female 1/4-28 Fingertight Fitting 0.020" hole (each)	55070-U	



10-32 to Female M6 Fingertight Fitting 0.020" hole (each)	55068	



Female 1/4-28 to Male 10-32, PEEK (each)	55071	



Female M6 to Male 10-32, PEEK (each)	55069	



Female 1/4-28 to Female M6, Tefzel (each)	59259-U	



P000471, 482, 487, 483, 472, 473, 485, 484, 475, 488, 476, 477, 478 & 486

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco





Rheodyne Model 5020 Low Pressure Mobile Phase Selection Valve

The Rheodyne Model 5020 fixed volume loop injector is constructed of Teflon and has 0.8mm/0.03" ID flow passages. Operates to 300psi (21kg/cm²). Supplied with a 0.5mL sample loop and a female Luer adapter for a Luer tip syringe.

Rheodyne Model 5011 Low Pressure Mobile Phase Selection Valve

Draw the mobile phase you need simply by rotating a switch. This zero dead volume, 7-port, 6-position rotary valve with a common center port operates to 300psi (21kg/cm²). Inert 0.8mm ID Teflon tubing ensures contaminant free mobile phases.

DESCRIPTION	CAT. NO.	PRICE
SWITCHING VALVES		
Model 5020 Low Pressure Sample Injection Valve	58814	
Model 5011 Low Pressure Mobile Phase Selection Valve	58829	
Mounting Bracket (for Model 5011 and Model 5020 valves)	57460-U	
SAMPLE LOOPS FOR MODEL 5020 VALVE		
0.1mL	57680-U	
1mL	57683	
5mL	57684	
10mL	57685	



Upchurch Low Pressure Shutoff Valves

- Designed for lower pressure applications
- Biocompatible, all polymer flow path

PEEK or Tefzel valve with 1/4-28 fittings, for pressures up to 1000psi (70kg/cm²). Flangeless nuts and ferrules included.

DESCRIPTION	CAT. NO.	PRICE
PEEK, for 1/16" tubing	505757	
PEEK, for 1/8" tubing	56704	
Tefzel (blue), for 1/16" tubing	505765	
Tefzel (blue), for 1/8" tubing	505773	

Cheminert Plastic Fittings

For Teflon Tubing

- Chemically inert
- Zero dead volume, small bore
- Autoclavable
- 500psi (35kg/cm²) pressure rating



Tube Endfittings

Fittings and washers included.

COLOR	QTY.	CAT. NO.	PRICE
FOR 1/16" (1.5mm) OD TUBING			
Mixed colors	12	58705	
FOR 1/8" (3mm) OD TUBING			
Natural	10	58711	
Mixed colors	12	58712	



KEL-F Tee Connector

Connects any three pieces of tubing, using 1/4"-28 fittings. Flangeless fittings included.

DESCRIPTION	CAT. NO.	PRICE
Tee for 1/8" tubing (1.5mm bore)	58750-U	
Tee for 1/16" tubing (0.25mm bore)	54989	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

LPLC Columns and Accessories

Cheminert Plastic Fittings & Tubing



Other Fittings

DESCRIPTION	CAT. NO.	PRICE
POLYPROPYLENE COUPLING		
Couples two pieces of 1/16" or 1/8" tubing, using flanged or flangeless ¼"-28 threaded fittings, pack of 5	58718	
¼"-28 THREADED PLUGS		
Plugs, PTFE (pack of 5)	58745	
PIPE ADAPTER		
Adapts ¼" pipe threads (NPT) to ¼"-28 threads	54985-U	



Luer Adapters

Female adapter (1/16" ID) connects syringe to ¼"-28 threaded tubing or adapter. Male adapter connects needle or Luer hub to ¼"-28 threaded tubing or adapter. Order coupling separately.

DESCRIPTION	CAT. NO.	PRICE
Female Luer adapter	58721	
Male Luer adapter	58722	



Glass-to-Teflon Connector

Joins Teflon tubing (using ¼"-28 threaded fitting) directly to glassware without coupling. Plain end of connector can be fused into glassware by glass blowing. Includes glass-to-Teflon union and flanged glass nipple. 7mm (¼") OD x 2mm ID x 3 ¼" (82mm) long.

DESCRIPTION	CAT. NO.	PRICE
Connector	58748	



Tubing Adapters

ADAPTS 1/4"-28 TO:	BORE	CAT. NO.	PRICE
1/4" OD plastic tubing	1.5mm/0.060"	58742	
1/8" OD plastic or SS tubing	1.5mm/0.060"	58743	
1/16" SS tubing (Valco HPLC 10-32 fitting)	0.8mm/0.031"	58744	



Teflon Tubing

Economical, flexible TFE Teflon tubing is ideal for use at pressures up to 500psi (35kg/cm²). Use in automatic analyzer, postcolumn reaction, and preparative scale systems; in-stream sampling devices; and when monitoring physiologically important compounds. The maximum recommended operating temperature for TFE Teflon is 200°C, but short term exposure to higher temperatures seldom causes damage.

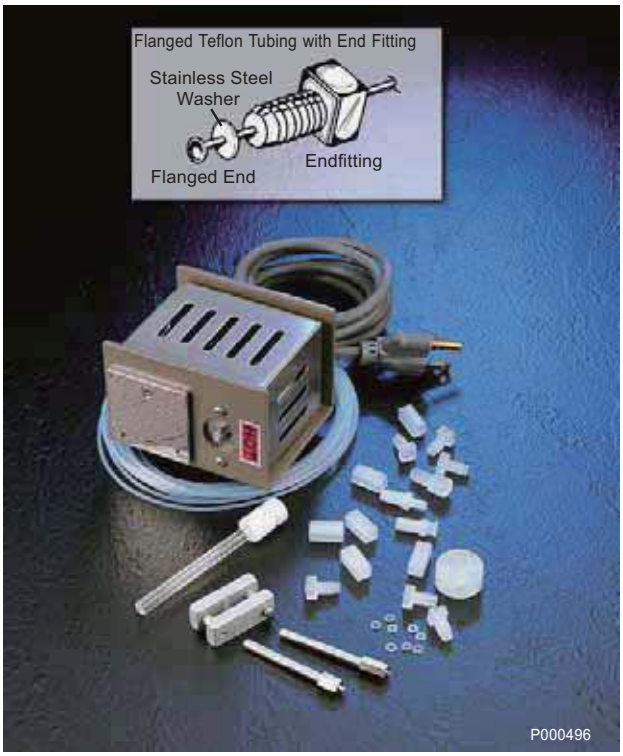
DIAMETER			
OD	ID	CAT. NO.	PRICE
10' (3m) LENGTH			
1/16"/1.58mm	0.8mm/0.031"	58700-U	
1/16"/1.58mm	0.5mm/0.023"	58701	
1/16"/1.58mm	0.3mm/0.012"	58702	
1/8"/3.2mm	1.5mm/0.063"	58703	
50' (15m) LENGTH			
1/16"/1.58mm	0.8mm/0.031"	58696-U	
1/16"/1.58mm	0.5mm/0.023"	58697-U	
1/16"/1.58mm	0.3mm/0.012"	58698-U	
1/8"/3.2mm	1.5mm/0.063"	58699	

FEP Teflon Tubing in 10'/3m Lengths

Tubing to connect low, medium, or high pressure pumps to reservoirs.

DESCRIPTION	CAT. NO.	PRICE
TUBING FOR MOST PUMPS		
1/8" OD x 0.0625" ID	58694-U	
TUBING FOR WATERS PUMP		
0.15" OD x 0.118" ID	58695-U	

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Each tube flanging starter kit contains:

- Flanging tool (115VAC) and accessories
- 20'/6m TFE Teflon tubing
- 20 Cheminert tube endfittings
- 20 Stainless steel washers
- 10 Couplings
- Male Luer adapter
- Female Luer adapter
- Plug
- Glass-to-Teflon connector
- Tee

Tube Flanging Tool

Assemble your own plastic tubing system.

Our starter kits save you money and provide a variety of the most commonly used fittings.

All flanging tools and kits include a tubing holder, 3 interchangeable flanging tips (3 sizes), and a razor blade. Cheminert tube end fittings can be autoclaved. Both 1/8" and 1/16" fittings have ¼"-28 threads.

DESCRIPTION	CAT. NO.	PRICE
TUBE FLANGING STARTER KIT		
1/16" OD tubing (0.031" ID)	58754	
1/8" OD tubing (0.063" ID)	58756-U	
FLANGING TOOL		
115VAC, 50/60Hz	58719	
220VAC, 50/60Hz[1]	58720-U	
FLANGING TIPS		
0.028" (for 1/16" OD x 0.010" / 0.020" ID)	54991	
0.040" (for 1/16" OD x 0.030" ID)	54992	
Natural color, pk. of 10		
1/16" OD (1.5mm) x 0.060" ID	58704	
1/8" OD (3mm) x 0.120" ID	58711	
Mixed color, pk. of 12		
1/16" OD (1.5mm) x 0.060" ID	58705	
1/8" OD (3mm) x 0.120" ID	58712	

[1] Does not have a CE mark.

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Ultrafiltration
Sartorious / Sartobind

Centrisart Concentrators

These Sartorius centrifugal membrane-based devices separate components based on molecular size. They are convenient for clarifying, concentrating, or dialysing samples. Centrisart C4 Micro-Concentrators effectively concentrate or exchange buffer in small volume samples (0.4mL). Centrisart C30 units process up to 3mL, and fit into standard laboratory centrifuges designed for 17mm tubes. When you need a protein-free ultrafiltrate, we recommend Centrisart I Centrifugal Ultrafiltration Units. Their unique design prevents membrane blockage. For 50mL-1000mL samples, use Sartocon-Micro Tangential Flow Ultrafiltration Modules.

Centrisart C4G Micro-Concentrators

0.4mL capacity. Maximum force 10,000g. Packs of 25 tubes.

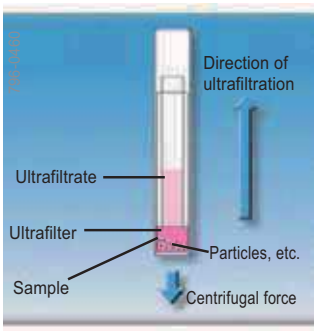
NOMINAL MOL. WT. LIMIT (DALTON)	CAT. NO.	PRICE
20kD	13249C4G	
100kD	13269C4G	
0.2µm Pores	13207C4G	

Centrisart C30 Centrifugal Concentrators

3.0mL capacity. Maximum force 5,000g. Packs of 25 tubes.

NOMINAL MOL. WT. LIMIT (DALTON)	CAT. NO.	PRICE
10kD	13239C30	
100kD	13269C30	
0.2µm Pores	13207C30	

Centrisart I Centrifugal Ultrafiltration Units



Data courtesy of Sartorius Corp.

Capacity: 2.5mL.
Dimensions: 14mm x 93mm long.
Filtration Area: 0.79cm^2.
Concentrate Volume: ~100µL.
Construction: polystyrene outer tube; cellulose propionate inner tube; cellulose triacetate or polysulfone filters.
Typical Performance: 2.5mL sample filtered in 30-90 min.
Maximum Force: 2500g (swinging bucket) or 2000g (fixed angle).

Packs of 12 tubes.

NOMINAL MOL. WT. LIMIT (DALTON)	CAT. NO.	PRICE
10kD	13239E	
20kD	13249E	
100kD	13269E	
300kD	13279E	

Sartocon-Micro Tangential Flow Ultrafiltration Modules

One per box; boxes of 10 available on request.

NOMINAL MOL. WT. LIMIT (DALTON)	FLOW RATE[1]	CAT. NO.	PRICE
10kD	25	15639001	
100kD	125	15669001	

[1] mL/min water, 28psi inlet pressure.



Sartobind Reusable Ion Exchange Membrane Units

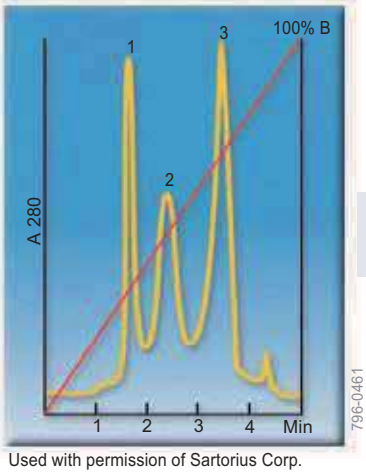
MEMBRANE DESCRIPTION	CAT. NO.	PRICE
15cm^2 (PK. OF 2)		
S-Type Exchanger	S15F	
Q-Type Exchanger	Q15F	
CM-Type Exchanger	C15F	
One S, One Q Unit	SQ15F	
One DEAE, One CM Unit	CD15F	
100cm^2 (EACH)		
S-Type Exchanger	S100F	
Q-Type Exchanger	Q100F	
DEAE-Type Exchanger	D100F	
CM-Type Exchanger	C100F	

Sartobind MA5 Membrane Units

Disposable, 5cm^2 surface area. Pack of 15.

MEMBRANE DESCRIPTION	CAT. NO.	PRICE
S-Type Exchanger	S5F	
Q-Type Exchanger	Q5F	
DEAE-Type Exchanger	D5F	
CM-Type Exchanger	C5F	

Proteins on a Quaternary Ion Exchange Membrane (Cat. No. Q15F) at a Flow Rate of 50mL/Minute



Used with permission of Sartorius Corp.

1. Transferrin
2. Ovalbumin
3. β-Lactoglobulin-A

Buffer: A = 20mM Tris, pH 8.5
B = A + 0.4M KCl
0-100% B as shown

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Separation MEDIA

Processing, Testing and Packaging



Working together...

...we will tailor separation media to meet your specific requirements and optimize the throughput of your processes.

We offer a comprehensive range of processing, testing and packaging capabilities applied to an extensive range of media from most manufacturers.

We also process, test and package client-provided media.

Optimized media preparation, testing and packaging is what we focus on. We have the media, facilities, expertise and documented processes to meet any project requirement.

To learn if separation media, testing and packaging capabilities can enhance your project requirements, contact your Supelco Technical Service representative.

Separation Media Processing Capabilities

- cleaning
- pre-wetting
- blending
- drying
- ion-exchange
- sanitizing
- sterilizing
- testing (QC, certificate of analysis)
- packaging (mg to Kg; clean room)

Sources of Media

- Dow
- E. Merck
- Mitsubishi
- Amersham Biosciences
- Sigma-Aldrich
- Tosoh Biosep
- Rohm and Haas

Media Types

- Alumina
- Carbon
- Dextran
- Florisil
- Polystyrene/Divinylbenzene
- Methacrylate
- Silica

Did you know...

Supelco can address your chem
standards needs, from off-th
shelf to custom packaged a
everything in betwee



Buy Chemical Standards in multiples of 3 and receive a discount through our 3-6-9 Multi-Ampul Discount program

Supelco Chemical Standards are tested for real-time formulation stability against retained lots

Supelco Chemical Standards are tested by chromatography against an independent reference material or a previously approved lot

Chemical Standards

TechTip

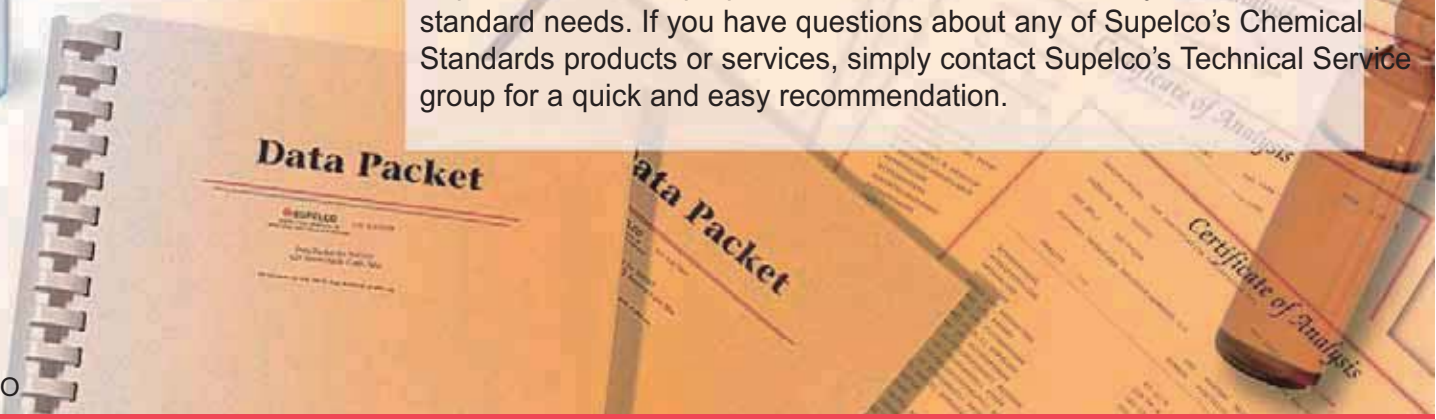
For storage of your standard after opening, use the Mininert valve and vial. It offers double protection against leakage with both septa and an on/off valve.



Supelco Chemical Standards products include...

- Certification and Documentation in the form of certificate of analysis that accompanies each standard
- Data Packets, Free of Charge providing comprehensive testing and validation data that can be assembled for any product
- Selected RDaR products that are tested against similar standards produced by independent manufacturer (Absolute Standards, Hamden, CT, USA)
- Separate Source Standards that meet US EPA requirements for formulations prepared from independently sourced materials
- Comprehensive Custom Re-Packaging services to repackage liquid chemicals from bulk size into 1mL to 20mL sized ampules
- Custom Chemical Solutions prepared to your specifications including testing and packaging from over 2200 raw materials

Supelco has or can prepare a solution tailored to meet you chemical standard needs. If you have questions about any of Supelco's Chemical Standards products or services, simply contact Supelco's Technical Service group for a quick and easy recommendation.





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- PESTANAL Standards 510

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Multipurpose Standards

Neat and Single Component Solutions

For:

- Environmental analyses
- Air monitoring analyses
- Food and beverage analyses
- Petroleum/chemical analyses



Most chemicals are 99% pure. None are less than 96% pure, except as noted.

Some of these products are classified as hazardous under European Union (EU) legislation. The Risk and Safety (R and S) phrases assigned by the EU are listed in the Index of EU Risk and Safety Phrases at the back of this catalog.

- Neat - pure materials not diluted in solvent
- Single Component Solutions - pure material quantitatively diluted into solvent
- Pestanal - pesticide residue analysis grade standards from Riedel-de Haën

Individual Calibration Standards (in 1mL of solvent, unless noted otherwise)

CAS N0.	COMPOUND	QTY./CONC.	SOLVENT	CAT. NO.	PRICE
71751-41-2	Abamectin	100mg	NEAT	PS2068	
	Abamectine – see Abamectin				
3383-96-8	Abate	100mg	NEAT	PS665	
	Acaraben – see Chlorobenzilate				
18181-80-1	Acarol	10mg	NEAT	PS1062	
83-32-9	Acenaphthene	5000mg 5000µg/mL	NEAT methanol	48500-U 40001	
15067-26-2	Acenaphthene-d10	100mg 2000µg/mL 2000µg/mL	NEAT methanol methylene chloride	442432 48093 48417	
208-96-8	Acenaphthylene	100mg 5000µg/mL	NEAT methanol	48566 40075	
30560-19-1	Acephate PESTANAL	250mg	NEAT	45315-250MG	
75-07-0	Acetaldehyde	1000mg	NEAT	506788	
1019-57-4	Acetaldehyde-2,4-DNPH	100mg 1000µg/mL	NEAT acetonitrile	442434 47340-U	
34256-82-1	Acetochlor PESTANAL	250mg	NEAT	36526-250MG	
67-64-1	Acetone	2000µg/mL 5000µg/mL	methanol:water, 90:10 methanol:water, 90:10	48358 40284	
6001-64-5	Acetone chloroform PESTANAL	1000mg	NEAT	36681-1G	
1567-89-1	Acetone-2,4-DNPH	50mg 1000µg/mL	NEAT acetonitrile	442436 47341	
75-05-8	Acetonitrile	1000mg	NEAT	48484	
98-86-2	Acetophenone	1000mg 2000µg/mL	NEAT methylene chloride	442438 48292	
50594-66-6	Acifluorfen PESTANAL	250mg	NEAT	34311-250MG	
107-02-8	Acrolein	5000mg 100mg	NEAT NEAT	48501 4S8501	
888-54-0	Acrolein-2,4-DNPH	25mg 1000µg/mL	NEAT acetonitrile	442441 47342	
107-13-1	Acrylonitrile	5000mg 100mg 1000µg/mL 5000µg/mL	NEAT NEAT water methanol	48502 4S8502 48709 40003	
	Actellic – see Pirimiphos-methyl				
	Activol – see Gibberellic acid				

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Multipurpose Standards
Neat and Single Component Solutions

CAS NO.	COMPOUND	QTY./CONC.	SOLVENT	CAT. NO.	PRICE
	Admire – see Imidacloprid				
	Afalon – see Linuron				
	Agritox – see Trichloronate				
	Akar – see Chlorobenzilate				
1757-18-2	Akton	1000mg	NEAT	PS675	
15972-60-8	Alachlor	200µg/mL	methanol	48308	
		1000µg/mL	methanol	41089	
	Alachlor PESTANAL	250mg	NEAT	45316-250MG	
	Alar – see Daminozide				
116-06-3	Aldicarb PESTANAL	250mg	NEAT	36669-250MG	
1646-88-4	Aldicarb-sulfone PESTANAL	250mg	NEAT	36670-250MG	
1646-87-3	Aldicarb-sulfoxide PESTANAL	100mg	NEAT	36784-100MG-R	
1646-88-4	Aldoxycarb	10mg	NEAT	PS1055	
309-00-2	Aldrin	2µg/mL	isooctane (10mL)	48963	
		200µg/mL	isooctane (10mL)	48962	
		5000µg/mL	methanol	40220-U	
	Aldrin PESTANAL	250mg	NEAT	36666-250MG	
	Alfacron – see Azamethiphos				
	Alfa-tox – see Diazinon				
95-95-4	Allethrin, mixture of stereo isomers PESTANAL	250mg	NEAT	45317-250MG	
	δ-trans Allethrin – see Bioallethrin				
93-71-0	Allidochlor PESTANAL	250mg	NEAT	45318-250MG	
107-18-6	Allyl Alcohol (1-Propene-3-ol)	1000mg	NEAT	442445-U	
107-05-1	Allyl chloride - see 3-Chloro-1-propene				
57-06-7	Allyl iso-thiocyanate PESTANAL	1000mg	NEAT	36682-1G	
	Alphamethrin – see α-Cypermethrin				
	Altosid – see Methoprene				
	Amber – see Triasulfuron				
	Ambush – see Permethrin isomers				
834-12-8	Ametryn	100mg	NEAT	49084	
	Ametryn PESTANAL	250mg	NEAT	45321-250MG	
	Amidosulfuron PESTANAL	250mg	NEAT	45748-250MG	
934-32-7	2-Aminobenzimidazole PESTANAL	250mg	NEAT	36570-250MG-R	
150-13-0	4-Aminobenzoic acid	1000mg	NEAT	442401	
96-16-8	3-Aminobenzotrifluoride - see α, α, α-Trifluoro-m-toluidine				
92-67-1	4-Aminobiphenyl	100mg	NEAT	442402-U	
35572-78-2	2-Amino-4, 6-dinitrotoluene	1000µg/mL	acetonitrile	47749-U	
1946-51-0	4-Amino-2,6-dinitrotoluene	1000µg/mL	acetonitrile	47750	
1066-51-9	Aminomethyl phosphonic acid	100mg	NEAT	MET1051A	
95-55-6	2-Aminophenol PESTANAL	1000mg	NEAT	36683-1G	
591-27-5	3-Aminophenol PESTANAL	1000mg	NEAT	36684-1G	
123-30-8	4-Aminophenol PESTANAL	1000mg	NEAT	35837-1G	
504-29-0	2-Aminopyridine PESTANAL	1000mg	NEAT	36685-1G	
462-08-8	3-Aminopyridine PESTANAL	1000mg	NEAT	36686-1G	
504-24-5	4-Aminopyridine PESTANAL	1000mg	NEAT	36687-1G	
	Aminotriazole - see Amitrole				
	Amiral – see Triadimefon				
33089-61-1	Amitraz PESTANAL	250mg	NEAT	45323-250MG	
61-82-5	Amitrole PESTANAL	250mg	NEAT	45324-250MG	
955-05-8	tert-Amyl methyl ether	1000mg	NEAT	442794	
		2000µg/mL	methanol	506737	
438-22-2	5-α-Androstane	2000µg/mL	methylene chloride	48168	
101-05-3	Anilazine PESTANAL	250mg	NEAT	45325-250MG-R	
62-53-3	Aniline	5000µg/ mL	methanol	40542	
	Aniline PESTANAL	250mg	NEAT	45326-250MG	
4165-6	Aniline-d5	100mg	NEAT	442454	
		2000µg/mL	methylene chloride	48788	
64249-01-0	Anilofos PESTANAL	250mg	NEAT	45749-250MG	

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CAS NO.	COMPOUND	QTY./CONC.	SOLVENT	CAT. NO.	PRICE
120-12-7	Anthracene	5000mg	NEAT	48567	
		200µg/mL	methanol	48647	
		1000µg/mL	acetone	40076	
1719-06-8	Anthracene-d10	100mg	NEAT	442456	
		2000µg/mL	methylene chloride	48863	
	9,10-Anthracenedione – see 9,10-Anthraquinone				
84-65-1	9,10-Anthraquinone	1000mg	NEAT	PS926	
	Anthraquinone PESTANAL	250mg	NEAT	45327-250MG-R	
86-88-4	ANTU PESTANAL	250mg	NEAT	45328-250MG	
	Aphox – see Pirimicarb				
	Applaud – see Buprofezin				
	Appollo – see Clofentezine				
54-49-9	Aramite	2000µg/mL	methylene chloride	47519-U	
	Arelon – see Isoproturon				
12674-11-2	Aroclor 1016	50mg	NEAT	48591	
		200µg/mL	methanol	48701	
		1000µg/mL	isooctane	48097	
		1000µg/mL	methanol	48050-U	
		1000µg/mL	hexane	90123R	
		50mg/kg	transformer oil (5mL)	47925	
		500mg/kg	transformer oil (5mL)	47962	
11104-28-2	Aroclor 1221	50mg	NEAT	48587	
		200µg/mL	methanol	48705	
		1000µg/mL	isooctane	48098	
		1000µg/mL	methanol	48051	
		1000µg/mL	hexane	90124R	
		50mg/kg	transformer oil (5mL)	47963	
		500mg/kg	transformer oil (5mL)	47964	
11141-16-5	Aroclor 1232	10mg	NEAT	48588	
		200µg/mL	methanol	48702	
		1000µg/mL	isooctane	44805	
		1000µg/mL	methanol	48052	
		1000µg/mL	hexane	90125R	
		50mg/kg	transformer oil (5mL)	47967-U	
		500mg/kg	transformer oil (5mL)	47968	
53469-21-9	Aroclor 1242	50mg	NEAT	48585	
		1µg/mL	isooctane	44812	
		200µg/mL	methanol	48706	
		1000µg/mL	isooctane	44806	
		1000µg/mL	methanol	48053-U	
		1000µg/mL	hexane	90126R	
		50mg/kg	transformer oil (5mL)	48732	
		500mg/kg	transformer oil (5mL)	48731	
12672-29-6	Aroclor 1248	50mg	NEAT	48589	
		1000µg/mL	isooctane	44807	
		200µg/mL	methanol	48703	
		1000µg/mL	methanol	48054	
		1000µg/mL	hexane	90127R	
		50mg/kg	transformer oil (5mL)	47965-U	
		500mg/kg	transformer oil (5mL)	47966	
11097-69-1	Aroclor 1254	50mg	NEAT	48586	
		1000µg/mL	isooctane	44808	
		1µg/mL	isooctane	44814	
		200µg/mL	methanol	48707	
		1000µg/mL	methanol	48055-U	
		1000µg/mL	hexane	90128R	
		50mg/kg	transformer oil (5mL)	48734	
		500mg/kg	transformer oil (5mL)	48733	
11096-82-5	Aroclor 1260	1000µg/ mL	isooctane	44809	
		1µg/mL	isooctane	44815	
		200µg/mL	methanol	48704	
		1000µg/mL	methanol	48056	
		1000µg/mL	hexane	90129R	
		50mg/kg	transformer oil (5mL)	48736	
		500mg/kg	transformer oil (5mL)	48735	

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CAS NO.	COMPOUND	QTY./CONC.	SOLVENT	CAT. NO.	PRICE
37324-23-5	Aroclor 1262	10mg	NEAT	442463	
		1µg/mL	isooctane	44816	
		1000µg/mL	isooctane	44810	
		50mg/kg	transformer oil (5mL)	47482	
		500mg/kg	transformer oil (5mL)	47483	
66230-04-4	Asana	100mg	NEAT	PS2004	
3244-90-4	Aspon	1000mg	NEAT	PS663	
	Assure – see Quizalofop ethyl				
3337-71-1	Asulam PESTANAL	250mg	NEAT	45329-250MG	
1912-24-9	Atrazine	100mg	NEAT	49085	
		1000µg/mL	methyl t-butyl ether	48187	
	Atrazine PESTANAL	250mg	NEAT	45330-250MG-R	
6190-65-4	Atrazine-desethyl PESTANAL	250mg	NEAT	36629-250MG	
3397-62-4	Atrazine-desethyl-desisopropyl PESTANAL	250mg	NEAT	36667-250MG	
1007-28-9	Atrazine-desisopropyl PESTANAL	250mg	NEAT	36628-250MG	
7313-54-4	Atrazine-desisopropyl-2-hydroxy PESTANAL	100mg	NEAT	45630-100MG-R	
2163-68-0	Atrazine-2-hydroxy PESTANAL	250mg	NEAT	36631-250MG	
	Avadex – see Diallate				
	Avadex BW – see Tri-allate				
	Axiom – see Akton				
11141-17-6	Azadirachtin	10mg	NEAT	PS2075	
66003-55-2	Azamethiphos PESTANAL	250mg	NEAT	45331-250MG	
2642-71-9	Azinphos-ethyl PESTANAL	250mg	NEAT	45332-250MG	
86-50-0	Azinphos-methyl PESTANAL	250mg	NEAT	45333-250MG	
4658-28-0	Aziprotr yne PESTANAL	250mg	NEAT	45334-250MG	
103-33-3	Azobenzene	500mg	NEAT	442465	
		2000µg/mL	methanol	47959	
41083-11-8	Azocyclotin PESTANAL	250mg	NEAT	45335-250MG	
	Azofume – see Azobenzene				
131860-33-8	Azoxystrobin PESTANAL	100mg	NEAT	46160-100MG-R	
	BAAM – see Amitraz				
	Balan – see Benfluralin				
	Banvel – see Dicamba				
101-27-9	Barban	1000mg	NEAT	PS540	
	Barban PESTANAL	250mg	NEAT	36752-250MG	
3766-81-2	Baycarb	1000mg	NEAT	PS1046	
114-26-1	Baygon	1000mg	NEAT	PS551	
	Bayleton – see Triadimefon				
55219-65-3	Baytan	100mg	NEAT	PS1064	
	Baytex – see Fenthion				
68359-37-5	Baythroid	100mg	NEAT	PS1090	
	BDMC	100mg	NEAT	PS450	
71626-11-4	Benalaxyl PESTANAL	250mg	NEAT	36760-250MG-R	
22781-23-3	Bendiocarb PESTANAL	250mg	NEAT	45336-250MG	
	Benefin – see Benfluralin				
1861-40-1	Benfluralin PESTANAL	250mg	NEAT	45337-250MG	
15310-01-7	Benodanil PESTANAL	250mg	NEAT	45338-250MG	
17804-35-2	Benomyl PESTANAL	250mg	NEAT	45339-250MG	
83055-99-6	Bensulfuron-methyl PESTANAL	250mg	NEAT	46048-250MG-R	
741-58-2	Bensulide PESTANAL	250mg	NEAT	45340-250MG-R	
25057-89-0	Bentazone PESTANAL	250mg	NEAT	45341-250MG-R	
	Bentazon methyl derivative	50mg	NEAT	PS1112	
28249-77-6	Benthiocarb	1000mg	NEAT	PS1017	
	Bethrodine – see Balan				
	Benylate – see Benzyl benzoate				
1157-84-2	Benzaldehyde-2,4-DNPH	100mg	NEAT	442469	
		100µg/mL	acetonitrile	47343	
93-98-1	Benzanilide	1000mg	NEAT	442470	

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CAS NO.	COMPOUND	QTY./CONC.	SOLVENT	CAT. NO.	PRICE
71-43-2	Benzene	5000mg	NEAT	48503	
		200µg/mL	methanol	48617	
		5000µg/mL	methanol	40004	
1076-43-3	Benzene-d6	1000mg	NEAT	442472	
		2000µg/mL	methanol	48940-U	
	Benzene hexachloride – see BHC				
92-87-5	Benzidine	100mg	NEAT	48504	
		500µg/mL	methylene chloride	48725	
		5000µg/mL	methanol	40005	
56-55-3	Benzo(a)anthracene	100mg	NEAT	48563	
		200µg/mL	methylene chloride	48651	
		1000µg/mL	methanol	40070-U	
1718-53-2	Benzo(a)anthracene-d12	10mg	NEAT	442468	
		2000µg/mL	methylene chloride	48789	
205-99-2	Benzo(b)fluoranthene	50mg	NEAT	48490	
		200µg/mL	methanol	48637	
		1000µg/mL	acetone	40072	
205-82-3	Benzo(j)fluoranthene	2000µg/mL	methylene chloride	502332	
	Benzo(jk)fluorene – see Fluoranthene				
207-08-9	Benzo(k)fluoranthene	50mg	NEAT	48492	
		200µg/mL	methylene chloride	48668	
		1000µg/mL	acetone	40073	
65-85-0	Benzoic acid	200µg/mL	methylene chloride	48323	
191-24-2	Benzo(ghi)perylene	25mg	NEAT	48491	
		200µg/mL	methylene chloride	48667	
119-61-9	Benzophenone	500mg	NEAT	442842	
50-32-8	Benzo(a)pyrene	100mg	NEAT	48564	
		200µg/mL	methylene chloride	48665	
		1000µg/mL	acetone	40071	
	Benzo(a)pyrene-d12	10mg	NEAT	442847	
192-97-2	Benzo(e)pyrene	25mg	NEAT	442475	
22212-55-1	Benzoylprop-ethyl PESTANAL	100mg	NEAT	45343-100MG-R	
83055-99-6	Benzsulfuron methyl	100mg	NEAT	PS1082	
100-51-6	Benzyl alcohol	1000mg	NEAT	442481	
100-46-9	Benzylamine	1000mg	NEAT	442483	
120-51-4	Benzyl benzoate	1000mg	NEAT	PS904	
85-68-7	Benzyl butyl phthalate	1000mg	NEAT	442503	
98-08-8	Benzotrifluoride - see α,α,α-Trifluorotoluene				
608-73-1	BHC (Benzene hexachloride)	500mg	NEAT	49007	
319-84-6	α-BHC	50mg	NEAT	48493	
		1000µg/mL	methanol	40100-U	
319-85-7	β-BHC	50mg	NEAT	48494	
		1000µg/mL	acetone	40101	
319-86-8	δ-BHC	50mg	NEAT	48495	
		1000µg/mL	methanol	40103-U	
58-89-9	γ-BHC (Lindane)	250mg	NEAT	442598	
		2µg/mL	isooctane (10mL)	48961	
		200µg/mL	isooctane (10mL)	48960-U	
		1000µg/mL	methanol	40102	
	γ-BHC (Lindane) PESTANAL	250mg	NEAT	45548-250MG	
	Bicyclopentadiene – see Dicyclopentadiene				
	Bidrin – see Dicrotophos				
42576-02-3	Bifenox PESTANAL	250mg	NEAT	45345-250MG-R	
82657-04-3	Bifenthrin PESTANAL	100mg	NEAT	34314-100MG	
28057-48-9	Bioallethrin PESTANAL	250mg	NEAT	45347-250MG-R	
28434-00-6	s-Bioallethrin	1000mg	NEAT	PS790	
92-52-4	Biphenyl	2000µg/ mL	methanol	48161	
	Biphenyl PESTANAL	1000mg	NEAT	35800-1G	
	Bi-phenyl-2-ol – see o-Phenylphenol				

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366-18-7	2,2'-Bipyridine PESTANAL	1000mg	NEAT	36759-1G	
111-44-4	Bis(2-chloroethyl)ether	5000mg	NEAT	48515-U	
		5000µg/mL	methanol	40016	
108-60-1	Bis(2-chloroisopropyl)ether	100mg	NEAT	48498	
		5000µg/mL	methanol	40040-U	
103-23-1	Bis(2-ethylhexyl) adipate	250mg	NEAT	442492	
117-81-7	Bis(2-ethylhexyl) phthalate	1000mg	NEAT	48557	
		5000µg/mL	methanol	40064	
56-35-9	Bis[tri-n-butyltin]oxide	1000mg	NEAT	PS282	
55179-31-2	Bitertanol, mix of diastereo isomers PESTANAL	250mg	NEAT	45349-250MG	
	Bladafum – see Sulfotep				
	Bladan – see Parathion				
	Bolstar – see Sulprofos				
	Botran – see Dicloran				
56073-10-0	Brodifacoum PESTANAL	100mg	NEAT	46036-100MG	
314-40-9	Bromacil PESTANAL	250mg	NEAT	45350-250MG	
	Bromex – see Dichlofenthion				
33399-00-7	Bromfenvinphos-ethyl, mix of cis and trans isomers PESTANAL	100mg	NEAT	45816-100MG	
	Brominal – see Bromoxynil				
79-08-3	Bromoacetic acid	100mg	NEAT	442494	
		1000µg/mL	methyl t-butyl ether	47655-U	
108-86-1	Bromobenzene	500mg	NEAT	442495	
		5000µg/mL	methanol	40406-U	
5589-96-8	Bromochloroacetic acid	50mg	NEAT	442496-U	
		1000µg/mL	methyl t-butyl ether	47659-U	
83463-62-1	Bromochloroacetonitrile	100mg	NEAT	442497	
694-80-4	2-Bromochlorobenzene	1000mg	NEAT	442333	
		750µg/mL	methanol	47487	
106-39-8	4-Bromochlorobenzene	1000mg	NEAT	442403	
		750µg/mL	methanol	47485	
74-97-5	Bromochloromethane	500mg	NEAT	442498	
		200µg/mL	methanol	48344	
		2000µg/mL	methanol	48067	
		20,000µg/mL	methanol	48711	
3017-95-6	2-Bromo-1-chloropropane	1000mg	NEAT	47758	
		2000µg/mL	methanol	48088	
		20,000µg/mL	methanol	48713	
7113-314-7	Bromodichloroacetic acid	100mg	NEAT	442499	
		1000µg/mL	methyl t-butyl ether	47278	
75-27-4	Bromodichloromethane	1000mg	NEAT	48540-U	
		200µg/mL	methanol	48615	
		5000µg/mL	methanol	40046	
540-51-2	2-Bromoethanol	1000mg	NEAT	442334	
		2000µg/mL	toluene	48874	
460-00-4	4-Bromofluorobenzene	1000mg	NEAT	442404	
		2000µg/mL	methanol	48083	
		25,000µg/mL	methanol	48800	
75-25-2	Bromoform	5000mg	NEAT	48539	
		200µg/mL	methanol	48618	
		5000µg/mL	methanol	40212	
74-83-9	Bromomethane	200µg/mL	methanol	48624	
580-13-2	2-Bromonaphthalene	20,000µg/mL	methanol	47929	
106-41-2	4-Bromophenol	1000mg	NEAT	442405	
	Bromophos – see Bromophos methyl				
4824-78-6	Bromophos-ethyl PESTANAL	250mg	NEAT	45353-250MG	
2104-96-3	Bromophos-methyl PESTANAL	250mg	NEAT	45354-250MG-R	
598-72-1	2-Bromopropionic acid	1000mg	NEAT	442337	
	Bromopropylate – see Acarol				

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CAS NO.	COMPOUND	QTY./CONC.	SOLVENT	CAT. NO.	PRICE
3042-84-0	Bromopyrazon PESTANAL	250mg	NEAT	45358-250MG	
1689-84-5	Bromoxynil PESTANAL	250mg	NEAT	45355-250MG	
	Bromoxynil-methyl ether	50mg	NEAT	MET426B	
1689-99-2	Bromoxynil-octanoate PESTANAL	250mg	NEAT	45356-250MG	
18181-80-1	Brompropylate PESTANAL	250mg	NEAT	45357-250MG	
116255-48-2	Bromuconazol PESTANAL	100mg	NEAT	46094-100MG-R	
52-51-7	Bronopol PESTANAL	250mg	NEAT	45359-250MG-R	
	Bunema – see Busan 40				
41483-43-6	Bupirim ate PESTANAL	250mg	NEAT	45360-250MG-R	
69327-76-0	Buprofezin PESTANAL	250mg	NEAT	45807-250MG	
51026-28-9	Busan 40	100mg	NEAT	PS2019	
128-03-0	Busan 85	100mg	NEAT	PS2020	
23184-66-9	Butachlor PESTANAL	250mg	NEAT	45818-250MG	
	Butacide – see Piperonyl butoxide				
71-36-3	n-Butanol	1000mg	NEAT	442665	
75-65-0	t-But anol	1000mg	NEAT	442790	
71-36-3	1-Butanol	2000µg/mL	methanol	47950	
78-93-3	2-But anone	100µg/mL 2000µg/mL 5000µg/mL	acetonitrile methanol:water, 90:10 methanol:water, 90:10	47344 48877 40311	
78-93-3	2-Butanone-2,4-DNPH	100mg	NEAT	442339	
34681-10-2	Butocarboxim PESTANAL	250mg	NEAT	45361-250MG	
	Butox – see Deltamethrin				
34681-23-7	Butoxycarboxim PESTANAL	250mg	NEAT	45362-250MG	
9003-13-8	Butoxypolypropylene glycol	1000mg	NEAT	PS908	
32629-47-9	Butralin PESTANAL	250mg	NEAT	36528-250MG	
123-86-4	n-Butyl acetate	100mg	NEAT	442666	
2008-41-5	Butylate PESTANAL	250mg	NEAT	45363-250MG	
104-51-8	n-Butylbenzene	1000mg 5000µg/mL	NEAT methanol	47322 41105	
135-98-8	sec-Butylbenzene	5000µg/mL	methanol	41104	
136-60-7	n-Butyl benzoate	1000mg	NEAT	442667	
85-68-7	Butylbenzylphthalate (see Benzyl butyl phthalate)				
98-28-2	4-tert-Butyl-2-chlorophenol	10mg	NEAT	MET607A	
637-92-3	tert-Butyl ethyl ether	1000mg	NEAT	442795	
	2,6-di-tert-Butylphenol	500mg	NEAT	442859	
98-54-4	4-tert-Butyl phenol	1000mg	NEAT	506761	
1527-98-6	n-Butyraldehyde-2,4-DNPH	100mg 1000µg/mL	NEAT acetonitrile	442504 47345-U	
75-60-5	Cacodylic acid PESTANAL	250mg	NEAT	45726-250MG-R	
124-65-2	Cacodylic acid sodium salt PESTANAL	250mg	NEAT	45727-250MG-R	
	Cadminate – see Cadmium succinate				
141-00-4	Cadmium succinate	1000mg	NEAT	PS280	
	Camphechlor – see Toxaphene				
79-92-5	Camphene	1000mg	NEAT	442505	
	Caparol – see Prometryn				
2425-06-1	Captafol PESTANAL	250mg	NEAT	45365-250MG	
133-06-2	Captan PESTANAL	250mg	NEAT	45366-250MG-R	
	Capture – see Bifenthrin				
	Carbamult – see Promecarb				
63-25-2	Carbaryl PESTANAL	250mg	NEAT	45367-250MG-R	
86-74-8	Carbazole	1000mg 2000µg/mL	NEAT methylene chloride	442506 48076	
10605-21-7	Carbendazim PESTANAL	250mg	NEAT	45368-250MG	
16118-49-3	Carbetam ide PESTANAL	250mg	NEAT	45369-250MG	
1563-66-2	Carbofuran PESTANAL	250mg	NEAT	45370-250MG-R	
16655-82-6	Carbofuran-3-hydroxy PESTANAL	10mg	NEAT	46038-10MG	

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	Carbofuranphenol-3-keto	50mg	NEAT	MET754F	
75-15-0	Carbon disulfide	100mg	NEAT	4S42200	
		1000mg	NEAT	442200	
		200µg/mL	methanol	48361	
		5000µg/mL	methanol	40363	
56-23-5	Carbon tetrachloride	1000mg	NEAT	48505	
		200µg/mL	methanol	48604	
		5000µg/mL	methanol	40360-U	
786-19-6	Carbophenothion PESTANAL	250mg	NEAT	45300-250MG-R	
22042-59-7	Cartap	500mg	NEAT	PS2069	
15263-52-2	Cartap hydrochloride PESTANAL	100mg	NEAT	45995-100MG	
	Carvadex – see Cyromazine				
	Charge – see l-Cyhalothrin				
2439-01-2	Chinomethionate PESTANAL	250mg	NEAT	45372-250MG	
56-75-7	Chloramphenicol	1000mg	NEAT	442513	
302-17-0	Chloral hydrate	1000µg/mL	acetonitrile	47335-U	
118-75-2	Chloranil	1000mg	NEAT	PS11	
57-74-9	Chlordane, technical mixture	20µg/mL	methanol	48699	
		200µg/mL	isooctane	47554-U	
		200µg/mL	isooctane (10mL)	48984	
		500µg/mL	methanol	48881	
		1000µg/mL	isooctane	48065-U	
		5000µg/mL	methanol	40089	
	Chlordane, technical mixture PESTANAL	250mg	NEAT	45378-250MG	
5103-71-9	α-Chlordane	10mg	NEAT	442449	
5103-74-2	γ-Chlordane	50mg	NEAT	442599	
22212-52-8	α-Chlordane (cis)	100µg/mL	hexane	48192	
5103-74-2	γ-Chlordane (trans)	100µg/mL	hexane	48193	
143-50-0	Chlordecone (Kepone)	100mg	NEAT	49046	
	Chlordecone PESTANAL	250mg	NEAT	45379-250MG	
19750-95-9	Chlordimeform hydrochloride PESTANAL	250mg	NEAT	35914-250MG	
14437-17-3	Chlorofenprop-methyl PESTANAL	250mg	NEAT	45381-250MG	
470-90-6	Chlorfenvinphos, mix of cis and trans isomers PESTANAL	250mg	NEAT	36551-250MG	
71422-67-9	Chlorfluazuron PESTANAL	250mg	NEAT	36530-250MG-R	
2464-37-1	Chlorflurenol PESTANAL	100mg	NEAT	45721-100MG	
2536-31-4	Chlorflurenol-methyl PESTANAL	250mg	NEAT	45302-250MG	
1698-60-8	Chloridazon PESTANAL	250mg	NEAT	45385-250MG	
90982-32-4	Chlorimuron ethyl	100mg	NEAT	PS1081	
	Chlorinated camphene – see Toxaphene				
999-81-5	Chlormequat chloride PESTANAL	250mg	NEAT	45387-250MG	
79-11-8	Chloroacetic acid	1000µg/mL	methyl t-butyl ether	47654-U	
	Chloroacetic acid PESTANAL	1000mg	NEAT	36544-1G	
95-51-2	2-Chloroaniline	2000µg/ mL	methanol	48031	
106-47-8	4-Chloroaniline	5000µg/ mL	methanol	40305	
	4-Chloroaniline PESTANAL	1000mg	NEAT	35823-1G	
	Chloroben – see 1,2-Dichlorobenzene				
108-90-7	Chlorobenzene	5000mg	NEAT	48506	
		200µg/mL	methanol	48610-U	
		5000µg/mL	methanol	40006	
		10000µg/mL	methylene chloride	46860-U	
3114-55-4	Chlorobenzene-d5	500mg	NEAT	442517	
		2000µg/mL	methanol	48086	
		5000µg/mL	methanol	48387	
510-15-6	Chlorobenzilate	200µg/mL	methylene chloride	48370	
118-91-2	2-Chlorobenzoic acid	1000mg	NEAT	506877	
74-11-3	4-Chlorobenzoic acid	1000mg	NEAT	506885	
873-32-5	2-Chlorobenzonitrile	1000mg	NEAT	MET2015A	
74-97-5	Chlorobromomethane – see Bromochloromethane				
3017-95-6	1-Chloro-2-bromopropane – see 2-Bromo-1-chloropropane				
3397-62-4	2-Chloro-4,6-diamino-1,3,5-triazine	100mg	NEAT	MET58C	

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CAS NO.	COMPOUND	QTY./CONC.	SOLVENT	CAT. NO.	PRICE
5278-95-5	Chlorodibromoacetic acid	100mg	NEAT	442519	
		1000µg/mL	methyl t-butyl ether	47277	
124-48-1	Chlorodibromomethane – see Dibromochloromethane				
97-50-7	5-Chloro-2,4-dimethoxyaniline PESTANAL	1000mg	NEAT	35991-1G	
75-00-3	Chloroethane (Ethyl chloride)	200µg/mL	methanol	48626	
		1000µg/mL	methanol	40015	
107-07-3	2-Chloroethanol (Ethylene chlorohydrin)	2000µg/mL	methanol	48085	
	2-Chloroethanol PESTANAL	1000mg	NEAT	36693-1G	
110-75-8	2-Chloroethyl vinyl ether	100mg	NEAT	4S8516	
		5000mg	NEAT	48516	
		200µg/mL	methanol	48672	
		5000µg/mL	methanol	40017	
348-51-6	1-Chloro-2-fluorobenzene	2000µg/ mL	methanol	48369	
352-33-0	1-Chloro-4-fluorobenzene	1000mg	NEAT	442257	
		5000µg/mL	methanol	48194	
67-66-3	Chloroform (Trichloromethane)	1000mg	NEAT	48520-U	
		200µg/mL	methanol	48603	
		5000µg/mL	methanol	40021	
544-10-5	1-Chlorohexane	100mg	NEAT	4S42258	
		1000mg	NEAT	442258	
615-67-8	Chlorohydroquinone PESTANAL	250mg	NEAT	45384-250MG	
59-50-7	4-Chloro-3-methylphenol	5000mg	NEAT	48519	
90-13-1	1-Chloronaphthalene	1000mg	NEAT	442259-U	
		2000µg/mL	methanol	48159	
91-58-7	2-Chloronaphthalene	1000mg	NEAT	48517	
		5000µg/mL	methanol	40018	
2675-77-6	Chloroneb PESTANAL	250mg	NEAT	45388-250MG	
89-63-4	4-Chloro-2-nitroaniline	1000mg	NEAT	48020	
619-08-9	2-Chloro-4-nitrophenol	1000mg	NEAT	MET669A	
3386-33-2	1-Chlorooctadecane	1000mg	NEAT	442260	
111-85-3	1-Chlorooctane	1000mg	NEAT	442261	
3691-35-8	Chlorophacinone PESTANAL	250mg	NEAT	45390-250MG	
95-57-8	2-Chlorophenol	5000mg	NEAT	48521	
		500µg/mL	methanol	48689	
	2-Chlorophenol PESTANAL	1000mg	NEAT	36746-1G	
108-43-0	3-Chlorophenol	1000mg	NEAT	36747-1G	
106-48-9	4-Chlorophenol	500mg	NEAT	442411	
	4-Chlorophenol PESTANAL	1000mg	NEAT	35826-1G	
614-61-9	o-Chlorophenoxy acetic acid	1000mg	NEAT	PS38	
76-06-2	Chloropicrin	100mg	NEAT	442521	
	Chloropicrin PESTANAL	250mg	NEAT	34321-250MG	
	Chloroprene	2000µg/mL	methanol	46869-U	
107-05-1	3-Chloro-1-propene (Allyl chloride)	1000mg	NEAT	442446	
		2000µg/mL	methanol	48295	
64902-72-3	Chlorosulfuron PESTANAL	100mg	NEAT	34322-100MG	
1897-45-6	Chlorothalonil PESTANAL	250mg	NEAT	36791-250MG	
95-49-8	2-Chlorot oluene	5000µg/mL	methanol	40150-U	
106-43-4	4-Chlorotoluene	5000µg/mL	methanol	40152-U	
94-74-6	4-Chloro-o-tolyloxyacetic acid	1000mg	NEAT	PS40	
2436-73-9	4-Chloro-o-tol yoxyacetic acid methyl ester	100mg	NEAT	PS1105	
1897-45-6	Chlorothalonil	1000mg	NEAT	PS1020	
15545-48-9	Chlorotoluron PESTANAL	250mg	NEAT	45400-250MG-R	
1891-95-8	Chloroxynil PESTANAL	100mg	NEAT	34320-100MG	
14816-20-7	Chlorphoxim PESTANAL	250mg	NEAT	45392-250MG	
101-21-3	Chlorpropham PESTANAL	250mg	NEAT	45393-250MG	
5836-10-2	Chlorpropylat PESTANAL	250mg	NEAT	45394-250MG	
2921-88-2	Chlorpyrifos	1000µg/mL	methyl-t-buyl ether	48104	
	Chlorpyriphos PESTANAL	250mg	NEAT	45395-250MG	
5598-13-0	Chlorpyriphos-methyl PESTANAL	250mg	NEAT	45396-250MG	

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	Chlorpyrifos methyl-O-analog	50mg	NEAT	MET418B	
64902-72-3	Chlorsulfuron	100mg	NEAT	PS1065	
1861-32-1	Chlorthal	1000mg	NEAT	PS33	
	Chlortokem – see Chlorotoluron				
218-01-9	Chrysene	100mg	NEAT	48565-U	
		200µg/mL	methylene chloride	48650	
		1000µg/mL	acetone	40074	
1719-03-5	Chrysene-d12	25mg	NEAT	442523	
		2000µg/mL	methylene chloride	48416	
	Ciodrin – see Crotoxyphos				
	CIPC – see Chloropropham				
	Citation – see Cyrmoazine				
	Classic – see Chlorimuron ethyl				
99129-21-2	Clethodim	100mg	NEAT	PS2045	
	Cletodine – see Clethodim				
105512-06-9	Clodinafop-propargyl PESTANAL	250mg	NEAT	46122-250MG-R	
74115-24-5	Clofentezine PESTANAL	250mg	NEAT	36763-250MG	
81777-89-1	Clomazone PESTANAL	100mg	NEAT	46120-100MG-R	
1702-17-6	Clopyralid PESTANAL	250mg	NEAT	36758-250MG	
99607-70-2	Cloquintocet mexyl PESTANAL	250mg	NEAT	46123-250MG-R	
	CMU – see Monuron				
	Commodore – see l-Cyhalothrin				
	Concord – see α-Cypermethrin				
	Copper naphthenate	1000mg	NEAT	PS2028	
1332-65-6	Copper oxychloride	1000mg	NEAT	PS292	
	Cotoran – see Fluometuron				
117-52-2	Coumafuryl PESTANAL	10mg	NEAT	34324-10MG	
	Counter – see Terbufos				
108-39-4	m-Cresol – see 3-Methylphenol				
95-48-7	o-Cresol – see 2-Methylphenol				
06-44-5	p-Cresol – see 4-Methylphenol				
535-89-7	Crimidine PESTANAL	250mg	NEAT	36564-250MG	
123-73-9	Crotonaldehyde-2,4-DNPH	100mg	NEAT	442529	
		100µg/mL	acetonitrile	47175-U	
7700-17-6	Crotoxyphos	50mg	NEAT	PS603	
	Cryson – see Resmethrin				
98-82-8	Cumene – see Isopropylbenzene				
	Cumene PESTANAL	1000mg	NEAT	36698-1G	
	Cuprinol – see Copper naphthenate				
	Curacron – see Profenofos				
	Curzate – see Cymoxanil				
21725-46-2	Cyanazine	100mg	NEAT	442530	
		2000µg/mL	methanol	48592	
2636-26-2	Cyanophos	100mg	NEAT	PS2034	
	Cyanox – see Cyanophos				
1134-23-2	Cycloate PESTANAL	250mg	NEAT	45408-250MG	
110-82-7	Cyclohexane	1000mg	NEAT	442531	
108-94-1	Cyclohexanone	1000mg	NEAT	442532	
108-94-1	Cyclohexanone-DNPH	100mg	NEAT	442533	
101205-02-1	Cycloxydim PESTANAL	100mg	NEAT	46071-100MG-R	
68359-37-5	Cyfluthrin PESTANAL	250mg	NEAT	46003	
	Cygon – see Dimethoate				
91465-08-6	λ-Cyhalothrin PESTANAL	100mg	NEAT	34325-100MG-R	
	Cyhexatin – see Tricyclohexyltin hydroxide				
	Cymate – see Ziram				
57966-95-7	Cymoxanil	100mg	NEAT	PS1067	
	Cymoxanil PESTANAL	100mg	NEAT	34326-100MG	

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	Cyolane – see Phosfolan				
52315-07-8	Cypermethrin	100mg	NEAT	PS1068	
67375-30-8	α-Cypermethrin	500mg	NEAT	PS2083	
67375-30-8	α-Cypermethrin PESTANAL	100mg	NEAT	45806-100MG	
52315-07-8	Cypermethrin, mix of isomers PESTANAL	250mg	NEAT	45412-250MG	
121552-61-2	Cyprodinil PESTANAL	250mg	NEAT	34389-250MG	
69581-33-5	Cyprofuram PESTANAL	250mg	NEAT	45413-250MG	
66215-27-8	Cyromazine	500mg	NEAT	PS2073	
94-75-7	2,4-D	1000mg	NEAT	49083	
		100µg/mL	methanol	47896	
		5000µg/mL	acetonitrile	40330	
	2,4-D PESTANAL	250mg	NEAT	45415-250MG-R	
	2,4-D sec-butyl ester	1000mg	NEAT	PS301	
2008-39-1	2,4-D dimethylamine salt	1000mg	NEAT	PS337	
3599-58-4	2,4-D ethanolamine salt	1000mg	NEAT	PS338	
	2,4-D ethyl ester	1000mg	NEAT	PS304	
25168-26-7	2,4-D isooctyl ester	1000mg	NEAT	PS319	
94-11-1	2,4-D isopropyl ester	1000mg	NEAT	PS43	
1928-38-7	2,4-D methyl ester	1000mg	NEAT	49142	
		200µg/mL	hexane	47979	
75-99-0	Dalapon	1000µg/mL	methyl t-butyl ether	47656-U	
	Dalapon PESTANAL	250mg	NEAT	35562-250MG	
58811-23-7	Dalapon methyl ester	200µg/mL	hexane	47980-U	
		1000µg/mL	methyl t-butyl ether	47663-U	
17640-02-7	Dalapon-methyl PESTANAL	250mg	NEAT	45383-250MG	
1596-84-5	Daminozide PESTANAL	250mg	NEAT	45418-250MG	
	Danitol – see Fenpropathrin				
94-82-6	2,4-DB PESTANAL	250mg	NEAT	45420-250MG-R	
18625-12-2	2,4-DB methyl ester	200µg/mL	hexane	47981	
	2,4-DB-methyl ester PESTANAL	250mg	NEAT	36776-250MG-R	
	DBCP – see 1,2-Dibromo-3-chloropropane				
	DBP – see Di-n-butylphthalate				
	DCB – see 2,6-Dichlorobenzonitrile				
83-05-6	4,4'-DDA PESTANAL	250mg	NEAT	35484-250MG	
53-19-0	2,4'-DDD	1000mg	NEAT	49015	
72-54-8	4,4'-DDD	20µg/mL	methanol	48680	
		5000µg/mL	methanol	40092	
		1000mg	NEAT	49009	
	4,4'-DDD (TDE) PESTANAL	250mg	NEAT	35486-250MG	
3424-82-6	2,4'-DDE PESTANAL	100mg	NEAT	45915-100MG	
72-55-9	4,4'-DDE	1000mg	NEAT	49017	
		200µg/mL	isooctane (10mL)	48968	
		5000µg/mL	methanol	40091	
	4,4'-DDE PESTANAL	250mg	NEAT	35487-250MG	
	DDT	1000MG	NEAT	PS74	
50-29-3	4,4'-DDT	1000mg	NEAT	49019	
		20µg/mL	methanol	48678	
		200µg/mL	isooctane (10mL)	48980	
		5000µg/mL	methanol	40124	
	4,4'-DDT PESTANAL	250mg	NEAT	35491-250MG	
	DDVP – see Dichlorvos				
2051-24-3	Decachlorobiphenyl	100mg	NEAT	442537	
	Decachlorobiphenyl	200µg/mL	acetone	48318	
434-90-2	Decafluorobiphenyl	1000mg	NEAT	442538	
		2000µg/mL	methylene chloride	48792	
5074-71-5	Decafluorotriphenylphosphine	100mg	NEAT	442543	
		2000µg/mL	methylene chloride	48082	
		25,000µg/mL	methylene chloride	48724-U	
	Decamethrin – see Deltamethrin				
124-18-5	n-Decane	1000mg	NEAT	442669	

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112-30-1	Decanol	1000mg	NEAT	442539	
872-05-9	1-Decene	1000mg	NEAT	442262	
	Dechlorane – see Mirex				
2016-57-1	Decylamine	1000mg	NEAT	442540	
85-00-7	Deiquat monohydrate PESTANAL	250mg	NEAT	45422-250MG-R	
	6-Deisopropylatrazine – see Atrazine desisopropyl				
52918-63-5	Deltamethrin PESTANAL	250mg	NEAT	45423-250MG	
	Delnav – see Dioxathion				
8065-48-3	Demeton O&S	100mg	NEAT	PS661662	
126-75-0	Demeton S	100mg	NEAT	PS662	
919-86-8	Demeton-S-methyl PESTANAL	250mg	NEAT	45304-250MG	
17040-19-6	Demeton-S-methyl-sulfone PESTANAL	250mg	NEAT	45424-250MG	
	Desanit – see Fensulfothion				
1014-69-3	Desmetryn PESTANAL	250mg	NEAT	45427-250MG	
140-56-7	Dexon	1000mg	NEAT	PS262	
10311-84-9	Dialifos PESTANAL	100mg	NEAT	36500-100MG	
2303-16-4	Diallate, mix of cis and trans isomers PESTANAL	100mg	NEAT	36501-100MG	
95-80-7	2,4-Diaminotoluene	1000mg	NEAT	442311	
333-41-5	Diazinon	1000mg	NEAT	49021	
	Diazinon PESTANAL	250mg	NEAT	45428-250MG	
53-70-3	Dibenzo(a,h)anthracene	100mg	NEAT	48574	
		200µg/mL	methylene chloride	48652	
132-64-9	Dibenzofuran	100mg	NEAT	442549	
		250mg	NEAT	45775-250MG	
		200µg/mL	methylene chloride	48325	
		5000µg/mL	methanol	40261	
189-64-0	Dibenzo(a,h)pyrene	500µg/mL	methylene chloride: benzene, 75:25	502340	
132-65-0	Dibenzothiophene	1000mg	NEAT	442550-U	
		250mg	NEAT	45776-250MG	
300-76-5	Dibrom PESTANAL	250mg	NEAT	45429-250MG	
631-64-1	Dibromoacetic acid	1000mg	NEAT	442551	
		1000µg/mL	methyl t-butyl ether	47660-U	
3252-43-5	Dibromoacetonitrile	1000mg	NEAT	442552	
92-86-4	4,4'-Dibrom obiphenyl	250mg	NEAT	442398	
		2000µg/mL	methylene chloride	48790-U	
124-48-1	Dibromochloromethane	1000mg	NEAT	48542	
		200µg/mL	methanol	48608	
		5000µg/mL	methanol	40200-U	
96-12-8	1,2-Dibromo-3-chloropropane (DBPC)	100mg	NEAT	4S42223	
		1000mg	NEAT	442223	
		200µg/mL	methanol	48338	
		5000µg/mL	methanol	40993	
	1,2-Dibromo-3-chloropropane PESTANAL	250mg	NEAT	36782-250MG-R	
106-93-4	1,2-Dibromoet hane (Ethylene dibromide)	200µg/mL	methanol	48880-U	
		5000µg/mL	methanol	40171	
	1,2-Dibromoethane PESTANAL	1000mg	NEAT	36699-1G	
1868-53-7	Dibromofluoromethane	1000mg	NEAT	442555	
		2000ug/mL	methanol	48077	
74-95-3	Dibromomethane	1000mg	NEAT	47799	
		2000µg/mL	methanol	48339	
		5000µg/mL	methanol	41097	
10386-84-2	4,4'-Dibrom ooctafluorobiphenyl	500mg	NEAT	442399-U	
		250µg/mL	acetone	47644-U	
		2000µg/mL	methylene chloride	48791	
615-58-7	2,4-Dibromophenol	1000mg	NEAT	442312	
608-33-3	2,6-Dibromophenol	1000mg	NEAT	442324	
600-05-5	2,3-Dibromopropionic acid	1000µg/mL	methyl t-butyl ether	47789	
105-99-7	Dibutyl adipate	1000mg	NEAT	442864	

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111-92-2	Di-n-butylamine PESTANAL	1000mg	NEAT	36700-1G	
1770-80-5	Dibutyl chlorendate	100mg	NEAT	442557	
		200µg/mL	acetonitrile	48129	
128-37-0	3,5-Di-tert-butyl-4-hydroxytol	1000mg	NEAT	442377	
84-74-2	Di-n-butyl phthalate	5000mg	NEAT	48559	
		5000µg/mL	methanol	40066	
	Dibutyl phthalate PESTANAL	1000mg	NEAT	36736-1G	
1918-00-9	Dicamba PESTANAL	250mg	NEAT	45430-250MG	
6597-78-0	Dicamba methyl ester	100mg	NEAT	PS1102	
		200µg/mL	hexane	47982	
	Di-captan – see Dicapthon				
2463-84-5	Dicapthon	1000mg	NEAT	PS669	
	Dichlobenil – see 2,6-Dichlorobenzonitrile				
1194-65-6	Dichlobenil PESTANAL	250mg	NEAT	45431-250MG	
97-17-6	Dichlofenthion PESTANAL	250mg	NEAT	45432-250MG	
1085-98-9	Dichlofluanid PESTANAL	250mg	NEAT	45433-250MG	
	Dichlofluanid-methyl – see Tolylfluanid				
99-30-9	Dichloran PESTANAL	250mg	NEAT	45435-250MG	
79-43-6	Dichloroacetic acid	1000µg/mL	methyl t-butyl ether	47657-U	
	Dichloroacetic acid PESTANAL	1000mg	NEAT	36545-1G	
79270-78-3	Dichlorprop-2-ethylhexyl ester PESTANAL	250mg	NEAT	45722-250MG	
15165-67-0	Dichlor prop-P PESTANAL	250mg	NEAT	36770-250MG-R	
3018-12-0	Dichloroacetonitrile	1000mg	NEAT	442560	
608-27-5	2,3-Dichloroaniline PESTANAL	1000mg	NEAT	36701-1G	
608-31-1	2,6-Dichloroaniline PESTANAL	1000mg	NEAT	36703-1G	
95-76-1	3,4-Dichloroaniline PESTANAL	1000mg	NEAT	35827-1G	
	o-Dichlorobenzene – see 1,2-Dichlorobenzene				
95-50-1	1,2-Dichlorobenzene	5000mg	NEAT	48522	
		200µg/mL	methanol	48639	
		5000µg/mL	methanol	40023	
	1,2-Dichlorobenzene PESTANAL	1000mg	NEAT	36707-1G	
2199-69-1	1,2-Dichlorobenzene-d4	250mg	NEAT	442226	
		2000µg/mL	methanol	48952-U	
		2000µg/mL	methylene chloride	48068	
541-73-1	1,3-Dichlorobenzene	5000mg	NEAT	48523	
		200µg/mL	methanol	48638	
		5000µg/mL	methanol	40214	
	1,3-Dichlorobenzene PESTANAL	1000mg	NEAT	36708-1G	
	p-Dichlorobenzene – see 1,4-Dichlorobenzene				
106-46-7	1,4-Dichlorobenzene	5000mg	NEAT	48524	
		200µg/mL	methanol	48627	
		5000µg/mL	methanol	40025	
	1,4-Dichlorobenzene PESTANAL	1000mg	NEAT	35775-1G	
3855-82-1	1,4-Dichlorobenzene-d4	1000mg	NEAT	442247	
		2000µg/mL	methanol	48049	
		2000µg/mL	methylene chloride	48419	
91-94-1	3,3'-Dichlorobenzidine	100mg	NEAT	48525	
		2000µg/mL	methanol	48029	
		5000µg/mL	methanol	40026	
51-36-5	3,5-Dichlorobenzoic acid	1000mg	NEAT	PS1107	
1194-65-6	2,6-Dichlorobenzonitrile	1000mg	NEAT	PS392	
90-98-2	4,4'-Dichlorobenzophenone	100mg	NEAT	MET854B	
2050-68-2	4,4'-Dichlorobiphenyl	500µg/mL	isooctane	48260-U	
110-56-5	1,4-Dichlorobutane	1000mg	NEAT	442248	
		2000µg/mL	methanol	48066	
		20,000µg/mL	methanol	48712	
110-57-6	trans-1,4-Dichloro-2-butene	100mg	NEAT	4S42814	
		1000mg	NEAT	442814	
		2000µg/mL	methanol	48303	
75-71-8	Dichlorod ifluoromethane	200µg/mL	methanol	48623	
		5000µg/mL	methanol	40346	

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	Dichlorodiphenyltrichloroethane – see 4,4'-DDT				
75-34-3	1,1-Dichloroethane	500mg	NEAT	48512	
		200µg/mL	methanol	48602	
		5000µg/mL	methanol	40012	
107-06-2	1,2-Dichloroethane (Ethylene dichloride)	500mg	NEAT	48509	
		200µg/mL	methanol	48613	
1760-07-0	1,2-Dichloroethane-d4	500mg	NEAT	442228	
		2000µg/mL	methanol	48941	
75-35-4	1,1-Dichloroethene	5000mg	NEAT	48526	
		200µg/mL	methanol	48601	
		1000µg/mL	methanol	40027	
156-59-2	cis-1,2-Dichloroethene	1000mg	NEAT	48597	
		2000µg/mL	methanol	48836	
		5000µg/mL	methanol	40173	
156-60-5	trans-1,2-Dichloroethene	5000mg	NEAT	48527	
		200µg/mL	methanol	48612	
		5000µg/mL	methanol	40028	
75-09-2	Dichloromethane (Methylene dichloride)	5000mg	NEAT	48538	
		200µg/mL	methanol	48600	
		5000µg/mL	methanol	40042	
97-23-4	Dichlorophene PESTANAL	250mg	NEAT	35992-250MG	
576-24-9	2,3-Dichlorophenol	500mg	NEAT	442291-U	
	2,3-Dichlorophenol PESTANAL	1000mg	NEAT	36709-1G	
120-83-2	2,4-Dichlorophenol	5000mg	NEAT	48528	
		500µg/mL	methanol	48690-U	
		5000µg/mL	methanol	40029	
	2,4-Dichlorophenol PESTANAL	1000mg	NEAT	35811-1G	
	2,4-Dichlorophenol-d3	50mg	NEAT	442880	
583-78-8	2,5-Dichlorophenol PESTANAL	1000mg	NEAT	35835-1G	
87-65-0	2,6-Dichlorophenol	5000µg/ mL	methanol	40302	
	2,6-Dichlorophenol PESTANAL	1000mg	NEAT	35990-1G-R	
95-77-2	3,4-Dichlorophenol	1000mg	NEAT	442375	
591-35-5	3,5-Dichlorophenol	1000mg	NEAT	442378	
	2,4-Dichlorophenoxy-acetic acid – see 2,4-D				
78-87-5	1,2-Dichloropropane	5000mg	NEAT	48529	
		200µg/mL	methanol	48605	
96-23-1	1,3-Dichloro-2-propanol	2000µg/ mL	methanol	48078	
513-88-2	1,1-Dichloro-2-propanone	1000mg	NEAT	442210	
563-58-6	1,1-Dichloropropene	5000µg/ mL	methanol	41166	
10061-01-5	cis-1,3-Dichloropropene	100mg	NEAT	47755	
		2000µg/mL	methanol	47368-U	
10061-02-6	trans-1,3-Dichloropropene	100mg	NEAT	47793	
		2000µg/mL	methanol	47369	
542-75-6	1,3-Dichloropropene (isomer mix)	2000mg	NEAT	48530-U	
	1,3-Dichloropropene, mix of isomers PESTANAL	250mg	NEAT	45440-250MG	
565-64-0	2,3-Dichloropropionic acid	1000mg	NEAT	442203	
120-36-5	Dichlorprop	1000mg	NEAT	PS44	
57153-17-0	Dichlorprop methyl ester	100mg	NEAT	442562	
62-73-7	Dichlorvos (DDVP) PESTANAL	250mg	NEAT	45441-250MG	
75736-33-3	Diclobut razol, mix of stereoisomers PESTANAL	250mg	NEAT	36764-250MG	
99-30-9	Dicloran	1000mg	NEAT	PS293	
115-32-2	Dicofol PESTANAL	250mg	NEAT	36677-250MG-R	
141-66-2	Dicrotophos PESTANAL	250mg	NEAT	45305-250MG	
101-83-7	Dicyclohexylamine	1000mg	NEAT	442564	
77-73-6	Dicyclopentadiene	1000mg	NEAT	PS2033	
60-57-1	Dieldrin	50mg	NEAT	49024	
		200µg/mL	isooctane (10mL)	48972	
		1000µg/mL	methanol	40088	
	Dieldrin PESTANAL	250mg	NEAT	36671-250MG	
579-66-8	2,6-Diethylaniline PESTANAL	1000mg	NEAT	36765-1G	

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CAS NO.	COMPOUND	QTY./CONC.	SOLVENT	CAT. NO.	PRICE
84-66-2	Diethyl phthalate PESTANAL	1000mg	NEAT	36737-1G	
123-79-5	Di(2-ethylhexyl)adipate	2000µg/mL	methanol	47995-U	
117-81-7	Di(2-ethylhexyl)phthalate	2000µg/mL	methanol	47994	
84-66-2	Diethyl phthalate	5000mg	NEAT	48561	
35367-38-5	Diflubenzuron PESTANAL	250mg	NEAT	45446-250MG	
83164-33-4	Diflufenican PESTANAL	100mg	NEAT	45751-100MG	
540-36-3	1,4-Difluorobenzene	1000mg 2000µg/mL	NEAT methanol	442249 48944	
38882-9	2,2'-Difluorobiphenyl	100mg 2000µg/mL	NEAT methylene chloride	442280 48787	
	Difluron – see Diflubenzuron				
	Difolatan – see Captafol				
1563-38-8	2,3-Dihydro-2,2-dimethyl-benzofuran-7-ol	1000mg	NEAT	MET754B	
110-96-3	Diisobutylamine	100mg	NEAT	506796	
929-57-7	1,6-Diisocyanaohexane	1000mg	NEAT	442254	
	Dimecron – see Phosphamidon				
115-26-4	Dimefox PESTANAL	100mg	NEAT	36502-100MG	
50563-36-5	Dimethachlor PESTANAL	250mg	NEAT	45447-250MG	
22936-75-0	Dimethametryn PESTANAL	250mg	NEAT	45448-250MG	
55290-64-7	Dimethipin	1000mg	NEAT	PS2052	
60-51-5	Dimethoate Dimethoate PESTANAL	100mg 200µg/mL 250mg	NEAT methylene chloride NEAT	442567 48371 45449-250MG	
95-68-1	2,4-Dimethylaniline	1000mg	NEAT	442315	
75-60-5	Dimethylarsinic acid	1000mg	NEAT	PS51	
152477-96-8	2,5-Dimethylbenzaldehyde-2,4-DNPH	100mg	NEAT	442321-U	
57-97-6	7,12-Dimethylbenz(a)anthracene	100mg 1000µg/mL	NEAT methanol	442425 40567	
68-12-12	Dimethyl formamide	1000mg	NEAT	442568	
81-20-9	1,3-Dimethyl-2-nitrobenzene	1000mg 250µg/mL	NEAT methyl-t-butyl ether	442243 48063	
105-67-9	2,4-Dimethylphenol	500mg 5000µg/mL	NEAT methanol	48531 40224	
101-42-8	1,1-Dimethyl-3-phenylurea	1000mg	NEAT	PS61	
950-35-6	Dimethyl-p-nitrophenylphosphate	100mg	NEAT	PS613	
131-11-3	Dimethyl phthalate	5000mg 5000µg/mL	NEAT methanol	48562 40069	
	Dimilin – see Diflubenzuron				
29091-05-2	Dinitramine PESTANAL	250mg	NEAT	34333-250MG	
99-65-0	1,3-Dinitrobenzene	1000mg 1000µg/mL	NEAT acetonitrile	442244 47746-U	
100-25-4	1,4-Dinitrobenzene	1000mg 2000µg/mL	NEAT methanol	442250 47945	
	4,6-Dinitro-o-cresol – see 2-Methyl-4,6-dinitrophenol				
534-52-1	Dinitro-o-cresol – see 2-Methyl-4,6-dinitrophenol				
51-28-5	2,4-Dinitrophenol 2,4-Dinitrophenol PESTANAL	5000µg/mL 250mg	methanol NEAT	40057 34334-250MG	
329-71-5	2,5-Dinitrophenol PESTANAL	250mg	NEAT	34335-250MG-R	
121-14-2	2,4-Dinitrotoluene	1000µg/mL	acetonitrile	47747	
606-20-2	2,6-Dinitrotoluene	1000µg/mL 5000µg/mL	acetonitrile methanol	47748-U 40034	
39300-45-3	Dinocap, technical mixture of isomers PESTANAL	250mg	NEAT	45452-250MG	
117-84-0	Di-n-octyl phthalate	5000mg	NEAT	48560-U	
88-85-7	Dinoseb Dinoseb PESTANAL	100mg 200µg/mL 250mg	NEAT methylene chloride NEAT	442570 48378 45453-250MG	
6099-79-2	Dinoseb methyl ether	200µg/mL	hexane	47984	
123-91-1	1,4-Dioxane	1000mg 2000µg/mL	NEAT methanol	442251 48367	

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78-34-2	Dioxathion	100mg	NEAT	PS658	
120-95-6	2,4-Di-tert-pentylphenol	1000mg	NEAT	442310	
131-18-0	Dipentylph thalate	1000mg	NEAT	442867	
82-66-6	Diphacinone	100mg	NEAT	PS288	
	Diphenadione – see Diphacinone				
	Diphenyl – see Biphenyl				
122-39-4	Diphenylamine	5000µg/mL	methanol	40263-U	
101-84-8	Diphenyl ether (Phenyl ether)	2000µg/mL	methanol	48155	
122-66-7	1,2-Diphenylhydrazine	100mg	NEAT	442232-U	
945-51-7	Diphenyl sulfoxide PESTANAL	1000mg	NEAT	36722-1G	
4147-51-7	Dipropetryn PESTANAL	250mg	NEAT	45459-250MG	
	Dipthal – see Tri-allate				
6385-62-2	Diquat dibromide monohydrate	1000mg	NEAT	PS365	
144-21-8	Disodium methyl arsenate	1000mg	NEAT	PS281	
	Disomar – see Disodium methyl arsenate				
298-04-4	Disulfoton	100mg	NEAT	442572	
	Disulfoton PESTANAL	250mg	NEAT	45460-250MG	
2497-06-5	Disulfoton-sulfone PESTANAL	100mg	NEAT	45871-100MG	
	Di-syston – see Disulfoton				
	DNBP – see Dinoseb				
629-97-0	n-Docosane	1000mg	NEAT	442670	
112-40-3	n-Dodecane	1000mg	NEAT	442671	
	Dolochlor – see Chloropicrin				
544-85-4	n-Dotriacontane	1000mg	NEAT	442672	
	Dowpon – see Dalapon				
	2,4-DP – see Dichlorprop				
	DPA – see Dalapon				
	DPX-F 5384 – see Benzsulfuron methyl				
	Dual (see Metolachlor)				
2921-88-2	Dursban (Chlorpyrifos)	100mg	NEAT	442573	
944-22-9	Dyfonate	1000mg	NEAT	PS664	
52-68-6	Dylox	1000mg	NEAT	PS608	
	Dyrene – see Anilazine				
112-95-8	n-Eicosane	1000mg	NEAT	442673	
3452-07-1	1-Eicosene	1000mg	NEAT	442265	
	EMQ – see Ethoxyquin				
	Enaven – see Benzoylprop ethyl				
	Endosulfan	1000mg	NEAT	PS81	
959-98-8	Endosulfan I (alpha)	25mg	NEAT	48576	
	α-Endosulfan PESTANAL	250mg	NEAT	45468-250MG	
33213-65-9	Endosulfan II (beta)	25mg	NEAT	48578	
	Endosulfan (beta isomer)	100mg	NEAT	PS812	
	β-Endosulfan PESTANAL	250mg	NEAT	36668-250MG-R	
115-29-7	Endosulfan (α+β=2+1) PESTANAL	250mg	NEAT	36750-250MG-R	
2157-19-9	Endosulfan alcohol PESTANAL	100mg	NEAT	36674-100MG	
	Endosulfan cyclic sulfate – see Endosulfan sulfate				
	Endosulfan lactone	50mg	NEAT	MET81C	
1031-07-8	Endosulfan sulfate	20µg/mL	methanol	48687	
		50mg	NEAT	PS813	
	Endosulfan sulfate PESTANAL	100mg	NEAT	36676-100MG-R	
145-73-3	Endothall	1000mg	NEAT	PS345	
		1000µg/mL	methanol	46864-U	
72-20-8	Endrin	100mg	NEAT	49032	
		20µg/mL	methanol	48675	
		200µg/mL	isooctane (10mL)	48976	
		5000µg/mL	methanol	40087	

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7421-93-4	Endrin aldehyde	25mg	NEAT	442578	
		20µg/mL	methanol	48723-U	
		1000µg/mL	methanol	40097	
53494-70-5	Endrin ketone	25mg	NEAT	442579	
	Enide – see Diphenamid				
	Enstar – see Kinoprene				
106-89-8	Epichlorohydrin	1000mg	NEAT	442580	
2104-64-5	EPN PESTANAL	100mg	NEAT	36503-100MG	
66230-04-4	Esfenvalerate PESTANAL	100mg	NEAT	46277-100MG	
	Estradiol-d3	25mg	NEAT	442878	
64-17-5	Ethanol (Ethyl alcohol)	2000µg/mL	methanol	48075	
	Ethazole – see Etridiazole				
16672-87-0	Ethephon PESTANAL	250mg	NEAT	45473-250MG	
563-12-2	Ethion PESTANAL	250mg	NEAT	45477-250MG	
13194-48-4	Ethoprophos PESTANAL	250mg	NEAT	45306-250MG	
91-53-2	Ethoxyquin PESTANAL	250mg	NEAT	45480-250MG-R	
126801-58-9	Ethoxysulfuron PESTANAL	100mg	NEAT	46300-100MG-R	
141-78-6	Ethyl acetate	1000mg	NEAT	442583	
		2000µg/mL	methanol	47947	
64-17-5	Ethyl alcohol – see Ethanol				
100-41-4	Ethylbenzene	5000mg	NEAT	48534	
		200µg/mL	methanol	48621	
		5000µg/mL	methanol	40036	
25837-05-2	Ethylbenzene-d10	2000µg/mL	methanol	48942	
115-84-4	2-Ethyl-2-butyl-1,3-propanediol	1000mg	NEAT	PS101	
75-00-3	Ethyl chloride – see Chloroethane				
107-07-3	Ethylene chlorohydrin – see 2-Chloroethanol				
5459-93-8	N-Ethylcyclohexylamine	1000mg	NEAT	MET502A	
106-93-4	Ethylene dibromide – see 1,2-Dibromoethane				
107-06-2	Ethylene dichloride – see 1,2-Dichloroethane				
75-21-8	Ethylene oxide	2000µg/mL	methylene chloride	47949	
		50,000µg/mL	methylene chloride	48891	
		50,000µg/mL	methanol	48838	
60-29-7	Ethyl ether	2000µg/mL	methanol	47948	
759-94-4	S-Ethyl dipropylthiocarbamate	1000mg	NEAT	PS54	
149-57-5	2-Ethylhexanoic acid	1000mg	NEAT	442347	
75-08-1	Ethyl mercaptan	1000mg	NEAT	506818	
107-27-7	Ethyl mercuric chloride	1000mg	NEAT	PS209	
	Ethylmercury chloride – see Ethyl mercuric chloride				
	Ethyl paraoxon – see Paraoxon				
	Ethyl parathion – see Parathion				
620-17-7	3-Ethylphenol	500mg	NEAT	442387	
123-07-9	4-Ethylphenol PESTANAL	1000mg	NEAT	36724-1G	
2593-15-9	Etridiazole (Ethazol)	250mg	NEAT	442590	
97-53-0	Eugenol PESTANAL	250mg	NEAT	35995-250MG	
	Evik – see Ametryn				
	Expand – see Sethoxydim				
52-85-7	Famphur	200µg/mL	methylene chloride	48379	
	Fenaminosulf – see Dexon				
	Fenamiphos sulfone	100mg	NEAT	MET612B	
31972-44-8	Fenamiphos-sulfon PESTANAL	100mg	NEAT	46292-100MG	
	Fenamiphos sulfoxide	50mg	NEAT	MET612A	
31972-43-7	Fenamiphos-sulfoxide PESTANAL	100mg	NEAT	46293-100MG	
14255-88-0	Fenazaflor PESTANAL	100mg	NEAT	36504-100MG	
120928-09-8	Fenazaquin PESTANAL	100mg	NEAT	46087-100MG-R	
13356-08-6	Fenbutatin oxide PESTANAL	250mg	NEAT	34342-250MG	
103112-36-3	Fenchlorazol-ethyl PESTANAL	100mg	NEAT	PS657	

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299-84-3	Fenchlorphos PESTANAL	250mg	NEAT	45485-250MG	
122-14-5	Fenitrothion PESTANAL	250mg	NEAT	45487-250MG	
	Fenophosphan – see Trichloronate				
71238-80-2	Fenoxaprop-P-ethyl PESTANAL	250mg	NEAT	36851-250MG	
79127-80-3	Fenoxycarb PESTANAL	250mg	NEAT	34343-250MG	
74738-17-3	Fenpiclonil PESTANAL	250mg	NEAT	36532-250MG	
64257-84-7	Fenpropathrin PESTANAL	250mg	NEAT	36767-250MG-R	
67564-91-4	Fenpropimorph PESTANAL	250mg	NEAT	36772-250MG-R	
111812-58-9	Fenpyroximate PESTANAL	100mg	NEAT	46137-100MG-R	
115-90-2	Fensulfothion PESTANAL	250mg	NEAT	45307-250MG	
55-38-9	Fenthion PESTANAL	250mg	NEAT	36552-250MG	
	Fenthoate – see Phenthoate				
51630-58-1	Fenvalerate PESTANAL	250mg	NEAT	45495-250MG	
	Fenvalerate alpha – see Asana				
	Filariol – see Bromophos ethyl				
79241-46-6	Fluazifop-p-butyl	100mg	NEAT	PS1097	
69806-50-4	Fluazifop-butyl PESTANAL	250mg	NEAT	36783-250MG	
2164-17-2	Fluometuron	500mg	NEAT	442593-U	
206-44-0	Fluoranthene	5000mg	NEAT	48535	
		200µg/mL	methylene chloride	48662	
		5000µg/mL	methanol	40037	
	Fluoranthene-d10	50mg	NEAT	442843	
86-73-7	Fluorene	5000mg	NEAT	48568	
		5000µg/mL	methanol	40078	
	Fluorene-d10	50mg	NEAT	442848	
62-74-8	Fluoroacetic acid sodium salt PESTANAL	1000mg	NEAT	36755-1G-R	
462-06-6	Fluorobenzene	1000mg	NEAT	47321	
		2000µg/mL	methanol	48943	
321-60-8	2-Fluorobiphenyl	2000µg/mL	methylene chloride	48722-U	
		10,000µg/mL	methylene chloride	47581-U	
321-38-0	1-Fluoronaphthalene	1000mg	NEAT	442266	
		2000µg/mL	methylene chloride	48720-U	
323-09-1	2-Fluoronaphthalene	100mg	NEAT	442349	
		2000µg/mL	methylene chloride	48721-U	
367-12-4	2-Fluorophenol	1000mg	NEAT	442350	
		2000µg/mL	methylene chloride	48719-U	
69377-81-7	Fluroxypyr PESTANAL	100mg	NEAT	45758-100MG-R	
66332-96-5	Flutolanil	1000mg	NEAT	PS2057	
76674-21-0	Flutriafol PESTANAL	100mg	NEAT	34344-100MG	
	Fluvalinate – see Mavrik				
107534-96-3	Folicur	100mg	NEAT	PS1091	
	Folimat – see Omethoate				
	Fonofos – see Dyfonate				
	Formaldehyde-2,4-DNPH	100mg	NEAT	442597	
		100µg/mL	acetonitrile	47177	
39148-24-8	Fosetyl-aluminium PESTANAL	250mg	NEAT	36790-250MG-R	
76-13-1	Freon 113	1000µg/mL	methanol	48411	
		2000µg/mL	methanol	47944	
	Freon 123	1000µg/mL	methanol	48412	
	Fumazone – see 1,2-Dibromo-3-chloropropane				
	Furatol – see Sodium fluoroacetate				
	Fusilade super – see Fluazifop-p-butyl				
	Gardona – see Tetrachlorvinphos				
	Garlon – see Triclopyr				
	(+/-) Geosmin	100µg/mL	methanol	47522-U	

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CAS NO.	COMPOUND	QTY./CONC.	SOLVENT	CAT. NO.	PRICE
	Gesagard – see Prometryn				
77-06-5	Gibberellic acid, GA3 PESTANAL	250mg	NEAT	36575-250MG	
	Glean – see Chlorsulfuron				
556-22-9	Glyodin	1000mg	NEAT	PS261	
	Glyoxide – see Glyodin				
1071-83-6	Glyphosate PESTANAL	250mg	NEAT	45521-250MG	
	Graminon – see Isoproturon				
69806-34-4	Haloxyfop PESTANAL	250mg	NEAT	45817-250MG	
	Harmony	100mg	NEAT	PS2011	
	Harness – see Acetochlor				
	HCB – see Hexachlorobenzene				
319-85-6	α-HCH PESTANAL	1000mg	NEAT	35809-1G	
319-85-7	β-HCH PESTANAL	250mg	NEAT	35911-250MG	
319-86-8	δ-HCH PESTANAL	250mg	NEAT	35912-250MG	
608-73-1	HCH, mix of isomers (α:β:γ.δ=1:1:1:1) PESTANAL	250mg	NEAT	36756-250MG	
	Heod – see Dieldrin				
76-44-8	Heptachlor	200µg/mL	isooctane (10mL)	48964	
		1000µg/mL	methanol	40098	
	Heptachlor PESTANAL	250mg	NEAT	35482-250MG	
1024-57-3	Heptachlor epoxide isomer A	1000µg/mL	methanol	48198	
	Heptachlor endo-epoxide, isomer A PESTANAL	100mg	NEAT	35492-100MG	
1024-57-3	Heptachlor epoxide isomer B	20µg/mL	methanol	48677	
		1000µg/mL	methanol	40099	
28044-83-9	Heptachlor exo-epoxide, isomer B PESTANAL	100mg	NEAT	34309-100MG	
629-78-7	n-Heptadecane	1000mg	NEAT	442676	
142-82-5	n-Heptane	1000mg	NEAT	442677	
592-76-7	1-Heptene	1000mg	NEAT	442267-U	
	Heptox – see Heptachlor				
87-82-1	Hexabromobenzene	500mg	NEAT	442605	
118-74-1	Hexachlorobenzene	1000mg	NEAT	48508	
		1000µg/mL	acetone	40008	
35065-30-6	2,2´,4,4´,5,5´-Hexachlorobiphenyl	10µg/mL	isooctane	47336	
87-68-3	Hexachlorobutadiene	5000mg	NEAT	48543	
		5000µg/mL	methanol	40050-U	
77-47-4	Hexachlorocyclopentadiene	500µg/mL	methanol	48388	
		5000µg/mL	methanol	40051	
67-72-1	Hexachloroethane	5000mg	NEAT	48511	
		5000µg/mL	methanol	40011	
70-30-4	Hexachlorophene	5000µg/mL	methanol	40323	
79983-71-4	Hexaconazol PESTANAL	100mg	NEAT	34348-100MG	
630-01-3	n-Hexacosane	1000mg	NEAT	442678	
544-76-3	n-Hexadecane	1000mg	NEAT	442679	
629-73-2	1-Hexadecene	1000mg	NEAT	442268	
1527-97-5	Hexaldehyde-2,4-DNPH	100mg	NEAT	442614	
		1000µg/mL	acetonitrile	47178-U	
110-54-3	Hexane	1000mg	NEAT	442615	
111-27-3	1-Hexanol	1000mg	NEAT	442269	
591-78-6	2-Hexanone	5mL	NEAT	47733-U	
		200µg/mL	methanol	48362	
630-06-8	n-Hexatriacontane	1000mg	NEAT	442680	
1077-16-3	n-Hexylbenzene (1-Phenylhexane)	1000mg	NEAT	442682-U	
	HHDN – see Aldrin				
2691-41-0	HMX	1000µg/mL	acetonitrile	47236	
134-31-6	8-Hydroxyquinoline sulfate PESTANAL	250mg	NEAT	36525-250MG-R	
	Hyvar – see Bromacil				
	Idryl – see Fluoranthene				
	Igran – see Terbutryn				
81334-34-1	Imazapyr PESTANAL	250mg	NEAT	45754-250MG-R	

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81335-37-7	Imazaquin PESTANAL	250mg	NEAT	45755-250MG-R	
81335-77-5	Imazethapyr	100mg	NEAT	PS2039	
138261-41-3	Imidacloprid PESTANAL	250mg	NEAT	46009-250MG	
732-11-6	Imidan	1000mg	NEAT	PS653	
96-45-7	2-Imidazolidinethione PESTANAL	250mg	NEAT	45531-250MG	
193-39-5	Indeno(1,2,3-cd)pyrene	10mg 200µg/mL	NEAT methanol	48499 48669	
120-72-9	Indole	1000mg 2000µg/mL	NEAT methanol	442619 48157	
74-88-4	Iodomethane	100mg 100mg 2000µg/mL	NEAT NEAT methanol:water, 80:20	47376 4S7376 47406	
	Iogran – see Triasulfuron				
3861-47-0	Ioxynil-octanoate PESTANAL	250mg	NEAT	36533-250MG	
	IPC – see Propham				
36734-19-7	Iprodione	100µg/mL	acetone	47955	
28154-48-2	Irgarol PESTANAL	250mg	NEAT	46105-250MG	
78-83-1	Isobutyl alcohol (see 2-Methyl-1-propanol)				
24683-00-9	2-Isobutyl-3-methoxypyrazine	100µg/mL	methanol	47528-U	
	Isobutyraldehyde-2,4-DNPH	100µg/mL	acetonitrile	47886	
465-73-6	Isodrin	5000µg/mL	methanol	40856	
78-59-1	Isophorone	5000mg	NEAT	48545	
75-31-0	Isopropylamine	1000mg	NEAT	442629	
98-82-8	Isopropylbenzene (Cumene)	5000µg/mL	methanol	40669	
	4,4'-Isopropyldidenediphenol	500mg	NEAT	442840	
108-20-3	Isopropyl ether	1000mg	NEAT	442627	
2814-20-2	2-Isopropyl-6-methyl-4-pyrimidinol	1000mg	NEAT	MET90B	
25773-40-4	2-Isopropyl-3-methoxypyrazine	100µg/mL	methanol	47527-U	
99-87-6	p-Isopropyltoluene	1000mg	NEAT	442732	
34123-59-6	Isoproturon PESTANAL	250mg	NEAT	45542-250MG	
	Isosystox – see Demeton S				
2256-01-1	Isovaleraldehyde-2,4-DNPH	100mg 1000µg/mL	NEAT acetonitrile	442632 47179	
	Karathane – see Dinocap				
23950-58-5	Kerb – see Pronamide				
	δ-Keto 153 – see Endrin ketone				
42588-37-4	Kinoprene	100mg	NEAT	PS2051	
	Kremite – see Terbuthylazine				
	Lannate – see Methomyl				
	Lasso – see Alachlor				
	Leptophos oxon	50mg	NEAT	MET677A	
	Leptophoxon – see Leptophos oxon				
	Lexone – see Metribuzin				
58-89-9	Lindane – see γ-BHC				
330-55-2	Linuron PESTANAL	250mg	NEAT	45549-250MG	
	Lonacol – see Zineb				
	Lorox – see Linuron				
	Machete – see Butachlor				
1634-78-2	Malaoxon PESTANAL	250mg	NEAT	45550-250MG-R	
121-75-5	Malathion PESTANAL	250mg	NEAT	45551-250MG	
1634-78-2	Malathion-O-analog	100mg	NEAT	MET86C	
	Maloran – see Chlorbromuron				
8018-01-7	Mancozeb, technical mixture PESTANAL	250mg	NEAT	45553-250MG	
12427-38-2	Maneb PESTANAL	250mg	NEAT	45554-250MG	
	Marlate – see Methoxychlor				
102851-06-9	Mavrik	100mg	NEAT	PS1071	

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94-74-6	MCPA PESTANAL	250mg	NEAT	45555-250MG	
26544-20-7	MCPA-2-ethylhexyl ester PESTANAL	250mg	NEAT	36977-250MG	
	MCPA methyl ester – see 4-Chloro-o- tolyloxyacetic acid methyl ester				
2786-19-7	MCPA methyl ester	2000µg/mL	hexane	47985-U	
94-81-5	MCPB PESTANAL	250mg	NEAT	45557-250MG	
2436-73-9	MCPP methyl ester	2000µg/mL	hexane	47986	
7085-19-0	Mecoprop PESTANAL	250mg	NEAT	45559-250MG	
94596-45-9	Mecoprop-P PESTANAL	250mg	NEAT	36773-250MG-R	
78-93-3	MEK – see 2-Butanone				
55814-41-0	M epronil PESTANAL	250mg	NEAT	34303-250MG	
	Mercaptophos – see Fenthion				
	Mertect – see Thiabendazole				
	Mesurol – see Methiocarb				
	Metacide – see Methyl parathion				
57837-19-1	Metalaxyl PESTANAL	250mg	NEAT	45565-250MG	
9002-91-9	Metaldehyde PESTANAL	1000mg	NEAT	36611-1G-R	
	Metam – see Metham sodium				
6734-80-1	Metam-sodium-dihydr ate PESTANAL	250mg	NEAT	45570-250MG	
	Metason – see Metaldehyde				
919-86-8	Metasystox I	50mg	NEAT	PS1096	
	Metasystoxor – see Oxydemeton-methyl				
67129-08-2	M etazachlor PESTANAL	250mg	NEAT	45567-250MG	
18691-97-9	Methabenzt hiazuron	100mg	NEAT	PS2048	
62610-77-9	Methacrifos PESTANAL	250mg	NEAT	45569-250MG	
	Methacrolein-2,4-DNPH	100mg	NEAT	442639	
		100µg/mL	acetonitrile	47180-U	
126-98-7	Methacrylonitrile	1000mg	NEAT	442640	
137-42-8	Metham sodium	1000mg	NEAT	PS221	
10265-92-6	Methamidophos PESTANAL	250mg	NEAT	45309-250MG	
91-80-5	M ethapyrilene HCl	1000mg	NEAT	442641	
950-37-8	Methidathion PESTANAL	250mg	NEAT	45572-250MG	
2032-65-7	Methiocarb	1000mg	NEAT	PS543	
	Methiocarb sulfone	50mg	NEAT	MET543A	
16752-77-5	Methomyl PESTANAL	250mg	NEAT	45573-250MG	
40596-69-8	Methoprene PESTANAL	250mg	NEAT	34386-250MG	
72-43-5	Methoxychlor	1000mg	NEAT	49054	
		200µg/mL	isooctane (10mL)	48982	
	Methoxychlor PESTANAL	250mg	NEAT	45575-250MG	
30667-99-3	p,p'-Methoxychlor-olefin	50mg	NEAT	MET83B	
	Methyl 2-aminobenzoate – see Methyl anthranilate				
134-20-3	Methyl anthranilate	100mg	NEAT	PS2055	
96-32-2	Methyl bromoacetate	1000µg/mL	methyl t-butyl ether	47662-U	
20428-74-4	Methyl bromochloroacetate	1000µg/mL	methyl t-butyl ether	47666-U	
	Methyl bromodichloroacetate	1000µg/mL	methyl t-butyl ether	47761	
57885-43-5	Methy-2-bromopropionate	1000mg	NEAT	442657	
1634-04-4	Methyl-t-butyl ether (MTBE)	1000mg	NEAT	48027	
		2000ug/mL	methanol	48483	
56-49-5	3-M ethylchloranthrene	50mg	NEAT	442388	
		2000µg/mL	methylene chloride	48376	
96-34-4	Methyl chloroacetate	1000µg/mL	methyl t-butyl ether	47661-U	
	Methyl chlorodibromoacetate	1000µg/mL	methyl t-butyl ether	47762	
56-49-5	3-Methylcholanthrene	50mg	NEAT	442388	
108-87-2	Methyl cyclohexane	1000mg	NEAT	442649	
6482-26-4	Methyl dibromoacetate	50mg	NEAT	442650	
		1000µg/mL	methyl t-butyl ether	47667-U	
	Methyl 2,3-dibromopropionate	1000µg/mL	methyl t-butyl ether	46970-U	
116-54-1	Methyl dichloroacetate	1000µg/mL	methyl t-butyl ether	47664-U	
	Methyl-2,4-dichlorophenoxybutyrate – see 2,4-DB methyl ester				

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	Methyl-2,4-dichlorophenylacetate	100mg	NEAT	442644	
		100µg/mL	acetone	47339	
		2000µg/mL	acetone	47329-U	
3674-09-7	Methyl-2,3-dichloropropionate	1000mg	NEAT	442656	
534-52-1	2-Methyl-4,6-dinitrophenol	500µg/mL	methanol	48697	
	(4,6-Dinitro-o-cresol)	5000µg/mL	methanol	40058	
		1000mg	NEAT	PS57	
	Methyl dursban – see Chlorpyrifos methyl				
75-09-2	Methylene chloride – see Dichloromethane				
	Methylene di-p-phenyl diisocyanate	1000mg	NEAT	442658-U	
78-93-3	Methyl ethyl ketone – see 2-Butanone				
108-10-1	Methyl isobutyl ketone – see 4-Methyl-2-pentanone				
	2-Methylisoborneol	100µg/mL	methanol	47523-U	
115-09-3	Methylmer cury chloride PESTANAL	250mg	NEAT	34356-250MG	
80-62-6	Methyl methacrylate	1000µg/mL	methanol	40439	
90-12-0	α-Methylnaphthalene	500mg	NEAT	442430	
92-12-0	1-Methylnaphthalene	2000µg/mL	methanol	48162	
91-57-6	2-Methylnaphthalene	1000mg	NEAT	442359	
		200µg/mL	methylene chloride	48366	
2581-34-2	3-Methyl-4-nitrophenol	1000mg	NEAT	MET678B	
298-00-0	Methyl parathion	500mg	NEAT	49055	
		1000µg/mL	acetone	40572	
107-83-5	2-Methylpentane	1000mg	NEAT	442360	
96-14-0	3-Methylpentane	1000mg	NEAT	442390	
108-10-1	4-Methyl-2-pentanone (Methyl isobutyl ketone)	1000mg	NEAT	442417	
		200µg/mL	methanol	48360	
		5000µg/mL	methanol	40349	
95-48-7	2-M ethylphenol (o-Cresol)	1000mg	NEAT	442361	
		5000µg/mL	methanol	40250-U	
108-39-4	3-Methylphenol (m-Cresol)	1000mg	NEAT	442391	
		5000µg/mL	methanol	40251-U	
106-44-5	4-M ethylphenol (p-Cresol)	1000mg	NEAT	442418	
		5000µg/mL	methanol	40252-U	
15090-23-0	3-Methylphosphinicopropionic acid PESTANAL	100mg	NEAT	36787-100MG-R	
78-83-1	2-Methyl-1-propanol (Isobutyl alcohol)	1000mg	NEAT	442623	
556-61-6	Methyl iso-thiocyanate PESTANAL	250mg	NEAT	45576-250MG	
3222-05-7	Methyl tribromoacetate	1000mg	NEAT	442654	
		1000µg/mL	methyl t-butyl ether	47730-U	
598-99-2	Methyl trichloroacetate	1000µg/mL	methyl t-butyl ether	47665-U	
	Methyl-2,4,5-trichlorophenoxyacetate – see 2,4,5-T methyl ester				
	Metiram – see Polyram				
3060-89-7	Metobromuron PESTANAL	250mg	NEAT	45578-250MG	
51218-45-2	Metolachlor PESTANAL	250mg	NEAT	45579-250MG	
21087-64-9	M etribuzin PESTANAL	250mg	NEAT	45581-250MG	
	Mevinphos – see Phosdrin				
338-45-4	cis-Mevinphos PESTANAL	100mg	NEAT	46057-100MG	
	Mexide – see Rotenone				
108-10-1	MIBK – see 4-Methyl-2-pentanone				
	Milogard – see Propazine				
2385-85-5	Mirex	500mg	NEAT	49057	
	Mirex PESTANAL	250mg	NEAT	45586-250MG	
	Mitac – see Amitraz				
	Mobilawn – see Dichlofenthion				
	Modown – see Bifenox				
2212-67-1	Molinate PESTANAL	250mg	NEAT	45587-250MG	
	Monate – see Monosodium acid methane arsonate				
	Moncut – see Flutolanil				
	Monitor – see Methamidophos				

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	Mono-chloroacetic acid – see Chloroacetic acid				
6923-22-4	Monocrotophos PESTANAL	250mg	NEAT	45589-250MG	
1746-81-2	Monolinuron PESTANAL	250mg	NEAT	45590-250MG	
2163-80-6	Monosodium acid methane arsonate	1000mg	NEAT	PS429	
150-68-5	Monuron	1000mg	NEAT	PS59	
	Monuron PESTANAL	250mg	NEAT	45591-250MG	
110-91-8	Morpholine PESTANAL	250mg	NEAT	45592-250MG	
	Mouser – see Brodifacoum				
	MSMA – see Monosodium acid methane arsonate				
1634-04-4	MTBE – seeMethyl-t-butyl ether				
	Myclobutanil – see Systhane				
88671-89-0	Mycl obutanil PESTANAL	100mg	NEAT	34360-100MG	
142-59-6	Nabam, technical mixture PESTANAL	250mg	NEAT	45593-250MG	
	Nabame – see Nabam				
	Naled – see Dibrom				
91-20-3	Naphthalene	5000mg	NEAT	48546	
		200µg/mL	methanol	48641	
		5000µg/mL	methanol	40053	
1146-65-2	N aphthalene-d8	250mg	NEAT	442716	
		2000µg/mL	methylene chloride	48715-U	
90-15-3	1-Naphthol PESTANAL	1000mg	NEAT	35825-1G-R	
1929-87-9	(2-Naphthoxy)acetic acid methyl ester PESTANAL	250mg	NEAT	45736-250MG	
86-87-3	1-Naphthylacetic acid PESTANAL	1000mg	NEAT	35745-1G	
134-32-7	1-Naphthylamine	250mg	NEAT	442271	
91-59-8	2-Naphthylamine	100mg	NEAT	442362	
132-66-1	N-1-Naphthylphthalamic acid	1000mg	NEAT	PS343	
15299-99-7	Napropamide PESTANAL	250mg	NEAT	45594-250MG	
132-66-1	Naptalam PESTANAL	250mg	NEAT	34361-250MG	
54-11-5	Nicotine	1000mg	NEAT	PS85	
	L(-)-Nicotine PESTANAL	1000mg	NEAT	36733-1G	
120738-89-8	Nitenp yram PESTANAL	100mg	NEAT	46077-100MG	
88-74-4	2-N itroaniline	1000mg	NEAT	442363	
		5000µg/mL	methanol	40324	
99-09-2	3-N itroaniline	1000mg	NEAT	442392	
100-01-6	4-Nitroaniline	1000mg	NEAT	442419	
		5000µg/mL	methanol	40342	
98-95-3	Nitrobenzene	1000mg	NEAT	48547	
		1000µg/mL	acetonitrile	47239	
		5000µg/mL	methanol	40054	
4165-60-0	Nitrobenzene-d5	1000mg	NEAT	442718	
		2000µg/mL	methylene chloride	48717-U	
1836-75-5	Nitrofen PESTANAL	250mg	NEAT	34381-250MG	
88-75-5	2-Nitrophenol	5000mg	NEAT	48548	
		500µg/mL	methanol	48694	
		5000µg/mL	methanol	40055	
100-02-7	4-Nitrophenol	5000mg	NEAT	48549	
		500µg/mL	methanol	48695	
		5000µg/mL	methanol	40056	
	4-Nitrophenol PESTANAL	1000mg	NEAT	35836-1G	
56-57-5	4-Nitroquinoline-N-oxide	1000mg	NEAT	442683	
924-16-3	N-Nitrosodi-n-butylamine	100mg	NEAT	442685	
		2000µg/mL	methylene chloride	48320-U	
55-18-5	N-Nitrosodiethylamine	1000mg	NEAT	442687	
		5000µg/mL	methanol	40334	
62-75-9	N-Nitrosodimethylamine	100mg	NEAT	48552	
		200µg/mL	methanol	48670	
		5000µg/mL	methanol	40059	
86-30-6	N-Nitrosodiphenylamine	1000mg	NEAT	48553	
		5000µg/mL	methanol	40060	

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621-64-7	N-Nitrosodi-n-propylamine	100mg	NEAT	48554	
		5000µg/mL	methanol	40061	
59-89-2	N-Nitrosomorpholine	5000µg/ mL	methanol	40485	
100-75-4	N-Nitrosopiperidine	5000µg/mL	methanol	40458	
10552-74-6	Nitrothal-iso-propyl PESTANAL	250mg	NEAT	45598-250MG	
88-72-2	2-Nitrotoluene	1000mg	NEAT	442365	
		1000µg/mL	acetonitrile	47240	
99-08-1	3-Nitrotoluene	1000mg	NEAT	442394	
		1000µg/mL	acetonitrile	47241	
99-99-0	4-Nitrotoluene	1000µg/ mL	acetonitrile	47242	
99-55-8	5-Nitro-o-toluidine	1000mg	NEAT	442423	
5103-73-1	cis-Nonachlor	25mg	NEAT	442527	
		100µg/mL	hexane	48138	
39765-80-5	trans-Nonachlor	25mg	NEAT	442811	
		100µg/mL	hexane	48137	
629-92-5	n-Nonadecane	1000mg	NEAT	442693	
111-84-2	n-Nonane	1000mg	NEAT	442694	
124-19-6	n-Non yl aldehyde	1000mg	NEAT	442719	
84852-15-3	4-Nonylphenol	100mg	NEAT	442873	
	Octachlor – see Chlordane				
2234-13-1	Octachloronaphthalene	20mg	NEAT	442725	
	Octalene – see Aldrin				
630-02-4	n-Octacosane	1000mg	NEAT	442696	
593-45-3	n-Octadecane	1000mg	NEAT	442697	
112-88-9	1-Octadecene	1000mg	NEAT	442272	
111-65-9	n-Octane	1000mg	NEAT	442698	
111-87-5	1-Octanol	1000mg	NEAT	442273	
111-66-0	1-Octene	1000mg	NEAT	442274	
1806-26-4	4-Octylphenol	500mg	NEAT	442850	
140-66-9	4-tert-Octylphenol	500mg	NEAT	442858	
1113-02-6	Omethoate PESTANAL	250mg	NEAT	45600-250MG-R	
2312-35-8	Omite	1000mg	NEAT	PS858	
34622-58-7	Orben carb PESTANAL	250mg	NEAT	34304-250MG	
	Ordram – see Molinate				
	Orthocide 406 – see Captan				
19044-88-3	Or yzalin PESTANAL	250mg	NEAT	45601-250MG	
	Oust – see Sulfometuron methyl				
74782-23-3	O xabetrinil PESTANAL	250mg	NEAT	45602-250MG	
19666-30-9	Oxadiazon	100mg	NEAT	442729	
	Oxadiazon PESTANAL	250mg	NEAT	36534-250MG	
77732-09-3	Oxadi xyl, technical mixture PESTANAL	100mg	NEAT	34365-100MG	
23135-22-0	Oxamyl	100mg	NEAT	442730	
	Oxamyl PESTANAL	250mg	NEAT	45603-250MG	
	Oxidimethiin – see Dimethipin				
108-60-1	2,2'-Oxybis (1-chloropropane) – see Bis(2-chloroisopropyl) ether				
301-12-2	Oxydemeton-methyl	100mg	NEAT	PS641	
	Paracide – see 1,4-Dichlorobenzene				
311-45-5	Paraoxon	100mg	NEAT	PS610	
1910-42-5	Paraquat dichloride hydrate PESTANAL	250mg	NEAT	36541-250MG	
	Paraquat CL tetrahydrate	1000mg	NEAT	PS366	
56-38-2	Parathion	500mg	NEAT	49062	
	Parathion-ethyl PESTANAL	250mg	NEAT	45607-250MG	
	Parathion-methyl – see Methyl parathion				
	Patoran – see Metobromuron				
	PCA – see Pyrazon				
	PCP – see Pentachlorophenol				
	PCP methyl ester – see Pentachloroanisole				

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527-20-8	Pentachloroaniline	100mg	NEAT	MET150A	
1825-21-4	Pentachloroanisole	1000mg	NEAT	PS1109	
608-93-5	Pentachlorobenzene	200µg/mL	methyl ene chloride	48386	
	Pentachlorobenzene PESTANAL	1000mg	NEAT	35886-1G	
76-01-7	Pentachloroethane	1000mg	NEAT	442740	
		5000µg/mL	methanol	40300-U	
82-68-8	Pentachloronitrobenzene	1000mg	NEAT	442741	
		200µg/mL	methylene chloride	48310-U	
		5000µg/mL	methanol	40156	
87-86-5	Pentachlorophenol	5000mg	NEAT	48555-U	
		250µg/mL	methylene chloride	48726-U	
		500µg/mL	methanol	48692	
		5000µg/mL	methanol	40062	
133-49-3	Pentachlorothiophenol	100mg	NEAT	MET690B	
6596-40-3	Pentacontane	250mg	NEAT	442743	
629-99-2	n-Pentacosane	250mg	NEAT	442699	
629-62-9	n-Pentadecane	1000mg	NEAT	442700	
363-72-4	Pentafluorobenzene	1000mg	NEAT	442744	
		2000µg/mL	methanol	48945	
771-61-9	Pentafluorophenol	1000mg	NEAT	442745	
		2000µg/mL	methylene chloride	48718	
109-66-0	Pentane	1000mg	NEAT	442746	
646-04-8	trans-2-Pentene	1000mg	NEAT	442815	
	Perchlorobenzene – see Hexachlorobenzene				
127-18-4	Perchloroethylene – see Tetrachloroethene				
311-89-7	Perfluorotributylamine (PFTBA)	1000mg	NEAT	442747-U	
52645-53-1	Permethrin (isomers)	100mg	NEAT	442748	
		1000µg/mL	methanol	47956	
	Permethrin, mix of cis and trans isomers PESTANAL	250mg	NEAT	45614-250MG	
61949-76-6	cis-Permethrin	50mg	NEAT	PS7581	
61949-77-7	trans-Permethrin PESTANAL	50mg	NEAT	46056-50MG-R	
	Peropal – see Azocyclotin				
	Persuit – see Imazethapyr				
198-55-0	Perylene	50mg	NEAT	442749	
		2000µg/mL	methylene chloride	48079	
1520-96-3	Perylene-d12	25mg	NEAT	442750	
		2000µg/mL	methylene chloride	48081	
85-01-8	Phenanthrene	5000mg	NEAT	48569	
		200µg/mL	methylene chloride	48661	
		5000µg/mL	methanol	40079	
1517-22-2	Phenanthrene-d10	100mg	NEAT	442753	
		2000µg/mL	methanol	48094	
		2000µg/mL	methylene chloride	48710-U	
108-95-2	Phenol	1000mg	NEAT	48556	
		500µg/mL	methanol	48688	
		5000µg/mL	methanol	40063	
	bis-Phenol A-d16	50mg	NEAT	442876	
4165-62-2	Phenol-d5 (analytical equivalent to Phenol-d6)	2000µg/mL	methylene chloride	48716-U	
22224-92-6	Phenamiphos	1000mg	NEAT	PS612	
13684-63-4	Phenmedipham PESTANAL	250mg	NEAT	45616-250MG	
26002-80-2	Phenothrin, mix of isomers PESTANAL	250mg	NEAT	45617-250MG	
	δ-(cis-trans)-Phenothrin	1000mg	NEAT	PS1030	
3739-38-6	3-Phenoxybenzoic acid	1000mg	NEAT	MET758C	
2597-03-7	Phenthoate	100mg	NEAT	PS2025	
	n-Phenylaniline – see Diphenylamine				
	Phenylbenzene – see Biphenyl				
	Phenyl chloromercury – see Phenyl mercuric chloride				
106-50-3	1,4-Phenylenediamine (4-Aminoaniline)	2000µg/mL	methylene chloride	48298	
101-84-8	Phenyl ether – see Diphenyl ether				
100-42-5	Phenylethylene – see Styrene				

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CAS NO.	COMPOUND	QTY./CONC.	SOLVENT	CAT. NO.	PRICE
1077-16-3	1-Phenylhexane – see n-Hexylbenzene				
	Phenyl hydroxy mercury – see Phenyl mercuric hydroxide				
100-56-1	Phenyl mercuric chloride	1000mg	NEAT	PS214	
100-57-2	Phenyl mercuric hydroxide	1000mg	NEAT	PS215	
8003-05-2	Phenyl mercury nitrate	100mg	NEAT	PS202	
90-43-7	o-Phenylphenol	1000mg	NEAT	PS420	
92-69-3	4-Phenyl phenol	1000mg	NEAT	506842	
103-85-5	N-Phenylthiourea PESTANAL	250mg	NEAT	34305-250MG-R	
298-02-2	Phorate	250mg	NEAT	36680-250MG	
2588-03-6	Phorat-sulfoxide PESTANAL	100mg	NEAT	45762-100MG-R	
2310-17-0	Phosalone PESTANAL	250mg	NEAT	45620-250MG-R	
7786-34-7	Phosdrin	1000mg	NEAT	PS87	
947-02-4	Phosfolan	1000mg	NEAT	PS842	
	Phosmet – see Imidan				
732-11-6	Phosmet PESTANAL	250mg	NEAT	45621-250MG	
13171-21-6	Phosphamidon, mix of E + Z isomers PESTANAL	250mg	NEAT	45622-250MG	
	Phospholan – see Phosfolan				
88-99-3	Phthalic acid	1000mg	NEAT	442758	
	Phthalthrin – see Tetramethrin				
1918-02-1	Picloram PESTANAL	250mg	NEAT	36774-250MG-R	
	Picloram methyl ester	100mg	NEAT	PS1108	
83-26-1	Pindone PESTANAL	250mg	NEAT	45625-250MG	
51-03-6	Piperonyl butoxide PESTANAL	250mg	NEAT	45626-250MG	
23103-98-2	Pirimicarb PESTANAL	250mg	NEAT	45627-250MG	
29232-93-7	Pirimiphos-methyl	1000mg	NEAT	PS644	
	Pirimor – see Pirimicarb				
83-26-1	2-Pivaloyl-1,3-indandione	1000mg	NEAT	PS905	
	Plifenat PESTANAL	250mg	NEAT	36569-250MG	
	Poast – see Sethoxydim				
	Polychloropinene – see Strobane				
9006-42-2	Polyram	1000mg	NEAT	PS225	
	Polywax 500	5000mg	NEAT	48475	
	Polywax 655	5000mg	NEAT	48477	
	Potassium dimethyl dithiocarbamate – see Busan 85				
	Pounce – see Permethrin isomers				
	Pramitol – see Prometon				
	Prebane – see Terbutryn				
	Prentox – see Piperonyl butoxide				
51218-49-6	Pretilachlor PESTANAL	250mg	NEAT	36777-250MG-R	
	Primicid – see Pirimiphos-ethyl				
	Princep – see Simazine				
67747-09-5	Prochloraz PESTANAL	250mg	NEAT	45631-250MG	
32809-18-0	Procymidone PESTANAL	250mg	NEAT	36640-250MG-R	
41198-08-7	Profenofos PESTANAL	250mg	NEAT	45632-250MG	
26399-36-0	Profluralin PESTANAL	250mg	NEAT	45633-250MG	
2631-37-0	Promecarb PESTANAL	250mg	NEAT	45634-250MG	
1610-18-0	Prometon	100mg	NEAT	49086	
	Prometon PESTANAL	250mg	NEAT	45635-250MG	
7287-19-6	Prometryn	100mg	NEAT	49087	
	Prometryn PESTANAL	250mg	NEAT	45636-250MG	
23950-58-5	Pronamide (Kerb)	100mg	NEAT	442764	
1918-16-7	Propachlor PESTANAL	250mg	NEAT	45637-250MG	
57-55-6	1,2-Propanediol	1000mg	NEAT	442233	
709-98-8	Propanil PESTANAL	250mg	NEAT	45639-250MG	
71-23-8	1-Propanol	1000mg	NEAT	442277	
67-63-0	2-Propanol	1000mg	NEAT	442369	
111479-05-1	Propaquizafop PESTANAL	250mg	NEAT	46007-250MG-R	

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CAS NO.	COMPOUND	QTY./CONC.	SOLVENT	CAT. NO.	PRICE
139-40-2	Propazine	100mg	NEAT	49088	
	Propetamphos – see Safrotin				
31218-83-4	Propetamphos PESTANAL	100mg	NEAT	34371-100MG	
122-42-9	Propham PESTANAL	250mg	NEAT	45641-250MG	
13194-48-4	Prophos	1000mg	NEAT	PS672	
	Propiconazole – see Tilt				
60207-90-1	Propiconazole, mix of stereoisomers PESTANAL	250mg	NEAT	45642-250MG	
725-00-8	Propionaldehyde-2,4-DNPH	100mg 1000µg/mL	NEAT acetonitrile	442768 47181	
79-09-4	Propionic acid	1000mg	NEAT	442769	
	Propoxur – see Baygon				
114-26-1	Propoxur PESTANAL	250mg	NEAT	45644-250MG	
103-65-1	n-Propylbenzene	1000mg 5000µg/mL	NEAT methanol	47323 41112	
75-56-9	Propylene oxide	500mg	NEAT	442770	
927-67-3	Propylthiourea PESTANAL	250mg	NEAT	45715-250MG	
23950-58-5	Propyzamide PESTANAL	250mg	NEAT	45645-250MG	
52888-80-9	Prosulfocarb PESTANAL	250mg	NEAT	36520-250MG-R	
34643-46-4	Prothiofos PESTANAL	250mg	NEAT	45311-250MG	
	Prothiophos – see Tokuthion				
123312-89-0	Pymetrozin PESTANAL	250mg	NEAT	46119-250MG-R	
	Pynamin – see Allethrin				
77458-01-6	Pyraclofos	500mg	NEAT	PS2046	
518-20-7	Pyranocoumarin PESTANAL	250mg	NEAT	45647-250MG	
1698-60-8	Pyrazon	1000mg	NEAT	PS430	
129-00-0	Pyrene	5000mg 200µg/mL 1000µg/mL	NEAT methylene chloride methanol	48570 48649 40082	
	Pyrene-d10	25mg	NEAT	442846	
8003-34-7	Pyrethrins, technical mixture PESTANAL	250mg	NEAT	45649-250MG	
96489-71-3	Pyridaben PESTANAL	250mg	NEAT	46047-250MG-R	
55512-33-9	Pyridate PESTANAL	250mg	NEAT	45312-250MG	
110-86-1	Pyridine	2000µg/ mL	methanol	48305-U	
7291-22-7	Pyridine-d5	2000µg/mL	methylene chloride	48714-U	
53112-28-0	Pyrimethanil PESTANAL	250mg	NEAT	46039-250MG-R	
	Pyron – see Pyridate				
13593-03-8	Quinalphos PESTANAL	250mg	NEAT	45651-250MG	
84087-01-4	Quinclorac PESTANAL	250mg	NEAT	36521-250MG	
90717-03-6	Quinmerac PESTANAL	250mg	NEAT	36522-250MG	
82-68-8	Quintozene PESTANAL	250mg	NEAT	45653-250MG	
76578-12-6	Quizalofop	50mg	NEAT	MET1080A	
	Ramrod – see Propachlor				
121-82-4	RDX	1000µg/mL	acetonitrile	47237	
	Reglone – see Diquat dibromide monohydrate				
	Remedy – see Triclopyr				
10453-86-8	Resmethrin, mix of cis and trans isomers PESTANAL	250mg	NEAT	45655-250MG	
	Ridomil – see Metalaxyl				
122931-48-0	Rimsulfuron PESTANAL	100mg	NEAT	46097-100MG-R	
	Ronilan – see Vinclozolin				
299-84-3	Ronnel	100mg	NEAT	442776	
	Ronstar – see Oxadiazon				
83-79-4	Rotenone PESTANAL	250mg	NEAT	45656-250MG	
	Roundup – see Glyphosate				
	Rovral – see Iprodione				
31218-83-4	Safrotin	100mg	NEAT	PS1076	
51630-58-1	Sanmarton	1000mg	NEAT	PS1032	
	Sanvex – see Cartap				

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CAS NO.	COMPOUND	QTY./CONC.	SOLVENT	CAT. NO.	PRICE
	Scepter – see Imazaquin				
26259-45-0	Secbumeton PESTANAL	250mg	NEAT	45658-250MG	
	Semevin – see Thiodicarb				
	Sencor – see Metribuzin				
74051-80-2	Sethoxydim PESTANAL	250mg	NEAT	36795-250MG	
1982-49-6	Siduron, mix of cis and trans isomers PESTANAL	250mg	NEAT	34373-250MG	
93-72-1	Silvex (2,4,5-TP)	1000mg 100µg/mL 5000µg/mL	NEAT methanol methanol	49117 47897 40552	
4841-20-7	Silvex methyl ester	1000mg 200µg/mL	NEAT hexane	49023 47987-U	
122-34-9	Simazine PESTANAL	250mg	NEAT	45659-250MG-R	
	Sinbar – see Terbacil				
62-74-8	Sodium fluoroacetate	1000mg	NEAT	PS105	
	Spectracide – see Diazinon				
	Spergon – see Chloranil				
	Spike – see Tebuthiuron				
111-01-3	Squalane	1000mg	NEAT	442784	
111-02-4	Squalene	1000mg	NEAT	442785	
8001-50-1	Strobane	100mg	NEAT	PS2023	
100-42-5	Styrene (Phenylethylene)	200µg/mL 5000µg/mL	methanol methanol	48347 40257-U	
	Subdue – see Metalaxyl				
	Suffix – see Benzoylprop ethyl				
3567-25-7	Sulcofuron-sodium monohydrate PESTANAL	250mg	NEAT	46076-250MG	
	Sulfaline – see Sulfaquinoxaline				
59-40-5	Sulfaquinoxaline Sulfaquinoxaline PESTANAL	10mg 250mg	NEAT NEAT	PS2056 45662-250MG	
74222-97-2	Sulfometuron methyl	100mg	NEAT	PS1074	
3689-24-5	Sulfotep PESTANAL	250mg	NEAT	45664-250MG	
7704-34-9	Sulfur PESTANAL	250mg	NEAT	36576-250MG	
35400-43-2	Sulprofos Sulprophos PESTANAL	1000mg 250mg	NEAT NEAT	PS1018 45665-250MG	
	Sumithion – see Fenitrothion				
	Sumithrin – see δ-(cis-trans)-Phenothrin				
	Sumitox – see Malathion				
	Supracide – see Methidathion				
	Surflan – see Oryzalin				
88671-89-0	Systhane Systox – see Demeton O&S	100mg	NEAT	PS2006	
93-76-5	2,4,5-T PESTANAL	250mg	NEAT	45667-250MG	
	2,4,5-T-amine	1000mg	NEAT	PS296	
2545-59-7 1928-37-6	2,4,5-T butoxyethyl ester 2,4,5-T methyl ester	1000mg 200µg/mL	NEAT hexane	PS309 47988	
	TBTO – see Bis[tri-n-butyltin]oxide				
56-35-9	TBTO PESTANAL	250mg	NEAT	45669-250MG	
	TCA – see Trichloroacetic acid				
	o,p'-TDE – see 2,4'-DDD				
	p,p'-TDE – see 4,4'-DDD				
107534-96-3	Tebuconazole – see Folicur Tebuconazole PESTANAL	250mg	NEAT	36565-250MG-R	
35265-85-0	Tebutam PESTANAL	250mg	NEAT	36566-250MG	
34014-18-1	Tebuthiuron PESTANAL	250mg	NEAT	45671-250MG	
	Technical HCH – see BHC				
	Tedion – see Tetradifon				
79538-32-2	Tefluthrin, mix of isomers PESTANAL	100mg	NEAT	35548-100MG	
	Telvar – see Monuron				
	Temephos – see Abate				



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3383-96-8	Temephos PESTANAL	250mg	NEAT	45673-250MG-R	
107-49-3	TEPP PESTANAL	100mg	NEAT	36567-100MG-R	
5902-51-2	Terbacil PESTANAL	250mg	NEAT	45675-250MG	
	Terbucarb – see Terbutol				
13071-79-9	Terbufos PESTANAL	250mg	NEAT	45313-250MG	
56070-16-7	Terbufos-sulfone PESTANAL	100mg	NEAT	46043-100MG-R	
10548-10-4	Terbufos-sulfoxide PESTANAL	100mg	NEAT	46044-100MG-R	
5915-41-3	Terbuthylazine PESTANAL	250mg	NEAT	45678-250MG-R	
30125-63-4	Terbuthylazine-desethyl PESTANAL	250mg	NEAT	36769-250MG-R	
1918-11-2	Terbutol	1000mg	NEAT	PS550	
886-50-0	Terbutryn PESTANAL	250mg	NEAT	45677-250MG	
84-15-1	o-Terphenyl (1,2-Diphenylbenzene)	500mg	NEAT	442721	
		2000µg/mL	acetone	48169	
		10,000µg/mL	methylene chloride	47580-U	
92-94-4	p-Terphenyl	500mg	NEAT	442733	
1718-51-0	p-Terphenyl-d14	100mg	NEAT	442734	
		2000µg/mL	methylene chloride	48418	
634-83-3	2,3,4,5-Tetrachloroaniline PESTANAL	1000mg	NEAT	36739-1G	
634-66-2	1,2,3,4-Tetrachlorobenzene	500mg	NEAT	442215	
		2000µg/mL	methanol	48158	
634-90-2	1,2,3,5-Tetrachlorobenzene	2000µg/mL	methanol	48156	
	1,2,3,5-Tetrachlorobenzene PESTANAL	250mg	NEAT	36928-250MG	
95-94-3	1,2,4,5-Tetrachlorobenzene	1000mg	NEAT	442219	
		1000µg/mL	acetonitrile	40177	
	1,2,4,5-Tetrachlorobenzene PESTANAL	250mg	NEAT	34379-250MG	
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)	10µg/mL	toluene	48599	
630-20-6	1,1,1,2-Tetrachloroethane	1000mg	NEAT	47753-U	
		200µg/mL	methanol	48345	
		5000µg/mL	methanol	40335	
79-34-5	1,1,2,2-Tetrachloroethane	1000mg	NEAT	48514	
		200µg/mL	methanol	48619	
		5000µg/mL	methanol	40014	
127-18-4	Tetrachloroethene (Perchloroethylene)	5000mg	NEAT	48571	
		200µg/mL	methanol	48609	
		5000µg/mL	methanol	40083	
87-87-6	Tetrachlorohydroquinone	1000mg	NEAT	MET690A	
117-18-0	1,2,4,5-Tetrachloro-3-nitrobenzene	1000mg	NEAT	PS151	
4901-51-3	2,3,4,5-Tetrachlorophenol	100mg	NEAT	442281	
		2000µg/mL	methanol	48153	
58-90-2	2,3,4,6-Tetrachlorophenol	5000µg/mL	methanol	48264	
	2,3,4,6-Tetrachlorophenol PESTANAL	100mg	NEAT	36539-100MG	
935-95-5	2,3,5,6-Tetrachlorophenol	50mg	NEAT	442284	
		2000µg/mL	methanol	48152	
877-09-8	2,4,5,6-Tetrachloro-m-xylene	1000mg	NEAT	442298	
		200µg/mL	methanol	48317	
961-11-5	Tetrachlorvinphos PESTANAL	250mg	NEAT	45679-250MG	
4181-95-7	n-Tetracontane	500mg	NEAT	442706	
646-31-1	n-Tetracosane	1000mg	NEAT	442707	
629-59-4	n-Tetradecane	1000mg	NEAT	442708	
1120-36-1	1-Tetradecene	1000mg	NEAT	442278	
116-29-0	Tetradifon PESTANAL	250mg	NEAT	45680-250MG	
107-49-3	Tetraethylpyrophosphate	1000mg	NEAT	PS601	
27813-21-4	cis-1,2,3,6-Tetrahydrophthalimide	5000mg	NEAT	MET260A	
110-01-0	Tetrahydrothiophene	1000mg	NEAT	442799	
7696-12-0	Tetramethrin PESTANAL	250mg	NEAT	45681-250MG-R	
2227-13-6	Tetrasul PESTANAL	250mg	NEAT	36568-250MG	
7098-22-8	n-Tetratetracontane	500mg	NEAT	442709	
14167-59-0	n-Tetratriacontane	1000mg	NEAT	442710	
479-45-8	Tetryl	1000µg/mL	acetonitrile	47238	

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148-79-8	Thiabendazole PESTANAL	250mg	NEAT	45684-250MG	
	Thifensulfuron-methyl – see Harmony				
	Thimet – see Phorate				
	Thiobel – see Cartap				
	Thiobencarb – see Benthiocarb				
28249-77-6	Thiobencarb PESTANAL	250mg	NEAT	45687-250MG	
59669-26-0	Thiodicarb PESTANAL	250mg	NEAT	34375-250MG	
297-97-2	Thionazin	2000µg/ mL	methylene chloride	48285-U	
	Thiophan – see Thiophanate methyl				
23564-06-9	Thiophanate	1000mg	NEAT	PS223	
23564-05-8	Thiophanate-methyl PESTANAL	250mg	NEAT	45688-250MG	
110-02-1	Thiophene	1000mg	NEAT	442802	
137-26-8	Thiram (Tetramethylthiuram disulfide)	1000mg	NEAT	PS24	
	Thiram PESTANAL	250mg	NEAT	45689-250MG	
60207-90-1	Tilt	100mg	NEAT	PS1075	
34643-46-4	Tokuthion	50mg	NEAT	442804	
	Tolban – see Profluralin				
57018-04-9	Tolclofos-methyl PESTANAL	250mg	NEAT	36641-250MG-R	
1773-44-0	o-Tolualdehyde-2,4-DNPH	100mg	NEAT	442722	
		100µg/mL	acetonitrile	47182	
2880-05-9	m-Tolualdehyde-2,4-DNPH	100µg/mL	acetonitrile	47183	
2571-00-8	p-Tolualdehyde-2,4-DNPH	100mg	NEAT	442735	
		100µg/mL	acetonitrile	47184-U	
108-88-3	Toluene	5000mg	NEAT	48572	
		200µg/mL	methanol	48620	
		5000µg/mL	methanol	40084	
2037-26-5	Toluene-d8	1000mg	NEAT	442809	
		2000µg/mL	methanol	48593	
584-84-9	Toluene-2,4-diisocyanate	1000mg	NEAT	442807	
95-53-4	o-Toluidine (2-Methylaniline)	100mg	NEAT	442723	
		2000µg/mL	methanol	48035	
731-27-1	Tolylfluanid PESTANAL	250mg	NEAT	45690-250MG-R	
	Topsin m – see Thiophanate-methyl				
	Tordon – see Picloram				
8001-35-2	Toxaphene (Camphechlor), technical mixture	200µg/mL	isooctane (10mL)	49135-U	
		500µg/mL	methanol	48243	
		1000µg/mL	isooctane	48103	
		2000µg/mL	methanol	48700-U	
		5000µg/mL	methanol	40111	
	Toxaphene PESTANAL	250mg	NEAT	45364-250MG-R	
93-72-1	2,4,5-TP – see Silvex				
	2,4,5-TP (Fenoprop) PESTANAL	250mg	NEAT	45691-250MG	
4841-20-7	2,4,5-TP methyl ester – see Silvex methyl ester				
87820-88-0	Tralkoxidym PESTANAL	250mg	NEAT	36536-250MG	
	Treflan – see Trifluralin				
638-68-6	n-Triacontane	500mg	NEAT	442711	
43121-43-3	Triadimefon PESTANAL	250mg	NEAT	45693-250MG	
	Triadimenol – see Baytan				
55219-65-3	Triadimenol, isomer A PESTANAL	250mg	NEAT	45694-250MG	
2303-17-5	Tri-allate	1000mg	NEAT	PS506	
	Triallate PESTANAL	250mg	NEAT	45695-250MG	
82097-50-5	Triasulfuron PESTANAL	250mg	NEAT	36537-250MG	
288-88-0	1,2,4-Triazole	1000mg	NEAT	MET1075A	
24017-47-8	Triazophos, technical mixture, approx 70% in xylene PESTANAL	250mg	NEAT	45696-250MG	
75-96-7	Tribromoacetic acid	100mg	NEAT	442819	
		1000µg/mL	methyl t-butyl ether	47729-U	

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118-79-6	2,4,6-Tribromophenol	1000mg	NEAT	442304	
		2000µg/mL	methylene chloride	48801	
78-48-8	1,2,4-Tributylphosphorotrithioate	1000mg	NEAT	PS562	
1461-22-9	Tributyltin chloride	500mg	NEAT	442869	
52-68-6	Trichlorfon PESTANAL	250mg	NEAT	45698-250MG-R	
76-03-9	Trichloroacetic acid	100mg	NEAT	442820	
		1000µg/mL	methyl t-butyl ether	47658-U	
	Trichloroacetic acid PESTANAL	250mg	NEAT	36789-250MG-R	
545-06-2	Trichloroacetonitrile	1000mg	NEAT	442821	
87-40-1	2,4,6-Trichloroanisole	100µg/mL	methanol	47526-U	
	1,2,3-Trichlorobenzene PESTANAL	1000mg	NEAT	36742-1G	
		5000µg/mL	methanol	40175	
120-82-1	1,2,4-Trichlorobenzene	5000mg	NEAT	48507	
		200µg/mL	methanol	48655	
		5000µg/mL	methanol	40007	
	1,2,4-Trichlorobenzene PESTANAL	1000mg	NEAT	36627-1G	
108-70-3	1,3,5-Trichlorobenzene	1000mg	NEAT	442235	
	1,3,5-Trichlorobenzene PESTANAL	250mg	NEAT	36555-250MG	
71-55-6	1,1,1-Trichloroethane (Methyl chloroform)	1000mg	NEAT	48510-U	
		200µg/mL	methanol	48614	
		5000µg/mL	methanol	40010-U	
79-00-5	1,1,2-Trichloroethane	5000mg	NEAT	48513	
		200µg/mL	methanol	48607	
		5000µg/mL	methanol	40013	
79-01-6	Trichloroethene (Trichloroethylene)	5000mg	NEAT	48573	
		200µg/mL	methanol	48606	
		5000µg/mL	methanol	40085	
75-69-4	Trichlorofluoromethane	5000mg	NEAT	48541	
		200µg/mL	methanol	48611	
		5000µg/mL	methanol	40047	
	Trichlorofon – see Dylox				
67-66-3	Trichloromethane – see Chloroform				
327-98-0	Trichloronate	50mg	NEAT	PS2007	
15950-66-0	2,3,4-Trichlorophenol	50mg	NEAT	442283-U	
		2000µg/mL	methanol	48154	
933-75-5	2,3,6-Trichlorophenol	100mg	NEAT	442287	
	2,3,6-Trichlorophenol PESTANAL	250mg	NEAT	36745-250MG	
95-95-4	2,4,5-Trichlorophenol	5000µg/mL	methanol	40179	
	2,4,5-Trichlorophenol PESTANAL	250mg	NEAT	36513-250MG	
88-06-2	2,4,6-Trichlorophenol	5000mg	NEAT	48518	
		500µg/mL	methanol	48691	
		5000µg/mL	methanol	40019	
	2,4,6-Trichlorophenol PESTANAL	250mg	NEAT	36543-250MG	
609-19-8	3,4,5-Trichlorophenol	25mg	NEAT	442373	
	(2,4,5-Trichlorophenoxy)acetic acid methyl ester - see 2,4,5-T methyl ester				
96-18-4	1,2,3-Trichloropropane	1000mg	NEAT	47794	
		200µg/mL	methanol	48355	
		5000µg/mL	methanol	40368	
	3,5,6-Trichloro-2-pyridinol	50mg	NEAT	MET674A	
98-08-8	α,α,α-Trichlorotoluene	1000mg	NEAT	442428	
6639-30-1	2,4,5-Trichlorotoluene	250mg	NEAT	442302	
		2000µg/mL	methanol	48150	
55335-06-3	Triclopyr PESTANAL	250mg	NEAT	36796-250MG-R	
638-67-5	n-Tricosane	1000mg	NEAT	442712-U	
13121-70-5	Tricyclohexyltin hydroxide	1000mg	NEAT	PS107	
629-50-5	n-Tridecane	1000mg	NEAT	442713	
24602-86-6	Tridemorph PESTANAL	250mg	NEAT	45699-250MG	
1912-26-1	Trietazine PESTANAL	100mg	NEAT	46086-100MG-R	
98-08-8	α,α,α-Trifluorotoluene (Benzotrifluoride)	1000mg	NEAT	442429	
		2000µg/mL	methanol	48389	
		10,000µg/mL	methanol	47582-U	
1582-09-8	Trifluralin PESTANAL	250mg	NEAT	45700-250MG-R	

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Multipurpose Standards
Neat and Single Component Solutions

CAS NO.	COMPOUND	QTY./CONC.	SOLVENT	CAT. NO.	PRICE
7756-94-7	Triisobutylene (mixed isomers)	1000mg	NEAT	442826	
95-63-6	1,2,4-Trimethylbenzene	1000mg	NEAT	47324	
		5000µg/mL	methanol	41107	
108-67-8	1,3,5-Trimethylbenzene	1000mg	NEAT	442236	
		5000µg/mL	methanol	41103	
560-21-4	2,3,3-Trimethylpentane	500mg	NEAT	502081	
2416-94-6	2,3,6-Trimethylphenol	1000mg	NEAT	442288	
527-60-6	2,4,6-Trimethylphenol	1000mg	NEAT	442306	
1066-45-1	Trimethylti n chloride PESTANAL	250mg	NEAT	34377-250MG	
95266-40-3	Trinexapac-ethyl PESTANAL	250mg	NEAT	46052-250MG-R	
99-35-4	1,3,5-Trinitrobenzene	500mg	NEAT	442237	
		1000µg/mL	acetonitrile	47243	
		2000µg/mL	methylene chloride	48283	
118-96-7	2,4,6-Trinitrotoluene	1000µg/mL	acetonitrile	47244	
612-71-5	1,3,5-Triphenylbenzene	1000mg	NEAT	442238	
217-59-4	Triphenylene	100mg	NEAT	442830	
115-86-6	Triphenyl phosphate	1000mg	NEAT	442829	
		500µg/mL	methyl t-butyl ether	48064	
639-58-7	Triphenyltin chloride	500mg	NEAT	442870	
126-72-7	Tris(2,3-dibromopropyl) phosphate	1000mg	NEAT	442833	
	Tupersan – see Siduron				
1120-21-4	n-Undecane	1000mg	NEAT	442714	
2057-84-3	Valeraldehyde-2,4-DNPH	100mg	NEAT	442834	
		100µg/mL	acetonitrile	47185-U	
	Vancide – see Maneb				
	Vendex – see Fenbutatin-oxide				
50471-44-8	Vinclozolin PESTANAL	250mg	NEAT	45705-250MG	
108-05-4	Vinyl acetate (Ethenyl acetate)	100mg	NEAT	4S8486	
		1000mg	NEAT	48486	
		5000µg/mL	acetonitrile	40327	
75-01-4	Vinyl chloride (Chloroethene)	200µg/mL	methanol	48625	
		2000µg/mL	methanol	500976	
	Voltage – see Pyraclofos				
	Vydate – see Oxamyl				
	Weedol – see Paraquat CL tetrahydrate				
108-38-3	m-Xylene (1,3-Dimethylbenzene)	5000mg	NEAT	48582	
		200µg/mL	methanol	48781	
		5000µg/mL	methanol	40202	
95-47-6	o-Xylene (1,2-Dimethylbenzene)	5000mg	NEAT	48581	
		200µg/mL	methanol	48780	
		5000µg/mL	methanol	40201	
106-42-3	p-Xylene (1,4-Dimethylbenzene)	5000mg	NEAT	48583	
		200µg/mL	methanol	48782	
		5000µg/mL	methanol	40203	
	Zerlate – see Ziram				
297-97-2	Zinophos	100mg	NEAT	PS668	
	Zinophos – see Thionazin				
137-30-4	Ziram PESTANAL	250mg	NEAT	45708-250MG	
	Zolone – see Phosalone				

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Multipurpose Standards
Fluka GC Reference Standards

Fluka GC Reference Standards can be used for a wide variety of applications, such as determining retention times or assaying for concentration. The high-purity of Fluka GC Reference Standards makes them ideal for either use. Each product includes an expiration date on the label to insure you always get the newest lot. Convenient packaging makes it easy for you to purchase only what you need. The purity of Fluka GC Reference Standards normally exceeds 99%. Each product includes a certificate of analysis.

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CAS NO.	COMPOUND	QTY.	CAT. NO.	PRICE
64-19-7	Acetic acid, >99.9 % (GC)	1mL 5mL	71251-1ML 71251-5ML	
67-64-1	Acetone, >99.9 % (GC)	1mL 5mL 10mL	90872-1ML 90872-5ML 90872-10ML	
100-66-3	Anisole, >99.9 % (GC)	5mL 10mL	96109-5ML 96109-10ML	
71-43-2	Benzene, >=99.9% (GC)	5mL 10mL 50mL	12540-5ML 12540-10ML 12540-50ML	
71-36-3	1-Butanol, >=99.9% (GC)	1mL 5mL	19422-1ML 19422-5ML	
78-92-2	(±)-2-Butanol, >99.8 % (GC)	1mL 5mL 10mL	96870-1ML 96870-5ML 96870-10ML	
78-93-3	2-Butanone , >=99.9% (GC)	1mL 5mL	02469-1ML 02469-5ML	
104-51-8	Butylbenzene, >=99.8% (GC)	5mL 10mL	19600-5ML 19600-10ML	
98-06-6	tert-Butylbenzene, >=99.5% (GC)	5mL 10mL	19640-5ML 19640-10ML	
107-92-6	Butyric acid, >=99.5% (GC)	1mL 5mL	19215-1ML 19215-5ML	
464-48-2	(-)-Camphor, >=99.0% (GC)	1000mg 5000mg	21293-1G 21293-5G	
334-48-5	Capric acid, >=99.5% (GC)	5000mg	21409-5G	
142-62-1	Caproic acid, >=99.5% (GC)	5mL	21529-5ML	
56-23-5	Carbon tetrachloride, >=99.7% (GC)	1mL 5mL	02671-1ML 02671-5ML	
67-66-3	Chloroform , >=99.9% (GC)	1mL 5mL	02487-1ML 02487-5ML	
124-07-2	Caprylic acid, >=99.5% (GC)	5mL	21639-5ML	
98-82-8	Cumene, >=99.5% (GC)	5mL 25mL	28220-5ML 28220-25ML	
110-82-7	Cyclohexane, >=99.7% (GC)	5mL 10mL 50mL	28920-5ML 28920-10ML 28920-50ML	
287-92-3	Cyclopentane, >=99.5% (GC)	5mL 10mL 50mL	29680-5ML 29680-10ML 29680-50ML	
535-77-3	m-Cymene, >=99.5% (GC)	250mg 1000mg	30037-250MG 30037-1G	
99-87-6	p-Cymene, >=99.5% (GC)	1mL 5mL	30039-1ML 30039-5ML	
75-35-4	1,1-Dichloroethylene, >=99.9% (GC)	1mL 5mL	02574-1ML 02574-5ML	
75-09-2	Dichloromethane , >=99.9% (GC)	1mL 5mL	02575-1ML 02575-5ML	

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Multipurpose Standards
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CAS NO.	COMPOUND	QTY.	CAT. NO.	PRICE
60-29-7	Diethyl ether, >99.9 % (GC)	1mL 5mL 10mL	91238-1ML 91238-5ML 91238-10ML	
127-19-5	N, N-Dimethylacetamide, >99.9 % (GC)	1mL 5mL 10mL	72336-1ML 72336-5ML 72336-10ML	
110-71-4	1,2-Dimethoxyethane, >99.7 % (GC)	1mL 5mL 10mL	72405-1ML 72405-5ML 72405-10ML	
68-12-2	N,N-Dimethylformamide, >99.9 % (GC)	1mL 5mL 10mL	72438-1ML 72438-5ML 72438-10ML	
67-68-5	Dimethyl sulfoxide, >99.95 % (GC)	1mL 5mL 10mL	94563-1ML 94563-5ML 94563-10ML	
123-91-1	Dioxane, >99.9 % (GC)	5mL 10mL	76887-5ML 76887-10ML	
64-17-5	Ethanol , >=99.9% (GC)	1mL 5mL	02483-1ML 02483-5ML	
110-80-5	2-Ethoxy-ethanol, > 99.9 % (GC)	1mL 5mL 10mL	79109-1ML 79109-5ML 79109-10ML	
100-41-4	Ethylbenzene, >=99.5% (GC)	5mL	03079-5ML	
107-21-1	Ethylene glycol, >99.9 % (GC)	1mL 5mL 10mL	85978-1ML 85978-5ML 85978-10ML	
109-87-5	Formaldehyde dimethyl acetal, > 99.9 % (GC)	1mL 5mL 10mL	88789-1ML 88789-5ML 88789-10ML	
124-18-5	Decane, >=99.8% (GC)	5mL 25mL	30540-5ML 30540-25ML	
872-05-9	1-Decene, >=99.5% (GC)	5mL 10mL 50mL	30649-5ML 30649-10ML 30649-50ML	
693-54-9	2-Decanone, >=99.5% (GC)	1mL 5mL	68228-1ML 68228-5ML	
101-77-9	4,4'-Diaminodiphenylmethane, >=99.0% (GC)	1000mg 5000mg	32948-1G 32948-5G	
75-83-2	2,2-Dim ethylbutane, >=99.5% (GC)	5mL 10mL	39730-5ML 39730-10ML	
79-29-8	2,3-Dim ethylbutane, >=99.5% (GC)	5mL 10mL	39760-5ML 39760-10ML	
112-40-3	Dodecane, >=99.8% (GC)	5mL 25mL	44010-5ML 44010-25ML	
123-01-3	Dodecylbenzene, >=99.5% (GC)	500mg	44178-500MG	
544-85-4	Dotriacontane, >=99.5% (GC)	250mg 1000mg	44253-250MG 44253-1G	
112-95-8	Eicosane, >=99.8% (GC)	1000g 5000mg	44818-1G 44818-5G	
10417-94-4	cis-5,8,11,14,17-Eicosapentaenoic acid, ~99% (GC)	100mg 500mg	44864-100MG 44864-500MG	
112-86-7	Erucic acid, >=99.5% (GC)	1000g 5000mg	45629-1G 45629-5G	
630-04-6	Hentriacont ane, >=99.5% (GC)	250mg 1000g	51529-250MG 51529-1G	
593-49-7	Heptacosane, >=99.5% (GC)	250mg 1000mg	51559-250MG 51559-1G	

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Fluka GC Reference Standards

CAS NO.	COMPOUND	QTY.	CAT. NO.	PRICE
629-78-7	Heptadecane, >=99.8% (GC)	1mL 5mL	51578-1ML 51578-5ML	
142-82-5	Heptane, >=99.8% (GC)	5mL 10mL 50mL	51730-5ML 51730-10ML 51730-50ML	
630-01-3	Hexacosane, >=99.5% (GC)	250mg 1000mg	52183-250MG 52183-1G	
544-76-3	Hexadecane, >=99.8% (GC)	5mL 25mL	52209-5ML 52209-25ML	
110-54-3	Hexane, >=99.7% (GC)	5mL 10mL 50mL	52750-5ML 52750-10ML 52750-50ML	
630-06-8	Hexatriacontane, >=99.5% (GC)	250mg 1000mg	52919-250MG 52919-1G	
592-41-6	1-Hexene, >=99.8% (GC)	5mL 10mL 50mL	52930-5ML 52930-10ML 52930-50ML	
540-84-1	Isooctane, >=99.7% (GC)	5mL 10mL 50mL	59030-5ML 59030-10ML 59030-50ML	
78-79-5	Isoprene, >=99.5% (GC)	1mL 5mL 10mL	59240-1ML 59240-5ML 59240-10ML	
108-21-4	Isopropyl acetate, >99.8 % (GC)	1mL 5mL 10mL	90871-1ML 90871-5ML 90871-10ML	
143-07-7	Lauric acid, >=99.5% (GC)	5000mg	61609-5G	
60-33-3	Linoleic acid, ~99% (GC)	5mL 25mL	62230-5ML 62230-25ML	
463-40-1	Linolenic acid, ~99% (GC)	1mL 5mL	62160-1ML 62160-5ML	
108-67-8	Mesitylene, >=99.8% (GC)	1mL	63908-1ML	
67-56-1	Methanol, >99.9 % (GC)	1mL 5mL 10mL	82762-1ML 82762-5ML 82762-10ML	
109-86-4	2-Methoxyethanol, >99.9 % (GC)	1mL 5mL 10mL	88907-1ML 88907-5ML 88907-10ML	
1120-34-9	Methyl cis-13-docosenoate, ~99% (GC)	1mL 5mL	45659-1ML 45659-5ML	
79-20-9	Methyl acetate, >=99.8% (GC)	1mL 5mL	45997-1ML 45997-5ML	
106-70-7	Methyl caproate, >=99.8% (GC)	1mL 5mL	21599-1ML 21599-5ML	
110-42-9	Methyl decanoate, >=99.5% (GC)	1mL 5mL	21479-1ML 21479-5ML	
2462-84-2	Methyl elaidate, >=99.0% (GC)	1mL 5mL	45119-1ML 45119-5ML	
77630-51-4	Methyl hentriacontanoate, >=99.0% (GC)	100mg 500mg	51532-100MG 51532-500MG	
1731-92-6	Methyl heptadecanoate, >=99.7% (GC)	1000g 5000mg	51633-1G 51633-5G	
5802-82-4	Methyl hexacosanoate, >=99.5% (GC)	100mg 500mg	52203-100MG 52203-500MG	
78-78-4	2-Methylbutane, >=99.7% (GC)	5mL 10mL 50mL	59060-5ML 59060-10ML 59060-50ML	
111-82-0	Methyl laurate, >=99.5% (GC)	1mL 5mL	61689-1ML 61689-5ML	
301-00-8	Methyl linolenate, ~99% (GC)	1mL 5mL	62200-1ML 62200-5ML	

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112-63-0	Methyl linoleate, >=99.0% (GC)	5mL 5mL	62280-5ML 63908-5ML	
563-46-2	2-Methyl-1-butene, >=99.5% (GC)	5mL 10mL 50mL	66030-5ML 66030-10ML 66030-50ML	
513-35-9	2-Methyl-2-butene, >=99.5% (GC)	5mL 10mL 50mL	66050-5ML 66050-10ML 66050-50ML	
108-87-2	Methylcyclohexane, >=99.5% (GC)	1mL 5mL	66294-1ML 66294-5ML	
96-37-7	Methyl cyclopentane, >=99.5% (GC)	5mL 10mL 50mL	66490-5ML 66490-10ML 66490-50ML	
101-14-4	4,4'-M ethylene-bis(2-chloroaniline), ~99% (GC)	250mg 1000mg	66681-250MG 66681-1G	
107-83-5	2-Methylpentane, >=99.5% (GC)	5mL 10mL 50mL	68310-5ML 68310-10ML 68310-50ML	
96-14-0	3-Methylpentane, >=99.5% (GC)	5mL 10mL 50mL	68320-5ML 68320-10ML 68320-50ML	
763-29-1	2-M ethyl-1-pentene, >=99.5% (GC)	5mL 25mL	68450-5ML 68450-25ML	
124-10-7	Methyl myristate, >=99.5% (GC)	1mL 5mL	70129-1ML 70129-5ML	
929-77-1	Methyl docosanoate, >=99.5% (GC)	1000mg 5000mg	11940-1G 11940-5G	
623-42-7	Methyl butyrate, >=99.8% (GC)	1mL 5mL	19358-1ML 19358-5ML	
106-73-0	Methyl heptanoate, >=99.8% (GC)	1mL 5mL	75218-1ML 75218-5ML	
112-62-9	Methyl oleat e, natural, ~99% (GC)	1mL 5mL	75160-1ML 75160-5ML	
112-39-0	Methyl palmitate, >=99.5% (GC)	1000mg 5000mg	76159-1G 76159-5G	
1120-25-8	Methyl palmitoleate, >=99.0% (GC)	1000mg	76176-1G	
1731-84-6	Methyl pelargonate, >=99.8% (GC)	1mL 5mL	76368-1ML 76368-5ML	
78-83-1	2-Methyl -1-propanol, >99.9 % (GC)	1mL 5mL 10mL	82059-1ML 82059-5ML 82059-10ML	
872-50-4	1-Methyl-2-pyrrolidone, >99.9 % (GC)	5mL 10mL	78769-5ML 78769-10ML	
112-61-8	Methyl stearate, >=99.5% (GC)	1000mg 5000mg	85769-1G 85769-5G	
2442-49-1	Methyl tetracosanoate, >=99.0% (GC)	250mg 1000mg	87115-250MG 87115-1G	
2433-97-8	Methyl tricosanoate, >=99.0% (GC)	250mg	91478-250MG	
1731-88-0	Methyl tridecanoate, >=99.5% (GC)	1mL 5mL	91558-1ML 91558-5ML	
624-24-8	Methyl valerate, >=99.8% (GC)	1mL	94560-1ML	
544-63-8	Myristic acid, >=99.5% (GC)	5000mg	70079-5G	
471-77-2	Neoabietic acid, ~99% (GC)	50mg	72066-50MG	
630-03-5	Nonacosane, >=99.5% (GC)	250mg 1000mg	74156-250MG 74156-1G	
629-92-5	Nonadecane, >=99.8% (GC)	1000mg 5000mg	74158-1G 74158-5G	
1731-94-8	Methyl nonadecanoate, >=99.5% (GC)	1000mg 5000mg	74208-1G 74208-5G	
108-10-1	4-Methyl-2-pentanone , >=99.7% (GC)	1mL 5mL	02474-1ML 02474-5ML	

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Multipurpose Standards
Fluka GC Reference Standards

CAS NO.	COMPOUND	QTY.	CAT. NO.	PRICE
111-84-2	Nonane, >=99.8% (GC)	5mL 10mL 50mL	74250-5ML 74250-10ML 74250-50ML	
7194-86-7	Nonatriacontane, > =99.5% (GC)	250mg 1000mg	74321-250MG 74321-1G	
630-02-4	Octacosane, >=99.5% (GC)	250mg 1000mg	74684-250MG 74684-1G	
593-45-3	Octadecane, >=99.8% (GC)	1000mg 5000mg	74691-1G 74691-5G	
111-65-9	Octane, >=99.8% (GC)	5mL 10mL 50mL	74820-5ML 74820-10ML 74820-50ML	
111-66-0	1-Octene, >=99.8% (GC)	5mL 10mL 50mL	74900-5ML 74900-10ML 74900-50ML	
112-80-1	Oleic acid, natural, ~99% (GC)	5mL 25mL	75090-5ML 75090-25ML	
57-10-3	Palmitic acid, >=99.0% (GC)	5000mg	76119-5G	
373-49-9	Palmitoleic acid, >=99.0% (GC)	1000mg	76169-1G	
629-99-2	Pentacosane, >=99.5% (GC)	250mg 1000mg	76493-250MG 76493-1G	
629-62-9	Pentadecane, >=99.8% (GC)	5mL 25mL	76509-5ML 76509-25ML	
109-66-0	Pentane, >=99.8% (GC)	5mL 10mL 50mL	76870-5ML 76870-10ML 76870-50ML	
71-41-0	1-Pentanol, >99.8 % (GC)	1mL 5mL 10mL	77597-1ML 77597-5ML 77597-10ML	
630-07-9	Pentatriacontane, >=99.5% (GC)	250mg 1000mg	76968-250MG 76968-1G	
638-36-8	Phytane, ~99% (GC)	50mg	80165-50MG	
67-63-0	2-Propanol, > 99.9 % (GC)	1mL 5mL 10mL	91237-1ML 91237-5ML 91237-10ML	
71-23-8	1-Propanol, > 99.9 % (GC)	1mL 5mL 10mL	96566-1ML 96566-5ML 96566-10ML	
103-65-1	Propylbenzene, >=99.8% (GC)	5mL 10mL	82118-5ML 82118-10ML	
95-63-6	Pseudocumene, >=99.5% (GC)	5mL 10mL 50mL	82540-5ML 82540-10ML 82540-50ML	
57-11-4	Stearic acid, >=99.5%	5000mg	85679-5G	
126-33-0	Sulfolane, >99.8 % (GC)	5mL 10mL	88965-5ML 88965-10ML	
4181-95-7	Tetracontane, >=99.5% (GC)	250mg 1000mg	87086-250MG 87086-1G	
646-31-1	Tetracosane, >=99.5% (GC)	1000mg 5000mg 1000mg	87089-1G 87089-5G 91478-1G	
629-59-4	Tetradecane olefine free, >=99.5% (GC)	5mL 25mL	87139-5ML 87139-25ML	
14167-59-0	Tetratriacontane, >=99.5% (GC)	250mg 1000mg	88152-250MG 88152-1G	
109-99-9	Tetrahydrofuran, > 99.9 % (GC)	5mL 10mL	78445-5ML 78445-10ML	
127-18-4	Tetrachloroethylene, >=99.9% (GC)	1mL 5mL	02666-1ML 02666-5ML	
108-88-3	Toluene, >=99.9% (GC)	5mL 25mL	89680-5ML 89680-25ML	
638-68-6	Triacontane, >=99.5% (GC)	250mg 1000mg	90270-250MG 90270-1G	

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Multipurpose Standards
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CAS NO.	COMPOUND	QTY.	CAT. NO.	PRICE
638-67-5	Tricosane, >=99.5% (GC)	1000mg 5000mg	91447-1G 91447-5G	
629-50-5	Tridecane, >=99.5% (GC)	5mL 10mL 50mL	91490-5ML 91490-10ML 91490-50ML	
76-05-1	Trifluoroacetic acid, >99.5 % (GC)	1mL 5mL 10mL	74564-1ML 74564-5ML 74564-10ML	
79-01-6	Trichloroethylene, >=99.9% (GC)	1mL 5mL	02667-1ML 02667-5ML	
79-00-5	1,1,2-Trichloroethane, >=99.9% (GC)	1mL 5mL	02668-1ML 02668-5ML	
107-39-1	2,4,4-Trimethyl-1-pentene, >=99.5% (GC)	5mL 25mL	92670-5ML 92670-25ML	
630-05-7	Tritriacontane, >=99.5% (GC)	250mg 1000mg	93435-250MG 93435-1G	
1120-21-4	Undecane, >=99.8% (GC)	5mL 25mL	94000-5ML 94000-25ML	
821-95-4	1-Undecene, >=99.5% (GC)	1mL 5mL 5mL	94138-1ML 94138-5ML 94560-5ML	
100-40-3	4-Vinyl-1-cyclohexene, >=99.5% (GC)	5mL 25mL	94950-5ML 94950-25ML	
95-47-6	o-Xylene, >=99.5% (GC)	5mL 10mL 50mL	95660-5ML 95660-10ML 95660-50ML	
108-38-3	m-Xylene, >=99.5% (GC)	5mL 10mL 50mL	95670-5ML 95670-10ML 95670-50ML	
106-42-3	p-Xylene, >=99.5% (GC)	5mL 10mL 50mL	95680-5ML 95680-10ML 95680-50ML	

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Multipurpose Standards
OEKANAL® Standards

Riedel-de Haën

Riedel-de Haën Oekanal® standards are for the analysis of substances of environmental concern. Oekanal standards are supplied with batch-specific certificates of analysis and labels. Oekanal standards are supplied as purified neat substances or dissolved in solvents. Oekanal standards are packaged in glass ampules and formulated for single use to reduce waste. Riedel-de Haën Oekanal quality is founded on 25 years of experience with the production and purification of high purity organic standard substances.



- Analysis of compounds of environmental concern
- Batch specific assay shown on the label and confirmed by a detailed certificate analysis accompanying the standard
- Most substances >99% purity
- Expiration date included

OEKANAL® Volatile Hydrocarbon Standards for Envionmental Analysis

CAS NO.	COMPOUND	QTY.	CAT. NO.	PRICE
107-13-1	Acrylonitrile	5mL	45960-5ML-R	
	Aflatoxine G1 solution, 5 ng/µl in methanol	2mL	46418-2ML	
	Aflatoxine G2 solution, 5 ng/µl in methanol	2mL	46423-2ML	
60-09-3	4-Aminoazobenzene	250mg	46130-250MG-R	
97-56-3	o-Aminoazotoluene	250mg	46085-250MG-R	
120-12-7	Anthracene	250mg	46051-250MG-R	
85-68-7	Benzyl butyl phthalate	250mg	36927-250MG	
84-77-5	Bis-decyl phthalate	250mg	36933-250MG	
75-27-4	Bromodichloromethane	250mg	36970-250MG	
75-25-2	Bromoform	250mg	36972-250MG	
108-90-7	Chlorobenzene	1000mg	46029-1G	
121-73-3	3-Chloronitrobenzene	250mg	45957-250MG	
100-00-5	4-Chloronitrobenzene	250mg	45925-250MG	
218-01-4	Chrysene	100mg	35754-100MG	
95-48-7	o-Cresol	250mg	36922-250MG	
108-39-4	m-Cresol	250mg	36923-250MG	
106-44-5	p-Cresol	250mg	36924-250MG	
838-88-0	4,4'-Diamino-3,3'-di methyldiphenylmethane	100mg	46106-100MG	
101-77-9	4,4'-Diaminodiphenylmethane	250mg	46092-250MG-R	
95-80-7	2,4-Diaminotoluene	250mg	45922-250MG	
823-40-5	2,6-Diaminotoluene	250mg	45921-250MG	
496-72-0	3,4-Diaminotoluene	250mg	45956-250MG	
598-20-9	1,2-Dibromo-1-chloroethane	1000mg	35975-1G	
124-48-1	Dibromochloromethane	250mg	36971-250MG	
75-34-3	1,1-Dichloroethane	250mg	36967-250MG	
156-59-2	cis-1,2-Dichloroethene	250mg	36968-250MG	
15-660-5	trans-1,2-Dichloroethene	250mg	36969-250MG	
119-93-7	3,3'-Dimethylbenzidine	100mg	46101-100MG-R	
121-14-2	2,4-Dinitrotoluene	250mg	45969-250MG	
606-20-2	2,6-Dinitrotoluene	250mg	45970-250MG-R	
206-44-0	Fluoranthene	250mg	45504-250MG	
57-09-0	Hexadecyltrimethylammonium bromide	1000mg	36932-1G	
95-13-6	Indene	250mg	45791-250MG	
56-49-5	3-Methylcholanthrene	100mg	45794-100MG	
90-12-0	1-Methylnaphthalene	250mg	45795-250MG	

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Multipurpose Standards
OEKANAL® Standards

CAS NO.	COMPOUND	QTY.	CAT. NO.	PRICE
99-55-8	2-Methyl-5-nitroaniline	250mg	45984-250MG	
134-32-7	1-Naphthylamine	250mg	34390-250MG	
91-59-8	2-Naphthylamine	100mg	46081-100MG-R	
100-17-4	4-Nitroanisole	250mg	36916-250MG-R	
98-95-3	Nitrobenzene	250mg	45308-250MG	
135-48-8	Pentacene	100mg	45797-100MG	
2778-96-3	Stearyl stearate	100mg	46408-100MG	
100-42-5	Styrene	250mg	45993-250MG	
634-90-2	1,2,3,5-Tetrachlorobenzene	250mg	36928-250MG	
4181-95-7	Tetracontane	100mg	46409-100MG	
95-53-4	o-Toluidine	250mg	45979-250MG	
108-44-1	m-Toluidine	250mg	45980-250MG-R	
118-79-6	2,4,6-Tribromophenol	250mg	36918-250MG	
137-17-7	2,4,5-Trimethylaniline	100mg	46127-100MG-R	
526-73-8	1,2,3-Trimethylbenzene	250mg	45935-250MG	

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Multipurpose Standards

PESTANAL® Standards

Riedel-de Haën Pestanal® standards are for residue analysis of the active ingredients in pesticides, pesticide derivatives, and metabolites. Pestanal standards are supplied with batch-specific certificates of analysis and labels. Many Pestanal standards are supplied in Pestanal solvents. These standards are packaged in glass ampules, and formulated for single use to reduce waste. Riedel-de Haën quality is founded on 25 experience with the production and purification of high purity organic standard substances.

- Trace level residue analysis of pesticides found in plant treatment
- Batch specific assay shown on the label and confirmed by a detailed certificate analysis accompanying the standard
- Most substances >99% purity
- Expiration date included

PESTANAL® Standards for Pesticide Residue Analysis

CAS NO.	COMPOUND	QTY.	CAT. NO.	PRICE
71751-41-2	Abamectin	100mg	46392-100MG-R	
30560-19-1	Acephate	250mg	45315-250MG	
34256-82-1	Acetochlor	100mg	33379-100MG	
57-15-8	Acetone chloroform	1000mg	36681-1G	
50494-66-6	Acifluorfen	250mg	34311-250MG	
74070-46-5	Aclonifen	250mg	36792-250MG-R	
101007-06-1	Acrinathrin	100mg	46415-100MG-R	
15972-60-8	Alachlor	250mg	45316-250MG	
116-06-3	Aldicarb	100mg	33386-100MG	
1646-88-4	Aldicarb-sulfone	100mg	33387-100MG	
1646-87-3	Aldicarb-sulfoxide	100mg	36784-100MG-R	
584-79-2	Allethrin, mixture of stereo isomers	100mg	33396-100MG	
93-71-0	Allidochlor	250mg	45318-250MG	
55635-13-7	Alloxydi m-sodium	250mg	45319-250MG	
57-06-7	Allyl iso-thiocyanate	1000mg	36682-1G	
2550-75-6	Alodan	250mg	45320-250MG	
934-32-7	2-Aminobenzimidazole	250mg	36570-250MG-R	
2032-59-9	Aminocarb	250mg	45322-250MG	
95-55-6	2-Aminophenol	1000mg	36683-1G	
123-30-8	4-Aminophenol	1000mg	35837-1G	
504-29-0	2-Aminopyridine	1000mg	36685-1G	
462-08-8	3-Aminopyridine	1000mg	36686-1G	
504-24-5	4-Aminopyridine	1000mg	36687-1G	
33089-61-1	Amitraz	250mg	45323-250MG	
61-82-5	Amitrole	250mg	45324-250MG	
101-05-3	Anilazine	250mg	45325-250MG-R	
62-53-3	Aniline	250mg	45326-250MG	
64249-01-0	Anilofos	100mg	37876-100MG	
84-65-1	Anthraquinone	250mg	45327-250MG-R	
86-88-4	ANTU	250mg	45328-250MG	
3337-71-1	Asulam	250mg	45329-250MG	
1610-17-9	Atraton	250mg	36630-250MG-R	
30360-56-6	Atraton -desisopropyl	250mg	36516-250MG	
6190-65-4	Atrazin-desethyl	250mg	36629-250MG	
19988-24-0	Atrazin-desethyl-2-hydroxy	100mg	45490-100MG	
3397-62-4	Atrazin-desethyl-desisopropyl	250mg	36667-250MG	
645-92-1	Atrazin-desethyl-desisopropyl-2-hydroxy	250mg	45613-250MG	
1007-28-9	Atrazin-desisopropyl	250mg	36628-250MG	
7313-54-4	Atrazin-desisopropyl-2-hydroxy	100mg	45630-100MG-R	
2163-68-0	Atrazin-2-hydroxy	250mg	36631-250MG	
35575-96-3	Azamethiphos	250mg	45331-250MG	
2642-71-9	Azinphos-ethyl	250mg	45332-250MG	
86-50-0	Azinphos-methyl	250mg	45333-250MG	
4658-28-0	Aziprotryne	250mg	45334-250MG	
41083-11-8	Azocyclotin	250mg	45335-250MG	

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Multipurpose Standards
PESTANAL® Standards

CAS NO.	COMPOUND	QTY.	CAT. NO.	PRICE
131860-33-8	Azoxystrobin min. 99 %	100mg	46160-100MG-R	
71626-11-4	Benalaxyl	250mg	36760-250MG-R	
3813-05-6	Benazolin	100mg	33380-100MG-R	
22781-23-3	Bendiocarb	250mg	45336-250MG	
1861-40-1	Benfluralin	250mg	45337-250MG	
68505-64-1	Benfuresate min. 99 %	100mg	46088-100MG-R	
15310-01-7	Benodanil	250mg	45338-250MG	
17804-35-2	Benomyl	250mg	45339-250MG	
98730-04-2	Benoxacor	250mg	46001-250MG	
83055-99-6	Bensulfuron-methyl	100mg	37897-100MG	
741-58-2	Bensulide	250mg	45340-250MG-R	
25057-89-0	Bentazone	250mg	45341-250MG-R	
29104-30-1	Benzoximate	100mg	33397-100MG	
22212-55-1	Benzoylprop-ethyl	100mg	45343-100MG-R	
1929-88-0	Benzthiazuron	100mg	36563-100MG	
42576-02-3	Bifenox	250mg	45345-250MG-R	
485-31-4	Binapacryl	250mg	45346-250MG-R	
22431-63-6	Bioallethrin	250mg	45347-250MG-R	
28434-01-7	Bioresmethrin	250mg	45348-250MG-R	
366-18-7	2,2'-Bipyridine	1000mg	36759-1G	
553-26-4	4,4'-Bipyridine, anhydrous	1000mg	36690-1G	
117-81-7	Bis-(2-ethylhexyl) phthalate	1000mg	36735-1G	
55179-31-2	Bitertanol, mixture of diastereo isomers	250mg	45349-250MG	
56073-10-0	Brodifacoum	100mg	46036-100MG	
28772-56-7	Bromadiolon	100mg	46035-100MG	
33399-00-7	Bromfenvinphos-ethyl, mixture of cis and trans isomers	100mg	45816-100MG	
13104-21-7	Bromfenvinphos-methyl	100mg	45815-100MG	
7640-33-7	7-Bromo-5-chloro-8-hydroxyquinoline	1000mg	35704-1G	
4824-78-6	Bromophos-ethyl	100mg	33399-100MG	
2104-96-3	Bromophos-methyl	100mg	33400-100MG	
1689-84-5	Bromoxynil	250mg	45355-250MG	
1689-99-2	Bromoxynil-octanoate	250mg	45356-250MG	
18181-80-1	Bromopropylate	250mg	45357-250MG	
3042-84-0	Bromopyrazon	250mg	45358-250MG	
116255-48-2	Bromuconazole, min. 99 %	100mg	46094-100MG-R	
52-51-7	Bronopol	250mg	45359-250MG-R	
41483-43-6	Bupirimate	250mg	45360-250MG-R	
69327-76-0	Buprofezin	100mg	37886-100MG	
23184-66-9	Butachlor	100mg	37887-100MG	
34681-24-8	Butocarboximsulfoxide	100mg	45719-100MG	
34681-23-7	Butoxycarboxim	100mg	36122-100MG	
33629-47-9	Butralin	250mg	36528-250MG	
3766-60-7	Buturon	100mg	36510-100MG	
75-60-5	Cacodylic acid	250mg	45726-250MG-R	
124-65-2	Cacodylic acid sodium salt	250mg	45727-250MG-R	
8001-35-2	Camphechlor, technical mixture	250mg	45364-250MG-R	
133-06-2	Captan	250mg	45366-250MG-R	
10605-21-7	Carbendazim	250mg	45368-250MG	
16118-49-3	Carbetamide	250mg	45369-250MG	
1563-66-2	Carbofuran	250mg	45370-250MG-R	
16655-82-6	Carbofuran-3-hydroxy	10mg	37896-10MG	
16709-30-1	Carbofuran-3-keto	10mg	37895-10MG-R	
786-19-6	Carbophenothion	250mg	45300-250MG-R	
55285-14-8	Carbosulfan	250mg	34300-250MG-R	
5234-68-4	Carboxin	250mg	45371-250MG	
15263-52-2	Cartap hydrochloride	100mg	45995-100MG	
2439-01-2	Chinomethionate	250mg	45372-250MG	
15879-93-3	a-Chloralose	250mg	45373-250MG	

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Multipurpose Standards

PESTANAL® Standards

CAS NO.	COMPOUND	QTY.	CAT. NO.	PRICE
118-75-2	p-Chloranil	250mg	45374-250MG	
2164-09-2	Chloranocryl	250mg	34317-250MG	
13360-45-7	Chlorbromuron	250mg	45377-250MG	
1967-16-4	Chlorbufam	250mg	45301-250MG	
57-74-9	Chlordane, technical mixture	250mg	45378-250MG	
3734-48-3	Chlorden	250mg	45380-250MG-R	
19750-95-9	Chlordi meform hydrochloride	250mg	35914-250MG	
85-34-7	Chlorfenac	100mg	34318-100MG	
14437-17-3	Chlorfenprop-methyl	250mg	45381-250MG	
470-90-6	Chlor fenvinphos, mixture of Z and E isomers	250mg	36551-250MG	
71422-67-8	Chlorfluazuron	250mg	36530-250MG-R	
2464-37-1	Chlorflurenol	100mg	45721-100MG	
2536-31-4	Chlorflurenol-methyl	250mg	45302-250MG	
1698-60-8	Chloridazon	250mg	45385-250MG	
24934-91-6	Chlormephos	250mg	45386-250MG	
991-81-5	Chlormequat chloride	250mg	45387-250MG	
108-42-9	3-Chloroaniline	1000mg	35824-1G	
97-50-7	5-Chloro-2,4-dimethoxyaniline	1000mg	35991-1G	
107-07-3	2-Chloroethanol	1000mg	36693-1G	
615-67-8	Chlorohydroquinone	250mg	45384-250MG	
5345-54-0	3-Chloro-4-methoxyaniline	1000mg	36762-1G	
95-74-9	3-Chloro-4-methylaniline	1000mg	36761-1G	
2675-77-6	Chloroneb	100mg	36125-100MG	
3691-35-8	Chlorophacinone	250mg	45390-250MG	
95-57-8	2-Chlorophenol	1000mg	36746-1G	
108-43-0	3-Chlorophenol	1000mg	36747-1G	
122-88-3	4-Chlorophenoxyacetic acid	250mg	45391-250MG	
14816-20-7	Chlorphoxim	250mg	45392-250MG	
76-06-2	Chloropicrin	250mg	34321-250MG	
64902-72-3	Chlorosulfuron	100mg	34322-100MG	
1897-45-6	Chlorothalonil	250mg	36791-250MG	
108-41-8	3-Chlorotoluene	1000mg	36696-1G	
1982-47-4	Chloroxuron	250mg	45389-250MG	
101-21-3	Chlorpropham	250mg	45393-250MG	
5836-10-2	Chlorpropylat	250mg	45394-250MG	
5598-13-0	Chlorpyriphos-methyl	250mg	45396-250MG	
1861-32-1	Chlorthal-dimethyl	250mg	45397-250MG	
1918-13-4	Chlorthiamid	250mg	45398-250MG	
500-28-7	Chlorthion	25mg	35030-25MG	
15545-48-9	Chlortoluron	250mg	45400-250MG-R	
142891-20-1	Cindon-ethyl	100mg	46336-100MG	
38083-17-9	Climbazol	100mg	36127-100MG	
105512-06-9	Clodinafop-propargyl	250mg	46122-250MG-R	
74115-24-5	Clofentezine	250mg	36763-250MG	
81777-84-1	Clomazone	250mg	46120-100MG-R	
1702-17-6	Clopyralid	250mg	36758-250MG	
57754-85-5	Clopyralid (2-hydroxyethyl)ammonium	250mg	36529-250MG	
99607-70-2	Cloquintocet-mexyl	250mg	46123-250MG-R	
81-82-3	Coumachlor	250mg	45402-250MG	
117-52-2	Coumafuryl	10mg	34324-10MG	
56-72-4	Coumaphos	250mg	45403-250MG	
5836-29-3	Coumatetralyl	250mg	45404-250MG	
535-89-7	Crimidine	250mg	36564-250MG	
13067-93-1	Cyanofenphos	100mg	36509-100MG	
1134-23-2	Cycloate	250mg	45408-250MG	
66-81-9	Cycloheximid mixture of stereo isomers	100mg	46401-100MG-R	
101205-02-1	Cycloxydim	100mg	46071-100MG-R	
2163-69-1	Cycluron	250mg	45409-250MG	

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Multipurpose Standards
PESTANAL® Standards

CAS NO.	COMPOUND	QTY.	CAT. NO.	PRICE
68359-37-5	b-Cyfluthrin	250mg	46003-250MG	
68359-37-5	Cyfluthrin, mixture of isomers	250mg	45410-250MG-R	
91465-08-6	l-Cyhalothrin	100mg	34325-100MG-R	
13121-70-5	Cyhexatin	250mg	45411-250MG	
57966-95-7	Cymoxanil	100mg	34326-100MG	
67375-30-8	a-Cypermethrin	100mg	45806-100MG	
52315-07-8	Cypermethrin, mixture of isomers	100mg	36128-100MG	
39515-40-7	Cyphenothrin, mixture of cis and trans isomers	100mg	46037-100MG	
113096-99-4	Cyproconazol, mixture of diastereomers	100mg	46068-100MG	
121552-61-2	Cypro dinil min. 99 %	250mg	34389-250MG	
69581-33-5	Cyprofuram	250mg	45413-250MG	
66215-27-8	Cyromazine	250mg	45414-250MG	
94-75-7	2,4-D	250mg	45415-250MG-R	
17640-02-7	Dalapon-methyl	250mg	45383-250MG	
127-20-8	Dalapon-sodium	250mg	45417-250MG	
1596-84-5	Daminozide	250mg	45418-250MG	
533-74-4	Dazomet	250mg	45419-250MG	
94-82-6	2,4-DB	250mg	45420-250MG-R	
18625-12-2	2,4-DB-methyl ester	250mg	36776-250MG-R	
90-98-2	4,4'-DBP	250mg	45421-250MG	
25168-26-7	2,4-D-1-Butyl ester	250mg	45732-250MG-R	
1929-73-3	2,4-D-butylglycolester	250mg	34315-250MG-R	
116-52-9	DCU	250mg	45812-250MG	
83-05-6	4,4'-DDA	250mg	35484-250MG	
53-19-0	2,4'-DDD	250mg	35485-250MG	
72-54-8	4,4'-DDD (TDE)	250mg	35486-250MG	
72-55-9	4,4'-DDE	250mg	35487-250MG	
101-76-8	4,4'-DDM	250mg	35488-250MG	
1022-22-6	4,4'-DDMU	250mg	35489-250MG	
2642-82-2	4,4'-DDOH	250mg	35490-250MG-R	
85-00-7	Deiquat, monohydrate	250mg	45422-250MG-R	
52918-63-5	Deltamethrin	250mg	45423-250MG	
919-86-8	Demeton-S-methyl	250mg	45304-250MG	
17040-19-6	Demeton-S-methyl-sulfone	250mg	45424-250MG	
13684-56-5	Desmedipham	250mg	45426-250MG	
1014-69-3	Desmetryn	250mg	45427-250MG	
80060-09-9	Diafenthiuron	250mg	46004-250MG-R	
10311-84-9	Dialifos	100mg	36500-100MG	
333-41-5	Diazinon	250mg	45428-250MG	
300-76-5	Dibrom	250mg	45429-250MG	
111-92-2	Di-n-butylamine	1000mg	36700-1G	
84-74-2	Dibutyl phthalate	1000mg	36736-1G	
1918-00-9	Dicamba	250mg	45430-250MG	
1194-65-6	Dichlobenil	250mg	45431-250MG	
97-17-6	Dichlofenthion	250mg	45432-250MG	
1085-98-9	Dichlofluanid	250mg	45433-250MG	
117-80-6	Dichlon	250mg	45434-250MG	
99-30-9	Dichloran	250mg	45435-250MG	
608-27-5	2,3-Dichloroaniline	1000mg	36701-1G	
554-00-7	2,4-Dichloroaniline	1000mg	35829-1G	
95-82-9	2,5-Dichloroaniline	1000mg	36702-1G	
608-31-1	2,6-Dichloroaniline	1000mg	36703-1G	
95-76-1	3,4-Dichloroaniline	1000mg	35827-1G	
626-43-7	3,5-Dichloroaniline	1000mg	36704-1G	
2008-58-4	2,6-Dichlorobenzamide	1000mg	36605-1G	
50-45-3	2,3-Dichlorobenzoic acid	250mg	34329-250MG	
50-84-0	2,4-Dichlorobenzoic acid	1000mg	36749-1G	
95-50-1	1,2-Dichlorobenzene	1000mg	36707-1G	

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Multipurpose Standards

PESTANAL® Standards

CAS NO.	COMPOUND	QTY.	CAT. NO.	PRICE
541-73-1	1,3-Dichlorobenzene	1000mg	36708-1G	
106-46-7	1,4-Dichlorobenzene	1000mg	35775-1G	
611-06-3	2,4-Dichloronitrobenzene	250mg	45745-250MG	
89-61-2	2,5-Dichloronitrobenzene	250mg	36572-250MG	
99-54-7	3,4-Dichloronitrobenzene	1000mg	35831-1G	
618-62-2	3,5-Dichloronitrobenzene	250mg	36573-250MG	
97-23-4	Dichlorophene	250mg	35992-250MG	
120-83-2	2,4-Dichlorophenol	1000mg	35811-1G	
583-78-8	2,5-Dichlorophenol	1000mg	35835-1G	
95-77-2	3,4-Dichlorophenol	250mg	36793-250MG-R	
591-35-5	3,5-Dichlorophenol	250mg	46070-250MG-R	
78-87-5	1,2-Dichloropropane	250mg	45438-250MG	
142-28-9	1,3-Dichloropropane	250mg	45439-250MG	
542-75-6	1,3-Dichloropropene, mixture of isomers	250mg	45440-250MG	
120-36-5	Dichlorprop, racemate	250mg	45436-250MG	
79270-78-3	Dichlorprop-2-ethylhexyl ester	250mg	45722-250MG	
15165-67-0	Dichlorprop-P	250mg	36770-250MG-R	
62-73-7	Dichlorvos	250mg	45441-250MG	
75736-33-3	Diclobutrazol, mixture of stereo isomers	250mg	36764-250MG	
51338-27-3	Diclofop-methyl	250mg	45442-250MG	
115-32-2	Dicofol	250mg	36677-250MG-R	
141-66-2	Dicrotophos	250mg	45305-250MG	
112636-83-6	Dicyclanil	100mg	46391-100MG	
2227-17-0	Dienochlor	250mg	45443-250MG	
84-66-2	Diethyl phthalate	1000mg	36737-1G	
119446-68-3	Difenoconazol	250mg	36531-250MG	
14214-32-5	Difenoxuron	250mg	45444-250MG	
43222-48-6	Difenzoquat methylsulfate	250mg	34331-250MG	
35367-38-5	Diflubenzuron	250mg	45446-250MG	
83164-33-4	Diflufenican	100mg	45751-100MG	
18467-77-1	Dikegulac, monohydrate	250mg	36794-250MG	
52508-35-7	Dikegulac-sodium	250mg	36797-250MG-R	
115-26-4	Dimefox	100mg	36502-100MG	
34205-21-5	Dimefuron	250mg	36788-250MG-R	
50563-36-5	Dimethachlor	250mg	45447-250MG	
22936-75-0	Dimethametryn	250mg	45448-250MG	
87674-68-8	Dimet henamid	100mg	46385-100MG-R	
110488-70-5	Dimethomorph, mixture of E + Z isomers	100mg	46027-100MG	
131-11-3	Dimethyl phthalate	1000mg	36738-1G	
96-31-1	N,N'-Dimethylurea	250mg	36574-250MG	
83657-24-3	Diniconazol, mixture of Z and E isomers	250mg	46049-250MG	
29091-05-2	Dinitramine	250mg	34333-250MG	
51-28-5	2,4-D initrophenol, (with approx. 0,3mL H2O/g)	250mg	34334-250MG	
329-71-5	2,5-Dinitr ophenol (with 0,5mL H2O/g)	250mg	34335-250MG-R	
973-21-7	Dinobuton	250mg	45451-250MG	
39300-45-3	D inocap, technical mixture of isom ers	250mg	45452-250MG	
2813-95-8	Dinoseb acetate	250mg	36799-250MG-R	
1420-07-1	Dinoterb	250mg	36775-250MG-R	
	Dinoterb-bis(2-hydroxyethyl)ammonium	250mg	36779-250MG-R	
63837-33-2	Diofenolan	250mg	46115-250MG-R	
6988-21-2	Dioxacarb	250mg	45454-250MG	
957-51-7	Diphenamid	250mg	45455-250MG	
122-39-4	Diphenylamine	250mg	45456-250MG	
84-62-8	Diphenyl phthalate	1000mg	36617-1G-R	
139-66-2	Diphenyl sulfide	1000mg	36720-1G-R	
127-63-9	Diphenyl sulfone	250mg	45458-250MG	
4147-51-7	Dipropetryn	250mg	45459-250MG	
131-16-8	Dipropyl phthalate	250mg	45624-250MG	

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CAS NO.	COMPOUND	QTY.	CAT. NO.	PRICE
2497-06-5	Disulfoton-sulfone	100mg	45871-100MG	
2497-07-6	Disulfoton-sulfoxide	100mg	45897-100MG-R	
5131-24-8	Ditalimfos	250mg	45461-250MG	
3347-22-6	Dithianon	250mg	45462-250MG	
330-54-1	Diuron	250mg	45463-250MG	
1928-38-7	2,4-D-methyl ester	250mg	45416-250MG	
534-52-1	DNOC	250mg	45464-250MG	
2702-72-9	2,4-D sodium, monohydrate	250mg	45747-250MG	
1593-77-7	Dodemorph, mixture of cis and trans isomers	250mg	45465-250MG	
2439-10-3	Dodine	250mg	45466-250MG	
17109-49-8	Edifenphos	250mg	45467-250MG	
155569-91-8	Emamectin-benzoate	250mg	46393-250MG	
959-98-7	a-Endosulfan	250mg	45468-250MG	
115-29-7	Endosulfan (a+b=2+1)	250mg	36750-250MG-R	
2157-19-9	Endosulfan alcohol	100mg	36674-100MG	
3868-61-9	Endosulfan lactone	100mg	36675-100MG	
145-73-3	Endothal, monohydrate	250mg	35525-250MG	
2104-64-5	EPN	100mg	36503-100MG	
106325-08-0	Epoxiconazol	250mg	36848-250MG	
28434-00-6	Esbiol	250mg	45470-250MG	
66230-04-4	Esfenvalerate min. 99 %	250mg	46277-100MG	
71245-23-3	Etaconazole	250mg	45471-250MG	
55283-68-6	Ethalfluralin	250mg	45472-250MG	
16672-87-0	Ethephon	250mg	45473-250MG	
30043-49-3	Ethidimuron	250mg	45474-250MG	
29973-13-5	Ethiofencarb	250mg	45475-250MG	
53380-23-7	Ethiofencarb-sulfone	10mg	45810-10MG	
53380-22-6	Ethiofencarb-sulfoxide	10mg	45811-10MG	
2941-55-1	Ethiolat	250mg	45476-250MG	
563-12-2	Ethion	250mg	45477-250MG	
23947-60-6	Ethirimol	250mg	45478-250MG	
26225-79-6	Ethofumesate	250mg	45479-250MG	
13194-48-4	Ethoprophos	250mg	45306-250MG	
91-53-2	Ethoxyquin	250mg	45480-250MG-R	
126801-58-9	Ethoxysulfuron	100mg	46300-100MG-R	
123-07-9	4-Ethylphenol	1000mg	36724-1G	
38260-54-7	Etrimfos, technical mixture	250mg	45481-250MG	
97-53-0	Eugenol	250mg	35995-250MG	
52-85-7	Famphur	250mg	34341-250MG	
140-56-7	Fenaminosulf	250mg	45482-250MG	
22224-92-6	Fenamiphos	250mg	45483-250MG	
31972-44-8	Fenamiphos-sulfon	100mg	46292-100MG	
31972-43-7	Fenamiphos-sulfoxid	100mg	46293-100MG	
60168-88-9	Fenarimol	250mg	45484-250MG	
14255-88-0	Fenazaflor	100mg	36504-100MG	
120928-09-8	Fenazaquin min. 99 %	100mg	46087-100MG-R	
114369-43-6	Fenbuconazole	100mg	46096-100MG-R	
13356-08-6	Fenbutatin oxide	250mg	34342-250MG	
103112-35-2	Fenchlorazol-ethyl	250mg	45760-250MG-R	
3740-92-9	Fenclorim	250mg	46005-250MG	
24691-80-3	Fenfuram	250mg	45486-250MG	
126833-17-8	Fenhexamid	100mg	46278-100MG-R	
3766-81-2	Fenobucarb	250mg	45488-250MG	
73519-55-8	Fenoxaprop, racemate	250mg	36849-100MG-R	
66441-23-4	Fenoxaprop-ethyl, racemate	250mg	45518-250MG	
113158-40-0	Fenoxaprop-P	100mg	36850-100MG	
71238-80-2	Fenoxaprop-P-ethyl	250mg	36851-250MG	
79127-80-3	Fenoxycarb	250mg	34343-250MG	

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CAS NO.	COMPOUND	QTY.	CAT. NO.	PRICE
74738-17-3	Fenpiclonil	250mg	36532-250MG	
64257-84-7	Fenpropathrin	250mg	36767-250MG-R	
67306-00-7	Fenpropidin	250mg	46017-250MG	
67564-91-4	Fenpropimorph	250mg	36772-250MG-R	
111812-58-9	Fenpyroximate	100mg	46137-100MG-R	
80-38-6	Fenson	250mg	45489-250MG	
115-90-2	Fensulfothion	250mg	45307-250MG	
55-38-9	Fenthion	250mg	36552-250MG	
3761-42-0	Fenthion-sulfone	10mg	46023-10MG	
3761-41-9	Fenthionsulfoxide	50mg	37885-50MG	
900-95-8	Fentin acetate	250mg	45491-250MG	
639-58-7	Fentin chloride	250mg	45492-250MG	
76-87-9	Fentin hydroxide	250mg	45493-250MG	
101-42-8	Fenuron	250mg	45494-250MG	
51630-58-1	Fenvalerate	250mg	45495-250MG	
14484-64-1	Ferbam, technical mixture	250mg	45496-250MG	
120068-37-3	Fipronil	100mg	46451-100MG	
52756-22-6	Flamprop-isopropyl	250mg	45497-250MG	
52756-25-9	Flamprop-methyl	250mg	45498-250MG	
57973-67-8	Flamprop-M-isopropyl	250mg	45752-250MG	
69806-50-4	Fluazifop-butyl	250mg	36783-250MG	
79241-46-6	Fluazifop-P-butyl	100mg	46276-100MG-R	
86811-58-7	Fluazuron min. 99 %	100mg	46113-100MG-R	
37893-02-0	Flubenzimine	250mg	45499-250MG	
131341-86-1	Fludioxonil min. 99 %	100mg	46102-100MG-R	
142459-58-3	Flufenacet	100mg	46327-100MG-R	
101463-69-8	Flufenoxuron min. 99 %	250mg	46069-250MG-R	
42835-25-6	Flumequine	250mg	45735-250MG	
69770-45-2	Flumethrin	100mg	46417-100MG	
62924-70-3	Flumetralin	250mg	45501-250MG	
62-74-8	Fluoroacetic acid sodium salt	1000mg	36755-1G-R	
15457-05-3	Fluorodifen	250mg	45506-250MG	
77501-60-7	Fluoroglycofen-ethyl	250mg	46121-250MG-R	
31251-03-3	Fluotrimazol	250mg	45507-250MG	
136426-54-5	Fluquinconazole	100mg	46301-100MG	
467-69-6	Flurenol	250mg	45508-250MG	
2314-09-2	Flurenol-butyl	250mg	45509-250MG	
59756-60-4	Fluridone	250mg	45511-250MG	
61213-25-0	Flurochloridone, mixture of isomers	250mg	36517-250MG	
69377-81-7	Fluroxypyr	100mg	45758-100MG-R	
81406-37-3	Fluroxypyr-1-methylheptyl ester	100mg	36780-100MG-R	
96525-23-4	Flurtamone	100mg	46286-100MG	
85509-19-9	Flusilazole	100mg	45753-100MG	
76674-21-0	Flutriafol	100mg	34344-100MG	
102851-06-9	t-Fluvalinate	250mg	46294-250MG	
133-07-3	Folpet	250mg	45512-250MG-R	
72178-02-0	Fomesafen	100mg	46325-100MG-R	
944-22-9	Fonofos	250mg	45513-250MG	
23422-53-9	Formetanate hydrochloride	250mg	45514-250MG	
2540-82-1	Formothion in Xylol	250mg	46424-250MG	
3878-19-1	Fuberidazole	250mg	45515-250MG	
57646-30-7	Furalaxyl	250mg	45516-250MG	
65907-30-4	Furathiocarb	250mg	45517-250MG	
60568-05-0	Furmecyclox	100mg	34347-100MG	
77-06-5	Gibberellic acid, GA3	250mg	36575-250MG	
77182-82-2	Glufosinate-ammonium	250mg	45520-250MG	
1071-83-6	Glyphosate	250mg	45521-250MG	
69806-34-4	Haloxyfop	250mg	45817-250MG	

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CAS NO.	COMPOUND	QTY.	CAT. NO.	PRICE
87237-48-7	Haloxyfop-2-ethoxyethyl	250mg	36778-250MG-R	
69806-40-2	Haloxyfop-methyl	250mg	45820-250MG	
319-84-6	a-HCH	1000mg	35809-1G	
1024-57-3	Heptachlor endo-epoxide, isomer A	100mg	35492-100MG	
28044-83-9	Heptachlor exo-epoxide, isomer B	100mg	34309-100MG	
23560-59-0	Heptenophos	250mg	45523-250MG	
87-68-3	Hexachloro-1,3-butadiene	250mg	45525-250MG	
70-30-4	Hexachlorophene	250mg	45526-250MG	
79983-71-4	Hexaconazol	100mg	34348-100MG	
51235-04-2	Hexazinone	100mg	36129-100MG	
65733-18-8	S-Hydroprene	250mg	46426-250MG	
767-00-0	4-Hydroxybenzonitrile	250mg	45528-250MG	
90-43-7	2-Hydroxybiphenyl	250mg	45529-250MG	
14191-95-8	4-Hydroxyp henylacetonitrile	250mg	36554-250MG	
148-24-3	8-Hydroxyquinoline	250mg	36524-250MG	
134-31-6	8-Hydroxyquinoline sulfate	250mg	36525-250MG-R	
35554-44-0	Imazalil	100mg	36130-100MG-R	
81405-85-8	Imazamethabenz-methyl, mixture of isomers	100mg	34350-100MG	
81334-34-1	Imazapyr	100mg	37877-100MG	
105827-78-9	Imidacloprid	100mg	37894-100MG	
96-45-7	2-Imidazolidinethione	250mg	45531-250MG	
120-93-4	2-Imidazolidinon	250mg	45731-250MG-R	
87-51-4	3-Indolylacetic acid	250mg	45533-250MG	
133-32-4	4-(3-Indolyl)-butyric acid	250mg	45532-250MG	
18181-70-9	Iodfenphos	250mg	45544-250MG	
1689-83-4	Ioxynil	100mg	36131-100MG	
26087-47-8	Iprobenphos	100mg	45814-100MG	
36734-19-7	Iprodione	100mg	36132-100MG	
28159-98-0	Irgarol min. 98 %	250mg	46105-250MG-R	
42509-80-8	Isazophos	100mg	36133-100MG	
25311-71-1	Isofenphos	100mg	36135-100MG	
2631-40-5	Isoprocarb	250mg	45541-250MG	
33820-53-0	Isopropalin	100mg	36505-100MG	
34123-59-6	Isoproturon	100mg	36137-100MG	
82558-53-7	Isoxaben	100mg	36138-100MG	
141112-29-0	Isoxaflutol	100mg	46437-100MG	
4849-32-5	Karbutilate	250mg	45546-250MG	
143390-89-0	Kresoxim-methyl	100mg	37899-100MG	
2164-08-1	Lenacil	100mg	36140-100MG-R	
21609-90-5	Leptophos	100mg	33366-100MG	
330-55-2	Linuron	100mg	36141-100MG	
103055-07-8	Lufenuron	100mg	46103-100MG-R	
1634-78-2	Malaoxon	100mg	36142-100MG	
121-75-5	Malathion	100mg	36143-100MG	
123-33-1	Maleic hydrazide	250mg	45552-250MG	
8018-01-7	Mancozeb, technical mixture	250mg	45553-250MG	
12427-38-2	Maneb	250mg	45554-250MG	
94-74-6	MCPA	250mg	45555-250MG	
3653-48-3	MCPA sodium	250mg	45746-250MG	
9481-5	MCPB	100mg	36145-100MG	
2595-54-2	Mecarbam	100mg	36515-100MG	
7085-19-0	Mecoprop	100mg	36147-100MG	
16484-77-8	Mecoprop-P	250mg	36773-250MG-R	
135591-00-3	Mefenpyr-diethyl	100mg	46302-100MG	
950-10-7	Mephosfolan	100mg	34352-100MG	
24307-26-4	Mepiquat chloride	100mg	36151-100MG	
2032-65-7	Mercaptodimethur	100mg	36152-100MG	
2179-25-1	Mercaptodimethursulfon	100mg	45729-100MG	

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CAS NO.	COMPOUND	QTY.	CAT. NO.	PRICE
57837-19-1	Metalaxyl	100mg	36153-100MG	
9002-91-9	Metaldehyde	1000mg	36611-1G-R	
41394-05-2	Metamitron	100mg	36154-100MG	
6734-80-1	Metam-sodium, dihydrate	250mg	45570-250MG	
67129-08-2	Metazachlor	100mg	36155-100MG	
62610-77-9	Methacrifos	250mg	45569-250MG	
10265-92-6	Methamidophos	100mg	33395-100MG	
950-37-8	Methidathion	100mg	36158-100MG	
72-43-5	Methoxychlor	100mg	36161-100MG	
41295-28-7	Methoxyphenone	100mg	34354-100MG	
96-34-4	Methyl chloroacetate	1000mg	36546-1G	
116-54-1	Methyl dichloroacetate	1000mg	36547-1G	
556-61-6	Methyl isothiocyanate	250mg	45576-250MG	
115-09-3	Methylmer cury chloride	100mg	33368-100MG	
15090-23-0	3-M ethylphosphinicopropionic acid	100mg	36787-100MG-R	
598-99-2	Methyl trichloroacetate	1000mg	36548-1G	
9006-42-2	Metiram, technical mixture	250mg	45577-250MG	
3060-89-7	Metobromuron	100mg	36162-100MG	
51218-45-2	Metolachlor	100mg	36163-100MG	
139528-85-1	Metosulam	100mg	46317-100MG	
19937-59-8	Metoxuron	100mg	36164-100MG	
21087-64-9	Metribuzin	100mg	36165-100MG	
74223-64-6	Metsulfuron-methyl	100mg	46432-100MG	
7786-34-7	Mevinphos, mixture of cis and trans isomers	100mg	36166-100MG	
338-45-4	cis-Mevinphos	50mg	46057-100MG	
26718-65-0	trans-Mevinphos	100mg	46064-50MG-R	
126-15-8	MGK 11, technical mixture	100mg	36167-100MG	
2385-85-5	Mirex	100mg	36170-100MG	
2212-67-1	Molinate	100mg	36171-100MG	
1746-81-2	Monolinuron	250mg	45590-250MG	
110-91-8	Morpholine	250mg	45592-250MG	
88671-89-0	Myclobutanil	100mg	34360-100MG	
142-59-6	Nabam, technical mixture	250mg	45593-250MG	
90-15-3	1-Naphthol	1000mg	35825-1G-R	
1929-87-9	(2-Naphthoxy)acetic acid methyl ester	250mg	45736-250MG	
86-86-2	1-Naphthylacetamide	1000mg	36732-1G	
86-87-3	1-Naphthylacetic acid	1000mg	35745-1G	
15299-99-7	Napropamide	100mg	36175-100MG	
555-37-3	Neburon	100mg	36176-100MG	
54-11-5	L(-)-Nicotine	1000mg	36733-1G	
120738-89-8	Nitenpyram	100mg	46077-100MG	
88-75-5	2-Nitrophenol	1000mg	35966-1G	
554-84-7	3-Nitrophenol	250mg	34363-250MG	
100-02-7	4-Nitrophenol	1000mg	35836-1G	
824-78-2	4-Nitrophenol sodium salt, dihydrate	1000mg	36612-1G-R	
10552-74-6	Nitrothal-isopropyl	100mg	36179-100MG	
104-40-5	4-n-Nonylphenol	100mg	46405-100MG	
104-40-5	N onylphenol, technical mixture	1000mg	46018-1G	
63284-71-9	Nuarimol	100mg	36180-100MG-R	
26530-20-1	Octhilinone	250mg	46078-250MG-R	
58810-48-3	Ofurace	100mg	46143-100MG-R	
1113-02-6	Omethoate	100mg	36181-100MG	
19044-88-3	Or yzalin	100mg	36182-100MG	
77732-09-3	Oxadixyl, technical mixture	100mg	34365-100MG	
144651-06-9	Oxasulfuron	100mg	46416-100MG	
42874-03-3	Oxyfluorfen	100mg	35031-100MG	
76738-62-0	Paclobutrazol, mixture of stereo isomers	250mg	46046-250MG	
311-45-5	Paraoxon-ethyl	100mg	36186-100MG	

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CAS NO.	COMPOUND	QTY.	CAT. NO.	PRICE
1910-42-5	Paraquat dichloride, hydrate	250mg	36541-250MG	
298-00-0	Parathion-methyl	100mg	36187-100MG	
66246-88-6	Penconazole	100mg	36189-100MG	
66063-05-6	Pencycuron	100mg	36190-100MG-R	
527-20-8	Pentachloroaniline	100mg	46012-100MG	
1441-02-7	Pentachlorophenyl acetate	100mg	35550-100MG	
72-56-0	Perthane	250mg	45615-250MG	
13684-63-4	Phenmedipham	100mg	36192-100MG	
26002-80-2	Phenothrin, mixture of isomers	100mg	36193-100MG	
122-59-8	Phenoxyacetic acid	250mg	34366-250MG	
2597-03-7	Phentoat	100mg	46079-100MG-R	
62-38-4	Phenylmercury acetate	250mg	45618-250MG	
100-56-1	Phenylmercury chloride	250mg	45619-250MG	
103-85-5	N-Phenylthiourea	250mg	34305-250MG-R	
2588-04-7	Phorat-sulfone	100mg	46031-100MG	
2588-03-6	Phorat-sulfoxide	100mg	45762-100MG-R	
298-02-2	Phorate, technical mixture	100mg	33388-100MG	
2310-17-0	Phosalone	100mg	36194-100MG	
732-11-6	Phosmet	100mg	36195-100MG	
14816-18-3	Phoxim	100mg	36197-100MG	
85-41-6	Phthalimide	1000mg	36734-1G	
1918-02-1	Picloram	250mg	36774-250MG-R	
83-26-1	Pindone	250mg	45625-250MG	
51-03-6	Piperonyl butoxide	250mg	45626-250MG	
24151-93-7	Piperophos	250mg	46011-250MG	
23103-98-2	Pirimicarb	250mg	45627-250MG	
23505-41-1	Pirimiphos-ethyl	250mg	45628-250MG	
29232-93-7	Pirimiphos-methyl	250mg	45629-250MG-R	
21757-82-4	Plifenat	250mg	36569-250MG	
51218-49-6	Pretilachlor	250mg	36777-250MG-R	
86209-51-0	Primisulfuron-methyl	250mg	46010-250MG-R	
67747-09-5	Prochloraz	250mg	45631-250MG	
32809-16-8	Procymidone	250mg	36640-250MG-R	
41198-08-7	Profenofos	250mg	45632-250MG	
26399-36-0	Profluralin	250mg	45633-250MG	
2631-37-0	Promecarb	250mg	45634-250MG	
7287-19-6	Prometryn	250mg	45636-250MG	
24579-73-5	Propamocarb	250mg	45638-250MG	
709-98-8	Propanil	250mg	45639-250MG	
111479-05-1	Propaquizafop	250mg	46007-250MG-R	
7374-53-0	Propazine-2-hydroxy	100mg	45809-100MG	
31218-83-4	Propetamphos	100mg	34371-100MG	
122-42-9	Propham	250mg	45641-250MG	
60207-90-1	Propiconazole, mixture of stereo isomers	250mg	45642-250MG	
12071-83-9	Propineb, technical mixture	250mg	45643-250MG	
114-26-1	Propoxur	250mg	45644-250MG	
768-52-5	N-iso-Propylaniline	1000mg	46030-1G-R	
927-67-3	Propylthiourea	250mg	45715-250MG	
23950-58-5	Propyzamide	250mg	45645-250MG	
52888-80-9	Prosulfocarb	250mg	36520-250MG-R	
94125-34-5	Prosulfuron	100mg	46104-100MG-R	
123312-89-0	Pymetrozine	250mg	46119-250MG-R	
24691-76-7	Pyracarbolid	250mg	45646-250MG	
518-20-7	Pyranocoumarin	250mg	45647-250MG	
13457-18-6	Pyrazophos	250mg	45648-250MG	
93697-74-6	Pyrazosulfuron-ethyl	100mg	46323-100MG-R	
8003-34-7	Pyrethrins, technical mixture	250mg	45649-250MG	
96489-71-3	Pyridaben	250mg	46047-250MG-R	

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Multipurpose Standards

PESTANAL® Standards

CAS NO.	COMPOUND	QTY.	CAT. NO.	PRICE
55512-33-9	Pyridate	250mg	45312-250MG	
88283-41-4	Pyrifenox, mixture of Z and E isomers	100mg	45737-100MG	
53122-28-0	Pyrimethanil	250mg	46039-250MG-R	
57369-32-1	Pyroquilon	250mg	45650-250MG	
13593-03-8	Quinalphos	250mg	45651-250MG	
84087-01-4	Quinclorac	250mg	36521-250MG	
90717-03-6	Quinmerac	250mg	36522-250MG	
124495-18-7	Quinoxyfen	100mg	46439-100MG	
82-68-8	Quintozene	250mg	45653-250MG	
76578-14-8	Quizalofop-ethyl	250mg	34306-250MG	
10453-86-8	Resmethrin, mixture of cis and trans isomers	250mg	45655-250MG	
122931-48-0	Rimsulfuron	250mg	46097-100MG-R	
83-79-4	Rotenone	250mg	45656-250MG	
7286-69-3	Sebuthylazin	250mg	36785-250MG-R	
26259-45-0	Secbumeton	250mg	45658-250MG	
74051-80-2	Sethoxydim	250mg	36795-250MG	
1982-49-6	Siduron, mixture of cis and trans isomers	250mg	34373-250MG	
19123-21-8	trans-Siduron	250mg	46040-250MG-R	
105024-66-6	Silafluofen	250mg	46026-250MG-R	
1014-70-6	Simetryn	250mg	45660-250MG	
118134-30-8	Spiroxamine mixture of diastereo isomers	100mg	46443-100MG	
57-24-9	L-Strychnine	250mg	45661-250MG	
3567-25-7	Sulcofuron-sodium, monohydrate	250mg	46076-250MG	
99105-77-8	Sulcotrione	100mg	46318-100MG	
59-40-5	Sulfaquinoxaline	250mg	45662-250MG	
3689-24-5	Sulfotep	250mg	45664-250MG	
7704-34-9	Sulfur	250mg	36576-250MG	
35400-43-2	Sulprophos	250mg	45665-250MG	
1918-18-9	Swep	250mg	45666-250MG	
1461-22-9	TBTC	250mg	45713-250MG	
56-35-9	TBTO	250mg	45669-250MG	
650-51-1	TCA	250mg	45670-250MG-R	
107534-96-3	Tebuconazole	250mg	36565-250MG-R	
112410-23-8	Tebufenozide	100mg	46095-100MG-R	
119168-77-3	Tebufenpyrad	100mg	46438-100MG	
96182-53-5	Tebupirimfos	100mg	46075-100MG-R	
35265-85-0	Tebutam	250mg	36566-250MG	
34014-18-1	Tebuthiuron	250mg	45671-250MG	
117-18-0	Tecnazene	250mg	45672-250MG	
83121-18-0	Teflubenzuron	250mg	45756-250MG-R	
79538-32-2	Tefluthrin, mixture of isomers	100mg	35548-100MG	
297-78-9	Telodrin	100mg	36506-100MG	
3383-96-8	Temephos	250mg	45673-250MG-R	
107-49-3	TEPP,technical mixture	100mg	36567-100MG-R	
5902-51-2	Terbacil	250mg	45675-250MG	
13071-79-9	Terbufos	250mg	45313-250MG-R	
56070-16-7	Terbufos-sulfone	100mg	46043-100MG-R	
10548-10-4	Terbufos-sulfoxide	100mg	46044-100MG-R	
33693-04-8	Terbumeton	250mg	45676-250MG-R	
30125-64-5	Terbumeton-desethyl	250mg	36514-250MG	
30125-63-4	Terbuthylazin-desethyl	250mg	36769-250MG-R	
5915-41-3	Terbuthylazine	250mg	45678-250MG-R	
886-50-0	Terbutryn	250mg	45677-250MG	
3481-20-7	2,3,5,6-Tetrachloroaniline	250mg	34476-250MG	
634-66-2	1,2,3,4-Tetrachlorobenzene	100mg	46014-100MG	
879-39-0	2,3,4,5-Tetrachloronitrobenzene	250mg	34374-250MG	
22248-79-9	Tetrachlorvinphos	250mg	45679-250MG	
116-29-0	Tetradifon	250mg	45680-250MG	

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CAS NO.	COMPOUND	QTY.	CAT. NO.	PRICE
7696-12-0	Tetramethrin	250mg	45681-250MG-R	
2227-13-6	Tetrasul	250mg	36568-250MG	
148-79-8	Thiabendazole	250mg	45684-250MG	
25366-23-8	Thiazafluron	250mg	45685-250MG-R	
51707-55-2	Thidiazuron	250mg	45686-250MG	
79277-27-3	Thifensulfuron-methyl	100mg	46028-100MG	
28249-77-6	Thiobencarb	250mg	45687-250MG	
31895-22-4	Thiocyclam hydrogeneoxalate	100mg	46324-100MG-R	
59669-26-0	Thiodicarb	250mg	34375-250MG	
39196-18-4	Thiofanox	250mg	45314-250MG	
39184-59-3	Thiofanox-sulfone	100mg	45764-100MG-R	
39184-27-5	Thiofanox-sulfoxide	100mg	45765-100MG-R	
	Thiometon in Shellsol	250mg	46129-250MG-R	
23564-05-8	Thiophanate-methyl	250mg	45688-250MG	
137-26-8	Thiram	250mg	45689-250MG	
1928-37-6	2,4,5-T-methyl ester	250mg	45668-250MG	
57018-04-9	Tolclofos-methyl	250mg	36641-250MG-R	
731-27-1	Tolylfluanid	250mg	45690-250MG-R	
93-72-1	2,4,5-TP	250mg	45691-250MG	
4841-20-7	2,4,5-TP-methyl ester	250mg	45692-250MG	
87820-88-0	Tralkoxidym	250mg	36536-250MG	
118712-89-3	Transfluthrin	250mg	46114-250MG	
55219-65-3	Triadimenol	250mg	46138-250MG	
55219-65-3	Triadimenol, isomer A	250mg	45694-250MG	
2303-17-5	Triallat	250mg	45695-250MG	
24017-47-8	Triazophos, approx. 70 % in xylene technical mixture	250mg	45696-250MG	
101200-48-0	Tribenuron-methyl	100mg	46013-100MG	
52-68-6	Trichlorfon	250mg	45698-250MG-R	
636-30-6	2,4,5-Trichloroaniline	1000mg	35828-1G	
634-93-5	2,4,6-Trichloroaniline	250mg	35996-250MG	
54135-80-7	2,3,4-Trichloroanisole	1000mg	36624-1G	
50375-10-5	2,3,6-Trichloroanisole	1000mg	36625-1G	
87-40-1	2,4,6-Trichloroanisole	100mg	34384-100MG	
50-73-7	2,3,5-Trichlorobenzoic acid	100mg	34307-100MG	
120-82-1	1,2,4-Trichlorobenzene	1000mg	36627-1G	
108-70-3	1,3,5-Trichlorobenzene	250mg	36555-250MG	
88-06-2	2,4,6-Trichlorophenol	250mg	36543-250MG	
127-90-2	2,4,5-Trichlorophenoxy acetic acid	250mg	45657-250MG	
55335-06-3	Triclopyr	250mg	36796-250MG-R	
41814-78-2	Tricyclazol	10mg	45808-10MG	
24602-86-6	Tridemorph	100mg	36199-100MG	
1912-26-1	Trietazin	100mg	46086-100MG-R	
141517-21-7	Trifloxystrobin	100mg	46447-100MG	
64628-44-0	Triflumuron	100mg	35029-100MG	
126535-15-7	Triflusulfuron-methyl	100mg	46326-100MG-R	
26644-62-2	Triforine	250mg	45701-250MG	
88-82-4	2,3,5-Triiodobenzoic acid	250mg	45702-250MG-R	
697-82-5	2,3,5-Trimethylphenol	250mg	34308-250MG	
1066-45-1	Trimethyltin chloride	250mg	34377-250MG	
1929-77-7	Vernolate	250mg	45704-250MG	
50471-44-8	Vinclozolin	250mg	45705-250MG	
81-81-2	Warfarin	250mg	45706-250MG-R	
12122-67-7	Zineb, technical mixture	250mg	45707-250MG	
137-30-4	Ziram	250mg	45708-250MG	

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3-6-9 Multi-Ampul Discount Program!

You now receive discounts off Supelco's list price for purchasing multiple units of your favorite environmental mixes.

The discounts apply to any one of the multicomponent environmental standard products listed in Drinking Water, Wastewater, Solid Waste, Groundwater, Contract Laboratory Program, or Fuels Standards sections.

Purchase 3 or more units on a single order and receive the following discounts:

Buy 3 to 5 units at one time and receive 10% discount.
Buy 6 to 8 units at one time and receive 20% discount.
Buy 9 or more units at one time and receive 30% discount.



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No need to remember new catalog numbers to receive the discounts!

Certification and Documentation

Complete information describing the manufacturing and testing of each product is available — either as the Certificate of Analysis provided with the product, or as a data packet (free of charge; we retain the data for up to two years from manufacture date). Complete Material Safety Data Sheet (MSDS) information is provided with your first purchase of any product.

- Neat standards are certified for purity and identity.
- Single and multicomponent solutions are certified for purity, identity, and concentration.
- Neat quantities of 25mg or less are accompanied with a tare weighing slip.

Data Packets – Free of Charge

Manufacturing and testing information is available for all environmental standards made by Supelco. Our data packets were developed to meet US EPA requirements specified in the March 1990 and subsequent CLP Statements of Work. Each data packet documents the rigorous analytical methods we use to verify raw material identity and purity, and provides certification as to purity and final concentration accuracy. All data packets are free of charge.

NOTE: We can assemble a data packet for any product we manufacture. If you would like a custom-assembled data packet, please let us know. We can assemble these free of charge also.

Reciprocal Data Review RDaR

Selected products are tested under a RDaR (Reciprocal Data Review) agreement with Absolute Standards Inc. (Hamden, CT, USA). Testing procedures for RDaR products document comparability to the following criteria:

- Concentration
- Relative retention time
- Coefficient of variation

RDaR products are indicated with a "RDaR" designation. Equivalent Absolute Standards products are available. For information about RDaR products, and about obtaining Absolute Standards products through Supelco, please contact us.

Separate Source Standards Meet US EPA Requirements S S

These products have identical formulations but are prepared from independently sourced raw materials, and are quality controlled independently. Products denoted Separate Source standards afford the convenience of working with Supelco as a single vendor while enabling you to meet independent calibration and quality control requirements of the US EPA.

To identify a Separate Source product in this catalog, look for the Separate Source symbol S S. To order, simply use the two Separate Source catalog numbers (4S- and 4- designations).

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Chemical Services
Custom Preparation and Packaging

Custom Chemical Standards

We can prepare chemical standards for your environmental, food and beverage, petroleum, chemical, or pharmaceutical applications, using carefully monitored raw materials and solvents. We ship most custom products within 7-10 working days of receiving the order.* Every custom standard includes a material safety data sheet (MSDS) and a certificate of composition; if testing is requested we can provide a certificate of analysis.

Quality Control

We offer three forms of quality control for custom-prepared standards:

- Gravimetric assurance (routine, no charge)

  Components are guaranteed to be within ±0.5% of the amounts you specify. A Certificate of Composition is included.

- Qualitative testing (optional)*

  Typically the method will be a verification of the GC or LC elution and of the number of components. We will provide a copy of the chromatogram.

- Quantitative testing (optional)*

  Typically the standard will be compared to a separately prepared reference batch of the same formulation, using the internal standard method (GC), or the external standard method (LC). We will provide a copy of the chromatogram and a Quantitative Certificate of Analysis.

Packaging

Typical packaging is 1mL, 2mL, 5mL, or 10mL in flame-sealed amber ampuls. Other packaging is available. Minimum order volume is 4mL, but this can be packaged in four 1mL ampuls or in a single ampul.

To Obtain a Quote

Telephone 814-359-3041 or Fax: 814-359-5750 or email techservice@sial.com

Within 24 hours we will confirm receipt of your request and provide a quote number.

* Qualitative and/or quantitative testing will add about one week to the delivery time for the product.

Materials Packaging Service

We can accept any materials repackaging job, large or small, simple or difficult. Our facilities and equipment enable us to package hygroscopic, light-sensitive, or other delicate materials under suitable conditions and into inert atmospheres. Our innovative ampul filling procedure eliminates product burning during the sealing process. We have experience repackaging biocides under ISO and cGMP requirements.

Bulk Liquids or Solids

We can convert any volume of bulk liquid into smaller volumes, accurately and precisely dispensing your material into clear or amber glass ampuls, from 0.2mL to 20mL. We can weigh solids into glass vials or ampuls, with accuracy and precision to meet your most demanding needs.

Labeling and Certificates

You choose the information to be included on your labels: ingredients, volume, company identification, etc. Labels can be sequentially numbered for inventory control or other needs. We can tailor certificates to your requirements – just tell us what you need.

Testing

Testing can be performed by you or by Supelco. We can provide evaluation samples before we ship your product.

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We can inventory your product, then deliver it in a single shipment to single or multiple sites, or according to your schedule. We have more than 35 years of experience in shipping chemicals, domestically and internationally. We can ship anywhere, using the best and most cost-effective means.

To Obtain a Quote

Telephone 814-359-3041, Fax 814-359-5750, or email techservice@sial.com

Within 24 hours we will confirm receipt of your request and provide a quote number.



Environmental Standards
Drinking Water Methods

These analytical reference standards are specifically designed for monitoring organic chemicals on the National Primary Drinking Water List in raw source water, finished drinking water, and drinking water at all stages of treatment, per methods developed by the US EPA Environmental Monitoring Systems Laboratory in Cincinnati, Ohio (EMSL-CI), under authority of the Safe Drinking Water Act (SDWA).

Safe Drinking Water Act (SDWA) — 500 Series Methods

The National Primary Drinking Water Regulations (NPDWR) and National Secondary Drinking Water Regulations (NSDWR) establish maximum contaminant levels in drinking water for more than 50 organic compounds. US EPA 500 Series methods are analytical methods for identifying and quantifying volatile organic compounds (VOCs), pesticides, synthetic organic compounds (SOCs), and trihalomethane disinfection byproducts (THMs) in drinking water. Most of these methods call for gas chromatography with a selective detector or for gas chromatography-mass spectrometry; one method calls for high performance liquid chromatography.

RELATED INFORMATION

Drinking Water Methods
Methods for the Determination of
Organic Compounds in Drinking Water
NTIS order number PB 89-220-461/AS (July 1991)
Order all methods from:
NTIS
5285 Port Royal Road
Springfield, VA 22161
(phone 703-487-4650)

The US Environmental Protection Agency website is www.epa.gov

COMPOUND CLASSIFICATION	US EPA METHOD NUMBER
Carbamates	531.1
Chlorinated Disinfection Byproducts & Solvents	551, 551.1
Chlorinated Pesticides	508, 508.1, 508A
Ethylene Dibromide/Dibromochloropropane	504
General Purpose Organics	525, 525.1, 525.2
Haloacetic Acids and Dalapon	552, 552.1, 552.2
Nitrogen- & Phosphorous-Containing Pesticides	507
Organohalide Pesticides & PCBs	505
Phthalate and Adipate Esters	506
Polycyclic Aromatic Hydrocarbons	550, 550.1
2,3,7,8-Tetrachlorodibenzo-p-dioxin	513
Trihalomethanes	501.1, 501.2, 501.3
Volatile Aromatic & Unsaturated Organics	503.1
Volatile Halogenated Organics	502.1, 502.2
Volatile Organics	524.1, 524.2

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
METHOD 501.1, 501.2, 501.3				
Calibration Standards Trihalomethanes Calibration Mix	4 analytes in methanol			
	100µg/mL each analyte	1mL	47904	
	200µg/mL each analyte	1mL	48746	
		1mL	4S8746	
	2000µg/mL each analyte	1mL	48140-U	
	Bromodichloromethane, Chloroform, Dibromochloromethane, Bromoform			
Internal/Surrogate Standard (for Method 501.3) Fluorobenzene	2000µg/mL in methanol	1mL	48943	
Performance Standard (for Method 501.3) 4-Bromofluorobenzene	2000µg/mL in methanol	1mL	48083	
METHOD 502.1, 502.2				
Calibration Standards 502/524 Volatiles Organic Calibration Mix Without gases.	54 analytes in methanol			
	200µg/mL each analyte	1mL	47933	
	2000µg/mL each analyte	1mL	502111	
	Benzene, Bromobenzene, Bromochloromethane, Bromodichloromethane, Bromoform, n-Butylbenzene, sec-Butylbenzene, tert-Butylbenzene, Carbon tetrachloride, Chlorobenzene, Chloroform, 2-Chlorotoluene, 4-Chlorotoluene, Dibromochloromethane, 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, Dibromomethane, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 1,1-Dichloroethane, 1,2-Dichloroethane, 1,1-Dichloroethene, cis-1,2-Dichloroethene, trans-1,2-Dichloroethene, 1,2-Dichloropropane, 1,3-Dichloropropane, 2,2-Dichloropropane, 1,1-Dichloropropene, cis-1,3-Dichloropropene, trans-1,3-Dichloropropene, Ethylbenzene, Hexachlorobutadiene, Isopropylbenzene, p-Isopropyltoluene, Methylene chloride, Naphthalene, n-Propylbenzene, 1,1,1,2-Tetrachloroethane, Styrene, 1,1,2,2-Tetrachloroethane, Tetrachloroethene, Toluene, 1,2,3-Trichlorobenzene, 1,2,4-Trichlorobenzene, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, Trichloroethene, 1,2,3-Trichloropropane, 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene, m-Xylene, o-Xylene, p-Xylene			

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Environmental Standards
Drinking Water Methods

MIXES AND SOLUTIONS	COMPOSITION			QTY.	CAT. NO.	PRICE
VOC Mix 1 S S	12 analytes, 2000µg/mL each in methanol			1mL 1mL	48775 4S8775	
	sec-Butylbenzene	4-Chlorotoluene	Isopropylbenzene			
	tert-Butylbenzene	1,2-Dichlorobenzene	n-Propylbenzene			
	Chlorobenzene	1,3-Dichlorobenzene	o-Xylene			
	2-Chlorotoluene	1,4-Dichlorobenzene	p-Xylene			
VOC Mix 2 S S	13 analytes, 2000µg/mL each in methanol			1mL 1mL	48777 4S8777	
	Benzene	Naphthalene	1,2,4-Trichlorobenzene			
	Bromobenzene	Styrene	1,2,4-Trimethylbenzene			
	n-Butylbenzene	Toluene	1,3,5-Trimethylbenzene			
	Ethylbenzene	1,2,3-Trichlorobenzene	m-Xylene			
	p-Isopropyltoluene					
VOC Mix 3 S S	14 analytes, 2000µg/mL each in methanol			1mL 1mL	48779 4S8779	
	1,2-Dibromo-3-chloropropane	1,1-Dichloropropene	1,1,2,2-Tetrachloroethane			
	1,2-Dibromoethane	cis-1,3-Dichloropropene	1,1,2-Trichloroethane			
	1,2-Dichloroethane	trans-1,3-Dichloropropene	Trichloroethene			
	1,2-Dichloropropane	Hexachlorobutadiene	1,2,3-Trichloropropane			
	1,3-Dichloropropane	1,1,1,2-Tetrachloroethane				
VOC Mix 4 S S	9 analytes, 2000µg/mL each in methanol			1mL 1mL	48786 4S8786	
	Bromochloromethane	Chloroform	2,2-Dichloropropane			
	Bromoform	Dibromomethane	Tetrachloroethene			
	Carbon tetrachloride	1,1-Dichloroethane	1,1,1-Trichlorethane			
VOC Mix 5 S S	6 analytes, 2000µg/mL each in methanol			1mL 1mL	48797 4S8797	
	Bromodichloromethane	1,1-Dichloroethene	trans-1,2-Dichloroethene			
	Dibromochloromethane	cis-1,2-Dichloroethene	Methylene chloride			
VOC Mix 6 S S	6 analytes, 2000µg/mL each in methanol			1mL 1mL	48799-U 4S8799	
	Bromomethane	Chloromethane	Trichlorofluoromethane			
	Chloroethane	Dichlorodifluoromethane	Vinyl chloride			
VOC Calibration Standards Kit S S	1mL of each of the following products				48804 4S8804	
	VOC Mix 1 (48775)	VOC Mix 3 (48779)	VOC Mix 5 (48797)			
	VOC Mix 2 (48777)	VOC Mix 4 (48786)	VOC Mix 6 (48799-U)			
VOC Mix 7* S S	12 analytes, 2000µg/mL each in methanol			1mL 1mL	48802-U 4S8802	
	Benzene	Chloroform	1,1-Dichloroethene			
	Bromodichloromethane	Dibromochloromethane	1,1,1-Trichloroethane			
	Bromoform	1,4-Dichlorobenzene	Trichloroethene			
	Carbon tetrachloride	1,2-Dichloroethane	Vinyl chloride			
VOC Mix 8*	11 analytes, 2000µg/mL each in methanol			1mL	48803	
	Chlorobenzene	1,2-Dichloropropane	Toluene			
	1,2-Dichlorobenzene	Ethylbenzene	o-Xylene			
	cis-1,2-Dichloroethylene	Styrene	p-Xylene			
	trans-1,2-Dichloroethylene	Tetrachloroethene				
EPA Phase V Volatile Organic Compounds Mix 9*	3 analytes, 2000µg/mL each in methanol			1mL	47399	
	Dichloromethane	1,2,4-Trichlorobenzene	1,1,2-Trichloroethane			
Internal Standards						
1-Chloro-2-fluorobenzene	2000µg/mL in methanol			1mL	48369	
2-Bromo-1-chloropropane ▲	20,000µg/mL in methanol			1mL	48713	
1,4-Dichlorobutane ▲	2000µg/mL in methanol			1mL	48066	
EPA 502 Internal Standard Mix ▲	2 analytes, 2000µg/mL each in methanol			1mL	48950-U	
	1-Chloro-2-bromopropane	Fluorobenzene				

▲ For Method 502.2.

* Designed for monitoring volatile compounds for which maximum contaminant levels have been established by the US EPA.

S S Separate Source standards. Prepared from independently sourced raw materials and quality controlled independently.

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Method 502

Chemical Standards

SUPELCO

Environmental Standards
Drinking Water Methods

MIXES AND SOLUTIONS	COMPOSITION			QTY.	CAT. NO.	PRICE
METHOD 503.1						
Calibration Standards VOC Mix 1	12 analytes, 2000µg/mL each in methanol sec-Butylbenzene tert-Butylbenzene Chlorobenzene 2-Chlorotoluene	4-Chlorotoluene 1,2-Dichlorobenzene 1,3-Dichlorobenzene 1,4-Dichlorobenzene	Isopropylbenzene n-Propylbenzene o-Xylene p-Xylene	1mL	48775	
VOC Mix 2	13 analytes, 2000µg/mL each in methanol Benzene Bromobenzene n-Butylbenzene Ethylbenzene p-Isopropyltoluene	Naphthalene Styrene Toluene 1,2,3-Trichlorobenzene	1,2,4-Trichlorobenzene 1,2,4-Trimethylbenzene 1,3,5-Trimethylbenzene m-Xylene	1mL	48777	
EPA Volatile Mix 503.1	3 analytes, 2000µg/mL each in methanol Hexachlorobutadiene	Tetrachloroethylene	Trichloroethylene	1mL	48237	
Internal/Surrogate Standards α, α, α -Trifluorotoluene	2000µg/mL in methanol			1mL	48389	
METHOD 504						
Calibration Standards EPA EDB/DBCP Mix	2 analytes, 2000µg/mL each in methanol 1,2-Dibromoethane	1,2-Dibromo-3-chloropropane		1mL	48225-U	
METHOD 505						
Calibration Standards EPA 505/525 Pesticides Mix A	5 analytes, 500µg/mL each in acetone Alachlor Aldrin	γ-BHC (Lindane) Dieldrin	Simazine	1mL	47725-U	
EPA 505/525 Update Pesticides Mix A	7 analytes, 500µg/mL each in acetone Alachlor Aldrin γ-BHC (Lindane)	Dieldrin cis-Nonachlor	trans-Nonachlor Simazine	1mL	47727-U	
EPA 505/525 Pesticides Mix B	7 analytes, 500µg/mL each in acetone Atrazine Endrin Heptachlor	Heptachlor epoxide (isomer B) Hexachlorobenzene	Hexachlorocyclopentadiene Methoxychlor	1mL	47726-U	
EPA 505/525 Update Pesticides Mix B	9 analytes, 500µg/mL each in acetone Atrazine α-Chlordane γ-Chlordane	Endrin Heptachlor Heptachlor epoxide (isomer B)	Hexachlorobenzene Hexachlorocyclopentadiene Methoxychlor	1mL	47728-U	
Aroclor 1016	200µg/mL in methanol			1mL	48701	
Aroclor 1221	200µg/mL in methanol			1mL	48705	
Aroclor 1232	200µg/mL in methanol			1mL	48702	
Aroclor 1242	200µg/mL in methanol			1mL	48706	
Aroclor 1248	200µg/mL in methanol			1mL	48703	
Aroclor 1254	200µg/mL in methanol			1mL	48707	
Aroclor 1260	200µg/mL in methanol			1mL	48704	
PCB Kit 3	7 individual solutions, 200µg/mL in methanol. Aroclor 1016 Aroclor 1221 Aroclor 1232	Aroclor 1242 Aroclor 1248	Aroclor 1254 Aroclor 1260		48825	
Chlordane	5000µg/mL in methanol			1mL	40089	
α-Chlordane	100µg/mL in hexane			1mL	48192	
γ-Chlordane	100µg/mL in hexane			1mL	48193	
Toxaphene	5000µg/mL in methanol			1mL	40111	

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METHOD 506				
Calibration Standards EPA 506 Phthalate Esters Mix	16 analytes, 500µg/mL each in methanol Bis(2-ethylhexyl)adipate; Butyl benzyl phthalate; Dimethyl phthalate Bis(2-ethylhexyl)phthalate; Diethyl phthalate; Di-n-butyl phthalate	1mL	48223	
EPA Phthalate Esters Mix	6 analytes, 2000µg/mL each in methanol Bis(2-ethylhexyl)phthalate; Diethyl phthalate; Di-n-butyl phthalate Butyl benzyl phthalate; Dimethyl phthalate; Di-n-octyl phthalate	1mL	48805-U	
Di(2-ethylhexyl)phthalate	2000µg/mL in methanol	1mL	47994	
Di(2-ethylhexyl)adipate	2000µg/mL in methanol	1mL	47995-U	
METHOD 507				
Internal Standards Triphenyl phosphate	500µg/mL in methyl tert-butyl ether	1mL	48064	
Surrogate Standards 1,3-Dimethyl-2-nitrobenzene (2-Nitro-m-xylene)	250µg/mL in methyl tert-butyl ether	1mL	48063	
METHOD 508, 508.1, 508A				
Calibration Standards Appendix IX Organochlorine Pesticides Mix	17 analytes, 2000µg/mL each in toluene:hexane (50:50) Aldrin; 4,4'-DDE; Endrin α-BHC; 4,4'-DDT; Endrin aldehyde β-BHC; Dieldrin; Heptachlor γ-BHC; Endosulfan I; Heptachlor epoxide δ-BHC; Endosulfan II; Methoxychlor 4,4'-DDD; Endosulfan sulfate	1mL	46960-U	
EPA 508/508.1 Chlorinated Pesticide Mix	12 analytes, 1000µg/mL each in methyl tert-butyl ether cis-Chlordane; Chlorothalonil; cis-Permethrin trans-Chlordane; Dacthal (DCPP); trans-Permethrin Chlorobenzilate; Etridiazole; Propachlor Chloroneb; Hexachlorobenzene; Trifluralin	1mL	502197	
Aroclor 1016	200µg/mL in methanol	1mL	48701	
Aroclor 1221	200µg/mL in methanol	1mL	48705	
Aroclor 1232	200µg/mL in methanol	1mL	48702	
Aroclor 1242	200µg/mL in methanol	1mL	48706	
Aroclor 1248	200µg/mL in methanol	1mL	48703	
Aroclor 1254	200µg/mL in methanol	1mL	48707	
Aroclor 1260	200µg/mL in methanol	1mL	48704	
PCB Kit 3	7 individual solutions, 200µg/mL in methanol. Aroclor 1016; Aroclor 1242; Aroclor 1254 Aroclor 1221; Aroclor 1248; Aroclor 1260 Aroclor 1232		48825	
508.1 Chlorinated Pesticide Mix	6 analytes, 1000µg/mL each in acetone Alachlor; Butachlor; Metolachlor Atrazine; Hexachlorocyclopentadiene; Simazine	1mL	502154	
Biphenyl	Neat	1000mg	442487	
Biphenyl	2000µg/mL in methanol	1mL	48161	
Chlordane	5000µg/mL in methanol	1mL	40089	
α-Chlordane	100µg/mL in hexane	1mL	48192	
γ-Chlordane	100µg/mL in hexane	1mL	48193	
Cyanazine	2000µg/mL in methanol	1mL	48592	
Hexachlorocyclopentadiene	2000µg/mL in methanol	1mL	40051	
Toxaphene	5000µg/mL in methanol	1mL	40111	
EPA 508.1 Instrument Performance Check Solution	4 analytes at concentrations indicated in methyl tert-butyl ether δ-BHC, 40µg/mL; Chlorpyrifos, 2µg/mL; DCPA, 50µg/mL Chlorothalonil, 50µg/mL	1mL	507989	



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MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
Internal Standards Pentachloronitrobenzene	5000µg/mL in methanol	1mL	40156	
Surrogate Standards 4,4'-Dichlorobiphenyl For Method 508	500µg/mL in isooctane	1mL	48260-U	
4,4'-Dibromobiphenyl For Method 508.1	2000µg/mL in methylene chloride	1mL	48790-U	
Performance Standards DDT-Endrin Mix	2 analytes, 500µg/mL each in methanol Endrin 4,4'-DDT	1mL	48282	
METHOD 513				
Calibration Standards 2,3,7,8-Tetrachloro-dibenzo-p-dioxin	Qualitative standard, approx. 10µg/mL in toluene	1mL	48599	
METHOD 524.1, 524.2				
Calibration Standards				
EPA 524.2 Volatile Organic Compounds Mix With gases.	60 analytes, 200µg/mL each in methanol Benzene, Bromobenzene, Bromochloromethane, Bromodichloromethane, Bromoform, Bromomethane, n-Butylbenzene, sec-Butylbenzene, tert-Butylbenzene, Carbon tetrachloride, Chlorobenzene, Chloroethane, Chloroform, Chloromethane, 2-Chlorotoluene, 4-Chlorotoluene, Dibromochloromethane, 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, Dibromomethane, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, Dichlorodifluoromethane, 1,1-Dichloroethane, 1,2-Dichloroethane, 1,1-Dichloroethene, cis-1,2-Dichloroethene, trans-1,2-Dichloroethene, 1,2-Dichloropropane, 1,3-Dichloropropane, 2,2-Dichloropropane, 1,1-Dichloropropene, cis-1,3-Dichloropropene, trans-1,3-Dichloropropene, Ethylbenzene, Hexachlorobutadiene, Isopropylbenzene, p-Isopropyltoluene, Methylene chloride, Naphthalene, n-Propylbenzene, 1,1,1,2-Tetrachloroethane, Styrene, 1,1,2,2-Tetrachloroethane, Tetrachloroethene, Toluene, 1,2,3-Trichlorobenzene, 1,2,4-Trichlorobenzene, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, Trichloroethene, Trichlorofluoromethane, 1,2,3-Trichloropropane, 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene, Vinyl chloride, m-Xylene, o-Xylene, p-Xylene	1mL	47932	
EPA 524.2 Rev 4 Update Ketones Mix	5 analytes in methanol:water (90:10) 200µg/mL each analyte 2000µg/mL each analyte Acetone, 2-Butanone, 1,1-Dichloro-2-propanone, 2-Hexanone, 4-Methyl-2-pentanone	1mL 1mL	47573-U 47428-U	
EPA 524 Rev 4 Update Mix	18 analytes in methanol 200µg/mL each analyte 2000µg/mL each analyte Acrylonitrile, Allyl chloride, Butyl chloride, Carbon disulfide, Chloroacetonitrile, trans-1,4-Dichloro-2-butene, Diethyl ether, Ethyl methacrylate, Hexachloroethane, Methacrylonitrile, Methyl acrylate, Methyl methacrylate, Methyl tert-butyl ether, Nitrobenzene, 2-Nitropropane, Pentachloroethane, Propionitrile, Tetrahydrofuran	1mL 1mL	506524 47427-U	
Iodomethane	2000µg/mL in methanol:water (80:20)	1mL	47406	
EPA 524 Rev 4 Calibration Kit	1mL of each of the following products. EPA 524.2 VOC Mix (47932), EPA 524 Rev. 4 Update Mix (506524), EPA 524 Rev. 4 Update Ketones Mix (47573-U), Iodomethane (47406)		47438-U	

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MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
EPA 502/524 VOC Mix A Without gases.	54 analytes in methanol 200µg/mL each analyte 2000µg/mL each analyte Benzene, Bromobenzene, Bromochloromethane, Bromodichloromethane, Bromoform, n-Butylbenzene, sec-Butylbenzene, tert-Butylbenzene, Carbon tetrachloride, Chlorobenzene, Chloroform, 2-Chlorotoluene, 4-Chlorotoluene, Dibromochloromethane, 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, Dibromomethane, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 1,1-Dichloroeth ane, 1,2-Dichloroethane, 1,1-Dichloroet hene, cis-1,2-Dichloroethene, trans-1,2-Dichloroethene, 1,2-Dichloropropane, 1,3-Dichloropropane, 2,2-Dichloropropane, 1,1-Dichl oropropene, cis-1,3-Dichloropropene, trans-1,3-Dichloropropene, Ethyl benzene, Hexachlorobutadiene, Isopropylbenzene, p-Isopropyltoluene, Methylene chloride, Naphthalene, n-Propylbenzene, 1,1,1,2-Tetrachloroethane, Styrene, 1,1,2,2-Tetrachloroethane, Tetrachloroethene, Toluene, 1,2,3-Trichlorobenzene, 1,2,4-Trichlorobenzene, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, Trichloroethene, 1,2,3-Trichloropropane, 1,2,4-Trim ethylbenzene, 1,3,5-Trim ethylbenzene, m-Xylene, o-Xylene, p-Xylene	1mL 1mL	47933 502111	
EPA 524 VOC Mix B	6 analytes, 200µg/mL each in methanol Bromomethane, Chloromethane, Trichlorofluoromethane, Chloroethane, Dichlorodifluoromethane, Vinyl chloride	1mL	47934	
EPA 524 VOC Kit	1mL of each of the following products EPA 524 Volatile Organic Compounds Mix A (47933) EPA 524 Volatile Organic Compounds Mix B (47934)	1mL	47936	
VOC Mix 1 S S	12 analytes, 2000µg/mL each in methanol sec-Butylbenzene, tert-Butylbenzene, Chlorobenzene, 2-Chlorotoluene, 4-Chlorotoluene, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, Isopropylbenzene, n-Propylbenzene, o-Xylene, p-Xylene	1mL 1mL	48775 4S8775	
VOC Mix 2 S S	13 analytes, 2000µg/mL each in methanol Benzene, Bromobenzene, n-Butylbenzene, Ethylbenzene, p-Isopropyltoluene, Naphthalene, Styrene, Toluene, 1,2,3-Trichlorobenzene, 1,2,4-Trichlorobenzene, 1,2,4-Trim ethylbenzene, 1,3,5-Trimethylbenzene, m-Xylene	1mL 1mL	48777 4S8777	
VOC Mix 3 S S	14 analytes, 2000µg/mL each in methanol 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, 1,2-Dichloroethane, 1,2-Dichloropropane, 1,3-Dichloropropane, 1,1-Dichloropropene, cis-1,3-Dichloropropene, trans-1,3-Dichloropropene, Hexachlorobutadiene, 1,1,1,2-T etrachloroethane, 1,1,2,2-T etrachloroethane, 1,1,2-Trichloroethane, Trichloroethene, 1,2,3-Trichloropropane	1mL 1mL	48779 4S8779	
VOC Mix 4 S S	9 analytes, 2000µg/mL each in methanol Bromochloromethane, Bromoform, Carbon tetrachloride, Chloroform, Dibromomethane, 1,1-Dich loroethane, 2,2-Dichloropropane, Tetrachloroethene, 1,1,1-Trichlorethane	1mL 1mL	48786 4S8786	
VOC Mix 5 S S	6 analytes, 2000µg/mL each in methanol Bromodichloromethane, Dibromochloromethane, 1,1-Dichloroethene, cis-1,2-Dichloroethene, trans-1,2-Dichloroethene, Methylene chloride	1mL 1mL	48797 4S8797	
VOC Mix 6 S S	6 analytes, 2000µg/mL each in methanol Bromomethane, Chloroethane, Chloromethane, Dichlorodifluoromethane, Trichlorofluoromethane, Vinyl chloride	1mL 1mL	48799-U 4S8799	
VOC Calibration Standards Kit S S	1mL of each of the following products VOC Mix 1 (48775), VOC Mix 2 (48777), VOC Mix 3 (48779), VOC Mix 4 (48786), VOC Mix 5 (48797), VOC Mix 6 (48799)		48804 4S8804	

S S Separate Source standards. Prepared from independently sourced raw materials and quality controlled independently.

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Method 524
Chemical Standards

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Environmental Standards
Drinking Water Methods

MIXES AND SOLUTIONS	COMPOSITION			QTY.	CAT. NO.	PRICE
QC Standards						
Discretionary Aromatic Volatiles Mix NC▲ For drinking water methods 502.2, 503.1, 524.2.	12 analytes, 50µg/mL each in methanol n-Butylbenzene sec-Butylbenzene tert-Butylbenzene Hexachlorobutadiene	Isopropylbenzene p-Isopropyltoluene Naphthalene n-Propylbenzene	1,2,3-Trichlorobenzene 1,2,4-Trichlorobenzene 1,2,4-Trimethylbenzene 1,3,5-Trimethylbenzene	1mL	47273	
Volatile Organic Contaminants Mix 1 NC▲ For drinking water methods 502.1, 502.2, 503.1, 524.1, 524.2.	9 analytes, 50µg/mL each in methanol Bromobenzene 4-Chlorotoluene 1,2-Dibromo-3-chloropropane	1,2-Dibromoethane Dibromomethane 2,2-Dichloropropane	1,1-Dichloropropene Styrene p-Xylene	1mL	47274	
Volatile Organic Contaminants Mix 2 NC▲	7 analytes, 50µg/mL each in methanol Bromochloromethane 2-Chlorotoluene cis-1,2-Dichloroethene	1,3-Dichloropropane 1,1,1,2-Tetrachloroethane	1,2,3-Trichloropropane o-Xylene	1mL	47275	
Internal Standards Fluorobenzene For Method 524.1	2000µg/mL in methanol			1mL	48943	
EPA 524 Internal Standard Mix For Method 524.2	2 analytes, 2000µg/mL each in methanol 1,2-Dichlorobenzene-d_4	Fluorobenzene		1mL	48948	
EPA 524.2 Fortification Solution	3 analytes, 2000µg/mL each in methanol 4-Bromofluorobenzene	1,2-Dichlorobenzene-d_4	Fluorobenzene	1mL	47358-U	
Surrogate Standards (For Method 524.1, 524.2) EPA 524 Surrogate Standard Mix	2 analytes, 2000µg/mL each in methanol 4-Bromofluorobenzene	1,2-Dichlorobenzene-d_4		1mL	48466	
4-Bromofluorobenzene 1,2-Dichlorobenzene-d_4	2000µg/mL in methanol 2000µg/mL in methanol			1mL 1mL	48083 48952-U	
Tuning Solutions See Methods 624 and 625.						
METHOD 525, 525.1, 525.2						
Calibration Standards EPA 525 Semivolatiles Calibration Mix Without pesticides.	25 analytes, 1000µg/mL each (except where noted) in acetone Acenaphthylene Anthracene Benzo(a)anthracene Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(a)pyrene Benzo(ghi)perylene Bis(2-ethylhexyl)adipate Bis(2-ethylhexyl)phthalate	Butyl benzyl phthalate Chrysene Dibenzo(a,h)anthracene Di-n-butylphthalate Diethyl phthalate Dimethyl phthalate 2,4-Dinitrotoluene 2,6-Dinitrotoluene	Fluorene Hexachlorobenzene Hexachlorocyclopentadiene Indeno(1,2,3-cd)pyrene Isophorone Pentachlorophenol (4000µg/mL) Phenanthrene Pyrene	1mL	506540	
EPA 525/525.1 PCB Mix	8 analytes, 500µg/mL each in hexane 2-Chlorobiphenyl 2,3-Dichlorobiphenyl 2,4,5-Trichlorobiphenyl	2,2',4,4'-Tetrachlorobiphenyl 2,2',3,4,6-Pentachlorobiphenyl 2,2',4,4',5,6'-Hexachlorobiphenyl	2,2',3,3',4,4',6-Heptachlorobiphenyl 2,2',3,3',4,5',6,6'-Octachlorobiphenyl	1mL	48246	
EPA 505/525 Pesticides Mix A	5 analytes, 500µg/mL each in acetone Alachlor Aldrin	γ-BHC (Lindane) Dieldrin	Simazine	1mL	47725-U	
EPA 505/525 Update Pesticides Mix A	7 analytes, 500µg/mL each in acetone Alachlor Aldrin γ-BHC (Lindane)	Dieldrin cis-Nonachlor	trans-Nonachlor Simazine	1mL	47727-U	
EPA 505/525 Pesticides Mix B	7 analytes, 500µg/mL each in acetone Atrazine Endrin Heptachlor	Heptachlor epoxide (isomer B) Hexachlorobenzene	Hexachlorocyclopentadiene Methoxychlor	1mL	47726-U	
EPA 505/525 Update Pesticides Mix B	9 analytes, 500µg/mL each in acetone Atrazine α-Chlordane γ-Chlordane	Endrin Heptachlor Heptachlor epoxide (isomer B)	Hexachlorobenzene Hexachlorocyclopentadiene Methoxychlor	1mL	47728-U	

▲ Supelco equivalent of the former EPA-certified QC sample.

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EPA 525 Update Phthalate Esters Mix	7 analytes, 500µg/mL each in methanol Butyl benzyl phthalate; Diethyl phthalate; Di-n-butyl-phthalate Bis(2-ethylhexyl)adipate; Dimethyl phthalate; Pentachlorophenol Bis(2-ethylhexyl)phthalate	1mL	47973	
EPA 525 Polynuclear Aromatic Hydrocarbons Mix A	13 analytes, 500µg/mL each in methylene chloride Acenaphthylene; Benzo(k)fluoranthene; Fluorene Anthracene; Benzo(ghi)perylene; Indeno(1,2,3-cd)pyrene Benzo(a)anthracene; Chrysene; Phenanthrene Benzo(a)pyrene; Dibenzo(ah)anthracene; Pyrene Benzo(b)fluoranthene	1mL	48953-U	
EPA 525 Polynuclear Aromatic Hydrocarbons Mix B	13 analytes, 500µg/mL each in acetone Acenaphthylene; Benzo(k)fluoranthene; Fluorene Anthracene; Benzo(ghi)perylene; Indeno(1,2,3-cd)pyrene Benzo(a)anthracene; Chrysene; Phenanthrene Benzo(a)pyrene; Dibenzo(ah)anthracene; Pyrene Benzo(b)fluoranthene	1mL	48249	
Toxaphene	500µg/mL in methanol	1mL	48243	
Internal Standards EPA 525/525.1 Internal Standard Mix	3 analytes, 500µg/mL each in acetone Acenaphthene-d_{10}; Chrysene-d_{12}; Phenanthrene-d_{10}	1mL	48242	
Surrogate Standards Perylene-d_{12}	2000µg/mL in methylene chloride	1mL	48081	
Fortification Standards EPA 525 Fortification Solution A	3 analytes, 2000µg/mL each in methylene chloride Acenaphthene-d_{10}; Chrysene-d_{12}; Phenanthrene-d_{10}	1mL	48230-U	
EPA 525 Fortification Solution B	4 analytes, 500µg/mL each in acetone Acenaphthene-d_{10}; Perylene-d_{12}; Phenanthrene-d_{10} Chrysene-d_{12}	1mL	48099	
Tuning Solutions see Method 625				
METHOD 531.1				
Calibration Standards Carbamate Mix RDaR	10 analytes, 100µg/mL each in methanol	1mL	46856-U	
	10 analytes, 100µg/mL each in methanol Aldicarb; Methomyl Aldicarb sulfone; Methiocarb Aldicarb sulfoxide; Oxamyl Carbofuran; Propoxur 3-Hydroxycarbofuran; Sevin (Carbaryl)	1mL	30042R	
METHOD 550, 550.1				
Calibration Standards TCL Polynuclear Aromatic Hydrocarbons Mix	16 analytes at indicated concentrations in acetonitrile:methanol (90:10) Acenaphthene, 1000µg/mL; Benzo(ghi)perylene, 80µg/mL; Fluorene, 100µg/mL Acenaphthylene, 500µg/mL; Benzo(a)pyrene, 50µg/mL; Indeno(1,2,3-cd)pyrene, 50µg/mL Anthracene, 20µg/mL; Chrysene, 50µg/mL; Naphthalene, 500µg/mL Benzo(a)anthracene, 50µg/mL; Dibenzo(a,h)anthracene, 200µg/mL; Phenanthrene, 40µg/mL Benzo(b)fluoranthene, 20µg/mL; Fluoranthene, 50µg/mL; Pyrene, 100µg/mL Benzo(k)fluoranthene, 20µg/mL	1mL	49156	

RDaR Product is tested under Reciprocal Data Review agreement with Absolute Standards Inc. (Hamden, CT, USA)

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METHOD 551, 551.1				
Calibration Standards				
EPA 551A Halogenated Volatiles Mix	10 analytes, 2000µg/mL each in acetone Bromodichloromethane, Dibromochloromethane, Tetrachloroethylene, Bromoform, 1,2-Dibrom o-3-chloropropane, 1,1,1-Trichloroethane, Carbon tetrachloride, 1,2-Dibromoethane, Trichloroethylene, Chloroform	1mL	48045	
EPA 551B Halogenated Volatiles Mix	7 analytes, 2000µg/mL each in acetone Bromochloroacetonitrile, Dichloroacetonitrile, Trichloroacetonitrile, Chloropicrin, 1,1-Dichloro-2-propanone, 1,1,1-Trichloro-2-propanone, Dibromoacetonitrile	1mL	48046	
Chloral Hydrate	1000µg/mL in acetonitrile	1mL	47335-U	
EPA 551 Disinfection Byproducts Kit	1mL of each of the following products EPA 551A Halogenated Volatiles Mix (48045), EPA 551B Halogenated Volatiles Mix (48046), Chloral Hydrate (47335-U)		48112	
METHOD 552				
Calibration Standards EPA 552 Halogenated Acetic Acids Mix	6 components, 2000µg/mL each in methyl tert-butyl ether Bromoacetic acid, Dibromoacetic acid, Bromochloroacetic acid, Dichloroacetic acid, Chloroacetic acid, Trichloroacetic acid	1mL	48047	
EPA 552 Esters Calibration Mix	6 components, 1000µg/mL each in methyl tert-butyl ether Methyl bromoacetate, Methyl chloroacetate, Methyl dichloroacetate, Methyl bromochloroacetate, Methyl dibromoacetate, Methyl trichloroacetate	1mL	47598-U	
2,4-Dichlorophenol,	5000µg/mL in methanol	1mL	40029	
2,4,6-Trichlorophenol	5000µg/mL in methanol	1mL	40019	
Internal Standards				
1,2,3-Trichloropropane	200µg/mL in methanol	1mL	48355	
1,2,3-Trichloropropane	1000µg/mL in methyl tert-butyl ether	1mL	47669-U	
Surrogate Standards				
3,5-Dichlorobenzoic acid	1000µg/mL in methyl tert-butyl ether	1mL	502316	
2,3-Dichloropropionic acid	1000µg/mL in methyl tert-butyl ether	1mL	47670-U	
METHOD 552.1				
EPA 552.1 Acids Calibration Mix with Surrogate	8 analytes at indicated concentrations in methyl tert-butyl ether Bromoacetic acid, 200µg/mL, Chloroacetic acid, 300µg/mL, Dichloroacetic acid, 300µg/mL, Bromochloroacetic acid, 200µg/mL, Dalapon, 200µg/mL, Trichloroacetic acid, 100µg/mL, Dibromoacetic acid, 100µg/mL, 2-Bromopropionic acid, 100µg/mL (surrogate)	1mL	47652-U	
METHOD 552.2				
Calibration Standards EPA 552.2 Acids Calibration Mix ICR With surrogate.	11 analytes at indicated concentrations in methyl tert-butyl ether Bromoacetic acid, 200µg/mL, Chloroacetic acid, 300µg/mL, Dichloroacetic acid, 300µg/mL, Bromochloroacetic acid, 200µg/mL, Chlorodibromoacetic acid, 200µg/mL, Tribromoacetic acid, 100µg/mL, Bromodichloroacetic acid, 200µg/mL, Dalapon, 200µg/mL, Dibr omoacetic acid, 100µg/ mL, Trichloroacetic acid, 100µg/mL, 2-Bromopropionic acid, 100µg/mL	1mL	47629-U	
EPA 552.2 Esters Calibration Mix ICR With surrogate.	11 analytes at indicated concentrations in methyl tert-butyl ether Methyl bromoacetate, 200µg/mL, Methyl chloroacetate, 300µg/mL, Methyl dichloroacetate, 300µg/mL, Methyl bromochloroacetate, 200µg/mL, Methyl chlorodibromoacetate, 200µg/mL, Methyl tribromoacetate, 100µg/mL, Methyl bromodichloroacetate, 200µg/mL, Dalapon methyl ester, 200µg/mL, Methyl trichloroacetate, 100µg/mL, Methyl 2-bromopropionate, 100µg/mL, Methyl dibromoacetate, 100µg/mL	1mL	47630-U	

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Environmental Standards
Drinking Water Methods, Odor Standards

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
EPA 552.2 Acids				
Calibration Mix	9 analytes at indicated concentrations in methyl tert-butyl ether Bromoacetic acid, 400µg/mL; Chloroacetic acid, 600µg/mL; Dichloroacetic acid, 600µg/mL Bromochloroacetic acid, 400µg/mL; Chlorodibromoacetic acid, 1000µg/mL; Tribromoacetic acid, 2000µg/mL Bromodichloroacetic acid, 400µg/mL; Dibromoacetic acid, 200µg/mL; Trichloroacetic acid, 200µg/mL	1mL	47787	
EPA 552.2 Esters				
Calibration Mix Without dalapon.	9 analytes at indicated concentrations in methyl tert-butyl ether Methyl bromoacetate, 400µg/mL; Methyl chloroacetate, 600µg/mL; Methyl dichloroacetate, 600µg/mL Methyl bromochloroacetate, 400µg/mL; Methyl chlorodibromoacetate, 1000µg/mL; Methyl tribromoacetate, 2000µg/mL Methyl bromodichloroacetate, 400µg/mL; Methyl dibromoacetate, 200µg/mL; Methyl trichloroacetate, 200µg/mL	1mL	47788	
Bromoacetic acid	1000µg/mL in methyl tert-butyl ether	1mL	47655-U	
Bromochloroacetic acid	1000µg/mL in methyl tert-butyl ether	1mL	47659-U	
Bromodichloroacetic acid	1000µg/mL in methyl tert-butyl ether	1mL	47278	
Chloroacetic acid	1000µg/mL in methyl tert-butyl ether	1mL	47654-U	
Chlorodibromoacetic acid	1000µg/mL in methyl tert-butyl ether	1mL	47277	
Dalapon	1000µg/mL in methyl tert-butyl ether	1mL	47656-U	
Dibromoacetic acid	1000µg/mL in methyl tert-butyl ether	1mL	47660-U	
Dichloroacetic acid	1000µg/mL in methyl tert-butyl ether	1mL	47657-U	
Tribromoacetic acid	1000µg/mL in methyl tert-butyl ether	1mL	47729-U	
Trichloroacetic acid	1000µg/mL in methyl tert-butyl ether	1mL	47658-U	
Methyl bromoacetate	1000µg/mL in methyl tert-butyl ether	1mL	47662-U	
Methyl bromochloroacetate	1000µg/mL in methyl tert-butyl ether	1mL	47666-U	
Methyl bromodichloroacetate	1000µg/mL in methyl tert-butyl ether	1mL	47761	
Methyl chloroacetate	1000µg/mL in methyl tert-butyl ether	1mL	47661-U	
Methyl chlorodibromoacetate	1000µg/mL in methyl tert-butyl ether	1mL	47762	
Dalapon methyl ester	1000µg/mL in methyl tert-butyl ether	1mL	47663-U	
Methyl dibromoacetate	1000µg/mL in methyl tert-butyl ether	1mL	47667-U	
Methyl dichloroacetate	1000µg/mL in methyl tert-butyl ether	1mL	47664-U	
Methyl tribromoacetate	1000µg/mL in methyl tert-butyl ether	1mL	47730-U	
Methyl trichloroacetate	1000µg/mL in methyl tert-butyl ether	1mL	47665-U	
Surrogate Standards				
2-Bromopropionic acid	1 000µg/mL in methyl tert-butyl ether	1mL	47645	
2,3-Dibromopropionic acid	1 000µg/mL in methyl tert-butyl ether	1mL	47789	
Methyl-2-bromopropionate	1 000µg/mL in methyl tert-butyl ether	1mL	47668-U	
Methyl-2,3-dibromopropionate	1 000µg/mL in methyl tert-butyl ether	1mL	46970-U	
DRINKING WATER ODOR STANDARDS				
(±)-Geosmin	100µg/mL in methanol	1mL	47522-U	
2-Methylisoborneol	100µg/mL in methanol	1mL	47523-U	
(±)-Geosmin and 2-Methylisoborneol	100µg/mL each in methanol	1mL	47525-U	
2,4,6-Trichloroanisole	100µg/mL in methanol	1mL	47526-U	
2-Isopropyl-3-methoxypyrazine	100µg/mL in methanol	1mL	47527-U	
2-Isobutyl-3-methoxypyrazine	100µg/mL in methanol	1mL	47528-U	
Drinking Water Odors Standards Kit	1mL of each of the following products: (±)-Geosmin (47522-U) 2-Methylisoborneol (47523-U) (±)-Geosmin and 2-Methylisoborneol (47525-U) 2,4,6-Trichloroanisole (47526-U) 2-Isopropyl-3-methoxypyrazine (47527-U) 2-Isobutyl-3-methoxypyrazine (47528-U)		47529-U	

Derivatization Products

The Diazald Kit is a set of distillation glassware designed for safely preparing diazomethane (~100mmol). No sharp edges or ground-glass joints. The 19/22 Clear-Seal tapered joints do not require grease even for vacuum applications, thus avoiding that source of contamination.

For replacement parts, contact our Technical Service department (phone 800-359-3041 or 814-359-3041).

DESCRIPTION	QTY.	CAT. NO.	PRICE
Methanolic Sulfuric Acid, 10% H_2SO_4 in methanol Methylating reagent for Methods 552.1 and 552.2.	6 x 5mL	506516	
Diazald Kit	1	Z100250-1KT	

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Environmental Standards
Wastewater Methods

These analytical reference standards are specifically designed for monitoring organic chemicals on the Priority Pollutants List in municipal and industrial wastewater, per methods developed by the US EPA Environmental Monitoring Systems Laboratory in Cincinnati, Ohio (EMSL-CI), under authority of the Clean Water Act (CWA).

Clean Water Act (CWA) — 600 Series Methods

US EPA 600 Series methods are analytical methods for identifying and quantifying volatile organic compounds, pesticides, and synthetic organic compounds ("Priority Pollutants") in municipal and industrial wastewater. Most of these methods call for gas chromatography with a selective detector or for gas chromatography/mass spectrometry; a few methods call for high performance liquid chromatography or allow the analyst to choose between GC and HPLC. Packed GC columns are described in the 600 Series methods, but chromatographic conditions can be changed (e.g., capillary columns may be used) if the changes do not make the method "less accurate or less precise" than the standard method.

RELATED INFORMATION

Order all methods from:
NTIS
5285 Port Royal Road
Springfield, VA 22161
(phone 703-487-4650)
Industrial Wastewater Methods
Methods for Chemical Analysis of Water & Waste
NTIS order number PB 84-128-677 (March 1983)
Methods for the Determination of Nonconventional Pesticides in Municipal and Industrial Wastewater
NTIS order number PB 92-190-289

The US Environmental Protection Agency website is www.epa.gov

COMPOUND CLASSIFICATION	US EPA METHOD NUMBER
Acids (Phenols), Base-Neutrals, Organochlorine Pesticides & PCBs	625
Acrolein/Acrylonitrile	603
Benzidine/3,3'-Dichlorobenzidine	605
Benomyl and Carbendazim	631
Chlorinated Hydrocarbons	612
Cyanazine	629
Dinitroaniline Pesticides	627
Haloethers	611
Nitrosamines	607
Organochlorine Pesticides and PCBs	608
Phenols	604
Phthalate Esters	606
Polynuclear Aromatic Hydrocarbons (PAHs)	610
Purgeable Aromatics	602
Purgeable Halocarbons	601
Purgeable Halocarbons	624
2,3,7,8-Tetrachlorodibenzo-p-dioxin	613

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
METHOD 601				
Calibration Standards				
EPA 601 Purgeable Mix Without gases. Includes 2-chloroethylvinyl ether.	23 analytes, 2000µg/mL each in methanol Bromodichloromethane, Bromoform, Carbon tetrachloride, Chloroform, Chlorobenzene, 2-Chloroethylvinyl ether, Dibromochloromethane, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 1,1-Dichloroet hane, 1,2-Dichloroethane, trans-1,2-Dichloroethylene, 1,1-Dichloroethylene, 1,2-Dichloropropane, cis-1,3-Dichloropropene, trans-1,3-Dichloropropene, Methylene chloride, 1,1,2,2-Tetrachloroethane, Tetrachloroethene, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, Trichloroethylene	1mL	47431-U	
VOC Mix 6 S S	6 analytes, 2000µg/mL each analyte in methanol Bromomethane, Chloroethane, Chloromethane, Dichlorodifluoromethane, Trichlorofluoromethane, Vinyl chloride	1mL 1mL	48799-U 4S8799	
EPA 601/602 Calibration Mix Includes 2-chloroethylvinyl ether.	26 analytes, 2000µg/mL each in methanol Benzene, Bromodichloromethane, Bromoform, Carbon tetrachloride, Chloroform, Chlorobenzene, 2-Chloroethylvinyl ether, Dibromochloromethane, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 1,1-Dichloroet hane, 1,2-Dichloroethane, trans-1,2-Dichloroethylene, 1,1-Dichloroethylene, 1,2-Dichloropropane, cis-1,3-Dichloropropene, trans-1,3-Dichloropropene, Ethylbenzene, Methylene chloride, 1,1,2,2-Tetrachloroethane, Tetrachloroethylene, Toluene, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, Trichloroethylene	1mL	47507-U	

S S Separate Source standards. Prepared from independently sourced raw materials and quality controlled independently.

Environmental Standards
Wastewater Methods

MIXES AND SOLUTIONS	COMPOSITION			QTY.	CAT. NO.	PRICE
EPA 601 Purgeable Halocarbons Mix Without gases.	22 analytes, 2000µg/mL each in methanol Bromodichloromethane Bromoform Carbon tetrachloride Chloroform Chlorobenzene Dibromochloromethane 1,2-Dichlorobenzene 1,3-Dichlorobenzene	1,4-Dichlorobenzene 1,1-Dichloroethane 1,2-Dichloroeth ane trans-1,2-Dichloroethylene 1,1-Dichloroethylene 1,2-Dichloropropane cis-1,3-Dichloropropene	trans-1,3-Dichloropropene Methylene chloride 1,1,2,2-Tetrachloroethane Tetrachloroethene 1,1,1-Trichloroethane 1,1,2-Trichloroethane Trichloroethylene	1mL	46964	
EPA 602 Purgeable Aromatics Mix SS	7 analytes in methanol 200µg/mL each analyte 200µg/mL each analyte 2000µg/mL each analyte Benzene Chlorobenzene 1,2-Dichlorobenzene	1,3-Dichlorobenzene 1,4-Dichlorobenzene	Ethylbenzene Toluene	1mL 1mL 1mL	48740 4S8740 46965	
Volatile Organic Compounds Mix 6 SS	6 analytes, 2000µg/mL each in methanol Bromomethane Chloroethane	Chloromethane Dichlorodifluoromethane	Trichlorofluoromethane Vinyl chloride	1mL 1mL	48799-U 4S8799	
2-Chloroethylvinyl ether	200µg/mL in methanol 5000µg/mL in methanol			1mL 1mL	48672 40017	
Trihalomethanes Calibrations Mix SS	4 analytes in methanol 100µg/mL each analyte 200µg/mL each analyte 200µg/mL each analyte 2000µg/mL each analyte Bromodichloromethane Bromoform	Chloroform	Dibromochloromethane	1mL 1mL 1mL 1mL	47904 48746 4S8746 48140-U	
Bromodichloromethane	200µg/mL in methanol			1mL	48615	
Bromoform	200µg/mL in methanol			1mL	48618	
Chloroform	200µg/mL in methanol			1mL	48603	
Dibromochloromethane	200µg/mL in methanol			1mL	48608	
Trihalomethanes Kit	1mL of each of the following products Trihalomethanes Calibration Mix (48746) Bromoform (48618) Bromodichloromethane (48615) Dibromochloromethane (48608) Chloroform (48603)				48824	
Trihalomethanes Calibrations Mix SS	4 analytes in methanol 100µg/mL each analyte 200µg/mL each analyte 200µg/mL each analyte 2000µg/mL each analyte Bromodichloromethane Bromoform	Chloroform	Dibromochloromethane	1mL 1mL 1mL 1mL	47904 48746 4S8746 48140-U	
Bromodichloromethane	5000µg/mL in methanol			1mL	40046	
Bromoform	5000µg/mL in methanol			1mL	40212	
Chloroform	5000µg/mL in methanol			1mL	40021	
Dibromochloromethane	2000µg/mL in methanol			1mL	40200-U	

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Environmental Standards
Wastewater Methods

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
QC Standards				
EPA 601 Purgeables Performance Mix	18 analytes at indicated concentrations in methanol Carbon tetrachloride, 120µg/mL; Chlorobenzene, 600µg/mL; 1,2-Dichlorobenzene, 600µg/mL; 1,3-Dichlorobenzene, 600µg/mL; 1,4-Dichlorobenzene, 600µg/mL; 1,1-Dichloroethane, 120µg/mL; 1,2-Dichloroethane, 120µg/mL; 1,1-Dichloroethylene, 120µg/mL; trans-1,2-Dichloroethylene, 120µg/mL; 1,2-Dichloropropane, 120µg/mL; cis-1,3-Dichloropropene, 120µg/mL; trans-1,3-Dichloropropene, 120µg/mL; Methylene chloride, 600µg/mL; 1,1,2,2-Tetrachloroethane, 120µg/mL; Tetrachloroethylene, 120µg/mL; 1,1,1-Trichloroethane, 120µg/mL; 1,1,2-Trichloroethane, 120µg/mL; Trichloroethylene, 120µg/mL	1mL	48747	
Internal and Surrogate Standards				
EPA Purgeable Internal Standards Mix	3 analytes, 20,000µg/mL each in methanol Bromochloromethane; 1-Chloro-2-bromopropane; 1,4-Dichlorobutane	1mL	48864	
Bromochloromethane	2000µg/mL in methanol	1mL	48067	
	20,000µg/mL in methanol	1mL	48711	
1,4-Dichlorobutane	2000µg/mL in methanol	1mL	48066	
	20,000µg/mL in methanol	1mL	48712	
2-Bromo-1-chloropropane	2000µg/mL in methanol	1mL	48088	
	20,000µg/mL in methanol	1mL	48713	
Additional QC Standards				
See Method 624				
METHOD 602				
Calibration Standards				
EPA 601/602 Calibration Mix Includes 2-chloroethylvinyl ether.	26 analytes, 2000µg/mL each in methanol Benzene; Bromodichloromethane; Bromoform; Carbon tetrachloride; Chloroform; Chlorobenzene; 2-Chloroethylvinyl ether; Dibromochloromethane; 1,2-Dichlorobenzene; 1,3-Dichlorobenzene; 1,4-Dichlorobenzene; 1,1-Dichloroethane; 1,2-Dichloroethane; trans-1,2-Dichloroethylene; 1,1-Dichloroethylene; 1,2-Dichloropropane; cis-1,3-Dichloropropene; trans-1,3-Dichloropropene; Ethylbenzene; Methylene chloride; 1,1,2,2-Tetrachloroethane; Tetrachloroethylene; Toluene; 1,1,1-Trichloroethane; 1,1,2-Trichloroethane; Trichloroethylene	1mL	47507-U	
EPA 602 Purgeable Aromatics	7 analytes in methanol			
	200µg/mL each analyte	1mL	48740	
	200µg/mL each analyte	1mL	4S8740	
	2000µg/mL each analyte Benzene; Chlorobenzene; 1,2-Dichlorobenzene; 1,3-Dichlorobenzene; 1,4-Dichlorobenzene; Ethylbenzene; Toluene	1mL	46965	
Internal/Surrogate Standards				
α, α, α-Trifluorotoluene	2000µg/mL in methanol	1mL	48389	
METHOD 603				
Calibration Standards				
Acrolein	Neat	5g	48501	
Acrylonitrile	Neat	5g	48502	
METHOD 604				
Calibration Standards				
EPA 604-M Phenols Mix SS	11 analytes at indicated concentrations in methanol 4-Chloro-3-methylphenol, 2500µg/mL; 2-Chlorophenol, 500µg/mL; 2,4-Dichlorophenol, 500µg/mL; 2,4-Dimethylphenol, 500µg/mL; 2,4-Dinitrophenol, 1500µg/mL; 2-Methyl-4,6-dinitrophenol, 2500µg/mL; 2-Nitrophenol, 500µg/mL; Pentachlorophenol, 2500µg/mL; Phenol, 500µg/mL; 2,4,6-Trichlorophenol, 1500µg/mL; 4-Nitrophenol, 2500µg/mL	1mL 1mL	48859 4S8859	
EPA 604-S Phenols Kit	11 individually packaged 1mL solutions (500µg/mL each in methanol) and 1 mix 4-Chloro-3-methylphenol; 2-Chlorophenol; 2,4-Dichlorophenol; 2,4-Dimethylphenol; 2,4-Dinitrophenol; 2-Methyl-4,6-dinitrophenol; 2-Nitrophenol; 4-Nitrophenol; Pentachlorophenol; Phenol; 2,4,6-Trichlorophenol; EPA 604- M Phenols Mix (48859)		48751	

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MIXES AND SOLUTIONS	COMPOSITION			QTY.	CAT. NO.	PRICE
METHOD 605						
Calibration Standards TCL Benzidines Mix SS	2 analytes, 2000µg/mL each in methanol			1mL 1mL	48906 4S8906	
	Benzidine	3,3'-Dichlorobenzidine				
METHOD 606						
Calibration Standards for Complete Analysis Phthalate Esters Mix SS	6 analytes, 2000µg/mL each in hexane 6 analytes, 2000µg/mL each in hexane 6 analytes, 2000µg/mL each in methanol			1mL 1mL 1mL	48231 4S8231 48805-U	
	Bis(2-ethylhexyl)phthalate Butyl benzyl phthalate	Diethyl phthalate Dimethyl phthalate	Di-n-butyl phthalate Di-n-octyl phthalate			
Additional Calibration Standards EPA 606-M Phthalate Esters Mix	6 analytes, 200µg/mL each in methanol			1mL	48741	
	Bis(2-ethylhexyl)phthalate Butyl benzyl phthalate	Diethyl phthalate Dimethyl phthalate	Di-n-butyl phthalate Di-n-octyl phthalate			
METHOD 607						
Calibration Standards EPA Nitrosamines Mix	3 analytes, 2000µg/mL each in methanol			1mL	48240-U	
	N-Nitrosodimethylamine	N-Nitrosodi-n-propylamine	N-Nitrosodiphenylamine			
METHOD 608, 608.1, 608.2						
Calibration Standards EPA 608 Pesticides Calibration Mix	16 analytes, 20µg/mL each in hexane:toluene (50:50)			1mL	47915-U	
	Aldrin α-BHC β-BHC γ-BHC (Lindane) δ-BHC 4,4'-DDD	4,4'-DDE 4,4'-DDT Dieldrin Endosulfan I Endosulfan II	Endosulfan sulfate Endrin Endrin aldehyde Heptachlor Heptachlor epoxide (isomer B)			
EPA Pesticide Mix	16 analytes at indicated concentrations in methanol:methylene chloride (98:2)			1mL	48858-U	
	Aldrin, 10µg/mL α-BHC, 10µg/mL β-BHC, 10µg/mL γ-BHC (Lindane), 10µg/mL δ-BHC, 10µg/mL 4,4'-DDD, 60µg/mL	4,4'-DDE, 20µg/mL 4,4'-DDT, 60µg/mL Dieldrin, 20µg/mL Endosulfan I, 20µg/mL Endosulfan II, 20µg/mL	Endosulfan sulfate, 60µg/mL Endrin, 20µg/mL Endrin aldehyde, 60µg/mL Heptachlor, 10µg/mL Heptachlor epoxide (isomer B), 10µg/mL			
Chlordane Toxaphene	5000µg/mL in methanol 5000µg/mL in methanol			1mL 1mL	40089 40111	
Aroclor Mix 1	4 analytes, 200µg/mL each in methanol			1mL	48861	
	Aroclor 1016 Aroclor 1232	Aroclor 1248	Aroclor 1260			
Aroclor Mix 2	3 analytes, 200µg/mL each in methanol			1mL	48862	
	Aroclor 1221	Aroclor 1242	Aroclor 1254			

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Environmental Standards
Wastewater Methods

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
EPA 608-S Organochlorine Pesticides and PCBs Kit	23 individually packaged 1mL solutions at indicated concentrations in methanol (except as noted), plus 3 mixes Aldrin, 20µg/mL; Aroclor 1016, 200µg/mL; Aroclor 1221, 200µg/mL; Aroclor 1232, 200µg/mL; Aroclor 1242, 200µg/mL; Aroclor 1248, 200µg/mL; Aroclor 1254, 200µg/mL; Aroclor 1260, 200µg/mL; α-BHC, 20µg/mL; β-BHC, 20µg/mL*; γ-BHC (Lindane), 20µg/mL; δ-BHC, 20µg/mL*; Chlordane, 20µg/mL; 4,4'-DDD, 20µg/mL; 4,4'-DDE, 20µg/mL; 4,4'-DDT, 20µg/mL; Dieldrin, 20µg/mL; Endosulfan sulfate, 20µg/mL; Endrin, 20µg/mL; Endrin aldehyde, 20µg/mL; Heptachlor, 20µg/mL; Heptachlor epoxide (isomer B), 20µg/mL; Toxaphene, 20µg/mL; EPA Pesticide Mix (48858-U); Aroclor Mix 1 (48861); Aroclor Mix 2 (48862)		48753-U	
METHOD 610				
Calibration Standards EPA 610 Polynuclear Aromatic Hydrocarbons Mixture SS	16 analytes at indicated concentrations in methanol:methylene chloride, 50:50 Acenaphthene, 1000µg/mL; Acenaphthylene, 2000µg/mL; Anthracene, 100µg/mL; Benzo(a)anthracene, 100µg/mL; Benzo(a)pyrene, 100µg/mL; Benzo(b)fluoranthene 200µg/mL; Benzo(k)fluoranthene, 100µg/mL; Benzo(ghi)perylene, 200µg/mL; Chrysene, 100µg/mL; Dibenzo(a,h)anthracene, 200µg/mL; Fluoranthene, 200µg/mL; Fluorene, 200µg/mL; Indeno(1,2,3-cd)pyrene, 100µg/mL; Naphthalene, 1000µg/mL; Phenanthrene, 100µg/mL; Pyrene, 100µg/mL	1mL 1mL	48743 4S8743	
EPA 610-S Polynuclear Aromatic Hydrocarbons Kit	16 individually packaged 1mL solutions, 200µg/mL each in methanol (except where noted), plus 1 mix Acenaphthene; Acenaphthylene; Anthracene; Benzo(a)anthracene■; Benzo(a)pyrene■; Benzo(b)fluoranthene; Benzo(k)fluoranthene■; Benzo(ghi)perylene■; Chrysene■; Dibenzo(a,h)anthracene■; Fluoranthene■; Fluorene; Indeno(1,2,3-cd)pyrene; Naphthalene; Phenanthrene■; Pyrene■; PAH Mixture 610-M (48743)		48755-U	
EPA 610-N Polynuclear Aromatic Hydrocarbons Kit	16 individually packaged neat compounds in quantities indicated Acenaphthene, 5g; Acenaphthylene, 0.1g; Anthracene, 5g; Benzo(a)anthracene, 0.1g; Benzo(a)pyrene, 0.1g; Benzo(b)fluoranthene, .05g; Benzo(ghi)perylene, .025g; Benzo(k)fluoranthene, .05g; Chrysene (93%), 0.1g; Dibenzo(a,h)anthracene, 0.1g; Fluoranthene, 5g; Fluorene, 5g; Indeno(1,2,3-cd)pyrene, .01g; Naphthalene, 5g; Phenanthrene, 5g; Pyrene, 5g		47351	
METHOD 611				
Calibration Standards EPA Haloethers Mix	5 analytes, 2000µg/mL each in hexane Bis(2-chloroethoxy)methane; Bis(2-chloroethyl)ether; Bis(2-chloroisopropyl)ether; 4-Bromophenylphenyl ether; 4-Chlorophenylphenyl ether	1mL	48228-U	

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* In methanol:methylene chloride, 98:2.

■ In methylene chloride.

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Environmental Standards
Wastewater Methods

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
METHOD 612				
Calibration Standards Hexachlorocyclopentadiene	500µg/mL in methanol	1mL	48388	
METHOD 613				
Calibration Standards 2,3,7,8-Tetrachloro-dibenzo-p-dioxin	Qualitative standard, approx. 10µg/mL in toluene	1mL	48599	
METHOD 624				
Calibration Standards				
EPA 624 Calibration Mix With gases	30 analytes, 100µg/mL each in methanol Benzene, Bromodichloromethane, Bromoform, Bromomethane, Carbon tetrachloride, Chlorobenzene, Chloroethane, Chloroform, Chloromethane, Dibromochloromethane, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 1,1-Dichloroethane, 1,2-Dichloroethane, 1,1-Dichloroethene, trans-1,2-Dichloroethene, 1,2-Dichloropropane, cis-1,3-Dichloropropene, trans-1,3-Dichloropropene, Ethylbenzene, Methylene chloride, 1,1,2,2-Tetrachloroethane, Tetrachloroethene, Toluene, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, Tri chloroethene, Trichlorofluoromethane, Vinyl chloride	1mL	47506	
2-Chloroethylvinyl ether	200µg/mL in methanol	1mL	48672	
	5000µg/mL in methanol	1mL	40017	
EPA Purgeable Halocarbon Calibration Kit	1mL of each of the following products EPA 624 Calibration Mix (47506), 2-Chloroethyl vinyl ether (40017)		47439-U	
EPA 624 Purgeable Calibration Mix Without gases. Includes 2-chloroethylvinyl ether.	26 analytes, 2000µg/mL each in methanol Benzene, Bromodichloromethane, Bromoform, Carbon tetrachloride, Chlorobenzene, 2-Chloroethyl vinyl ether, Chloroform, Dibromochloromethane, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 1,1-Dichloroeth ane, 1,2-Dichloroethane, 1,1-Dichloroethene, trans-1,2-D ichloroethene, 1,2-Dichloropropane, cis-1,3-Dichloropropene, trans-1,3-Dichloropropene, Ethylbenzene, Methylene chloride, 1,1,2,2-Tetrachloroethane, Tetrachloroethene, Toluene, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, Trichloroethene	1mL	47432-U	
EPA 624 Calibration Mix B	5 analytes, 2000µg/mL each in methanol Bromomethane, Chloroethane, Chloromethane, Trichlorofluoromethane, Vinyl chloride	1mL	46967-U	
EPA Purgeable A with Dichlorobenzene	14 analytes in methanol			
	200µg/mL each analyte	1mL	47969	
	2000µg/mL each analyte	1mL	48059	
	Carbon tetrachloride, Chlorobenzene, 2-Chloroethylvinyl ether, Chloroform, Dibromochloromethane, 1,2-Dichlorobenzene, 1,1-Dichloroethane, 1,1-Dichloroethene, 1,2-Dichloropropane, Methylene chloride, Tetrachloroethene, 1,1,2-Trichloroethane, Trichloroethylene, Trichlorofluoromethane			
EPA Purgeable B with Dichlorobenzene	13 analytes in methanol			
	200µg/mL each analyte	1mL	47970-U	
	2000µg/mL each analyte	1mL	48058	
	Benzene, Bromodichloromethane, Bromoform, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 1,2-Dichloroethane, trans 1,2-Dichloroethene, cis-1,3-Dichloropropene, trans-1,3-Dichloropropene, Ethylbenzene, 1,1,2,2-Tetrachloroethane, Toluene, 1,1,1-Trichloroethane			
EPA Purgeable C	4 analytes in methanol			
	200µg/mL each analyte	1mL	48853	
	2000µg/mL each analyte	1mL	48057-U	
	Bromomethane, Chloroethane, Chloromethane, Vinyl chloride			
HC Purgeables Kit	1mL of each of the following products EPA HC Purgeable A with Dichlorobenzene (48059), EPA HC Purgeable B with Dichlorobenzene (48058), EPA HC Purgeable C (48057)		47371	

SS Separate Source standards. Prepared from independently sourced raw materials and quality controlled independently.

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Environmental Standards
Wastewater Methods

MIXES AND SOLUTIONS	COMPOSITION			QTY.	CAT. NO.	PRICE
EPA 624 Calibration Mix A Without gases	25 analytes, 2000µg/mL each in methanol Benzene Bromodichloromethane Bromoform Carbon tetrachloride Chlorobenzene Chloroform Dibromochloromet hane 1,2-Dichlorobenzene 1,3-Dichlorobenzene	 1,4-Dichlorobenzene 1,1-Dichloroethane 1,2-Dichloroet hane 1,1-Dichloroethene trans-1,2-Dichloroethene 1,2-Dichloropropane cis-1,3-Dichloropropene trans-1,3-Dichloropropene	 Ethylbenzene Methylene chloride 1,1,2,2-Tetrachloroethane Tetrachloroethene Toluene 1,1,1-Trichloroethane 1,1,2-Trichloroethane Trichloroethene	1mL	46966	
EPA 624 Calibration Mix B	5 analytes, 2000µg/mL each in methanol Bromomethane Chloroethane	 Chloromethane Trichlorofluoromethane	 Vinyl chloride	1mL	46967-U	
2-Chloroethylvinyl ether	200µg/mL in methanol 5000µg/mL in methanol			1mL 1mL	48672 40017	
EPA Purgeable A	13 analytes, 200µg/mL each in methanol Carbon tetrachloride Chlorobenzene 2-Chloroethylvinyl ether Chloroform Dibromochloromethane	 1,1-Dichloroethane 1,1-Dichloroethene 1,2-Dichloropropane Methylene chloride	 Tetrachloroethene 1,1,2-Trichloroethane Trichloroethene Trichlorofluoromethane	1mL 1mL	48851-U 4S8851	
EPA Purgeable B SS	11 analytes, 200µg/mL each in methanol Benzene Bromodichloromethane Bromoform 1,2-Dichloroethane	 trans-1,2-Dichloroethene cis-1,3-Dichloropropene trans-1,3-Dichloropropene Ethylbenzene	 1,1,2,2-Tetrachloroethane Toluene 1,1,1-Trichloroethane	1mL 1mL	48852-U 4S8852	
QC Standards EPA Volatiles Mix 1 NC▲ SS	11 analytes, 50µg/mL each in methanol Carbon tetrachloride Chlorobenzene 1,3-Dichlorobenzene 1,4-Dichlorobenzene	 1,2-Dichloroethane 1,1-Dichloroethene trans-1,2-Dichloroethene 1,2-Dichloropropane	 Ethylbenzene Tetrachloroethene 1,1,2-Trichloroethane	1mL	47269	
EPA Volatiles Mix 2 NC▲	12 analytes, 50µg/mL each in methanol Benzene Bromodichloromethane Bromoform Chloroform	 Dibromochloromethane 1,2-Dichlorobenzene 1,1-Dichlo roethane Methylene chloride	 1,1,2,2-Tetrachloroethane Toluene 1,1,1-Trichloroethane Trichloroethene	1mL	47270	
Internal Standards EPA Purgeable Internal Standards Mix	3 analytes, 20,000µg/mL each in methanol Bromochloromethane	 1-Chloro-2-bromopropane	 1,4-Dichlorobutane	1mL	48864	
Surrogate Standards Benzene-d_6 4-Bromofluorobenzene 1,2-Dichloroethane-d_4 1,4-Difluorobenzene Fluorobenzene Pentafluorobenzene	 2000µg/mL in methanol 2000µg/mL in methanol 2000µg/mL in methanol 2000µg/mL in methanol 2000µg/mL in methanol 2000µg/mL in methanol			 1mL 1mL 1mL 1mL 1mL 1mL	 48940-U 48083 48941 48944 48943 48945	
Tuning Solution◆	4-Bromofluorobenzene		2000µg/mL in methanol 25,000µg/mL in methanol	1mL 1mL	48083 48800	

SS Separate Source standards. Prepared from independently sourced raw materials and quality controlled independently.
▲ Supelco equivalent of the former EPA Certified QC Sample.
◆ For additional tuning solutions, see Method 625.

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MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
METHOD 625				
Calibration Standards				
625 Semivolatile Calibration Mix	55 analytes, 1000µg/mL each in methylene chloride:benzene (3:1) Acenaphthene, Acenaphthylene, Anthracene, Azobenzene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,I)perylene, Benzo(a)pyrene, Bis(2-chloroethoxy)methane, Bis(2-chloroethyl)ether, Bis(2-chloroisopropyl)ether, Bis(2-ethylhexyl)phthalate, 4-Bromophenyl phenyl ether, Butyl benzyl phthalate, Carbazole, 4-Chloro-3-methylphenol, 2-Chloronaphthalene, 2-Chlorophenol, 4-Chlorophenylphenyl ether, Chrysene, Dibenzo(a,h)anthracene, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 2,4-Dichlorophenol, Diethyl phthalate, 2,4-Dimethylphenol, Dimethyl phthalate, 2,4-Dinitrophenol, 2,4-Dinitrotoluene, 2,6-Dinitrotoluene, Di-n-butyl phthalate, Di-n-octyl phthalate, Fluoranthene, Fluorene, Hexachlorobenzene, Hexachlorobutadiene, Hexachlorocyclopentadiene, Hexachloroethane, Indeno(1,2,3-cd)pyrene, Isophorone, 2-Methyl-4,6-dinitrophenol, Naphthalene, Nitrobenzene, 2-Nitrophenol, 4-Nitrophenol, N-Nitrosodimethyl amine, N-Nitrosodi-n-propylamine, Pentachlorophenol, Phenanthrene, Phenol, Pyrene, 1,2,4-Trichlorobenzene, 2,4,6-Trichlorophenol	1mL	506559	
TCL Benzidines Mix	2 analytes, 2000µg/mL each in methanol Benzidine, 3,3'-Dichlorobenzidine	1mL	48906	
N-Nitrosodiphenylamine	5000µg/mL in methanol	1mL	40060	
EPA 625 Semivolatile Calibration Kit	1mL of each of the following products 625 Semivolatile Calibration Mix (506559), TCL Benzidines Mix (48906), N-Nitrosodiphenylamine (40060)		47444-U	
EPA 625 Semivolatile Calibration Add-On Mix 1	17 analytes, 2000µg/mL each in methylene chloride Acenaphthene, Acenaphthylene, Anthracene, Azobenzene, Benzo(a)anthracene, Benzo(b)fluoranthene, 4-Chlorophenylphenyl ether, Chrysene, Dibenzo(a,h)anthracene, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, Hexachlorobutadiene, Hexachlorocyclopentadiene, Hexachloroethane, Indeno(1,2,3-cd)pyrene, Isophorone, 2-Methyl-4,6-dinitrophenol	1mL	46828-U	
EPA 625 Semivolatile Calibration Add-On Mix 2	10 analytes, 2000µg/mL each in methylene chloride Acenaphthene, Acenaphthylene, Anthracene, Azobenzene, 4-Chlorophenylphenyl ether, Chrysene, Dibenzo(a,h)anthracene, 1,2-Dichlorobenzene, Hexachlorobutadiene, Hexachlorocyclopentadiene, Hexachloroethane, Indeno(1,2,3-cd)pyrene	1mL	46829-U	
8270/625/CLP/Appendix IX Semivolatile Calibration Mix	44 analytes, 1000µg/mL each in methylene chloride:benzene (3:1) Acenaphthene, Acenaphthylene, Anthracene, Azobenzene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,I)perylene, Benzo(a)pyrene, Bis(2-chloroethoxy)methane, Bis(2-chloroethyl)ether, Bis(2-chloroisopropyl)ether, Bis(2-ethylhexyl)phthalate, 4-Bromophenyl phenyl ether, Butyl benzyl phthalate, Carbazole, 2-Chloronaphthalene, 4-Chlorophenylphenyl ether, Chrysene, Dibenzo(a,h)anthracene, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, Diethyl phthalate, Dimethyl phthalate, 2,4-Dinitrotoluene, 2,6-Dinitrotoluene, Di-n-butyl phthalate, Di-n-octyl phthalate, Fluoranthene, Fluorene, Hexachlorobenzene, Hexachlorobutadiene, Hexachlorocyclopentadiene, Hexachloroethane, Indeno(1,2,3-cd)pyrene, Isophorone, Naphthalene, Nitrobenzene, N-Nitrodimethyl amine, N-Nitrosodi-n-propylamine, Phenanthrene, Pyrene, 1,2,4-Trichlorobenzene	1mL	502049	
EPA 625 Phenol Mix in Methanol SS	11 analytes at indicated concentrations in methanol 4-Chloro-3-methylphenol, 2500µg/mL; 2,4-Dinitrophenol, 1500µg/mL; Pentachlorophenol, 2500µg/mL; 2-Chlorophenol, 500µg/mL; 2-Methyl-4,6-dinitrophenol, 2500µg/mL; Phenol, 500µg/mL; 2,4-Dichlorophenol, 500µg/mL; 2-Nitrophenol, 500µg/mL; 2,4,6-Trichlorophenol, 1500µg/mL; 2,4-Dimethylphenol, 500µg/mL; 4-Nitrophenol, 2500µg/mL	1mL 1mL	48859 4S8859	

SS Separate Source standards. Prepared from independently sourced raw materials and quality controlled independently.

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Method 625
Chemical Standards

SUPELCO

Environmental Standards
Wastewater Methods

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
EPA CLP/625 Pesticide Mix	16 analytes, 2000µg/mL each in hexane:toluene (50:50) Aldrin, α-BHC, β-BHC, δ-BHC (Lindane), γ-BHC, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Dieldrin, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin aldehyde, Heptachlor, Heptachlor epoxide	1mL	47914	
EPA 625 Phenol Mix	11 analytes at indicated concentrations in methylene chloride 4-Chloro-3-methylphenol, 2500µg/mL; 2-Chlorophenol, 500µg/mL; 2,4-Dichlorophenol, 500µg/mL; 2,4-Dimethylphenol, 500µg/mL; 2,4-Dinitrophenol, 2500µg/mL; 2-Methyl-4,6-dinitrophenol, 2500µg/mL; 2-Nitrophenol, 500µg/mL; 4-Nitrophenol, 2500µg/mL; Pentachlorophenol, 2500µg/mL; Phenol, 500µg/mL; 2,4,6-Trichlorophenol, 1500µg/mL	1mL	48866	
EPA 625 Base/Neutral 1	12 analytes, 200µg/mL each in methylene chloride Acenaphthylene, Benzo(b)fluoranthene, Bis(2-chloroethyl)ether, Bis(2-ethylhexyl)phthalate, Bis(2-chloroisopropyl)ether, 4-Bromophenylphenyl ether, 1,4-Dichlorobenzene, 3,3'-Dichlorobenzidine, Dimethyl phthalate, Di-n-butyl phthalate, 2,6-Dinitrotoluene, Nitrobenzene	1mL	48831	
EPA 625 Base/Neutral 2	15 analytes, 200µg/mL each in methylene chloride Acenaphthene, Anthracene, Benzo(a)anthracene, Bis(2-chloroethoxy)methane, Chrysene, Dibenzo(a,h)anthracene, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, Diethyl phthalate, 2,4-Dinitrotoluene, Fluorene, Hexachlorobenzene, Hexachlorobutadiene, Naphthalene, Pyrene	1mL	48832	
EPA 625 Base/Neutral 3	11 analytes, 200µg/mL each in methylene chloride Azobenzene, Butyl benzyl phthalate, 2-Chloronaphthalene, Fluoranthene, Hexachlorocyclopentadiene, Hexachloroethane, Isophorone, N-Nitrosodi-n-propylamine, N-Nitrosodiphenylamine, Phenanthrene, 1,2,4-Trichlorobenzene	1mL	48833	
EPA 625 Base/Neutral 4	8 analytes, 200µg/mL each in methylene chloride Benzidine, Benzo(a)pyrene, Benzo(ghi)perylene, Benzo(k)fluoranthene, 4-Chlorophenylphenyl ether, Di-n-octyl phthalate, Indeno(1,2,3-cd)pyrene, N-Nitrosodimethylamine	1mL	48834	
EPA Pesticide Mix	16 analytes at indicated concentrations in methanol:methylene chloride (98:2) Aldrin, 10µg/mL; α-BHC, 10µg/mL; β-BHC, 10µg/mL; γ-BHC (Lindane), 10µg/mL; δ-BHC, 10µg/mL; 4,4'-DDD, 60µg/mL; 4,4'-DDE, 20µg/mL; 4,4'-DDT, 60µg/mL; Dieldrin, 20µg/mL; Endosulfan I, 20µg/mL; Endosulfan II, 20µg/mL; Endosulfan sulfate, 60µg/mL; Endrin, 20µg/mL; Endrin aldehyde, 60µg/mL; Heptachlor, 10µg/mL; Heptachlor epoxide (isomer B), 10µg/mL	1mL	48858-U	
Chlordane	5000µg/mL in methanol	1mL	40089	
Toxaphene	5000µg/mL in methanol	1mL	40111	
Aroclor Mix 1	4 analytes, 200µg/mL each in methanol Aroclor 1016, Aroclor 1232, Aroclor 1248, Aroclor 1260	1mL	48861	
Aroclor Mix 2	3 analytes, 200µg/mL each in methanol Aroclor 1221, Aroclor 1242, Aroclor 1254	1mL	48862	

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MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
Tuning Solutions				
Benzidine-Decafluorotriphenyl-phosphine	At stated concentrations in methylene chloride Benzidine, 500µg/mL Decafluorotriphenylphosphine (DFTPP), 250µg/mL	1mL	48727	
Pentachlorophenol-Decafluoro-triphenylphosphine	250µg/mL each analyte in methylene chloride Pentachlorophenol Decafluorotriphenylphosphine (DFTPP)	1mL	48728	
Decafluorotriphenylphosphine (DFTPP)	25,000µg/mL in methylene chloride	1mL	48724-U	
Perfluorotributylamine (PFTBA)	Neat	1g	442747-U	
Internal/Surrogate Standards				
2-Fluorophenol	2000µg/mL in methylene chloride	1mL	48719-U	
Pentafluorophenol	2000µg/mL in methylene chloride	1mL	48718	
Phenol-d_6■	2000µg/mL in methylene chloride	1mL	48716-U	
Aniline-d_5	2000µg/mL in methylene chloride	1mL	48788	
Anthracene-d_{10}	2000µg/mL in methylene chloride	1mL	48863	
Benzo(a)anthracene-d_{12}	2000µg/mL in methylene chloride	1mL	48789	
Decafluorobiphenyl	2000µg/mL in methylene chloride	1mL	48792	
4,4'-Dibromobiphenyl	2000µg/mL in methylene chloride	1mL	48790-U	
4,4'-Dibromooctafluorobiphenyl	2000µg/mL in methylene chloride	1mL	48791	
2,2'-Difluorobiphenyl	2000µg/mL in methylene chloride	1mL	48787	
1-Fluoronaphthalene	2000µg/mL in methylene chloride	1mL	48720-U	
2-Fluoronaphthalene	2000µg/mL in methylene chloride	1mL	48721-U	
Naphthalene-d_8	2000µg/mL in methylene chloride	1mL	48715-U	
Nitrobenzene-d_5	2000µg/mL in methylene chloride	1mL	48717-U	
Phenanthrene-d_{10}	2000µg/mL in methylene chloride	1mL	48710-U	
Pyridine-d_5	2000µg/mL in methylene chloride	1mL	48714-U	
METHOD 627				
Benfluralin	Neat	1000mg	PS389	
Trifluralin	Neat	250mg	442824	
METHOD 629				
Calibration Standards				
Cyanazine	2000µg/mL in methanol	1mL	48592	
METHOD 631				
Calibration Standards				
Benomyl	Neat	100mg	PS222	

■ Method 625 calls for a phenol-d_6 standard, and phenol-d_5 raw material is used to manufacture this standard. However, phenolic hydrogen exchange occurs naturally, converting phenol-d_6 to phenol-d_5. In analyzing this standard, your system will detect phenol-d_5, not phenol-d_6.

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Environmental Standards
Solid Waste, Groundwater Methods

Resource Conservation and Recovery Act (RCRA) — 8000 Series Methods

US EPA 8000 Series (or SW-846) methods are analytical methods for identifying and quantifying organic compounds on the EPA's Appendix VIII and Appendix IX lists in solid wastes and groundwater at active hazardous treatment, storage, and disposal sites. Most of these methods call for gas chromatography with a selective detector or for gas chromatography-mass spectrometry; two methods call for high performance liquid chromatography. An additional method, Toxicity Characteristic Leaching Procedure (TCLP) Method 1311, is used to estimate the toxicity of solid waste materials under the leaching conditions in a landfill. Materials designated as "hazardous" based on results of Method 1311 cannot be disposed of in conventional landfills.

RELATED INFORMATION

Test Methods for Evaluation of Solid Wastes (3rd edition)
Volume 1 Lab Manual – Physical/Chemical Methods
NTIS order number PB 89-148-076 (January 1988)
US Government Methods
Order all methods from:
NTIS
5285 Port Royal Road
Springfield, VA 22161
(phone 703-487-4650)

The US Environmental Protection Agency website is www.epa.gov

Standards on the pages that follow are specifically designed for monitoring organic chemicals on the Appendix VIII and Appendix IX Lists in solid wastes and groundwater at hazardous treatment, storage, and disposal sites, per methods developed by the Environmental Monitoring Systems Laboratory in Las Vegas (EMSL-LV), under authority of the Resource Conservation and Recovery Act (RCRA).

COMPOUND CLASSIFICATION	US EPA METHOD NUMBER
Acrylonitrile/Acetonitrile	8030, 8031
Chlorinated Herbicides	8150, 8151, 8151A
Chlorinated Hydrocarbons	8120, 8121
Chlorinated Pesticides and PCBs	8080, 8081, 8082
1,2-Dibromoethane, 1,2-Dibromo-3-chloropropane	8011
Haloethers	8111
Halogenated and Aromatic Volatile Organics	8010, 8020, 8021
Nitroaromatics and Cyclic Ketones	8090
Nitroaromatics and Nitramines by HPLC	8330
Nitrosamines by GC	8070
Nonhalogenated Volatile Organics	8015
Phenols	8040
Phthalate Esters	8061
Polynuclear Aromatic Hydrocarbons	8100
Polynuclear Aromatic Hydrocarbons	8310
Semivolatile Organic Compounds	8270
Toxicity Characteristic Leaching Procedure (TCLP)	1311
Volatile Organic Compounds (VOC)	8240, 8260

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
METHOD 1311				
These analytical reference standards are specifically designed for monitoring organic chemicals (acids, bases-neutrals, pesticides, herbicides, volatile compounds) listed in US Environmental Protection Agency Solid Waste Method 1311, Toxicity Characteristic Leaching Procedure.				
Calibration Standards				
EPA TCLP Acids Mix	6 analytes, 1000µg/mL each in methanol: m-Cresol, o-Cresol, p-Cresol, Pentachbrophenol, 2,4,5-Trichlorophenol, 2,4,6-Trichlorophenol	1mL	48142	
EPA TCLP Base-Neutrals Mix-A	6 analytes, 1000µg/mL each in acetone: 2,4-Dinitrotoluene, Hexachlorobutadiene, Nitrobenzene, Hexachlorobenzene, Hexachloroethane, Pyridine	1mL	48947	
EPA TCLP Base-Neutrals Mix-B	7 analytes, 1000µg/mL each in acetone: 1,4-Dichlorobenzene, Hexachlorobutadiene, Nitrobenzene, 2,4-Dinitrotoluene, Hexachloroethane, Pyridine, Hexachlorobenzene	1mL	47989-U	
EPA TCLP Volatiles Mix	11 analytes, 1000µg/mL each in methanol (except as noted): Benzene, 1,4-Dichlorobenzene, Tetrachloroethene, Carbon tetrachloride, 1,2-Dichloroethane, Trichloroethene, Chlorobenzene, 1,1-Dichloroethene, Vinyl chloride, Chloroform, Methyl ethyl ketone, 5000µg/mL	1mL	48143	
EPA TCLP Herbicides Mix	2 analytes, 1000µg/mL each in acetonitrile: 2,4-D methyl ester, Silvex methyl ester	1mL	48141	
EPA TCLP Pesticides Mix	5 analytes, 1000µg/mL each in methanol: γ-BHC (Lindane), Heptachlor, Methoxychlor, Endrin, Heptachlor epoxide	1mL	48139	
TCLP 2,4-D	100µg/mL in methanol	1mL	47896	
TCLP 2,4,5-TP (Silvex)	100µg/mL in methanol	1mL	47897	
Chlordane	5000µg/mL in methanol	1mL	40089	
Toxaphene	5000µg/mL in methanol	1mL	40111	

Environmental Standards
Solid Waste, Groundwater Methods

MIXES AND SOLUTIONS	COMPOSITION			QTY.	CAT. NO.	PRICE
METHOD 8010 (REPLACED WITH METHOD 8021)						
Calibration Standards EPA 8010 Halogenated Volatile Organic Compounds Mix 1	14 analytes, 2000µg/mL each in methanol Bromoform Carbon tetrachloride Chloroform Dibromomethane 1,1-Dichloroethane	1,2-Dichlo roethane 1,2-Dichloropropane 1,1,1,2-Tetrachloroethane 1,1,2,2-Tetrachloro ethane Tetrachloroethylene	1,1,1-Trichloroethane 1,1,2-Trichloroethane Trichloroethylene 1,2,3-Trichloropropane	1mL	48224	
EPA 8010 Halogenated Volatile Organic Compounds Mix 2	13 analytes, 2000µg/mL each in methanol Bromobenzene Bromodichloromethane Chlorobenzene Dibromochloromethane 1,2-Dichlorobenzene	1,3-Dichlorobenzene 1,4-Dichlorobenzene 1,1-Dichloroethene cis-1,2-Dichloroethene	trans-1,2-Dichloroethene cis-1,3-Dichloropropene trans-1,3-Dichloropropene Methylene chloride	1mL	48395	
VOC Mix 5	6 analytes, 2000µg/mL each in methanol Bromodichloromethane Dibromochloromethane	1,1-Dichloroethene cis-1,2-Dichloroethene	trans-1,2-Dichloroethene Methylene chloride	1mL	48797	
Chloroprene Iodomethane	custom-prepared standard (see page 360) 2000µg/mL in methanol:water (80:20)			1mL	47406	
VOC Mix 6 SS	6 analytes, 2000µg/mL each in methanol Bromomethane Chloroethane	Chloromethane Dichlorodifluoromethane	Trichlorofluoromethane Vinyl chloride	1mL 1mL	48799-U 4S8799	
EPA EDB/DBCP Mix	2 analytes, 2000µg/mL each in methanol 1,2-Dibromo-3-chloropropane	1,2-Dibromoethane		1mL	48225-U	
Surrogate Standards EPA 8010 Surrogate Mix (1987)	3 analytes, 2000µg/mL each in methanol Bromochloromethane	1-Chloro-2-bromopropane	1,4-Dichlorobutane	1mL	48234	
Bromochloromethane	2000µg/mL in methanol			1mL	48067	
4-Bromofluorobenzene	2000µg/mL in methanol			1mL	48083	
2-Bromochlorobenzene	750µg/mL in methanol			1mL	47487	
4-Bromochlorobenzene	750µg/mL in methanol			1mL	47485	
METHOD 8011						
Calibration Standards EPA EDB/DBCP Mix	2 analytes, 2000µg/mL each in methanol 1,2-Dibromo-3-chloropropane	1,2-Dibromoethane		1mL	48225-U	
METHOD 8015						
Calibration Standards EPA 8015 Nonhalogenated Volatile Organics Mix	4 analytes, 2000µg/mL each in methanol 2-Butanone (MEK) Diethyl ether	Ethanol	4-Methyl-2-pentanone (MIBK)	1mL	48236	
METHOD 8020 (REPLACED WITH METHOD 8021)						
Calibration Standards EPA 8020B Aromatic Volatile Organics Mix 1	9 analytes, 2000µg/mL each in methanol Benzene Chlorobenzene 1,2-Dichlorobenzene	1,3-Dichlorobenzene 1,4-Dichlorobenzene Ethylbenzene	Toluene m-Xylene o-Xylene	1mL	48226-U	
EPA 8020/8240 Aromatic Volatiles Mix	11 analytes, 100µg/mL each in methanol Benzene Chlorobenzene 1,2-Dichlorobenzene 1,3-Dichlorobenzene	1,4-Dichlorobenzene Ethylbenzene Styrene Toluene	m-Xylene o-Xylene p-Xylene	1mL	47504	
Styrene p-Xylene	5000µg/mL in methanol 5000µg/mL in methanol			1mL 1mL	40257-U 40203	

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Environmental Standards
Solid Waste, Groundwater Methods

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
Internal Standards				
α,α,α-Trifluorotoluene	2000µg/mL in methanol	1mL	48389	
Surrogate Standards				
2-Bromochlorobenzene	750µg/mL in methanol	1mL	47487	
4-Bromochlorobenzene	750µg/mL in methanol	1mL	47485	
4-Bromofluorobenzene	2000µg/mL in methanol	1mL	48083	
1,4-Difluorobenzene	2000µg/mL in methanol	1mL	48944	
Fluorobenzene	2000µg/mL in methanol	1mL	48943	
α,α,α-Trifluorotoluene	2000µg/mL in methanol	1mL	48389	
METHOD 8021 (1987), 8021A (1990)				
Calibration Standards				
VOC Mix 1 SS	12 analytes, 2000µg/mL each in methanol sec-Butylbenzene, 4-Chlorotoluene, Isopropylbenzene tert-Butylbenzene, 1,2-Dichlorobenzene, n-Propylbenzene Chlorobenzene, 1,3-Dichlorobenzene, o-Xylene 2-Chlorotoluene, 1,4-Dichlorobenzene, p-Xylene	1mL 1mL	48775 4S8775	
VOC Mix 2 SS	13 analytes, 2000µg/mL each in methanol Benzene, Naphthalene, 1,2,4-Trichlorobenzene Bromobenzene, Styrene, 1,2,4-Trimethylbenzene n-Butylbenzene, Toluene, 1,3,5-Trimethylbenzene Ethylbenzene, 1,2,3-Trichlorobenzene, m-Xylene p-Isopropyltoluene	1mL 1mL	48777 4S8777	
VOC Mix 3 SS	14 analytes, 2000µg/mL each in methanol 1,2-Dibromo-3-chloropropane, 1,1-Dichloropropene, 1,1,2,2-Tetrachloroethane 1,2-Dibromoethane, cis-1,3-Dichloropropene, 1,1,2-Trichloroethane 1,2-Dichloroethane, trans-1,3-Dichloropropene, Trichloroethene 1,2-Dichloropropane, Hexachlorobutadiene, 1,2,3-Trichloropropane 1,3-Dichloropropane, 1,1,1,2-Tetrachloroethane	1mL 1mL	48779 4S8779	
VOC Mix 4 SS	9 analytes, 2000µg/mL each in methanol Bromochloromethane, Chloroform, 2,2-Dichloropropane Bromoform, Dibromomethane, Tetrachloroethene Carbon tetrachloride, 1,1-Dichloroethane, 1,1,1-Trichloroethane	1mL 1mL	48786 4S8786	
VOC Mix 5 SS	6 analytes, 2000µg/mL each in methanol Bromodichloromethane, 1,1-Dichloroethene, trans-1,2-Dichloroethene Dibromochloromethane, cis-1,2-Dichloroethene, Methylene chloride	1mL 1mL	48797 4S8797	
VOC Mix 6 SS	6 analytes, 2000µg/mL each in methanol Bromomethane, Chloromethane, Trichlorofluoromethane Chloroethane, Dichlorodifluoromethane, Vinyl chloride	1mL 1mL	48799-U 4S8799	
VOC Calibration Standards Kit SS	1mL of each of the following products VOC Mix 1 (48775), VOC Mix 3 (48779), VOC Mix 5 (48797) VOC Mix 2 (48777), VOC Mix 4 (48786), VOC Mix 6 (48799-U)		48804 4S8804	
2-Chloroethylvinyl ether	200µg/mL in methanol 5000µg/mL in methanol	1mL 1mL	48672 40017	
Internal Standards				
EPA Internal Standard Mix	2 analytes, 2000µg/mL each in methanol 2-Bromo-1-chloropropane, Fluorobenzene	1mL	48950-U	
Surrogate Standards				
2-Bromochlorobenzene	750µg/mL in methanol	1mL	47487	
4-Bromochlorobenzene	750µg/mL in methanol	1mL	47485	
Bromochloromethane	2000µg/mL in methanol	1mL	48067	
2-Bromo-1-chloropropane	20,000µg/mL in methanol	1mL	48713	
1,4-Dichlorobutane	2000µg/mL in methanol	1mL	48066	

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Environmental Standards
Solid Waste, Groundwater Methods

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
METHOD 8030 (REPLACED WITH METHODS 8031 AND 8033)				
Calibration Standards				
Acetonitrile	Neat	1000mg	48484	
Acrolein	Neat	5000mg	48501	
Acrylonitrile	Neat	5000mg	48502	
	1000µg/mL in water	1mL	48709	
	5000µg/mL in methanol	1mL	40003	
METHOD 8031				
Calibration Standards				
Acrylonitrile	Neat	5000mg	48502	
	1000µg/mL in water	1mL	48709	
	5000µg/mL in methanol	1mL	40003	
METHOD 8040				
Calibration Standards				
EPA 8040A Phenols Calibration Mix	24 analytes, 500µg/mL each in isopropanol 2-sec-Butyl-4,6-dinitrophenol (Dinoseb), 2-Methylph enol, 2,3,4,6-Tetrachlorophenol 4-Chloro-3-methylphenol, 3-Methylphenol, 2,3,5,6-Tetrachlorophenol 2-Chlorophenol, 4-Methyl phenol, 2,3,4-Trichlorophenol 2,4-Dichlorophenol, 2-Nitrophenol, 2,3,5-Trichlorophenol 2,6-Dichlorophenol, 4-Nitrophenol, 2,3,6-Trichlorophenol 2,4-Dimethylphenol, Pentachlorophenol, 2,4,5-Trichlorophenol 2,4-Dinitrophenol, Phenol, 2,4,6-Trichlorophenol 2-Methyl-4,6-dinitrophenol, 2,3,4,5-T etrachlorophenol, 3,4,5-Trichlorophenol	1mL	47899	
EPA 8040A Phenols Mix	9 analytes, 2000µg/mL each in isopropanol 4-Chloro-3-methylphenol, 3-Methylphenol, Pentachlorophenol 2,4-Dichlorophenol, 2-Nitrophenol, Phenol 2-Methyl-4,6-dinitrophenol, 4-Nitrophenol, 2,4,6-Trichlorophenol	1mL	48235-U	
EPA 8040B Phenols Mix	9 analytes, 2000µg/mL each in isopropanol 2-sec-Butyl-4,6-dinitrophenol (Dinoseb), 2,4-Dimethylphenol, 4-Methylphenol 2-Chlorophenol, 2,4-Dinitrophenol, 2,3,4,6-T etrachlorophenol 2,6-Dichlorophenol, 2-Methylph enol, 2,4,5-Trichlorophenol	1mL	48238	
EPA 8040 Surrogate Standard Mix	2 analytes, 2000µg/mL each in isopropanol 2-Fluorophenol, 2,4,6-Tribromophenol	1mL	47951	
METHOD 8061				
Calibration Standards				
EPA Phthalate Esters Mix SS	6 analytes, 2000µg/mL each in hexane Bis(2-ethylhexyl)phthalate, Diethyl phthalate, Di-n-butyl phthalate Butyl benzyl phthalate, Dimethyl phthalate, Di-n-octyl phthalate	1mL 1mL	48231 4S8231	
EPA Phthalate Esters Mix	6 analytes, 2000µg/mL each in methanol Bis(2-ethylhexyl)phthalate, Diethyl phthalate, Di-n-butyl phthalate Butyl benzyl phthalate, Dimethyl phthalate, Di-n-octyl phthalate	1mL	48805-U	
METHOD 8070				
Calibration Standards				
EPA Nitrosamines Mix SS	3 analytes, 2000µg/mL each in methanol N-Nitrosodimethylamine, N-Nitrosodiphenylamine, N-Nitrosodi-n-propylamine	1mL	48240-U	

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Environmental Standards
Solid Waste, Groundwater Methods

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
METHOD 8080, 8081, 8082				
Calibration Standards				
EPA 8080 Pesticides Mix	17 analytes, 250µg/mL each in toluene:hexane (50:50), except as noted Aldrin, α-BHC, β-BHC, γ-BHC (Lindane), δ-BHC, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Dieldrin, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin aldehyde, Heptachlor, Heptachlor epoxide (isomer B), Methoxychlor (1000µg/mL)	1mL	47913	
TCL Pesticides Mix S S	18 analytes, 2000µg/mL each in toluene:hexane (50:50) Aldrin, α-BHC, β-BHC, γ-BHC (Lindane), δ-BHC, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Dieldrin, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin aldehyde, Endrin ketone, Heptachlor, Heptachlor epoxide, Methoxychlor	1mL 1mL	48913 4S8913	
Toxaphene	1000µg/mL in isooctane	1mL	48103	
Chlordane	1000µg/mL in isooctane	1mL	48065-U	
Aroclor PCBs RDaR				
Aroclor 1016	1000µg/mL in isooctane	1mL	48097	
Aroclor 1221	1000µg/mL in isooctane	1mL	48098	
Aroclor 1232	1000µg/mL in isooctane	1mL	44805	
Aroclor 1242	1000µg/mL in isooctane	1mL	44806	
Aroclor 1248	1000µg/mL in isooctane	1mL	44807	
Aroclor 1254	1000µg/mL in isooctane	1mL	44808	
Aroclor 1260	1000µg/mL in isooctane	1mL	44809	
Aroclor 1262	1000µg/mL in isooctane	1mL	44810	
Pesticides Calibration Standards Kit	1mL of each of the following products TCL Pesticides Mix (48913), Toxaphene (48103), Chlordane (48065-U), Aroclor 1016 (48097), Aroclor 1221 (48098), Aroclor 1232 (44805), Aroclor 1242 (44806), Aroclor 1248 (44807), Aroclor 1254 (44808), Aroclor 1260 (44809), Aroclor 1262 (44810)		48114	
Kit PCB-A-21	6 individual 1mL solutions, 1000µg/mL each in isooctane Aroclor 1232, Aroclor 1242, Aroclor 1248, Aroclor 1254, Aroclor 1260, Aroclor 1262		44803	
QC Standards				
EPA 8080 System Evaluation Mix	2 analytes, 5µg/mL each in methanol Endrin, p,p'-DDT	1mL	47395	
Surrogate Standards				
8080 Spike Mix	6 analytes at indicated concentrations in methanol Aldrin, 20µg/mL; γ-BHC (Lindane), 20µg/mL; 4,4'-DDT, 50µg/mL; Dieldrin, 50µg/mL; Endrin, 50µg/mL; Heptachlor, 20µg/mL	1mL	47614-U	
EPA 8080/8270 Pesticide Surrogate Mix	2 analytes, 2000µg/mL each in toluene:hexane (50:50) Dibutyl chlorendate, 2,4,5,6-Tetrachloro-m-xylene	1mL	47903	
Pesticide Surrogate Spike Mix	2 analytes, 200µg/mL each in acetone Decachlorobiphenyl, 2,4,5,6-Tetrachloro-m-xylene	1mL	48460	
DDT-Endrin Mix	2 analytes, 500µg/mL each in methanol 4,4'-DDT, Endrin	1mL	48282	
Dibutyl chlorendate	200µg/mL in acetonitrile	1mL	48129	
2,4,5,6-Tetrachloro-m-xylene	200µg/mL in methanol	1mL	48317	
Decachlorobiphenyl	200µg/mL in acetone	1mL	48318	

RDaR Product is tested under Reciprocal Data Review agreement with Absolute Standards Inc. (Hamden, CT, USA)
S S Separate Source standards. Prepared from independently sourced raw materials and quality controlled independently.

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Environmental Standards
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MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
Calibration Standards				
Pesticide 8081 Standard Mix	22 analytes, 200µg/mL each in hexane:toluene (50:50) Aldrin, α-BHC, β-BHC, γ-BHC (Lindane), δ-BHC, α-Chlordane, γ-Chlordane, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Dieldrin, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin aldehyde, Endrin ketone, Heptachlor, Heptachlor epoxide isomer B, Methoxychlor, Decachlorobiphenyl, 2,4,5,6-Tetrachloro-m-xylene	1mL	46845-U	
TCL Pesticides Mix SS	18 analytes, 2000µg/mL each in toluene:hexane (50:50) Aldrin, α-BHC, β-BHC, γ-BHC (Lindane), δ-BHC, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Dieldrin, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin aldehyde, Endrin ketone, Heptachlor, Heptachlor epoxide, Methoxychlor	1mL 1mL	48913 4S8913	
CLP Organochlorine Pesticides Mix	20 analytes, 2000µg/mL each in hexane:toluene (50:50) Aldrin, α-BHC, β-BHC, γ-BHC (Lindane), δ-BHC, α-Chlordane, γ-Chlordane, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Dieldrin, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin aldehyde, Endrin keton, Heptachlor, Heptachlor epoxide isomer B, Methoxychlor	1mL	47426-U	
γ-Chlordane	100µg/mL in hexane	1mL	48193	
Toxaphene	200µg/mL in isooctane	1mL	47616-U	
	200µg/mL in isooctane	10mL	49135-U	
Aroclor Standard Mix 1	4 analytes at indicated concentrations in acetone:methanol (40:60) Aroclor 1016, 500µg/mL; Aroclor 1260, 500µg/mL; Decachlorpbiphenyl, 50µg/mL; 2,4,5,6-Tetrachloro-m-xylene, 50µg/mL	1mL	46846-U	
PCB Kit 3	7 individual 1mL solutions, 200µg/mL each in methanol Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242, Aroclor 1248, Aroclor 1254, Aroclor 1260		48825	
Aroclor 1016	200µg/mL in methanol	1mL	48701	
Aroclor 1221	200µg/mL in methanol	1mL	48705	
Aroclor 1232	200µg/mL in methanol	1mL	48702	
Aroclor 1242	200µg/mL in methanol	1mL	48706	
Aroclor 1248	200µg/mL in methanol	1mL	48703	
Aroclor 1254	200µg/mL in methanol	1mL	48707	
Aroclor 1260	200µg/mL in methanol	1mL	48704	
Internal Standards				
Pentachloronitrobenzene	5000µg/mL in methanol	1mL	40156	
Surrogate Standards				
Pesticide Surrogate Spike Mix	2 analytes, 200µg/mL each in acetone Decachlorobiphenyl, 2,4,5,6-Tetrachloro-m-xylene	1mL	48460	
DDT-Endrin Mix	2 analytes, 500µg/mL each in methanol 4,4'-DDT, Endrin	1mL	48282	
METHOD 8090				
Calibration Standards				
EPA Nitroaromatics/Cyclic Ketones Mix	6 analytes, 2000µg/mL each in hexane:acetone (94:6) 1,3-Dinitrobenzene, 2,4-Dinitrotoluene, 2,6-Dinitrotoluene, Isophorone, 1,4-Naphthoquinone, Nitrobenzene	1mL	48227	
Surrogate Standards				
2-Fluorobiphenyl	2000µg/mL in methylene chloride	1mL	48722-U	

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Environmental Standards
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MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
METHOD 8100				
Calibration Standards TCL Polynuclear Aromatic Hydrocarbons Mix SS	16 analytes, 2000µg/mL each in methylene chloride:benzene (50:50) Acenaphthene, Acenaphthylene, Anthracene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(ghi)perylene, Benzo(a)pyrene, Chrysene, Dibenzo(a,h)anthracene, Fluoranthene, Fluorene, Indeno(1,2,3-cd)pyrene, Naphthalene, Phenanthrene, Pyrene	1mL 1mL	48905-U 4S8905	
Surrogate Standards 2-Fluorobiphenyl 1-Fluoronaphthalene	 2000µg/mL in methylene chloride 2000µg/mL in methylene chloride	 1mL 1mL	 48722-U 48720-U	
METHOD 8111				
Calibration Standards EPA Haloethers Mix	5 analytes, 2000µg/mL each in hexane Bis(2-chloroethoxy)methane, Bis(2-chloroethyl)ether, Bis(2-chloroisopropyl)ether, 4-Bromophenylphenyl ether, 4-Chlorophenylphenyl ether	1mL	48228-U	
METHOD 8120 (REPLACED WITH METHOD 8121)				
Calibration Standards EPA Chlorinated Hydrocarbons Mix	10 analytes, 2000µg/mL each in hexane 2-Chloronaphthalene, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, Hexachlorobenzene, Hexachlorobutadiene, Hexachlorocyclopentadiene, Hexachloroethane, 1,2,4,5-Tetrachlorobenzene, 1,2,4-Trichlorobenzene	1mL	48229	
METHOD 8121				
Calibration Standards EPA Chlorinated Hydrocarbons Mix	10 analytes, 2000µg/mL each in hexane 2-Chloronaphthalene, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, Hexachlorobenzene, Hexachlorobutadiene, Hexachlorocyclopentadiene, Hexachloroethane, 1,2,4,5-Tetrachlorobenzene, 1,2,4-Trichlorobenzene	1mL	48229	
METHOD 8150/8151/8151A				
Calibration Standards Acid Herbicides Mix	12 analytes at indicated concentrations in methanol 2,4-D, 100µg/mL; 2,4-DB acid, 100µg/mL; Dalapon, 250µg/mL; Dicamba, 10µg/mL; Dichloroprop, 100µg/mL; Dinoseb, 50µg/mL; MCPA, 10,000µg/mL; MCPP, 10,000µg/mL; Pentachlorophenol, 50µg/mL; Picloram, 100µg/mL; 2,4,5-T, 10µg/mL; 2,4,5-TP, 10µg/mL	1mL	46861-U	
EPA 8150 Herbicide Methyl Derivatives Mix	10 analytes, 200µg/mL each (except as indicated) in hexane 2,4-D, 2,4-DB, Dalapon, Dicamba, Dichlorprop, Dinoseb, MCPA (2000µg/mL), MCPP (2000µg/mL), 2,4,5-T, 2,4,5-TP (Silvex)	1mL	47375	
2,4-D Methyl Ester	200µg/mL in hexane	1mL	47979	
2,4-DB Methyl Ester	200µg/mL in hexane	1mL	47981	
Dalapon Methyl Ester	200µg/mL in hexane	1mL	47980-U	
Dicamba Methyl Ester	200µg/mL in hexane	1mL	47982	
Dinoseb Methyl Ester	200µg/mL in hexane	1mL	47984	
MCPA Methyl Ester	2000µg/mL in hexane	1mL	47985-U	
MCPP Methyl Ester	2000µg/mL in hexane	1mL	47986	
2,4,5-T Methyl Ester	200µg/mL in hexane	1mL	47988	
2,4,5-TP Methyl Ester (Silvex)	200µg/mL in hexane	1mL	47987-U	
Internal Standards 4,4´-Dibromooctafluorobiphenyl	 250µg/mL in acetone	 1mL	 47644-U	
Surrogate Standards Methyl 2,4-dichlorophenylacetate	 100µg/mL in acetone 2000µg/mL in acetone	 1mL 1mL	 47339 47329-U	

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Environmental Standards
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MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
METHOD 8240 (REPLACED WITH METHOD 8260)				
Calibration Standards EPA 8020/8240 Aromatic Volatiles Mix	11 analytes, 100µg/mL each in methanol Benzene, Chlorobenzene, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, Ethylbenzene, Styrene, Toluene, m-Xylene, o-Xylene, p-Xylene	1mL	47504	
EPA 8240B Calibration Mix 1	16 analytes, 2000µg/mL each in methanol Bromochloromethane, Bromodichloromethane, Dibromochloromethane, 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, cis-1,4-Dichloro-2-butene, trans-1,4-Dichloro-2-butene, 1,1-Dichloroethene, cis-1,2-Dichloroethene, trans-1,2-Dichloroethene, 1,3-Dichloropropane, 2,2-Dichloropropane, cis-1,3-Dichloropropene, trans-1,3-Dichloropropene, 1,1-Dichloropropylene, Methylene chloride	1mL	47363	
EPA 8240B Calibration Mix 1A	11 analytes, 2000µg/mL each in methanol Bromodichloromethane, Dibromochloromethane, 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, cis-1,4-Dichloro-2-butene, trans-1,4-Dichloro-2-butene, 1,1-Dichloroethene, trans-1,2-Dichloroethene, cis-1,3-Dichloropropene, trans-1,3-Dichloropropene, Methylene chloride	1mL	47276	
EPA 8240B Calibration Mix 2	7 analytes, 2000µg/mL each in methanol:water (80:20) Acetone, Acetonitrile, Acrylonitrile, 2-Butanone, 2-Hexanone, Isobutyl alcohol, 4-Methyl-2-pentanone	1mL	47364	
EPA 8240B Calibration Mix 3	16 analytes, 2000µg/mL each in methanol Allyl chloride, Benzene, Chlorobenzene, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, Ethylbenzene, Ethyl methacrylate, Methacrylonitrile, Methyl methacrylate, Propionitrile, Styrene, Toluene, 1,2,3-Trichlorobenzene, m-Xylene, o-Xylene	1mL	47365	
EPA 8240B Calibration Mix 4	14 analytes, 2000µg/mL each in methanol Bromoform, Carbon tetrachloride, Chloroform, Dibromomethane, 1,1-Dichloroethane, 1,2-Dichlo roethane, 1,2-Dichloropropane, 1,1,1,2-Tetrachloroethane, 1,1,2,2-Tetrachloro ethane, Tetrachloroethylene, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, Trichloroethylene, 1,2,3-Trichloropropane	1mL	47366	
VOC Mix 6 SS	6 analytes, 2000µg/mL each in methanol Bromomethane, Chloroethane, Chloromethane, Dichlorodifluoromethane, Trichlorofluoromethane, Vinyl chloride	1mL 1mL	48799-U 4S8799	
EPA 8240B Calibration Mix 6	7 analytes, 2000µg/mL each in methanol cis-1,4-Dichloro-2-butene, trans-1,4-Dichloro-2-butene, cis-1,3-Dichloropropene, trans-1,3-Dichloropropene, 1,4-Dioxane, Iodomethane, Pentachloroethane	1mL	48256	
EPA 8240B Calibration Mix 7	8 analytes,2000µg/mL each in methanol Allyl chloride, Ethyl methacrylate, Methacrylonitrile, Methyl methacrylate, 2-Picoline, Propionitrile, Pyridine, Styrene	1mL	48257	
Acrolein	Neat	5g	48501	
Carbon disulfide	5000µg/mL in methanol	1mL	40363	
	5000µg/mL in methanol	4 x 1mL	47409	
Chloral hydrate	1000µg/mL in acetonitrile	1mL	47335-U	
Chloropropene	custom prepared standard; see index			
Iodomethane	Neat	100mg	47376	
	2000µg/mL in methanol:water (80:20)	1mL	47406	
Vinyl acetate	Neat	1g	48486	
Internal Standards VOA Internal Standards Mix	3 analytes, 1000µg/mL each in methanol Bromochloromethane, Chlorobenzene-d_5, 1,4-Difluorobenzene	1mL	48835	
EPA 8240B Internal Standards Mix	3 analytes, 25µg/mL each in methanol Bromochloromethane, Chlorobenzene-d_5, 1,4-Difluorobenzene	1mL	47357	

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Environmental Standards
Solid Waste, Groundwater Methods

MIXES AND SOLUTIONS	COMPOSITION			QTY.	CAT. NO.	PRICE
Surrogate Standards						
VOA Surrogate Spike Mix	3 analytes, 1000µg/mL each in methanol			1mL	48101	
	4-Bromofluorobenzene	1,2-Dichloroethane-d_4	Toluene-d_8			
EPA 8240B/8260A Surrogate Mix	3 analytes, 25µg/mL each in methanol			1mL	47076-U	
	4-Bromofluorobenzene	1,2-Dichloroethane-d_4	Toluene--d_8			
EPA 8240B/8260A Matrix Spike Mix	5 analytes, 25µg/mL each in methanol			1mL 10 x 1mL	47075-U 47412	
	Benzene	1,1-Dichloroethene	Trichloroethene			
	Chlorobenzene	Toluene				
System Performance Check Compounds						
8240B/8260A Matrix Spike Mix	5 analytes, 2500µg/mL each in methanol			1mL	47411-U	
	Benzene	1,1-Dichloroethylene	Trichloroethylene			
	Chlorobenzene	Toluene				
8240B/8260A System Performance Check Compounds	5 analytes, 2000µg/mL each in methanol			1mL	47389	
	Bromoform	Chloromethane	1,1,2,2-Tetrachloroethane			
	Chlorobenzene	1,1-Dichloroethane				
EPA 8240B/8260A Calibration Check Compounds SS	6 analytes, 2000µg/mL each in methanol			1mL 1mL	47385-U 4S7385	
	Chloroform	1,2-Dichloropropane	Toluene			
	1,1-Dichloroethene	Ethylbenzene	Vinyl chloride			
EPA 8240B/8260A GC/MS Tuning Solution						
4-Bromofluorobenzene	25µg/mL in methanol			1mL 4 x 1mL	47077 47414	
4-Bromofluorobenzene	25,000µg/mL in methanol			1mL	48800	
Perfluorotributylamine (PFTBA) Tuning Solution						
Perfluorotributylamine	Neat			1g	442747-U	
25,000µg/mL in methylene chloride				1mL	48724-U	
METHOD 8260						
Calibration Standards						
8260 Volatiles Calibration Mix	52 analytes, 2000µg/mL each in methanol			1mL	500607	
	Benzene	1,3-Dichlorobenzene	n-Propylbenzene			
	Bromobenzene	1,4-Dichlorobenzene	Styrene			
	Bromochloromethane	1,1-Dichloroet hane	1,1,1,2-Tetrachloroethane			
	Bromodichloromethane	1,2-Dichlor oethane	1,1,2,2-Tetrachloroethane			
	Bromoform	1,1-Dichloroethene	Tetrachloroethene			
	n-Butylbenzene	cis-1,2-Dichloroethene	Toluene			
	sec-Butylbenzene	trans-1,2-Dichloroethene	1,2,3-Trichlorobenzene			
	tert-Butylbenzene	1,2-Dichloropropane	1,2,4-Trichlorobenzene			
	Carbon tetrachloride	1,3-Dichloropropane	1,1,1-Trichloroethane			
	Chlorobenzene	2,2-Dichloropropane	1,1,2-Trichloroethane			
	Chloroform	1,1-Dichloropropene	Trichloroethene			
	2-Chlorotoluene	Ethylbenzene	1,2,3-Trichloropropane			
	4-Chlorotoluene	Hexachlorobutadiene	1,2,4-Trimethylbenzene			
	Dibromochloromethane	Isopropylbenzene	1,3,5-Trimethylbenzene			
	1,2-Dibromo-3-chloropropane	p-Isopropyltoluene	m-Xylene			
	1,2-Dibromoethane	Methylene chloride	o-Xylene			
	Dibromomethane	Naphthalene	p-Xylene			
	1,2-Dichlorobenzene					
VOC Mix 6 SS	6 analytes, 2000µg/mL each in methanol			1mL 1mL	48799-U 4S8799	
	Bromomethane	Chloromethane	Trichlorofluoromethane			
	Chloroethane	Dichlorodifluoromethane	Vinyl chloride			
EPA 8260 Volatile Calibration Kit	1mL of each of the following products 8260 Volatiles Calibration Mix (500607) Volatile Organic Compounds Mix 6 (48799-U)				47442-U	

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MIXES AND SOLUTIONS	COMPOSITION			QTY.	CAT. NO.	PRICE
VOC Mix 1 S|S	12 analytes, 2000µg/mL each in methanol			1mL 1mL	48775 4S8775	
	sec-Butylbenzene	4-Chlorotoluene	Isopropylbenzene			
	tert-Butylbenzene	1,2-Dichlorobenzene	n-Propylbenzene			
	Chlorobenzene	1,3-Dichlorobenzene	o-Xylene			
	2-Chlorotoluene	1,4-Dichlorobenzene	p-Xylene			
VOC Mix 2 S|S	13 analytes, 2000µg/mL each in methanol			1mL 1mL	48777 4S8777	
	Benzene	Naphthalene	1,2,4-Trichlorobenzene			
	Bromobenzene	Styrene	1,2,4-Trimethylbenzene			
	n-Butylbenzene	Toluene	1,3,5-Trimethylbenzene			
	Ethylbenzene	1,2,3-Trichlorobenzene	m-Xylene			
	p-Isopropyltoluene					
VOC Mix 3 S|S	14 analytes, 2000µg/mL each in methanol			1mL 1mL	48779 4S8779	
	1,2-Dibromo-3-chloropropane	1,1-Dichloropropene	1,1,2,2-Tetrachloroethane			
	1,2-Dibromoethane	cis-1,3-Dichloropropene	1,1,2-Trichloroethane			
	1,2-Dichloroethane	trans-1,3-Dichloropropene	Trichloroethene			
	1,2-Dichloropropane	Hexachlorobutadiene	1,2,3-Trichloropropane			
	1,3-Dichloropropane	1,1,1,2-Tetrachloroethane				
VOC Mix 4 S|S	9 analytes, 2000µg/mL each in methanol			1mL 1mL	48786 4S8786	
	Bromochloromethane	Chloroform	2,2-Dichloropropane			
	Bromoform	Dibromomethane	Tetrachloroethene			
	Carbon tetrachloride	1,1-Dichloroethane	1,1,1-Trichlorethane			
VOC Mix 5 S|S	6 analytes, 2000µg/mL each in methanol			1mL 1mL	48797 4S8797	
	Bromodichloromethane	1,1-Dichloroethene	trans-1,2-Dichloroethene			
	Dibromochloromethane	cis-1,2-Dichloroethene	Methylene chloride			
VOC Mix 6 S|S	6 analytes, 2000µg/mL each in methanol			1mL 1mL	48799-U 4S8799	
	Bromomethane	Chloromethane	Trichlorofluoromethane			
	Chloroethane	Dichlorodifluoromethane	Vinyl chloride			
VOC Calibration Standards Kit RDaR	1mL of each of the following products				48804	
	VOC Mix 1 (48775)	VOC Mix 3 (48779)	VOC Mix 5 (48797)			
	VOC Mix 2 (48777)	VOC Mix 4 (48786)	VOC Mix 6 (48799-U)			
EPA Method 8260 Kit	1mL of each of the following products				48261	
	VOC Mix 1 (48775)	VOC Mix 4 (48786)	EPA 8260 Surrogate Standard Mix (48959)			
	VOC Mix 2 (48777)	VOC Mix 5 (48797)				
	VOC Mix 3 (48779)	VOC Mix 6 (48799-U)	EPA 8260 Internal Standard Mix (48958)			
EPA 8260 Calibration Mix 2	8 analytes, 2000µg/mL each in methanol:water (95:5)			1.5mL 1.5mL	46831-U 4S6831-U	
	Acetone	2-Chloroethyl vinyl ether	4-methyl-2-pentanone			
	2-Butanone	2-Hexanone	Vinyl acetate			
	Carbon disulfide	Iodomethane				
Acrolein/Acrylonitrile Mix	2 analytes, 2000µg/mL each in water 2000µg/mL each analyte			1mL 1mL	46870-U 4S6870-U	
	Acrolein	Acrylonitrile				
Acrolein/Acrylonitrile Mix	2 analytes, 10,000µg/mL each in deionized water			1mL	46871-U	
	Acrolein	Acrylonitrile				

RDaR Product is tested under Reciprocal Data Review agreement with Absolute Standards Inc. (Hamden, CT, USA)

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MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
Appendix IX Volatiles Calibration Mix	49 analytes, 2000µg/mL each in methanol Acetonitrile, Acrylonitrile, Allyl chloride, Benzene, Bromodichloromethane, Bromoform, Carbon disulfide, Carbon tetrachloride, Chlorobenzene, Chlorodibromomethane, Chloroform, 1,2-Dichlorobenzene, 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, Dibromomethane, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, trans-1,4-Dichloro-2-butene, 1,1-Dichloroethane, 1,2-Dichloroethane, 1,1-Dichloroethene, trans-1,2-Dichloroethene, 1,2-Dichloropropane, cis-1,3-Dichloropropene, trans-1,3-Dichloropropene, 1,4-Dioxane, Ethyl benzene, Ethyl methacrylate, Hexachloroethane, Isobutanol, Methylcrylonitrile, Methylene chloride, Methyl methacrylate, Naphthalene, Pentachloroethane, Propionitrile, Pyridine, Styrene, 1,1,1,2-Tetrachloroethane, 1,1,2,2-Tetrachloroethane, Tetrachloroethene, Toluene, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, Trichloroethene, 1,2,3-Trichloropropane, m-Xylene, o-Xylene, p-Xylene	1mL	506532	
VOC Mix 6 SS	6 analytes, 2000µg/mL each in methanol Bromomethane, Chloroethane, Chloromethane, Dichlorodifluoromethane, Trichlorofluoromethane, Vinyl chloride	1mL 1mL 4 x 1mL	48799-U 4S8799 47408	
TCL Volatiles Mix 1	4 analytes, 2000µg/mL each in methanol:water (90:10) Acetone, 2-Butanone, 2-Hexanone, 4-Methyl-2-pentanone	1mL 1mL	48949 4S8949	
Iodomethane SS	2000µg/mL in methanol:water (80:20)	1mL	47406	
Acrolein	Neat	5000mg	48501	
Vinyl acetate	Neat	1g	48486	
Appendix IX Volatiles Calibration Kit	1mL of each of the following products Appendix IX Volatiles Calibration Mix (506532), TCL Volatiles Mix 1 (48949), Iodomethane (47406), Acrolein (48501), Vinyl acetate (48486), Volatile Organic Compounds Mix 6 (48799-U)		47441-U	
Internal Standards EPA 8260A Internal Standards Mix	4 analytes in methanol 25µg/mL each analyte 2000µg/mL each analyte Chlorobenzene-d_5, 1,4-Difluorobenzene, Pentafluorobenzene, 1,4-Dichlorobenzene-d_4	1mL 1mL	47392 48958	
8260A Internal Standards Mix	3 analytes in methanol 25µg/mL each analyte 250µg/mL each analyte Chlorobenzene-d_5, 1,4-Dichlorobenzene-d_4, Fluorobenzene	1mL 1mL	47777 47776	
8260 Internal Standards Mix 1	3 analytes, 2500µg/mL each in methanol Chlorobenzene-d_5, 1,4-Dichlorobenzene-d_4, Fluorobenzene	1mL	46838-U	
8260A Internal Standards Mix	3 analytes, 250µg/mL each in methanol Chlorobenzene-d_5, 1,4-Dichlorobenzene-d_4, Fluorobenzene	5mL	46839-U	
Surrogate Standards EPA 8260 Surrogate Standards Mix	3 analytes, 2000µg/mL each in methanol 4-Bromofluorobenzene, Dibromofluoromethane, Toluene-d_8	1mL	48959	

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EPA 8240B/8260A Matrix Spike Mix	5 analytes, 25µg/mL each in methanol			1mL 10 x 1mL	47075-U 47412	
	Benzene Chlorobenzene	1,1-Dichloroethene Toluene	Trichloroethene			
8260A Surrogate Standards Mix	4 analytes in methanol 250µg/mL each analyte 2000µg/mL each analyte 4-Bromofluorobenzene Dibromofluoromethane	1,2-Dichloroethane-d_4	Toluene-d_8	1mL 1mL	47779 47778	
8260A Surrogate Standards Mix 2	4 analytes, 250µg/mL each in methanol 4-Bromofluorobenzene Dibromofluoromethane	1,2-Dichloroethane-d_4	Toluene-d_8	5mL	46842-U	
EPA 8240B/8260A GC/MS Tuning Solution	4-Bromofluorobenzene, 25µg/mL in methanol			1mL 4 x 1mL	47077 47414	
4-Bromofluorobenzene	25,000µg/mL in methanol			1mL	48800	
System Performance Check Compounds 8240B/8260A System Performance Check Compounds	5 analytes, 2000µg/mL each in methanol Bromoform Chlorobenzene	Chloromethane 1,1-Dichloroethane	1,1,2,2-Tetrachloroethane	1mL	47389	
EPA 8240B/8260A Calibration Check Compounds SS	6 analytes, 2000µg/mL each in methanol Chloroform 1,1-Dichloroethene	1,2-Dichloropropane Ethylbenzene	Toluene Vinyl chloride	1mL 1mL	47385-U 4S7385	
8240B/8260A Matrix Spike Mix	5 analytes, 2500µg/mL each in methanol Benzene Chlorobenzene	1,1-Dichloroethylene Toluene	Trichloroethylene	1mL	47411-U	
METHOD 8270						
Calibration Standards						
CLP Semivolatile Calibration Mix ■	64 analytes, 1000µg/mL each in methylene chloride:benzene (3:1) Acenaphthene Acenaphthylene Anthracene Azobenzene Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(ghi)perylene Benzo(k)fluoranthene Butyl benzyl phthalate Bis(2-chloroethoxy)methane Bis(2-chloroethyl) ether Bis (2-Chloroisopropyl) ether Bis(2-ethylhexyl) phthalate 4-Bromophenylphenyl ether Carbazole 4-Chloroaniline 2-Chloronaphthalene 4-Chloro-3-methyl phenol 2-Chlorophenol 4-Chlorophenyl phenyl ether Chrysene	Dibenzo(a,h)anthracene Dibenzofuran Di-n-butyl phthalate 1,2-Dichlorobenzene 1,3-Dichlorobenzene 1,4-Dichlorobenzene 2,4-Dichlorophenol Diethyl phthalate 2,4-Dimethylphenol 4,6-Dinitro-2-methylphenol 2,4-Dinitrophenol Dimethyl phthalate 2,4-Dinitrotoluene 2,6-Dinitrotoluene Di-n-octyl phthalate Fluoranthene Fluorene Hexachlorobenzene Hexachlorobutadiene Hexachlorocyclopentadiene Hexachloroethane	Indeno(1,2,3-cd)pyrene Isophorone 2-Methylnaphthalene 2-Methylphenol 4-Methylphenol Naphthalene 2-Nitroaniline 3-Nitroaniline 4-Nitroaniline Nitrobenzene 2-Nitrophenol 4-Nitrophenol N-Nitrosodimethylamine N-Nitrosodi-n-propylamine Pentachlorophenol Phenanthrene Phenol Pyrene 1,2,4-Trichlorobenzene 2,4,5-Trichlorophenol 2,4,6-Trichlorophenol	1mL	506508	

■ For information on a kit containing this product, see the following page (Cat. No. 47348-U).

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MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
EPA 8270/Appendix IX Semivolatile Calibration Mix	39 analytes, 1000µg/mL each in methylene chloride Aniline, Acetophenone, 2-Acetylaminofluorene, 4-Aminobiphenyl, Benzyl alcohol, 2-sec-Butyl-4,6-dinitrophenol (Dinoseb), 2,6-Dichlorophenol, p-Dimethylaminoazobenzene, 7,12-Dimethylbenz-(a)anthracene, 1,3-Dinitrobenzene, Diphenylamine, Ethyl methanesulfonate, Hexachloropropene, Isosafrole, Methapyrilene (HCl), 2-Methyl aniline (o-Toluidine), 3-Methylcholanthrene, Methyl methanesulfonate, 3-Methylphenol, 2-Methyl pyridine (2-Picoline), 1-Naphthylamine, 2-Naphthylamine, 4-Nitroquinoline-1-oxide, N-Nitrosodi-n-butylamine, N-Nitrosodiethylamine, N-Nitrosomethylethylamine, N-Nitrosomorpholine, N-Nitrosopiperidine, N-Nitrosopyrrolidine, 5-Nitro-o-toluidine, Pentachlorobenzene, Pentachloronitrobenzene, Pentachloroethane, Phenacetin, Pyridine, Safrole, 1,2,4,5-Tetrachlorobenzene, 2,3,4,6-Tetrachlorophenol, 1,3,5-Trinitrobenzene	1mL	506567	
EPA 8270 Benzidines Mix	3 analytes, 2000µg/mL each in methanol Benzidine, 3,3'-Dichlorobenzidine, 3,3'-Dimethylbenzidine	1mL	48467	
Benzoic acid	2000µg/mL in methylene chloride	1mL	47508-U	
Hexachlorophene	5000µg/mL in methanol	1mL	40323	
1,4-Naphthoquinone	2000µg/mL in methylene chloride	1mL	47511-U	
N-Nitrosodiphenylamine	5000µg/mL in methanol	1mL	40060	
1,4-Phenylenediamine	2000µg/mL in methylene chloride	1mL	48298	
EPA 8270 Calibration Kit	1mL of each of the following products CLP Semivolatile Calibration Mix (506508), EPA 8270/Appendix IX Semivolatile Calibration Mix (506567), EPA 8270 Benzidines Mix (48467), Benzoic acid(47508-U), Hexachlorophene (40323), 1,4-Naphthoquinone (47511-U), N-Nitrosodiphenylamine (40060), 1,4-Phenylenediamine (48298)		47348-U	
Aramite	2000µg/mL in methylene chloride	1mL	47519-U	
8270/625/CLP/Appendix IX Semivolatile Calibration Mix	44 analytes, 1000µg/mL each in methylene chloride:benzene (3:1) Acenaphthene, Acenaphthylene, Anthracene, Azobenzene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,I)perylene, Benzo(a)pyrene, Bis(2-chloroethoxy)methane, Bis(2-chloroethyl)ether, Bis(2-chloroisopropyl)ether, Bis(2-ethylhexyl)phthalate, 4-Bromophenyl phenyl ether, Butyl benzyl phthalate, Carbazole, 2-Chloronaphthalene, 4-Chlorophenylphenyl ether, Chrysene, Dibenzo(a,h)anthracene, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, Diethyl phthalate, Dimethyl phthalate, 2,4-Dinitrotoluene, 2,6-Dinitrotoluene, Di-n-butyl phthalate, Di-n-octyl phthalate, Fluoranthene, Fluorene, Hexachlorobenzene, Hexachlorobutadiene, Hexachlorocyclopentadiene, Hexachloroethane, Indeno(1,2,3-cd)pyrene, Isophorone, Naphthalene, Nitrobenzene, N-Nitrodimethyl amine, N-Nitrosodi-n-propylamine, Phenanthrene, Pyrene, 1,2,4-Trichlorobenzene	1mL	502049	
EPA 8270 Phenols Mix	18 analytes, 2000µg/mL each in isopropanol 2-sec-Butyl-4,6-dinitrophenol (Dinoseb), 4-Chloro-3-methylphenol, 2-Chlorophenol, 2,4-Dichlorophenol, 2,6-Dichlorophenol, 2,4-Dimethylphenol, 2,4-Dinitrophenol, 2-Methyl-4,6-dinitrophenol, 2-Methylphenol, 3-Methylph enol, 4-Methylph enol, 2-Nitrophenol, 4-Nitrophenol, Pentachlorophenol, Phenol, 2,3,4,6-Tetrachlorophenol, 2,4,5-Trichlorophenol, 2,4,6-Trichlorophenol	1mL	47377	
EPA 8270 Phenols Mix 2	8 analytes, 2000µg/mL each in methylene chloride 2-Methylphenol, 3-Methylpheno l, 4-Methylphe nol, Hexachlorophene, 2,4,5-Trichlorophenol, 2,3,4,6-Tetrachlorophenol, Dinoseb, 2,6-Dichlorophenol	1mL	47909	
EPA Phthalate Esters Mix SS	6 analytes, 2000µg/mL each in hexane Bis(2-ethylhexyl)phthalate, Butyl benzyl phthalate, Diethyl phthalate, Dimethyl phthalate, Di-n-butyl phthalate, Di-n-octyl phthalate	1mL 1mL	48231 4S8231	
EPA 8270 Nitrosamines 9-Component Mix	9 analytes, 2000µg/mL each in methanol N-Nitrosodi-n-butylamine, N-Nitrosodiethylamine, N-Nitrosodimethylamine, N-Nitrosodi-n-propylamine, N-Nitrosodiphenylamine, N-Nitrosomethylethylamine, N-Nitrosomorpholine, N-Nitrosopiperidine, N-Nitrosopyrrolidine	1mL	502138	

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EPA 8270 Nitrosamines 6-Component Mix	6 analytes, 2000µg/mL each in methanol N-Nitrosodi-n-butylamine; N-Nitrosomethylethylamine; N-Nitrosopiperidine N-Nitrosodiethylamine; N-Nitrosomorpholine; N-Nitrosopyrrolidine	1mL	48489	
EPA Nitrosamines Mix	3 analytes, 2000µg/mL each in methanol N-Nitrosodimethylamine; N-Nitrosodiphenylamine; N-Nitrosodi-n-propylamine	1mL	48240-U	
EPA 8270 Chlorinated Hydrocarbons Mix	13 analytes, 2000µg/mL each in methylene chloride 2-Chloronaphthalene; Hexachlorobutadiene; Pentachlorobenzene 1,2-Dichlorobenzene; Hexachlorocyclopentadiene; Pentachloroethane 1,3-Dichlorobenzene; Hexachloroethane; Tetrachlorobenzene 1,4-Dichlorobenzene; Hexachloropropene; 1,2,4-Trichlorobenzene Hexachlorobenzene	1mL	47926	
EPA Chlorinated Hydrocarbons Mix	10 analytes, 2000µg/mL each in hexane 2-Chloronaphthalene; Hexachlorobenzene; Hexachloroethane 1,2-Dichlorobenzene; Hexachlorobutadiene; 1,2,4,5-Tetrachlorobenzene 1,3-Dichlorobenzene; Hexachlorocyclopentadiene; 1,2,4-Trichlorobenzene 1,4-Dichlorobenzene	1mL	48229	
EPA 8270 Ethers and Phthalates Mix	11 analytes, 2000µg/mL each in methylene chloride Bis(2-chloroethoxy)methane; 4-Bromophenylphenyl ether; Di-n-butyl phthalate Bis(2-chloroethyl)ether; 4-Chlorophenylphenyl ether; Di-n-octyl phthalate Bis(2-ethylhexyl)phthalate; Diethyl phthalate; Butylbenzyl phthalate Bis(2-chloroisopropyl)ether; Dimethyl phthalate	1mL	47643-U	
EPA Haloethers Mix	5 analytes, 2000µg/mL each in hexane Bis(2-chloroethoxy)methane; Bis(2-chloroisopropyl)ether; 4-Chlorophenylphenyl ether Bis(2-chloroethyl)ether; 4-Bromophenylphenyl ether	1mL	48228-U	
EPA Nitroaromatics/Cyclic Ketones Mix	6 analytes, 2000µg/mL each in hexane:acetone (94:6) 1,3-Dinitrobenzene; 2,6-Dinitrotoluene; 1,4-Naphthoquinone 2,4-Dinitrotoluene; Isophorone; Nitrobenzene	1mL	48227	
TCL Pesticides Mix SS	18 analytes, 2000µg/mL each in toluene:hexane (50:50) Aldrin; 4,4'-DDE; Endrin α-BHC; 4,4'-DDT; Endrin aldehyde β-BHC; Dieldrin; Endrin ketone γ-BHC (Lindane); Endosulfan I; Heptachlor δ-BHC; Endosulfan II; Heptachlor epoxide 4,4'-DDD; Endosulfan sulfate; Methoxychlor	1mL 1mL	48913 4S8913	
EPA 8270 Organophosphorus Pesticides Mix	9 analytes, 2000µg/mL each in hexane:acetone (80:20) Dimethoate; Methyl parathion; Sulfotep Disulfoton; Parathion; Thionazin Famphur; Phorate; O,O,O-Triethylphosphorothioate	1mL	48469	
EPA 8270 Organophosphorous Pesticides Mix	9 analytes, 2000µg/mL each in methylene chloride Diethyl 2-pyrazinyl phosphorothioate (thionazin); Famphur; Phorate Dimethoate; Methyl parathion; Tetraethyl dithiopyrophosphate (Sulfotep) Disulfoton; Parathion; Triethyl phosphorothioate	1mL	47908	
EPA 8270 Base/Neutrals Mix A	10 analytes, 2000µg/mL each in methanol Aniline; 2-Methylnaphthalene; 3-Nitroaniline Benzyl alcohol; 2-Naphthylamine; 4-Nitroaniline 4-Chloroaniline; 2-Nitroaniline; o-Toluidine Dibenzofuran	1mL	48470	
EPA 8270 Base/Neutrals Mix B	8 analytes, 2000µg/mL each in methanol Acetophenone; α,α,α-Dimethylphenethylamine; 2-Picoline 2-Acetylaminofluorine; 1-Naphthylamine; Pyridine 4-Aminobiphenyl; 5-Nitro- o-toluidine	1mL	48195	
EPA 8270 Base/Neutrals Mix C	10 analytes, 2000µg/mL each in methanol:acetone (90:10) p-Dimethylaminoazobenzene; Hexachloropropylene; Pentachloronitrobenzene 7,12-Dimethyl-benz(a)anthracene; Methapyrilene HCl *; Phenacetin Diphenylamine; 4-Nitroquinoline-N-oxide; 1,3,5-Trinitrobenzene Pentachlorobenzene	1mL	48472	

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* Weight corrected for salt.

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Method 8270

Chemical Standards

SUPELCO

Environmental Standards
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MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
EPA 8270 Base/Neutrals Mix D	10 analytes, 2000µg/mL each in hexane:acetone (80:20) Chlorobenzilate, Isosafrole, Methyl methanesulfonate Diallate, Kepone, Pronamide Ethyl methanesulfonate, 3-Methylcholanthrene, Safrole Isodrin	1mL	48478	
EPA 8270 Benzidines Mix	3 analytes, 2000µg/mL each in methanol Benzidine, 3,3'-Dichlorobenzidine, 3,3'-Dimethylbenzidine	1mL	48467	
EPA 8270 Herbicide Esters Mix	3 analytes, 2000µg/mL each in hexane 2,4-D methyl ester, Silvex methyl ester, 2,4,5-T methyl ester	1mL	48474	
Chlordane	5000µg/mL in methanol	1mL	40089	
Toxaphene	2000µg/mL in methanol	1mL	48700-U	
Hexachlorophene	5000µg/mL in methanol	1mL	40323	
1,4-Phenylenediamine	2000µg/mL in methylene chloride	1mL	48298	
PCB Kit 3	7 individual 1mL solutions, 200µg/mL each in methanol Aroclor 1016, Aroclor 1242, Aroclor 1254 Aroclor 1221, Aroclor 1248, Aroclor 1260 Aroclor 1232		48825	
TCL PAH Mix SS	16 analytes, 2000µg/mL each in methylene chloride:benzene (50:50) Acenaphthene, Benzo(ghi)perylene, Fluorene Acenaphthylene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene Anthracene, Chrysene, Naphthalene Benzo(a)anthracene, Dibenzo(a,h)anthracene, Phenanthrene Benzo(b)fluoranthene, Fluoranthene, Pyrene Benzo(k)fluoranthene	1mL 1mL	48905-U 4S8905	
Internal Standards Semivolatile Internal Standards Mix	6 analytes, 2000µg/mL each in methylene chloride Acenaphthene-d_{10}, 1,4-Dichlorobenzene-d_4, Perylene-d_{12} Chrysene-d_{12}, Naphthalene-d_8, Phenanthrene-d_{10}	1mL 2 x 1mL	46955-U 48902	
Semivolatile Internal Standards Mix	6 analytes, 2000µg/mL each in methylene chloride Acenaphthene-d_{10}, 1,4-Dichlorobenzene-d_4, Perylene-d_{12} Chrysene-d_{12}, Naphthalene-d_8, Phenanthrene-d_{10}	25mL	46866-U	
Surrogate Standards 8270 Surrogate Mix	6 analytes, 4000µg/mL each component in methylene chloride 2-Fluorobiphenyl, Nitrobenzene-d_5, p-Terphenyl-d_{14} 2-Fluorophenol, Phenol-d_6 ▲, 2,4,6-Tribromophenol	1mL	47960-U	
EPA 8270 Acids Surrogate Spike Mix For sediment/soil samples	3 analytes, 2000µg/mL each in methanol 2-Fluorophenol, Phenol-d_6 ▲, 2,4,6-Tribromophenol	1mL	48875	
EPA 8270 Acids Surrogate Spike Mix HC	3 analytes, 10,000µg/mL each in methanol 2-Fluorophenol, Phenol-d_6 ▲, 2,4,6-Tribromophenol	1mL	47260-U	
EPA 8270 Acids Surrogate Spike Mix For sediment/soil samples	3 analytes, 1000µg/mL each in methanol 2-Fluorophenol, Phenol-d_6 ▲, 2,4,6-Tribromophenol	1mL 10 x 1mL	47619-U 47419	
EPA 8270 Base/Neutrals Surrogate Spike Mix	3 analytes, 1000µg/mL each in methylene chloride 2-Fluorobiphenyl, Nitrobenzene-d_5, 4-Terphenyl-d_{14}	1mL	48925	
EPA 8270 Base/Neutrals Surrogate Spike Mix HC	3 analytes, 5000µg/mL each in methylene chloride 2-Fluorobiphenyl, Nitrobenzene-d_5, 4-Terphenyl-d_{14}	1mL	47263	
EPA 8270 Base/Neutrals Surrogate Spike Mix	3 analytes, 500µg/mL each in methylene chloride 2-Fluorobiphenyl, Nitrobenzene-d_5, 4-Terphenyl-d_{14}	10 x 1mL	47417	
EPA 8080/8270 Pesticide Surrogate Mix For sediment/soil samples	2 analytes, 2000µg/mL each in toluene:hexane (50:50) Dibutyl chlorendate, 2,4,5,6-Tetrachloro-m-xylene	1mL	47903	

SS Separate Source standards. Prepared from independently sourced raw materials and quality controlled independently.

▲ This method calls for a phenol-d_6 standard, and phenol-d_6 raw material is used to manufacture this standard. However, phenolic hydrogen exchange occurs naturally, converting phenol-d_6 to phenol-d_5. In analyzing this standard, your system will detect phenol-d_5, not phenol-d_6.

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Environmental Standards
Solid Waste, Groundwater Methods

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
8270 Matrix Spike Mix	11 analytes at indicated concentrations in methanol Acenaphthene, 1000µg/mL; 2,4-Dinitrotoluene, 1000µg/mL; Phenol, 1500µg/mL 4-Chloro-3-methylphenol, 1500µg/mL; 4-Nitrophenol, 1500µg/mL; Pyrene, 1000µg/mL 2-Chlorophenol, 1500µg/mL; N-Nitrosodi-N-propylamine, 1000µg/mL; 1,2,4-Trichlorobenzene, 1000µg/mL 1,4-Dichlorobenzene, 1000µg/mL; Pentachlorophenol, 1500µg/mL	10mL	46854-U	
EPA 8270 Base/Neutrals Matrix Spike Mix	6 analytes in methanol			
For sediment/soil samples	500µg/mL each analyte	10 x 1mL	47421	
For water samples	100µg/mL each analyte	10 x 1mL	47420-U	
For all samples	1000µg/mL each analyte Acenaphthene; 2,4-Dinitrotoluene; Pyrene 1,4-Dichlorobenzene; N-Nitrosodi-n-propylamine; 1,2,4-Trichlorobenzene	1mL	502294	
EPA 8270 Acids Matrix Spiking Solution	5 analytes in methanol			
For sediment/soil samples	1000µg/mL each analyte	10 x 1mL	47423	
For water samples	200µg/mL each analyte	10 x 1mL	47422	
For all samples	2000µg/mL each analyte 4-Chloro-3-methylphenol; 4-Nitrophenol; Phenol 2-Chlorophenol; Pentachlorophenol	1mL	502308	
8270 LCS Mix 1	78 analytes, 100µg/mL each in acetone:methylene chloride (90:10) Acenaphthene; 1,3-Dichlorobenzene; 1-Methylnaphthalene Acenaphthylene; 1,4-Dichlorobenzene; 2-Methylnaphthalene Aniline; 3,3'-Dichlorobenzidine; 2-Methylphenol Anthracene; 2,4-Dichlorophenol; 3-Methylphenol Benzo(a)anthracene; Diethylphthalate; 4-Methylphenol Benzo(a)pyrene; 2,4-Dimethylphenol; Naphthalene Benzo(b)fluoranthene; Dimethylphthalate; 2-Nitroaniline Benzo(g,h,i)perylene; 1,2-Dinitrobenzene; 3-Nitroaniline Benzo(k)fluoranthene; 1,3-Dinitrobenzene; 4-Nitroaniline Benzoic acid; 1,4-Dinitrobenzene; Nitrobenzene Benzyl alcohol; 4,6-Dinitro-2-methylphenol; 2-Nitrophenol 4-Bromophenylphenylether; 2,4-Dinitrophenol; 4-Nitrophenol Butyl benzyl phthalate; 2,4-Dinitrotoluene; N-Nitrosodimethylamine Carbazole; 2,6-Dinitrotoluene; N-Nitrosodiphenylamine 4-Chloroaniline; Di-n-octylphthalate; N-Nitroso-di-n-propylamine 2-Chloronaphthalene; 1,2-Diphenylhydrazine; 2,2'-oxybis(1-chloropropane) Bis(2-chloroethoxy)methane; Bis(2-ethylhexyl)adipate; Pentachlorophenol Bis(2-chloroethyl)ether; Bis(2-ethylhexyl)phthalate; Phenanthrene 4-Chloro-3-methylphenol; Fluoranthene; Phenol 2-Chlorophenol; Fluorene; Pyrene 4-Chlorophenylphenylether; Hexachlorobenzene; Pyridine Chrysene; Hexachlorobutadiene; 2,3,4,6-Tetrachlorophenol Dibenzo(a,h)anthracene; Hexachlorocyclopentadiene; 2,3,5,6-Tetrachlorophenol Dibenzofuran; Hexachloroethane; 1,2,4-Trichlorobenzene Di-n-butylphthalate; Indeno(1,2,3-cd)pyrene; 1,2,4-Trichlorobenzene 1,2-Dichlorobenzene; Isophorone; 2,4,6-Trichlorophenol	25mL	46853-U	
QC Standards 8270B System Performance Check Compounds	4 analytes, 1000µg/mL each in methylene chloride 2,4-Dinitrophenol; N-Nitrosodi-n-propylamine; 4-Nitrophenol Hexachlorocyclopentadiene	1mL	47390-U	
Base/Neutrals Calibration Check Compounds Mix	7 analytes, 2000µg/mL each in methylene chloride Acenaphthene; Di-n-octyl phthalate; Hexachlorobutadiene Benzo(a)pyrene; Fluoranthene; N-Nitrosodiphenylamine 1,4-Dichlorobenzene	1mL	48464	
EPA 8270 GC/MS Tuning Solution	3 analytes, 50µg/mL each in methylene chloride Benzidine; 4,4'-DDT; Pentachlorophenol	4 x 1mL	47415	
EPA 8270 GC/MS Tuning Solution II	4 analytes, 1000µg/mL each in methylene chloride Benzidine; DFTPP; Pentachlorophenol 4,4'-DDT	1mL	47548-U	

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Environmental Standards
Solid Waste, Groundwater Methods

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
Decafluorotriphenylphosphine (DFTPP)■	25,000µg/mL in methylene chloride	1mL	48724-U	
EPA 8270A Acids Calibration Check Compounds SS	6 analytes, 2000µg/mL each in methylene chloride 4-Chloro-3-methylphenol; 2-Nitrophenol; Phenol 2,4-Dichlorophenol; Pentachlorophenol; 2,4,6-Trichlorophenol	1mL 1mL	47386 4S7386	
EPA 8270 GC/MS Tuning Solution	4 analytes, 50µg/mL each in methylene chloride Benzidine; Decafluorotriphenyl-phosphine (DFTPP); Pentachlorophenol 4,4'-DDT	1mL	47387	
EPA 8270 GC/MS Tuning Solution Decafluorotriphenylphosphine (DFTPP)	1000µg/mL in acetone	1mL	47941	
METHOD 8310				
Calibration Standards TCL Polynuclear Aromatic Hydrocarbons Mix	16 analytes at indicated concentrations in acetonitrile:methanol (90:10) Acenaphthene, 1000µg/mL; Benzo(ghi)perylene, 80µg/mL; Fluorene, 100µg/mL Acenaphthylene, 500µg/mL; Benzo(a)pyrene, 50µg/mL; Indeno(1,2,3-cd)pyrene, 50µg/mL Anthracene, 20µg/mL; Chrysene, 50µg/mL; Naphthalene, 500µg/mL Benzo(a)anthracene, 50µg/mL; Dibenzo(a,h)anthracene, 200µg/mL; Phenanthrene, 40µg/mL Benzo(b)fluoranthene, 20µg/mL; Fluoranthene, 50µg/mL; Pyrene, 100µg/mL Benzo(k)fluoranthene, 20µg/mL	1mL	49156	
Polynuclear Aromatic Hydrocarbons Mix	18 analytes, 2000µg/mL each in benzene:methylene chloride (50:50) Acenaphthene; Benzo(ghi)perylene; Indeno(1,2,3-cd)pyrene Acenaphthylene; Benzo(a)pyrene; α-Methylnaphthalene Anthracene; Chrysene; 2-Methylnaphthalene Benzo(a)anthracene; Dibenz(a,h)anthracene; Naphthalene Benzo(b)fluoranthene; Fluorene; Pyrene Benzo(k)fluoranthene; Fluoranthene; Phenanthrene	1mL	47543-U	
Surrogate Standards Decachlorobiphenyl	200µg/mL in acetone	1mL	48318	
METHOD 8330				
Calibration Standards				
EPA 8330 Mix A	8 explosives, each at 100µg/mL in acetonitrile 2-Amino-4,6-dinitro toluene; HMX; 1,3,5-Trinitrobenzene 1,3-Dinitrobenzene; N itrobenzene; 2,4,6-Trinitrotoluene 2,4-Dinitrotoluene; RDX	1mL	47283	
EPA 8330 Mix B	6 explosives, each at 100µg/mL in acetonitrile 4-Amino-2,6-dinitrotoluene; 2-Nitrotoluene; 4-Nitrotoluene 2,6-Dinitrotoluene; 3-Nitrotoluene; Tetryl	1mL	47284	
Single Component Standards				
2-Amino-4,6-dinitrotoluene	1000µg/mL in acetonitrile	1mL	47749-U	
4-Amino-2,6-dinitrotoluene	1000µg/mL in acetonitrile	1mL	47750	
1,3-Dinitrobenzene	1000µg/mL in acetonitrile	1mL	47746-U	
2,4-Dinitrotoluene	1000µg/mL in acetonitrile	1mL	47747	
2,6-Dinitrotoluene	1000µg/mL in acetonitrile	1mL	47748-U	
HMX	1000µg/mL in acetonitrile	1mL	47236	
Nitrobenzene	1000µg/mL in acetonitrile	1mL	47239	
2-Nitrotoluene	1000µg/mL in acetonitrile	1mL	47240	
3-Nitrotoluene	1000µg/mL in acetonitrile	1mL	47241	
4-Nitrotoluene	1000µg/mL in acetonitrile	1mL	47242	
RDX	1000µg/mL in acetonitrile	1mL	47237	
Tetryl	1000µg/mL in acetonitrile	1mL	47238	
1,3,5-Trinitrobenzene	1000µg/mL in acetonitrile	1mL	47243	
2,4,6-Trinitrotoluene	1000µg/mL in acetonitrile	1mL	47244	
EPA 8330 Energetic Materials Kit▲	14 individually packaged 1mL solutions at 1000µg/mL in acetonitrile 2-Amino-4,6-dinitrotoluene; HMX; RDX 4-Amino-2,6-dinitrotoluene; Nitrobenzene; Tetryl 1,3-Dinitrobenzene; 2-Nitroto luene; 1,3,5-Trinitrobenzene 2,4-Dinitrotoluene; 3-Nitro toluene; 2,4,6-Trinitrotoluene 2,6-Dinitrotoluene; 4-Nitrotoluene		47245	

SS Separate Source standards. Prepared from independently sourced raw materials and quality controlled independently.

■ For alternate tuning solutions, see our listing of Method 625 standards.

▲ HMX, RDX, and tetryl are shipped in separate containers as required under US Federal Department of Transportation guidelines.

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Environmental Standards
CLP Standards

US EPA Contract Laboratory Program Methods

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Superfund Act.

US EPA Contract Laboratory Program (CLP) methods are analytical methods for identifying and quantifying organic compounds on the EPA's Target Compound List (TCL) in groundwater, sediment, and soil samples at abandoned hazardous waste sites.

The following analytical reference standards are specifically designed for monitoring organic chemicals on the US EPA's Target Compound List in water, sediment or soil from hazardous waste sites, per methods developed by the Environmental Monitoring Systems Laboratory in Las Vegas (EMSL-LV), under authority of the Superfund Amendments Reauthorization Act (SARA).

Data Packets – Free of Charge

Our data packets meet US EPA requirements specified in the March 1990 and subsequent CLP Statements of Work. Each packet documents the rigorous analytical methods we use to verify a raw material's identity and purity, and provides certification as to purity and final concentration accuracy. All data packets are free of charge.

MIXES AND SOLUTIONS	COMPOSITION			QTY.	CAT. NO.	PRICE
OLM04 STATEMENT OF WORK						
EPA CLP Volatile Mix 1	36 analytes, 1000µg/mL each in methanol			1mL	47547-U	
	Acetone	Dibromochloromethane	Methylene chloride			
	Benzene	1,1-Dichloroethane	Styrene			
	Bromodichloromethane	1,2-Dichloro ethane	1,1,2,2-Tetrachloroethane			
	Bromoform	1,1-Dichloroethene	Tetrachloroethene			
	Bromomethane	cis-1,2-Dichloroethene	Toluene			
	2-Butanone	trans-1,2-Dichloroethene	1,1,1-Trichloroethane			
	Carbon disulfide	1,2-Dichloropropane	1,1,2-Trichloroethane			
	Carbon tetrachloride	cis-1,3-Dichloropropene	Trichloroethene			
	Chlorobenzene	trans-1,3-Dichloropropene	Vinyl chloride			
	Chloroethane	Ethylbenzene	m-Xylene			
	Chloroform	2-Hexanone	o-Xylene			
	Chloromethane	4-Methyl-2-pentanone	p-Xylene			
EPA CLP SOW OLM04 Volatiles Mix 2	14 analytes, 2000µg/mL each in methanol			1mL	47513-U	
	Cyclohexane	1,4-Dichlorobenzene	Methyl cyclohexane			
	1,2-Dibromo-3-chloropropane	Dichlorodifluoromethane	Methyl tert-butyl ether			
	1,2-Dibromoethane	Freon 113	1,2,4-Trichlorobenzene			
	1,2-Dichlorobenzene	Isopropylbenzene (Cumene)	Trichlorofluoromethane			
	1,3-Dichlorobenzene	Methyl acetate				
VOA Internal Standard Mix	3 analytes, 1000µg/mL each in methanol			1mL	48835	
	Bromochloromethane	Chlorobenzene-d_5	1,4-Difluorobenzene			
VOA Surrogate Spike Mix	3 analytes, 1000µg/mL each in methanol			1mL	48101	
	4-Bromofluorobenzene	1,2-Dichloroethane-d_4	Toluene-d_8			
CLP OLM04 Volatiles Calibration Kit	each of the following products				46820-U	
	Mix 1 (47547-U)	Mix 2 (47513-U)	Mix 3 (48835)			
	Mix 4 (48101)					
CLP Semivolatiles Calibration Mix 1	64 analytes, 1000µg/mL each in methylene chloride:benzene (75:25)			1mL	506508	
	Acenaphthene	Dibenzo(a,h)anthracene	Indeno(1,2,3-cd)pyrene			
	Acenaphthylene	Dibenzofuran	Isophorone			
	Anthracene	Di-n-butyl phthalate	2-Methylnaphthalene			
	Azobenzene	1,2-Dichlorobenzene	2-Methylphenol			
	Benzo(a)anthracene	1,3-Dichlorobenzene	4-Methylphenol			
	Benzo(a)pyrene	1,4-Dichlorobenzene	Naphthalene			
	Benzo(b)fluoranthene	2,4-Dichlorophenol	2-Nitroaniline			
	Benzo(ghi)perylene	Diethyl phthalate	3-Nitroaniline			
	Benzo(k)fluoranthene	2,4-Dimethylphenol	4-Nitroaniline			
	Butyl benzyl phthalate	4,6-Dinitro-2-methylphenol	Nitrobenzene			
	Bis(2-chloroethoxy)methane	2,4-Dinitrophenol	2-Nitrophenol			
	Bis(2-chloroethyl) ether	Dimethyl phthalate	4-Nitrophenol			
	Bis (2-Chloroisopropyl) ether	2,4-Dinitrotoluene	N-Nitrosodimethylamine			
	Bis(2-ethylhexyl) phthalate	2,6-Dinitrotoluene	N-Nitrosodi-n-propylamine			
	4-Bromophenylphenyl ether	Di-n-octyl phthalate	Pentachlorophenol			
	Carbazole	Fluoranthene	Phenanthrene			
	4-Chloroaniline	Fluorene	Phenol			
	2-Chloronaphthalene	Hexachlorobenzene	Pyrene			
	4-Chloro-3-methyl phenol	Hexachlorobutadiene	1,2,4-Trichlorobenzene			
	2-Chlorophenol	Hexachlorocyclopentadiene	2,4,5-Trichlorophenol			
	4-Chlorophenyl phenyl ether	Hexachloroethane	2,4,6-Trichlorophenol			
	Chrysene					

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Environmental Standards
CLP Standards

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
3,3'-Dichlorobenzidine	2000µg/mL in methanol	1mL	48029	
N-Nitrosodiphenylamine	5000µg/mL in methanol	1mL	40060	
EPA CLP SOW OLM04 Semi-Volatile Mix	7 analytes, 2000µg/mL each in methylene chloride Analyte 1, Analyte 2, Analyte 3, Analyte 4, Analyte 5, Analyte 6, Analyte 7	1mL	47514-U	
Semivolatile Internal Standards Mix 5	6 analytes, 2000µg/mL each in methylene chloride 1,4-Dichlorobenzene-d4, Chrysene-d12, Perylene-d12, Acenaphthene-d10, Naphthalene-d8, Phenanthrene-d10	1mL	46955-U	
CLP Semivolatiles Surrogate Standards Mix 6	8 analytes, 4000µg/mL each in methylene chloride 1,2-Dichlorobenzene-d4, 2-Chlorophenol-d4, 2-Fluorophenol, p-Terphenyl-d14, 2,4,6-Tribromophenol, 2-Fluorobiphenyl, Nitro benzene-d5, Phenol-d6	1mL	46824-U	
CLP OLM04 Semivolatiles Calibration Kit	each of the following products Mix 1 (506508, prev. page), Mix 2 (48029), Mix 3 (40060), Mix 4 (47514-U), Mix 5 (46955-U), Mix 6 (46824-U)		46822-U	
Pesticide Standard Mix A-1	11 analytes at stated concentrations in hexane:toluene (99:1) α-BHC, 0.5µg/mL; Decachlorobiphenyl, 1µg/mL; Heptachlor, 0.5µg/mL; γ-BHC, 0.5µg/mL; Dieldrin, 1µg/mL; Methoxychlor, 5µg/mL; 4,4'-DDD, 1µg/mL; Endosulfan I, 0.5µg/mL; 2,4,5,6-Tetrachloro-m-xylene, 0.5µg/mL; 4,4'-DDT, 1µg/mL; Endrin, 1µg/mL	1mL	47977	
Pesticide Standard Mix B-1	13 analytes at stated concentrations in hexane:toluene (99.5:0.5) Aldrin, 0.5µg/mL; 4,4'-DDE, 1µg/mL; Endrin ketone, 1µg/mL; β-BHC, 0.5µg/mL; Decachlorobiphenyl, 1µg/mL; Heptachlor epoxide (isomer B), 0.5µg/mL; δ-BHC, 0.5µg/mL; Endosulfan II, 1µg/mL; α-Chlordane, 0.5µg/mL; Endosulfan sulfate, 1µg/mL; 2,4,5,6-Tetrachloro-m- xylene, 0.5µg/mL; γ-Chlordane, 0.5µg/mL; Endrin aldehyde, 1µg/mL	1mL	47978	
Pesticide Performance Evaluation Mix A	8 analytes at stated concentrations in hexane:toluene (99:1) α-BHC, 1µg/mL; 4,4'-DDT, 10µg/mL; Methoxychlor, 25µg/mL; β-BHC, 1µg/mL; Decachlorobiphenyl, 2µg/mL; Tetrachloro-m-xylene, 2µg/mL; γ-BHC, 1µg/mL; Endrin, 5µg/mL	1mL	47975	
Pesticide Resolution Check Mix A	9 analytes at stated concentrations in hexane:toluene (99:1) γ-Chlordane, 1µg/mL; 4,4'-DDE, 2µg/mL; Decachlorobiphenyl, 2µg/mL; Dieldrin, 2µg/mL; Endosulfan I, 1µg/mL; Endosulfan sulfate, 2µg/mL; Endrin ketone, 2µg/mL; Methoxychlor, 10µg/mL; 2,4,5,6-Tetrachloro-m- xylene, 2µg/mL	1mL	47976	
Pesticide Surrogate Spike Mix	2 analytes, 200µg/mL each in acetone Decachlorobiphenyl, 2,4,5,6-Tetrachloro-m-xylene	1mL	48460	
Toxaphene	1000µg/mL in isooctane	1mL	48103	
Aroclor 1016 RDaR	1000µg/mL in isooctane	1mL	48097	
Aroclor 1221 RDaR	1000µg/mL in isooctane	1mL	48098	
Aroclor 1232 RDaR	1000µg/mL in isooctane	1mL	44805	
Aroclor 1242 RDaR	1000µg/mL in isooctane	1mL	44806	
Aroclor 1248 RDaR	1000µg/mL in isooctane	1mL	44807	
Aroclor 1254 RDaR	1000µg/mL in isooctane	1mL	44808	
Aroclor 1260 RDaR	1000µg/mL in isooctane	1mL	44809	
CLP OLM04 Pesticides/PCB Calibration Kit	each of the following products Mix 1 (47977), Mix 2 (47978), Mix 3 (47975), Mix 4 (47976), Mix 5 (48460), Mix 6 (48103), Mix 7 (48097), Mix 8 (48098), Mix 9 (44805), Mix 10 (44806), Mix 11 (44807), Mix 12 (44808), Mix 13 (44809)		46823-U	
FEB. '88 STATEMENT OF WORK				
Volatiles				
VOA Surrogate Spike Mix	3 analytes, 250µg/mL each in methanol 4-Bromofluorobenzene, 1,2-Dichloroethane-d_4, Toluene-d_8	1mL	48876	
VOA Matrix Spike Mix	5 analytes, 250µg/mL each in methanol Benzene, 1,1-Dichloroethene, Trichloroethene, Chlorobenzene, Toluene	1mL	48399	

RDaR Product is tested under Reciprocal Data Review agreement with Absolute Standards Inc. (Hamden, CT, USA)

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Environmental Standards
CLP Standards

MIXES AND SOLUTIONS	COMPOSITION			QTY.	CAT. NO.	PRICE
Vinyl acetate	5000µg/mL in acetonitrile			1mL	40327	
Semivolatiles Internal Standard Mix 5	6 analytes, 2000µg/mL each inmethylene chloride 1,4-Dichlorobenzene-d4 Acenaphthene-d10	Chrysene-d12 Naphthalene-d8	Perylene-d12 Phenanthrene-d10	1mL	46955-U	
Acids Surrogate Spike Mix	3 analytes, 2000µg/mL each in methanol 2-Fluorophenol	Phenol-d_5	2,4,6-Tribromophenol	1mL	48875	
Base/Neutrals Surrogate Spike Mix	3 analytes, 1000µg/mL each in methylene chloride 2-Fluorobiphenyl	Nitrobenzene-d_5	4-Terphenyl-d_{14}	1mL	48925	
Base/Neutrals Calibration Check Compounds Mix	7 analytes, 2000µg/mL each in methylene chloride Acenaphthene Benzo(a)pyrene 1,4-Dichlorobenzene	Di-n-octyl phthalate Fluoranthene	Hexachlorobutadiene N-Nitrosodiphenylamine	1mL	48464	
Pesticides/PCBs Dibutyl chlorendate	200µg/mL in acetonitrile			1mL	48129	
MAR. '90, DEC. '90, AUG. '91 STATEMENTS OF WORK						
Volatiles CLP Volatiles Calibration Mix A	33 analytes, 2000µg/mL each in methanol Benzene Bromochloromethane Bromodichloromethane Bromoform Carbon tetrachloride Chlorobenzene Chlorodibromomethane Chloroform 1,2-Dibromo-3-chloropropane 1,2-Dibromoethane 1,2-Dichlorobenzene	1,3-Dichlorobenzene 1,4-Dichlorobenzene 1,1-Dichloro ethane 1,2-Dichloroethane 1,1-Dichloroethene cis-1,2-Dichloroethene trans-1,2-D ichloroethene 1,2-Dichloropropane cis-1,3-Dichloropropene trans-1,3-Dichloropropene Ethylbenzene	Methylene chloride Styrene 1,1,2,2-Tetrachloroethane Tetrachloroethene Toluene 1,1,1-Trichloroethane 1,1,2-Trichloroethane Tri chloroethene m-Xylene o-Xylene p-Xylene	1mL	47566-U	
EPA Purgeable C	4 analytes, 2000µg/mL each in methanol Bromomethane Chloromethane	Chloroethane	Vinyl chloride	1mL	48057-U	
TCL Volatiles Mix 1 SS	4 analytes, 2000µg/mL each in methanol:water (90:10) Acetone 2-Butanone	2-Hexanone	4-Methyl-2-pentanone	1mL 1mL	48949 4S8949	
Carbon disulfide Vinyl acetate	5000µg/mL in methanol Neat			1mL 1000mg	40363 48486	
TCL Volatiles Mix 1 SS	4 analytes, 2000µg/mL each in methanol:water (90:10) Acetone 2-Butanone	2-Hexanone	4-Methyl-2-pentanone	1mL 1mL	48949 4S8949	
TCL Volatiles Mix 2 SS	6 analytes, 2000µg/mL each in methanol Bromoform Carbon tetrachloride	Chloroform 1,1-Dichloroethane	1,1,2-Trichloroethane Trichloroethylene	1mL 1mL	48452 4S8452	
TCL Volatiles Mix 3 SS	7 analytes, 2000µg/mL each in methanol 1,2-Dichloroethan e cis-1,3-Dichloropropene trans-1,3-Dichloropropene	Ethylbenzene Tetrachloroethene	1,1,1-Trichloroethane p-Xylene	1mL 1mL	48453 4S8453	
TCL Volatiles Mix 4 SS	8 analytes, 2000µg/mL each in methanol Benzene Chlorobenzene 1,2-Dichloropropane	Styrene 1,1,2,2-Tetrachloroethane Toluene	m-Xylene o-Xylene	1mL 1mL	48957 4S8957	
TCL Volatiles Mix 5 SS	10 analytes, 2000µg/mL each in methanol Bromodichloromethane Bromomethane Chloroethane Chloromethane	Dibromochloromethane 1,1-Dichloroethylene cis-1,2-Dichloroethene	trans-1,2-Dichloroethene Methylene chloride Vinyl chloride	1mL 1mL	48455 4S8455	

SS Separate Source standards. Prepared from independently sourced raw materials and quality controlled independently.

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Environmental Standards
CLP Standards

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
Carbon disulfide	5000µg/mL in methanol	1mL	40363	
Vinyl acetate	5000µg/mL in acetonitrile	1mL	40327	
VOA Calibration Standards Kit	1mL of each of the following products TCL Volatiles Mix 1 (48949) TCL Volatiles Mix 2 (48452) TCL Volatiles Mix 3 (48453) TCL Volatiles Mix 4 (48957) TCL Volatiles Mix 5 (48455) Carbon disulfide (40363) Vinyl acetate (40327)		48115	
CLP VOA Internal Standard Spiking Solution	3 analytes, 2000µg/mL each in methanol Chlorobenzene-d_5 1,4-Difluorobenzene 1,4-Dichlorobenzene-d_4	1mL	47568-U	
VOA Internal Standard Mix	3 analytes, 1000µg/mL each in methanol Bromochloromethane Chlorobenzene-d_5 1,4-Difluorobenzene	1mL	48835	
VOA Surrogate Spike Mix	3 analytes, 1000µg/mL each in methanol 4-Bromofluorobenzene 1,2-Dichloroethane-d_4 Toluene-d_8	1mL	48101	
VOA Matrix Spike Mix	5 analytes, 1000µg/mL each in methanol Benzene 1,1-Dichloroethene Trichloroethylene Chlorobenzene Toluene	1mL	48102	
VOA Extract Screening Mix 1	5 analytes, 1000µg/mL each in methanol Benzene Toluene p-Xylene Ethylbenzene o-Xylene	1mL	48247-U	
4-Bromofluorobenzene	2000µg/mL in methanol	1mL	48083	
EPA CLP SOW OLM04 Volatiles Mix	14 analytes, 2000µg/mL each in methanol Cyclohexane 1,4-Dichlorobenzene Methyl cyclohexane 1,2-Dibromo-3-chloropropane Dichlorodifluoromethane Methyl tert-butyl ether 1,2-Dibromoethane Freon 113 1,2,4-Trichlorobenzene 1,2-Dichlorobenzene Isopropylbenzene (Cumene) Trichlorofluoromethane 1,3-Dichlorobenzene Methyl acetate	1mL	47513-U	
Semivolatiles				
CLP Semivolatile Calibration Mix Without pesticides	64 analytes, 1000µg/mL each in methylene chloride:benzene (3:1) Acenaphthene Dibenzo(a,h)anthracene Indeno(1,2,3-cd)pyrene Acenaphthylene Dibenzofuran Isophorone Anthracene Di-n-butyl phthalate 2-Methylnaphthalene Azobenzene 1,2-Dichlorobenzene 2-Methylphenol Benzo(a)anthracene 1,3-Dichlorobenzene 4-Methylphenol Benzo(a)pyrene 1,4-Dichlorobenzene Naphthalene Benzo(b)fluoranthene 2,4-Dichlorophenol 2-Nitroaniline Benzo(ghi)perylene Diethyl phthalate 3-Nitroaniline Benzo(k)fluoranthene 2,4-Dimethylphenol 4-Nitroaniline Butyl benzyl phthalate 4,6-Dinitro-2-methylphenol Nitrobenzene Bis(2-chloroethoxy)methane 2,4-Dinitrophenol 2-Nitrophenol Bis(2-chloroethyl) ether Dimethyl phthalate 4-Nitrophenol Bis (2-Chloroisopropyl) ether 2,4-Dinitrotoluene N-Nitrosodimethylamine Bis(2-ethylhexyl) phthalate 2,6-Dinitrotoluene N-Nitrosodi-n-propylamine 4-Bromophenylphenyl ether Di-n-octyl phthalate Pentachlorophenol Carbazole Fluoranthene Phenanthrene 4-Chloroaniline Fluorene Phenol 2-Chloronaphthalene Hexachlorobenzene Pyrene 4-Chloro-3-methyl phenol Hexachlorobutadiene 1,2,4-Trichlorobenzene 2-Chlorophenol Hexachlorocyclopentadiene 2,4,5-Trichlorophenol 4-Chlorophenyl phenyl ether Hexachloroethane 2,4,6-Trichlorophenol Chrysene	1mL	506508	
TCL Benzidines Mix	2 analytes, 2000µg/mL each in methanol Benzidine 3,3'-Dichlorobenzidine	1mL 1mL	48906 4S8906	

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Environmental Standards
CLP Standards

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
N-Nitrosodiphenylamine	5000µg/mL in methanol	1mL	40060	
Benzoic acid	2000µg/mL in methylene chloride	1mL	47508-U	
Benzyl alcohol	2000µg/mL in methylene chloride	1mL	47509-U	
TCL SemivolatileCalibration Kit	1mL of each of the following products CLP Semivolatile Calibration Mix (506508) TCL Benzidines Mix (48906) N-Nitrosodiphenylamine (40060) Benzoic acid (47508-U) Benzyl alcohol (47509-U)		47346-U	
TCL Phenols Mix S S	11 analytes, 2000µg/mL each in methylene chloride 4-Chloro-3-methylphenol 2-Chlorophenol 2,4-Dichlorophenol 2,4-Dimethylphenol 2,4-Dinitrophenol 2-Methyl-4,6-dinitrophenol 2-Nitrophenol 4-Nitrophenol Pentachlorophenol Phenol 2,4,6-Trichlorophenol	1mL 1mL	48904 4S8904	
TCL Polynuclear Aromatic Hydrocarbons Mix S S	16 analytes, 2000µg/mL each in methylene chloride:benzene (50:50) Acenaphthene Acenaphthylene Anthracene Benzo(a)anthracene Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(ghi)perylene Benzo(a)pyrene Chrysene Dibenzo(a,h)anthracene Fluoranthene Fluorene Indeno(1,2,3-cd)pyrene Naphthalene Phenanthrene Pyrene	1mL 1mL	48905-U 4S8905	
TCL Benzidines Mix S S	2 analytes, 2000µg/mL each in methanol Benzidine 3,3'-Dichlorobenzidine	1mL 1mL	48906 4S8906	
Semivolatiles TCL Hazardous Substances Mix 1 S S	4 analytes, 2000µg/mL each in methylene chloride Benzoic acid 2-Methylphenol 4-Methylphenol 2,4,5-Trichlorophenol	1mL 1mL	48907 4S8907	
TCL Hazardous Substances Mix 2 S S	8 analytes, 2000µg/mL each in methylene chloride Aniline Benzyl alcohol 4-Chloroaniline Dibenzofuran 2-Methylnaphthalene 2-Nitroaniline 3-Nitroaniline 4-Nitroaniline	1mL 1mL	48908 4S8908	
TCL Base/Neutrals Mix 1 S S	14 analytes, 2000µg/mL each in methylene chloride Bis(2-chloroethoxy)methane Bis(2-chloroethyl)ether Bis(2-chloroisopropyl)ether Bis(2-ethylhexyl)phthalate 4-Bromophenylphenyl ether Butyl benzyl phthalate 4-Chlorophenylphenyl ether Diethyl phthalate Dimethyl phthalate Di-n-butyl phthalate Di-n-octyl phthalate N-Nitrosodimethylamine N-Nitrosodi-n-propylamine N-Nitrosodiphenylamine	1mL 1mL	48900-U 4S8900	
TCL Base/Neutrals Mix 2 S S	15 analytes, 2000µg/mL each in methylene chloride Azobenzene Carbazole 2-Chloronaphthalene 1,2-Dichlorobenzene 1,3-Dichlorobenzene 1,4-Dichlorobenzene 2,4-Dinitrotoluene 2,6-Dinitrotoluene Hexachlorobenzene Hexachlorobutadiene Hexachlorocyclopentadiene Hexachloroethane Isophorone Nitrobenzene 1,2,4-Trichlorobenzene	1mL 1mL	48120-U 4S8120	
Semivolatiles Calibration Standards Kit S S	1mL of each of the following products TCL Phenols Mix (48904) TCL Hazardous Substances Mix 1 (48907) TCL Polynuclear Aromatic Hydrocarbons Mix (48905-U) TCL Hazardous Substances Mix 2 (48908) TCL Benzidines Mix (48906) TCL Base/Neutrals Mix 1 (48900-U) TCL Base/Neutrals Mix 2 (48120-U)		48118 4S8118	
TCL Calibration Standards Kit	1mL of each of the following products TCL Phenols Mix (48904) TCL Base/Neutrals Mix 2 (48120-U) TCL Hazardous Substances Mix 2 (48908) TCL Base/Neutrals Mix 1 (48900-U) TCL Hazardous Substances Mix 1 (48907) TCL Polynuclear Aromatic Hydrocarbons Mix (48905-U) TCL Pesticides Mix (48913) TCL Benzidines Mix (48906) Semivolatile Internal Standard Mix, 2 x 1mL (48902)		48909	

S S Separate Source standards. Prepared from independently sourced raw materials and quality controlled independently.

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Environmental Standards
CLP Standards

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
Semivolatile Base/Neutrals Surrogate Spike Mix	4 analytes in methylene chloride			
	1000µg/mL each analyte	1mL	48935	
	5000µg/mL each analyte	1mL	47262	
	1,2-Dichlorobenzene-d_4 Nitrobenzene-d_5 4-Terphenyl-d_{14} 2-Fluorobiphenyl			
Semivolatile Acids Surrogate Spike Mix	4 analytes in methanol			
	2000µg/mL each analyte	1mL	48939	
	10,000µg/mL each analyte	1mL	47261	
	2-Chlorophenol-d_4 Phenol-d_6▲ 2,4,6-Tribromophenol 2-Fluorophenol			
8270 Matrix Spike Mix	11 analytes at indicated concentrations in methanol	10mL	46854-U	
	Acenaphthene, 1000µg/mL; N-Nitrosodi-n-propylamine, 1000µg/mL; 4-Chloro-3-methylphenol, 1500µg/mL; Pentachlorophenol, 1500µg/mL; 2-Chlorophenol, 1500µg/mL; Phenol, 1500µg/mL; 1,4-Dichlorobenzene, 1000µg/mL; Pyrene, 1000µg/mL; 2,4-Dinitrotoluene, 1000µg/mL; 1,2,4-Trichlorobenzene, 1000µg/mL; 4-Nitrophenol, 1500µg/mL			
Semivolatile Base/Neutrals Matrix Spike Mix A	6 analytes, 1000µg/mL each in methanol	1mL	48100-U	
	Acenaphthene 2,4-Dinitrotoluene Pyrene 1,4-Dichlorobenzene N-Nitrosodi-n-propylamine 1,2,4-Trichlorobenzene			
Semivolatile Base/Neutrals Matrix Spike Mix B	6 analytes, 1000µg/mL each in methylene chloride	1mL	48869	
	Acenaphthene 2,4-Dinitrotoluene Pyrene 1,4-Dichlorobenzene N-Nitrosodi-n-propylamine 1,2,4-Trichlorobenzene			
Semivolatile Acids Matrix Spike Mix	5 analytes, 2000µg/mL each in methanol	1mL	48878	
	4-Chloro-3-methylphenol 4-Nitrophenol Pentachlorophenol 2-Chlorophenol Phenol			
GPC Calibration Mix A	3 analytes at indicated concentrations in methylene chloride	1mL	48424	
	Bis(2-ethylhexyl)phthalate, 1000µg/mL Methoxychlor, 200µg/mL Perylene, 20µg/mL			
Decafluorotriphenylphosphine	2000µg/mL in methylene chloride	1mL	48082	
HC Semivolatile Internal Standards Mix	6 analytes, 4000µg/mL each in methylene chloride:benzene (50:50)	1mL	47906	
	Acenaphthene-d_{10} 1,4-Dichlorobenzene-d_4 Perylene-d_{12} Chrysene-d_{12} Naphthalene-d_8 Phenanthrene-d_{10}			
Semivolatile Internal Standards Mix	6 analytes, 2000µg/mL each in methylene chloride	1mL	46955-U	
	RDaR	2mL	48902	
		25mL	46866-U	
	Acenaphthene-d_{10} 1,4-Dichlorobenzene-d_4 Perylene-d_{12} Chrysene-d_{12} Naphthalene-d_8 Phenanthrene-d_{10}			
TCL Phenols/Benzidines Mix	13 analytes, 2000µg/mL each in methylene chloride	1mL	47992-U	
	Benzidine 2,4-Dimethylphenol 4-Nitrophenol 4-Chloro-3-methylphenol 4,6-Dinitro-o-cresol Pentachlorophenol 2-Chlorophenol 2,4-Dinitrophenol Phenol 3,3'-Dichlorobe nzidine 2-Nitrophenol 2,4,6-T richlorophenol 2,4-Dichlorophenol			
TCL Hazardous Substances Mix	12 analytes, 2000µg/mL each in methylene chloride	1mL	47990-U	
	Aniline o-Cresol 2-Nitroaniline Benzoic acid p-Cresol 3-Nitroaniline Benzyl alcohol Dibenzofuran 4-Nitroaniline 4-Chloroaniline 2-Methylnaphthalene 2,4,5-Trichlorophenol			
TCL Base/Neutrals Mix	29 analytes, 2000µg/mL each in methylene chloride	1mL	47991-U	
	Azobenzene 1,2-Dichlorobenzene Hexachlorobutadiene Bis(2-chloroethoxy)methane 1,3-Dichlorobenzene Hexachlorocyclopentadiene Bis(2-chloroethyl)ether 1,4-Dichlorobenzene Hexachloroethane Bis(2-chloroisopropyl)ether Diethyl phthalate Isophorone Bis(2-ethylhexyl)phthalate Dimethyl phthalate Nitrobenzene 4-Bromophenylphenyl ether 2,4-Dinitrotoluene N-Nitrosodimethylamine Butyl benzyl phthalate 2,6-Dinitrotoluene N-Nitrosodi-n-propylamine Carbazole Di-n-butyl phthalate N-Nitrosodiphenylamine 2-Chloronaphthalene Di-n-octyl phthalate 1,2,4-Trichlorobenzene 4-Chlorophenylphenyl ether Hexachlorobenzene			

RDaR Product is tested under Reciprocal Data Review agreement with Absolute Standards Inc. (Hamden, CT, USA)

▲ Phenolic hydrogen exchange occurs naturally, converting phenol-d_6 to phenol-d_5. In analyzing this standard, your system will detect phenol-d_5, not phenol-d_6.

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Environmental Standards
CLP Standards

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
8270/625/CLP/Appendix IX Semivolatile Calibration Mix	44 analytes, 1000µg/mL each in methylene chloride:benzene (3:1) Acenaphthene, Acenaphthylene, Anthracene, Azobenzene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,I)perylene, Benzo(a)pyrene, Bis(2-chloroethoxy)methane, Bis(2-chloroethyl)ether, Bis(2-chloroisopropyl)ether, Bis(2-ethylhexyl)phthalate, 4-Bromophenyl phenyl ether, Butyl benzyl phthalate, Carbazole, 2-Chloronaphthalene, 4-Chlorophenylphenyl ether, Chrysene, Dibenzo(a,h)anthracene, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, Diethyl phthalate, Dimethyl phthalate, 2,4-Dinitrotoluene, 2,6-Dinitrotoluene, Di-n-butyl phthalate, Di-n-octyl phthalate, Fluoranthene, Fluorene, Hexachlorobenzene, Hexachlorobutadiene, Hexachlorocyclopentadiene, Hexachloroethane, Indeno(1,2,3-cd)pyrene, Isophorone, Naphthalene, Nitrobenzene, N-Nitrodimethyl amine, N-Nitrosodi-n-propylamine, Phenanthrene, Pyrene, 1,2,4-Trichlorobenzene	1mL	502049	
EPA CLP SOW OLM04 Semivolatiles Mix	5 analytes, 2000µg/mL each in methylene chloride Acetophenone, Atrazine, Benzaldehyde, Biphenyl, Caprolactam	1mL	47514-U	
Pesticides/PCBs CLP Organochlorine Pesticides Mix	20 analytes, 2000µg/mL each in hexane:toluene (50:50) Aldrin, α-BHC, β-BHC, γ-BHC, δ-BHC, α-Chlordane, γ-Chlordane, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Dieldrin, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin aldehyde, Endrin ketone, Heptachlor, Heptachlor epoxide isomer B, Methoxychlor	1mL	47426-U	
TCL Pesticides Mix S S	18 analytes, 2000µg/mL each in toluene:hexane (50:50) Aldrin, α-BHC, β-BHC, γ-BHC (Lindane), δ-BHC, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Dieldrin, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin aldehyde, Endrin ketone, Heptachlor, Heptachlor epoxide, Methoxychlor	1mL 1mL	48913 4S8913	
Toxaphene	1000µg/mL in isooctane	1mL	48103	
Chlordane	1000µg/mL in isooctane	1mL	48065-U	
Aroclor 1016	1000µg/mL in isooctane RDaR	1mL	48097	
Aroclor 1221	1000µg/mL in isooctane RDaR	1mL	48098	
Aroclor 1232	1000µg/mL in isooctane RDaR	1mL	44805	
Aroclor 1242	1000µg/mL in isooctane RDaR	1mL	44806	
Aroclor 1248	1000µg/mL in isooctane RDaR	1mL	44807	
Aroclor 1254	1000µg/mL in isooctane RDaR	1mL	44808	
Aroclor 1260	1000µg/mL in isooctane RDaR	1mL	44809	
Aroclor 1262	1000µg/mL in isooctane RDaR	1mL	44810	
Pesticide Calibration Standards Kit	1mL of each of the following products TCL Pesticides Mix (48913), Toxaphene (48103), Chlordane (48065-U), Aroclor 1016 (48097), Aroclor 1221 (48098), Aroclor 1232 (44805), Aroclor 1242 (44806), Aroclor 1248 (44807), Aroclor 1254 (44808), Aroclor 1260 (44809), Aroclor 1262 (44810)		48114	
EPA CLP/625 Pesticide Mix	16 analytes, 2000µg/mL each in hexane:toluene (50:50) Aldrin, α-BHC, β-BHC, γ-BHC, δ-BHC, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Dieldrin, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin aldehyde, Heptachlor, Heptachlor epoxide (isomer B)	1mL	47914	

RDaR Product is tested under Reciprocal Data Review agreement with Absolute Standards Inc. (Hamden, CT, USA)

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Environmental Standards
CLP Standards

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
Appendix IX Organochlorine Pesticides Mix	17 analytes, 2000µg/mL each in toluene:hexane (50:50) Aldrin, α-BHC, β-BHC, γ-BHC, δ-BHC, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Dieldrin, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin aldehyde, Heptachlor, Heptachlor epoxide, Methoxychlor	1mL	46960-U	
a-Chlordane	100µg/mL in hexane	1mL	48192	
g-Chlordane	100µg/mL in hexane	1mL	48193	
Pesticide Surrogate Spike Mix	2 analytes, 200µg/mL each in acetone Decachlorobiphenyl, 2,4,5,6-Tetrachloro-m-xylene	1mL	48460	
Pesticide Matrix Spike Mix (3/90 SOW)	6 analytes at indicated concentrations in methanol Aldrin, 100µg/mL; γ-BHC, 100µg/mL; 4,4'-DDT, 400µg/mL; Dieldrin, 400µg/mL; Endrin, 400µg/mL; Heptachlor, 100µg/mL	1mL	48458	
Pesticide Matrix Spiking Mix (12/90 & 8/91 SOW)	6 analytes at stated concentrations in methanol Aldrin, 100µg/mL; 4,4'-DDT, 200µg/mL; Dieldrin, 200µg/mL; Endrin, 200µg/mL; Heptachlor, 100µg/mL; γ-BHC (Lindane), 100µg/mL	1mL	48449	
Pesticide Performance Evaluation Mix	6 analytes at stated concentrations in hexane:toluene (99:1) α-BHC, 10µg/mL; β-BHC, 10µg/mL; γ-BHC, 10µg/mL; 4,4'-DDT, 100µg/mL; Endrin, 50µg/mL; Methoxychlor, 250µg/mL	1mL	48397	
Pesticide Performance Evaluation Mix A	8 analytes at stated concentrations in hexane:toluene (99:1) α-BHC, 1µg/mL; β-BHC, 1µg/mL; γ-BHC, 1µg/mL; 4,4'-DDT, 10µg/mL; Decachlorobiphenyl, 2µg/mL; Endrin, 5µg/mL; Methoxychlor, 25µg/mL; Tetrachloro-m-xylene, 2µg/mL	1mL	47975	
Pesticide Resolution Check Mix	7 analytes at stated concentrations in hexane:toluene (99:1) γ-Chlordane, 10µg/mL; 4,4'-DDE, 20µg/mL; Dieldrin, 20µg/mL; Endosulfan I, 10µg/mL; Endosulfan sulfate, 20µg/mL; Endrin ketone, 20µg/mL; Methoxychlor, 100µg/mL	1mL	48276-U	
Pesticide Standard Mix A	9 analytes at stated concentrations in hexane:toluene (98:2) α-BHC, 5µg/mL; γ-BHC, 5µg/mL; 4,4'-DDD, 10µg/mL; 4,4'-DDT, 10µg/mL; Dieldrin, 10µg/mL; Endosulfan I, 5µg/mL; Endrin, 10µg/mL; Heptachlor, 5µg/mL; Methoxychlor, 50µg/mL	1mL	48796	
Pesticide Standard Mix A-1	11 analytes at stated concentrations in hexane:toluene (99:1) α-BHC, 0.5µg/mL; γ-BHC, 0.5µg/mL; 4,4'-DDD, 1µg/mL; 4,4'-DDT, 1µg/mL; Decachlorobiphenyl, 1µg/mL; Dieldrin, 1µg/mL; Endosulfan I, 0.5µg/mL; Endrin, 1µg/mL; Heptachlor, 0.5µg/mL; Methoxychlor, 5µg/mL; 2,4,5,6-Tetrachloro-m-xylene, 0.5µg/mL	1mL	47977	
Pesticide Mix A-2	11 analytes at indicated concentrations in hexane:toluene (99:1) α-BHC, 5µg/mL; γ-BHC (Lindane), 5µg/mL; 4,4'-DDD, 10µg/mL; 4,4'-DDT, 10µg/mL; Decachlorobiphenyl, 10µg/mL; Dieldrin, 10µg/mL; Endosulfan I, 5µg/mL; Endrin, 10µg/mL; Heptachlor, 5µg/mL; Methoxychlor, 50µg/mL; 2,4,5,6-Tetrachloro-m-xylene, 5µg/mL	1mL	46862-U	
Pesticide Standard Mix B	11 analytes at stated concentrations in hexane:toluene (99:1) Aldrin, 5µg/mL; β-BHC, 5µg/mL; δ-BHC, 5µg/mL; α-Chlordane, 5µg/mL; γ-Chlordane, 5µg/mL; 4,4'-DDE, 10µg/mL; Endosulfan II, 10µg/mL; Endosulfan sulfate, 10µg/mL; Endrin aldehyde, 10µg/mL; Endrin ketone, 10µg/mL; Heptachlor epoxide (isomer B), 5µg/mL	1mL	48196	
Pesticide Standard Mix B-1	13 analytes at stated concentrations in hexane:toluene (99.5:0.5) Aldrin, 0.5µg/mL; β-BHC, 0.5µg/mL; δ-BHC, 0.5µg/mL; α-Chlordane, 0.5µg/mL; γ-Chlordane, 0.5µg/mL; 4,4'-DDE, 1µg/mL; Decachlorobiphenyl, 1µg/mL; Endosulfan II, 1µg/mL; Endosulfan sulfate, 1µg/mL; Endrin aldehyde, 1µg/mL; Endrin ketone, 1µg/mL; Heptachlor epoxide (isomer B), 0.5µg/mL; 2,4,5,6-Tetrachloro-m- xylene, 0.5µg/mL	1mL	47978	
Pesticide Mix B-2	13 analytes at indicated concentrations in hexane:toluene (99.5:0.5) Aldrin, 5µg/mL; β-BHC, 5µg/mL; δ-BHC, 5µg/mL; α-Chlordane, 5µg/mL; γ-Chlordane, 5µg/mL; 4,4'-DDE, 10µg/mL; Decachlorobiphenyl, 10µg/mL; Endosulfan II, 10µg/mL; Endosulfan sulfate, 10µg/mL; Endrin aldehyde, 10µg/mL; Endrin ketone, 10µg/mL; Heptachlor epoxide isomer b, 5µg/mL; 2,4,5,6-Tetrachloro-m-xylene, 5µg/mL	1mL	46863-U	

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Environmental Standards
CLP, BTEX and GRO Standards

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
GPC Calibration Mix A	3 analytes at indicated concentrations in methylene chloride Bis(2-ethylhexyl)phthalate, 1000µg/mL; Methoxychlor, 200µg/mL; Perylene, 20µg/mL	1mL	48424	
2,4,5-Trichlorophenol	5000µg/mL in methanol	1mL	40179	
LOW CONCENTRATION STATEMENT OF WORK				
1,4-Dichlorobenzene-d_4	2000µg/mL in methanol	1mL	48049	
QTM STATEMENT OF WORK (MARCH 27, 1992 DRAFT)				
QTM Volatile Halocarbons Mix	14 analytes, 2000µg/mL each in methanol Bromodichloromethane; Bromoform; Carbon tetrachloride; Chloroform; 1,1-Dichloroethane; 1,2-Dichloroethane; 1,1-Dichloroethene; cis-1,2-Dichloroethene; trans-1,2-Dichloroethene; 1,1,2,2-Tetrachloroethane; Tetrachloroethene; 1,1,1-Trichloroethane; Trichloroethene; Vinyl chloride	1mL	48001	
QTM PAH Mix	16 analytes, 2000µg/mL each in methylene chloride Acenaphthene; Acenaphthylene; Anthracene; Benzo(a)anthracene; Benzo(b)fluoranthene; Benzo(ghi)perylene; Benzo(a)pyrene; 2-Bromonaphthylene; Chrysene; Dibenzo(a,h)anthracene; Fluoranthene; Fluorene; Indeno(1,2,3-cd)pyrene; Naphthalene; Phenanthrene; Pyrene	1mL	47930-U	
QTM PAH Site Monitoring Solution	20,000µg/mL in methanol 2-Bromonaphthalene	1mL	47929	

UST, GRO, DRO and Fuel Standards

Supelco offers the following stock standards for use in Underground Storage Tank (UST) remediation, Gasoline Range Organics (GRO) analyses and Diesel Range Organics (DRO) analyses. Individual fuel standards can be used for fingerprint analysesic Total Petroleum Hydrocarbon (TPH) / Extractable Petroleum Hydrocarbon (EPH) standards are also available for your convenience. Custom mixes are available through our Custom Chemical Service.

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
BTEX STANDARDS				
UST BTEX Mix SS	6 analytes, 200µg/mL each in methanol Benzene; Ethylbenzene; Toluene; m-Xylene; o-Xylene; p-Xylene	1mL 1mL	48026 4S8026	
HC BTEX Mix	6 analytes, 2000µg/mL each in methanol Benzene; Ethylbenzene; Toluene; m-Xylene; o-Xylene; p-Xylene	1mL	47993	
HC BTEX/MTBE Mix	7 analytes, 2000µg/mL each in methanol Benzene; Ethylbenzene; Methyl tert-butyl ether; Toluene; m-Xylene; o-Xylene; p-Xylene	1mL	47505-U	
GASOLINE RANGE ORGANICS (GRO) STANDARDS				
Gasoline Additives Mix	4 analytes, 200µg/mL each in methanol 1,2-Dibromoethane; Dibromomethane; 1,2-Dichloroethane; Methyl tert-butyl ether	1mL	47905	
Gasoline Range Organics (GRO) Mix	9 analytes, 2000µg/mL each in methanol Benzene; Ethylbenzene; 3-Methylpentane; Naphthalene; Toluene; 1,2,4-Trimethylbenzene; 2,2,4-Trimethylbenzene; m-Xylene; o-Xylene	1mL	47576-U	
PVOC Mix	8 analytes, 2000µg/mL each in methanol Benzene; Ethylbenzene; Methyl tert-butyl ether; Toluene; 1,2,4-Trimethylbenzene; 1,3,5-Trimethylbenzene; m-Xylene; o-Xylene	1mL	47916	
EPA Gasoline Range Organics (GRO) Mix	9 analytes at indicated concentrations in methanol Benzene, 500µg/mL; Ethylbenzene, 500µg/mL; Heptane, 500µg/mL; 2-Methylpentane, 1500µg/mL; Toluene, 1500µg/mL; 1,2,4-Trimethylbenzene, 1000µg/mL; 2,2,4-Trimethylpentane, 1500µg/mL; m-Xylene, 1000µg/mL; o-Xylene, 1000µg/mL	1mL	47577-U	

SS Separate Source standards. Prepared from independently sourced raw materials and quality controlled independently.

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Environmental Standards

GRO, DRO and Fuel Standards

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
UST Modified Gasoline Range Organics (GRO)	10 analytes, 1000µg/mL each in methanol Benzene, Ethylbenzene, Methyl tert-butyl ether, Naphthalene, Toluene, 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene, m-Xylene, o-Xylene, p-Xylene	1mL	48167	
Revised PVOC/GRO Mix	10 analytes, 2000µg/mL each in methanol Benzene, Ethylbenzene, Methyl tert-butyl ether, Naphthalene, Toluene, 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene, m-Xylene, o-Xylene, p-Xylene	1mL	47578-U	
Surrogate Standards α,α,α-Trifluorotoluene	10,000µg/mL in met'hanol	1mL	47582-U	
Internal Standard 1-Chloro-4-fluorobenzene	5000µg/mL in methanol	1mL	48194	
DIESEL RANGE ORGANICS (DRO) STANDARDS				
UST Modified Diesel Range Organics (DRO)	10 analytes, 1000µg/mL each in hexane n-Decane, n-Dodecane, n-Tetradecane, n-Hexadecane, n-Octadecane, n-Eicosane, n-Docosane, n-Tetracosane, n-Hexacosane, n-Octacosane	1mL	48166	
Internal Standard or Surrogate Standard for Diesel 1-Chlorooctadecane	10,000µg/mL in methylene chloride	1mL	47584-U	
Surrogate Standard for Diesel 2-Fluorobiphenyl	10,000µg/mL in methylene chloride	1mL	47581-U	
Surrogate Standard o-Terphenyl	2000µg/mL in acetone 10,000µg/mL in methylene chloride	1mL 1mL	48169 47580-U	
Internal Standard for DRO 5-α-Androstane	2000µg/mL in methylene chloride	1mL	48168	
INDIVIDUAL FUEL STANDARDS				
Aviation Gasoline■	20,000µg/mL in methanol	1mL	47531-U	
Gasoline■	20,000µg/mL in methanol	1mL	47516-U	
Jet (Turbine) Fuel■	20,000µg/mL in methanol	1mL	47533-U	
JP-4 Military Fuel Standard	10,000µg/mL in methylene chloride	1mL	47585-U	
JP-5 Military Fuel Standard	10,000µg/mL in methylene chloride	1mL	47586-U	
JP-8 Military Fuel Standard	10,000µg/mL in methylene chloride	1mL	47587-U	
Kerosene Reference Standard	50,000µg/mL in hexane	1mL	47517-U	
No. 1 Fuel Oil■	20,000µg/mL in methanol	1mL	47518-U	
No. 2 Fuel Oil■	20,000µg/mL in methanol	1mL	47515-U	
No. 3 Fuel Oil■	50,000µg/mL in hexane	1mL	47534-U	
No. 4 Fuel Oil■	50,000µg/mL in hexane	1mL	47535-U	
No. 6 Fuel Oil	20,000µg/mL in hexane:chloroform (50:50)	1mL	47536-U	
STATE-SPECIFIC PETROLEUM METHOD STANDARDS				
Connecticut n-Hydrocarbon Mix	15 analytes, 1000µg/mL each in methylene chloride:carbon disulfide (85:15) n-Decane, n-Docosane, n-Dodecane, n-Dotriacontane, n-Eicosane, n-Hexacosane, n-Hexadecane, n-Hexatriacontane, n-Nonane, n-Octacosane, n-Octadecane, n-Tetracosane, n-Tetradecane, n-Tetratriacontane, n-Triacontane	1mL	46827-U	
Florida n-Hydrocarbons Mix	17 analytes, 1000µg/mL each in methylene chloride:carbon disulfide (50:50) n-Octane, n-Decane, n-Dodecane, n-Tetradecane, n-Hexadecane, n-Octadecane, n-Eicosane, n-Docosane, n-Tetracosane, n-Hexacosane, n-Octacosane, n-Triacontane, n-Dotriacontane, n-Tetratriacontane, n-Hexatriacontane, n-Octatriacontane, n-Tetracontane	1mL	46855-U	

■ Refinery grade.

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MISA Analyses

The Ontario Ministry of the Environment has established monitoring of wastewater discharges by nine industrial sectors as part of the Municipal/Industrial Strategy for Abatement (MISA) program. Analytes that must be monitored under MISA regulations include 34 volatile and 70 semivolatile organic compounds. Because analyses of these compounds at low levels in waste effluents can be complex, high quality standards are essential for routine daily calibration of instruments. We have developed these analytical standards for analytes monitored under the May 1990 MISA regulations.

MIXES AND SOLUTIONS	COMPOSITION			QTY.	CAT. NO.	PRICE
MISA GROUP 16 – HALOGENATED VOLATILE ORGANICS						
MISA Group 16 Mix	2000µg/mL each in methanol			1mL	48132	
	Bromoform	1,4-Dichlorobenzene	1,2-Dibromoethane			
	Carbon tetrachloride	1,1-Dichloroeth ane	1,1,2,2-Tetrachloroethane			
	Chlorobenzene	1,2-Dichloroethane	Tetrachloroethylene			
	Chloroform	cis-Dichl oropropene	1,1,2-Trichloroethane			
	1,2-Dichlorobenzene	trans-Dichloropropene	Trichloroethylene			
	1,3-Dichlorobenzene	1,2-Dichloropropane				
Volatile Organic Compounds Mix 5 SS	6 analytes, 2000µg/mL each in methanol			1mL 1mL	48797 4S8797	
	Bromodichloromethane	cis-1,2-Dichloroethylene	Dichloromethane			
	Dibromochloromethane	1,1-Dichloroethylene	trans-1,2-Dichloropropylene			
Volatile Organic Compounds Mix 6 SS	6 analytes, 2000µg/mL each in methanol			1mL 1mL	48799-U 4S8799	
	Bromomethane	Chloromethane	Trichlorofluoromethane			
	Chloroethane	Dichlorodifluoromethane	Vinyl chloride			
MISA GROUP 17 – NONHALOGENATED ORGANICS						
MISA Group 17 Mix	7 analytes, 2000µg/mL each in methanol			1mL	48133	
	Benzene	Toluene	o-Xylene			
	Ethylbenzene	m-Xylene	p-Xylene			
	Styrene					
MISA GROUP 18 – WATER SOLUBLE VOLATILE COMPOUNDS						
Acrolein	Neat			5g	48501	
Acrylonitrile	Neat			5g	48502	
MISA GROUP 19 – BASE/NEUTRAL EXTRACTABLES						
MISA Group 19 Mix B	12 analytes, 2000µg/mL each in methylene chloride			1mL	48135	
	Butyl benzyl phthalate	2,6-Dinitrotoluene	Indole			
	Biphenyl	Di-n-butyl phthalate	N-nitrosodi-n-propylamine			
	Bis(2-ethylhexyl)phthalate	Di-n-octyl phthalate	N-nitrosodiphenylamine			
	2,4-Dinitrotoluene	Diphenyl ether	Perylene			
TCL Polynuclear Aromatic Hydrocarbon Mix SS	16 analytes, 2000µg/mL each in methylene chloride:benzene (50:50)			1mL 1mL	48905-U 4S8905	
	Acenaphthene	Benzo(ghi)perylene	Fluorene			
	Acenaphthylene	Benzo(a)pyrene	Indeno(1,2,3-cd)pyrene			
	Anthracene	Chrysene	Naphthalene			
	Benzo(a)anthracene	Dibenzo(a,h)anthracene	Phenanthrene			
	Benzo(b)fluoranthene	Fluoranthene	Pyrene			
	Benzo(k)fluoranthene					
MISA GROUP 20 – PHENOLIC EXTRACTABLES						
MISA Phenols Group 20 Mix A	10 analytes, 2000µg/mL each in methanol			1mL	48130-U	
	o-Cresol	4,6-Dinitro-o-cresol	2,3,4-Trichlorophenol			
	p-Cresol	2,3,4,6-Tetrachlorophenol	2,3,5-Trichlorophenol			
	2,6-Dichlorophenol	2,3,5,6-T etrachlorophenol	2,4,5-Trichlorophenol			
	2,4-Dimethylphenol					
MISA Phenols Group 20 Mix B	10 analytes, 2000µg/mL each in methanol			1mL	48131	
	p-Chloro-m-cresol	2,4-Dinitrophenol	Phenol			
	2-Chlorophenol	4-Nitrophenol	2,3,4,5-Tetrachlorophenol			
	m-Cresol	Pentachlorophenol	2,4,6-Trichlorophenol			
	2,4-Dichlorophenol					

SS Separate Source standards. Prepared from independently sourced raw materials and quality controlled independently.

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Chemical Standards

SUPELCO

International Standards
Canada

MISA Analyses

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
MISA GROUP 22 – ORGANOCHLORINE PESTICIDES				
TCL Pesticides Mix SS	18 analytes, 2000µg/mL each in toluene:hexane (50:50) Aldrin, α-BHC, β-BHC, γ-BHC (Lindane), δ-BHC, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Dieldrin, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin aldehyde, Endrin ketone, Heptachlor, Heptachlor epoxide, Methoxychlor	1mL 1mL	48913 4S8913	
Hexachlorobenzene	Neat	1000mg	48508	
Hexachlorobenzene	1000µg/mL in acetone	1mL	40008	
Mirex	Neat	500mg	49057	
Oxychlordane	inquire			
MISA GROUP 23 – CHLORINATED HYDROCARBONS				
MISA Group 23 Mix	11 analytes, 2000µg/mL each in methylene chloride Hexachlorobenzene, Hexachlorobutadiene, Hexachlorocyclopentadiene, Hexachloroethane, Pentachlorobenzene, 1,2,3,4-Tetrachlorobenzene, 1,2,3,5-Tetrachlorobenzene, 1,2,4,5-Tetrachlorobenzene, 1,2,3-Trichlorobenzene, 1,2,4-Trichlorobenzene, 2,4,5-Trichlorotoluene	1mL	48136	
MISA GROUP 27 – POLYCHLORINATED BIPHENYLS				
Aroclor 1016	200µg/mL in methanol	1mL	48701	
Aroclor 1221	200µg/mL in methanol	1mL	48705	
Aroclor 1232	200µg/mL in methanol	1mL	48702	
Aroclor 1242	200µg/mL in methanol	1mL	48706	
Aroclor 1248	200µg/mL in methanol	1mL	48703	
Aroclor 1254	200µg/mL in methanol	1mL	48707	
Aroclor 1260	200µg/mL in methanol	1mL	48704	
PCB Kit 3	Each of the Aroclor mixtures listed above		48825	
PCB Kit – High	6 individual 1mL solutions, 1000µg/mL each in isooctane Aroclor 1232, Aroclor 1242, Aroclor 1248, Aroclor 1254, Aroclor 1260, Aroclor 1262		44803	
PCB Kit – Low	6 individual 1mL solutions, 1µg/mL each in isooctane Aroclor 1232, Aroclor 1242, Aroclor 1248, Aroclor 1254, Aroclor 1260, Aroclor 1262		44804	
SINGLE COMPONENT STANDARDS FOR MISA ANALYSES				
Biphenyl	2000µg/mL in methanol	1mL	48161	
1-Chloronaphthalene	2000µg/mL in methanol	1mL	48159	
Diphenyl ether	2000µg/mL in methanol	1mL	48155	
Indole	2000µg/mL in methanol	1mL	48157	
1-Methylnaphthalene	2000µg/mL in methanol	1mL	48162	
1,2,3,4-Tetrachlorobenzene	2000µg/mL in methanol	1mL	48158	
1,2,3,5-Tetrachlorobenzene	2000µg/mL in methanol	1mL	48156	
2,3,4,5-Tetrachlorophenol	2000µg/mL in methanol	1mL	48153	
2,3,5,6-Tetrachlorophenol	2000µg/mL in methanol	1mL	48152	
2,3,4-Trichlorophenol	2000µg/mL in methanol	1mL	48154	
2,4,5-Trichlorotoluene	2000µg/mL in methanol	1mL	48150	
CEN PCB Congener Mix-1	12 analytes, 10µg/mL each in heptane 2,2´,5-Trichlorobiphenyl, 2,4´,5-Trichlorobiphenyl, 2,4,4´-Trichlorobiphenyl, 2,2´,5,5´-Tetrachlorobiphenyl, 2,2´,3,5´-T etrachlorobiphenyl, 2,2´,4,5,5´-Pentachlorobiphenyl, 2,3´,4,4´,5-Pentachlorobiphenyl, 2,2´,3,4,4´,5´,6-Hexachlorobiphenyl, 2,2´,4,4´,5,5´-Hexachlorobiphenyl, 2,2´,3,4,4´,5´-Hexachlorobiphenyl, 2,2´,3,4,4´,5,5´-Heptachlorobiphenyl, 2,2´,3,3´,4,4´,5,5´-Octachlorobiphenyl	1mL	47927	

Quebec Ministry of Environmental PAH Mix

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
PAH Mix	23 analytes, 500µg/mL each in methylene chloride:benzene (75:25) Acenaphthene, Acenaphthylene, Anthracene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(j)fluoranthene, Benzo(k)fluoranthene, Benzo(ghi)perylene, Benzo(c)phenanthrene, Benzo(a)pyrene, Chrysene, Dibenzo(a,h)anthracene, Dibenzo(a,h)pyrene, Dibenzo(a,i)pyrene, Dibenzo(a,l)pyrene, 7,12-Dimethylbenz(a)anthracene, Fluoranthene, Fluorene, Indeno(1,2,3-cd)pyrene, 3-Methylcholanthrene, Naphthalene, Phenanthrene, Pyrene	1mL	502065	

SS Separate Source standards. Prepared from independently sourced raw materials and quality controlled independently.

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International Standards
Europe, Korea

European Mixes

DNPH Mixes – the following dinitrophenylhydrazine (DNPH) standards were developed in response to European requests for working and calibration check standards for the ambient air analysis of carbonyl emissions from automobile exhaust. Methods for this analysis are equivalent to California Air Resources Board 1004 (Sacramento, CA, USA). Concentrations are of the equivalent carbonyl quantity before derivatization. The Certificate of Analysis accompanying each of these products states both DNPH-derivatized and non-derivatized concentrations.

PAH Mix – The PAH Calibration Mix (Cat. No. 47940-U) was developed for determining polynuclear aromatic hydrocarbons (PAHs) by HPLC, using fluorescence detection, for the following methods:

DIN Method 38407, part 8 (for PAHs in drinking water, groundwater, and surface water)

DIN NAW (Normenausschuss Wasserwesen) working group draft method DIN 38407, part 18 (for PAHs in water)

DIN 38414, part 21, draft method (for PAHs in sediment and sludge)

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
Carbonyl-DNPH Mix 1	13 analytes, 20µg/mL each (aldehyde equivalent) in acetonitrile, except where indicated Acetaldehyde-DNPH, Acetone-DNPH, Acrolein-DNPH, Benzaldehyde-DNPH, Butanone-DNPH, n-Butyraldehyde-DNPH, Crotonaldehyde-DNPH, Formaldehyde-DNPH (40µg/mL), Hexaldehyde-DNPH, Methacrolein-DNPH, Propionaldehyde-DNPH, p-Tolualdehyde-DNPH, Valeraldehyde-DNPH	1mL	47672-U	
Carbonyl-DNPH Mix 2	14 analytes, 2µg/mL each (aldehyde equivalent) in acetonitrile, except where indicated Acetaldehyde-DNPH, Acetone-DNPH, Acrolein-DNPH, Benzaldehyde-DNPH, 2-Butanone-DNPH, n-Butyraldehyde-DNPH, Crotonaldehyde-DNPH, Cyclohexanone-DNPH (5µg/mL), Formaldehyde-DNPH (4µg/mL), Hexaldehyde-DNPH, Methacrolein-DNPH, Propionaldehyde-DNPH, p-Tolualdehyde-DNPH, Valeraldehyde-DNPH	1mL	47671-U	
Cyclohexanone-DNPH	500µg/mL in acetonitrile	1mL	47673-U	
PAH MIX				
PAH Calibration Mix	16 analytes, 10µg/mL each in acetonitrile Acenaphthene, Acenaphthylene, Anthracene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(ghi)perylene, Benzo(a)pyrene, Chrysene, Dibenzo(a,h)anthracene, Fluoranthene, Fluorene, Indeno(1,2,3-cd)pyrene, Naphthalene, Phenanthrene, Pyrene	1mL	47940-U	

Korean Drinking Water Regulations

The following products were introduced to support laboratories conducting drinking water analyses under Korean Drinking Water Regulations (KDWR).

Korean calibration reference standards are quantitative mixtures of volatile organic chemicals and pesticides of known concern. These formulations are intended for the calibration of a gas chromatographic system equipped with a capillary column and appropriate detector. Products are packaged in amber ampuls to prevent photodegradation and solvent or analyte loss. Five ampules are packaged per product. Each product includes a Certificate of Analysis stating the lot-dependent gravimetric and quality inspection data.

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
KDWR VOC Mix A	17 analytes, 100µg/mL each in methanol Benzene, Bromodichloromethane, Bromoform, Carbon tetrachloride, Chloroform, Dibromochloromethane, 1,1-Dichloroethene, Ethylbenzene, Methylene chloride, Phenol, Tetrachloroethylene, Toluene, 1,1,1-Trichloroethane, Trichloroethylene, m-Xylene, o-Xylene, p-Xylene	5 x 1mL	506575	
KDWR VOC Mix B■	10 analytes, 100µg/mL each in methanol Bromodichloromethane, Bromoform, Carbon tetrachloride, Chloroform, Dibromochloromethane, 1,1-Dichloroethene, Methylene chloride, Tetrachloroethylene, 1,1,1-Trichloroethane, Trichloroethylene	5 x 1mL	506583	
KDWR Pesticides Mix	5 analytes, 1000µg/mL each in methanol Carbaryl, Diazinon, Fenitrothion, Malathion, Parathion	5 x 1mL	47627-U	

■Designed for the most recent Korean water regulations.

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Other Environmental Standards
PCB Mixes

Miscellaneous Standards

MIXES AND SOLUTIONS	COMPOSITION			QTY.	CAT. NO.	PRICE
PCB MIXES						
CEN PCB Congener Mix-1	12 analytes, 10µg/mL each in heptane			1mL	47927	
	2,2´,5-Trichlorobiphenyl	2,2´,3,5´-T etrachlorobiphenyl	2,2´,4,4´,5,5´-Hexachlorobiphenyl			
	2,4´,5-Trichlorobiphenyl	2,2´,4,5,5´-Pentachlorobiphenyl	2,2´,3,4,4´,5´-Hexachlorobiphenyl			
	2,4,4´-Trichl orobiphenyl	2,3´,4,4´,5-Pentachlorobiphenyl	2,2´,3,4,4´,5,5´-Heptachlorobiphenyl			
	2,2´,5,5´-Tetrachl orobiphenyl	2,2´,3,4´,5´,6-Hexachlorobiphenyl	2,2´,3,3´,4,4´,5,5´-Octachlorobiphenyl			
PCB Congener Mix 1	6 analytes, 10µg/mL each in isooctane			10mL	47330-U	
	2,6-Dichlorobiphenyl	2,2',5,5'-Tetrachl orobiphenyl	2,2'4,4'5,5'-Hexachlorobiphenyl			
	2,4,4'-Trichlorobiphenyl	2,2'3,4,4 ',5'-Hexachlorobiphenyl	2,2',3,4,4'5,5'-Heptachlorobiphenyl			
Aroclor 1016	1000µg/mL in isooctane		RDaR	1mL	48097	
Aroclor 1221	1000µg/mL in isooctane		RDaR	1mL	48098	
Aroclor 1232	1000µg/mL in isooctane		RDaR	1mL	44805	
Aroclor 1242	1000µg/mL in isooctane		RDaR	1mL	44806	
Aroclor 1248	1000µg/mL in isooctane		RDaR	1mL	44807	
Aroclor 1254	1000µg/mL in isooctane		RDaR	1mL	44808	
Aroclor 1260	1000µg/mL in isooctane		RDaR	1mL	44809	
Aroclor 1262	1000µg/mL in isooctane		RDaR	1mL	44810	
Pesticide-HC Calibration Standards Kit	1mL of each of the following products				48114	
	Aroclor 1016 (48097)	Aroclor 1248 (44807)	Chlordane (48065)			
	Aroclor 1221 (48098)	Aroclor 1254 (44808)	Toxaphene (48103)			
	Aroclor 1232 (44805)	Aroclor 1260 (44809)	TCL Pesticides Mix (48913)			
	Aroclor 1242 (44806)	Aroclor 1262 (44810)				
PCB Kit – High	6 individual 1mL solutions, 1000µg/mL each in isooctane				44803	
	Aroclor 1232	Aroclor 1248	Aroclor 1260			
	Aroclor 1242	Aroclor 1254	Aroclor 1262			
PCB Kit – Low	6 individual 1mL solutions, 1µg/mL each in isooctane				44804	
	Aroclor 1232	Aroclor 1248	Aroclor 1260			
	Aroclor 1242	Aroclor 1254	Aroclor 1262			
Aroclor 1016	200µg/mL in methanol			1mL	48701	
Aroclor 1221	200µg/mL in methanol			1mL	48705	
Aroclor 1232	200µg/mL in methanol			1mL	48702	
Aroclor 1242	200µg/mL in methanol			1mL	48706	
Aroclor 1248	200µg/mL in methanol			1mL	48703	
Aroclor 1254	200µg/mL in methanol			1mL	48707	
Aroclor 1260	200µg/mL in methanol			1mL	48704	
PCB Kit 3	Each of the Aroclor mixtures listed above				48825	
Aroclor Mix 1	4 analytes, 200µg/mL each in methanol			1mL	48861	
	Aroclor 1016	Aroclor 1248	Aroclor 1260			
	Aroclor 1232					
Aroclor Mix 2	3 analytes, 200µg/mL each in methanol			1mL	48862	
	Aroclor 1221	Aroclor 1242	Aroclor 1254			
DCMA PCB Mixture	10 analytes in hexane			2 x 5mL	48596-U	
	Use this qualitative mix of isomers for identifying PCBs in pigments and other materials. Prepared according to Dry Colors Manufacturers' Association specifications.					
	2-Chlorobiphenyl, 100µg/mL	2,2',3,3',6,6'-Hexachlorobiphenyl, 10µg/mL				
	3,3'-Dichlorobiphenyl , 100µg/mL	2,2',3,4',5,5',6-Heptachlorobiphenyl, 5µg/mL				
	2,4,5-Trichlorobiphenyl, 10µg/mL	2,2',3,3',4,4',5,5'-Octachlorobiphenyl, 5µg/mL				
	2,2',4,4'-Tetrachlorobiphenyl, 10µg/mL	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl, 5µg/mL				
	2,3',4,5',6-Pentachlorobiphenyl, 10µg/mL	2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl, 5µg/mL				
Transformer Oil (PCB-free)				50mL	46956	
				250mL	40900-U	

RDaR Product is tested under Reciprocal Data Review agreement with Absolute Standards Inc. (Hamden, CT, USA)

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Other Environmental Standards
PCB Mixes, Semivolatiles and Pesticides

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
PCB Congener Mix 1	6 analytes, 10µg/mL each in isooctane 2,6-Dichlorobiphenyl; 2,2',5,5'-Tetrachlorobiphenyl; 2,2'4,4'5,5'-Hexachlorobiphenyl 2,4,4'-Trichlorobiphenyl; 2,2'3,4,4',5'-Hexachlorobiphenyl; 2,2',3,4,4'5,5'-Heptachlorobiphenyl	10mL	47330-U	
CEN PCB Congener Mix-1	12 analytes, 10µg/mL each in heptane 2,2´,5-Trichlorobiphenyl; 2,2´,4,5,5´-Pentachlorobiphenyl; 2,2´,4,4´,5,5´-Hexachlorobiphenyl 2,4´,5-Trichlorobiphenyl; 2,3´,4,4´,5-Pentachlorobiphenyl; 2,2´,3,4,4´,5´-Hexachlorobiphenyl 2,4,4´-Trichlorobiphenyl; 2,2´,3,4,4´,5,5´-Heptachlorobiphenyl 2,2´,5,5´-Tetrachlorobiphenyl; 2,2´,3, 3´,4,4´,5,5´-Octachlorobiphenyl 2,2´,3,5´-Tetrachlorobiphenyl; 2,2´,3,4´,5´,6-Hexachlorobiphenyl	1mL	47927	
SEMIVOLATILE COMPOUNDS				
Phenols Kit	45 individually packaged analytes (1g each unless noted otherwise) Purity 96+%. 2-Bromophenol; 3,4-Dichlorophenol; 4-Methylphenol 3-Bromophenol; 3,5-Dichlorophenol; 2-Nitrophenol 4-Bromophenol; 2,3-Dimethylphenol; 3-Nitrophenol 2-Chloro-5-methylphenol; 2,4-Dimethylphenol, 0.5g; 4-Nitrophenol 4-Chloro-2-methylphenol; 2,5-Dimethylphenol; Pentachlorophenol 4-Chloro-3-methylphenol, 5g; 2,6-Dimethylphenol; Phenol 2-Chlorophenol, 5g; 3,4-Di methylphenol; 2,3,4-Trichlorophenol 3-Chlorophenol; 3,5-Dimethylphenol; 2,3,5-Trichlorophenol 4-Chlorophenol; 2,5-Dinitrophenol; 2,3,6-Trichlorophenol 2,4-Dibromophenol; 3,4-Dinitrophenol; 2,4,5-Trichlorophenol 2,6-Dibromophenol; 2-Ethylphenol; 2,4,6-Trichlorophenol, 5g 2,3-Dichlorophenol; 3-Ethylphenol; 3,4,5-Trichlorophenol, 25mg 2,4-Dichlorophenol, 5g; 4-Ethylphenol; 2,3,5-Trimethylphenol 2,5-Dichlorophenol; 2-Methylpheno l; 2,3,6-Trimethylphenol 2,6-Dichlorophenol; 3-Methylpheno l; 2,4,6-Trimethylphenol		44578-U	
Polynuclear Aromatic Hydrocarbons Mix	10 analytes, 500µg/mL each in toluene Anthracene; Chrysene; Phenanthrene Benzo(a)anthracene; Fluoranthene; Pyrene Benzo(a)pyrene; Perylene; Triphenylene Benzo(e)pyrene	1mL	49155	
MISCELLANEOUS PESTICIDES				
Pesticides Concentrated Solutions Kit	13 individual solutions, 200µg/mL each in isooctane Aldrin; 4,4´-DDE; Endrin γ-BHC (Lindane); 2,4´-DDT; Heptachlor Chlordane; 4,4´-DDT; Heptachlor epoxide 2,4´-DDD; Dieldrin; Methoxychlor 4,4´-DDD		48998	
Triazine Pesticides Standard Mix	7 analytes, 100µg/mL each in methanol Ametryn; Prometon; Simazine Atrazine; Propazine; Terbutryn Prometryn	1mL	48392	
Neat Triazine Pesticides Kit	7 individually packaged pesticides, 100mg each Ametryn; Prometon; Simazine Atrazine; Propazine; Terbutryn Prometryn		49092	
Organophosphorus Pesticides Mix A	8 analytes, 2000µg/mL each in hexane:acetone (9:1) Chlorpyrifos (Dursban); Ethoprophos (MOCAP); Methyl parathion Dichlorvos; Fenchlorvos (Ronnel); Prothiofos (Tokuthion) Disulfoton; Guthion	1mL	48391	
Chlorinated Pesticides Mix	13 analytes at indicated concentrations in isooctane Aldrin, 50µg/mL; 4,4´-DDD, 190µg/mL; Dieldrin, 120µg/mL α-BHC, 25µg/mL; 4,4´-DDE, 100µg/mL; Endrin, 200µg/mL β-BHC, 100µg/mL; 2,4´DDT, 225µg/mL; Heptachlor, 25µg/mL γ-BHC (Lindane), 25µg/mL; 4,4'-DDT, 260µg/mL; Heptachlor epoxide, 80µg/mL 2,4'-DDD 200µg/mL	1mL 5 x 1mL	47557-U 49151	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



Air Monitoring Standards
NIOSH and OSHA Methods

NIOSH and OSHA Methods for Workplace Atmospheres

The following standards are for use with methods listed in OSHA and NIOSH manuals of methods for analysis of workplace contaminants. The standards are quantitative formulations for use as chromatographic calibration or spiking solutions. Products include Certificate of Analysis describing lot-specific production and analytical information. Free data packets containing data on raw materials and final production are available for most of these products. Request the data packet when ordering the standard; the order number is the same as that for the standard, preceded by the letters DP.

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
NIOSH 2501 / OSHA 52 METHOD DESCRIPTION: ANALYSIS OF ACROLEIN IN INDOOR AIR				
Acrolein	Neat	5000mg	48501	
NIOSH 2001 / OSHA 32 METHOD DESCRIPTION: ANALYSIS OF CRESOL IN INDOOR AIR				
o-Cresol	5000µg/mL in methanol	1mL	40250-U	
m-Cresol	5000µg/mL in methanol	1mL	40251-U	
p-Cresol	5000µg/mL in methanol	1mL	40252-U	
NIOSH 5519 METHOD DESCRIPTION: ANALYSIS OF ENDRIN IN INDOOR AIR				
Endrin	Neat	100mg	49032	
NIOSH 2541 / OSHA 52 METHOD DESCRIPTION: ANALYSIS OF FORMALDEHYDE IN INDOOR AIR				
Formaldehyde Oxazolidine	2000µg/mL in toluene	1mL	48414	
OSHA 42, OSHA 47 METHOD DESCRIPTION: ANALYSIS OF ISOCYANATES IN INDOOR AIR				
	Individual solutions, 1000µg/mL in dimethyl sulfoxide			
N,N'-(2-Methyl-1,3-phenylene)bis[4-(2-pyridinyl)-1-piperazinecarboxyamide] (derivative of 2,6-TDIP)		1mL	48144	
N,N'-(4-Methyl-1,3-phenylene)bis[4-(2-pyridinyl)-1-piperazinecarboxyamide] (derivative of 2,4-TDIP)		1mL	48145	
N,N'-1,6-Hexanediylbis[4-(2-pyridinyl)-1-piperazinecarboxyamide] (derivative of 1,6-HDIP)		1mL	48146	
N,N'-(Methylenediphenylene)bis[4-(2-pyridinyl)-1-piperazinecarboxyamide] (derivative of 4,4´-MDIP)		1mL	48147	
OSHA 80 METHOD DESCRIPTION: ANALYSIS OF METHYLENE CHLORIDE IN INDOOR AIR				
Methylene Chloride	Neat	5000mg	48538	
NIOSH 2005 METHOD DESCRIPTION: ANALYSIS OF NITROBENZENES IN INDOOR AIR				
Nitrobenzene	5000µg/mL in methanol	1mL	40054	
OSHA 32 METHOD DESCRIPTION: ANALYSIS OF PHENOL IN INDOOR AIR				
Phenol	500µg/mL in methanol	1mL	48688	
	5000µg/mL in methanol	1mL	40063	
NIOSH 5503 METHOD DESCRIPTION: ANALYSIS OF PCBS IN INDOOR AIR				
Aroclor Mix 1	4 analytes, 200µg/mL each in methanol Aroclor 1016, Aroclor 1248, Aroclor 1260, Aroclor 1232	1mL	48861	
Aroclor Mix 2	3 analytes, 200µg/mL each in methanol Aroclor 1221, Aroclor 1242, Aroclor 1254	1mL	48862	
NIOSH 5506, 5515 METHOD DESCRIPTION: ANALYSIS OF PAHS IN INDOOR AIR				
EPA 610 Polynuclear Aromatic Hydrocarbons Mixture SS	16 analytes at indicated concentrations in methanol:methylene chloride (50:50) Acenaphthene, 1000µg/mL; Acenaphthylene, 2000µg/mL; Anthracene, 100µg/mL; Benzo(a)anthracene, 100µg/mL; Benzo(a)pyrene, 100µg/mL; Benzo(b)fluoranthene, 200µg/mL; Benzo(k)fluoranthene, 100µg/mL; Benzo(ghi)perylene, 200µg/mL; Chrysene, 100µg/mL; Dibenzo(a,h)anthracene, 200µg/mL; Fluoranthene, 200µg/mL; Fluorene, 200µg/mL; Indeno(1,2,3-cd)pyrene, 100µg/mL; Naphthalene, 1000µg/mL; Phenanthrene, 100µg/mL; Pyrene, 100µg/mL	1mL 1mL	48743 4S8743	
OSHA 51 METHOD DESCRIPTION: ANALYSIS OF VINYL ACETATE IN INDOOR AIR				
Vinyl Acetate	Neat	1000mg	48486	

SS Separate Source standards. Prepared from independently sourced raw materials and quality controlled independently.

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Air Monitoring Standards
US EPA IP Methods

Compendium of Methods for the Determination of Air Pollutants in Indoor Air (IP)

The following standards are for use with EPA document number EPA/600/4-90/010. The standards are quantitative formulations for use as chromatographic calibration or spiking solutions. Products include a Certificate of Analysis describing lot-specific properties and analytical information. Free data packets are available for these products. Data packets contain data on raw materials and final production. Request the data packet when ordering the standard; the order number is the same as that for the standard, preceded by the letters DP.

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
IP1 METHOD DESCRIPTION: ANALYSIS OF VOLATILE ORGANICS (BP 80-200C) IN INDOOR AIR BY GC/MS				
EPA TO-1 Toxic Organics Mix 1A	9 analytes, 2mg/mL each in methanol n-Heptane, Toluene, o-Xylene 1-Heptene, Ethylbenzene, m-Xylene Benzene, Isopropylbenzene (cumene), p-Xylene	1mL	48896	
EPA TO-1 Toxic Organics Mix 1B	14 analytes, 2mg/mL each in methanol Allyl chloride, Carbon tetrachloride, Bromoform Acrylonitrile, 1,2-Dichloropropane, Tetrachloroethylene Chloroform, Trichloroethylene, Chlorobenzene 1,2-Dichloroethane, 1,3-Dichloropropane, Bromobenzene 1,1,1-Trichloroethane, Ethylene dibromide	1mL	48897	
IP6 METHOD DESCRIPTION: ANALYSIS OF ALDEHYDES AND KETONES IN INDOOR AIR BY HPLC/UV				
TO11/IP-6A Aldehyde/ Ketone-DNPH Mix	15 analytes, 15µg/mL each (aldehyde equivalent) in acetonitrile Acetaldehyde-2,4-DNPH, 2,5-Dimethylbenzaldehyde-2,4-DNPH, m-Tolualdehyde-2,4-DNPH Acrolein-2,4-DNPH, Formaldehyde-2,4-DNPH, o-Tolualdehyde-2,4-DNPH Acetone-2,4-DNPH, Hexaldehyde-2,4-DNPH, p-Tolualdehyde-2,4-DNPH Benzaldehyde-2,4-DNPH, Isovaleraldehyde-2,4-DNPH, Valeraldehyde-2,4-DNPH Butyraldehyde-2,4-DNPH, Propionaldehyde-2,4-DNPH Crotonaldehyde-2,4-DNPH	1mL	47285-U	
IP7 METHOD DESCRIPTION: ANALYSIS OF POLYNUCLEAR AROMATIC HYDROCARBONS IN INDOOR AIR BY GC/FID AND HPLC/UV				
EPA 610 Polynuclear Aromatic Hydrocarbons Mix SS	16 analytes at indicated concentrations in methanol:methylene chloride (50:50) Acenaphthene, 1000µg/mL, Benzo(ghi)perylene, 200µg/mL, Indeno(1,2,3-cd)pyrene, 100µg/mL Acenaphthylene, 2000µg/mL, Benzo(a)pyrene, 100µg/mL, Naphthalene, 1000µg/mL Anthracene, 100µg/mL, Chrysene, 100µg/mL, Phenanthrene, 100µg/mL Benzo(a)anthracene, 100µg/mL, Dibenzo(a,h)anthracene, 200µg/mL, Pyrene, 100µg/mL Benzo(b)fluoranthene, 200µg/mL, Fluoranthene, 200µg/mL Benzo(k)fluoranthene, 100µg/mL, Fluorene, 200µg/mL	1mL 1mL	48743 4S8743	
IP8 METHOD DESCRIPTION: ANALYSIS OF ORGANOCHLORINE PESTICIDES IN INDOOR AIR BY GC/ECD				
EPA Pesticide Mix	16 analytes at indicated concentrations in methanol:methylene chloride (98:2) Aldrin, 10µg/mL, 4,4'-DDE, 20µg/mL, Endosulfan sulfate, 60µg/mL α-BHC, 10µg/mL, 4,4'-DDT, 60µg/mL, Endrin, 20µg/mL β-BHC, 10µg/mL, Dieldrin, 20µg/mL, Endrin aldehyde, 60µg/mL γ-BHC (Lindane), 10µg/mL, Endosulfan I, 20µg/mL, Heptachlor, 10µg/mL δ-BHC, 10µg/mL, Endosulfan II, 20µg/mL, Heptachlor epoxide isomer B, 10µg/mL 4,4'-DDD, 60µg/mL	1mL	48858-U	

SS Separate Source standards. Prepared from independently sourced raw materials and quality controlled independently.

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



Air Monitoring Standards
ASTM Methods

American Society for Testing and Materials (ASTM) Methods

The following standards are use with methods developed under ASTM Committee D-22, described in the Annual Book of ASTM Methods, Volume 11.03, Atmospheric Analysis, Occupational Health and Safety. The standards are quantitative formulations for use as chromatographic calibration or spiking solutions. Products include a Certificate of Analysis describing lot-specific production and analytical information. Free data packets are available for most of these products. Data packets contain data on raw materials and final production. Request the data packet when ordering the standard; the order number is the same as that for the standard, preceded by the letters DP.

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
ASTM D4861 METHOD DESCRIPTION: ANALYSIS OF PCBS IN AIR				
Aroclor Mix 1	4 analytes, 200µg/mL each in methanol Aroclor 1016 · Aroclor 1248 · Aroclor 1260 Aroclor 1232	1mL	48861	
Aroclor Mix 2	3 analytes, 200µg/mL each in methanol Aroclor 1221 · Aroclor 1242 · Aroclor 1254	1mL	48862	
ASTM 4947 METHOD DESCRIPTION: ANALYSIS OF CHLORDANE AND HEPTACHLOR IN AIR				
Chlordane	200µg/mL in isooctane	1mL	47554-U	
	200µg/mL in isooctane	10mL	48984	
	1000µg/mL in isooctane	1mL	48065-U	
Heptachlor	200µg/mL in isooctane	10mL	48964	
ASTM 5197 METHOD DESCRIPTION: ANALYSIS OF ALDEHYDES IN AIR				
TO11/IP-6A Aldehyde/ Ketone-DNPH Mix	15 analytes, 15µg/mL each (aldehyde equivalent) in acetonitrile Acetaldehyde-2,4-DNPH · Crotonaldehyde-2,4-DNPH · Propionaldehyde-2,4-DNPH Acrolein-2,4-DNPH · 2,5-Dimethylbenzaldehyde-2,4-DNPH · m-Tolualdehyde-2,4-DNPH Acetone-2,4-DNPH · o-Tolualdehyde-2,4-DNPH Benzaldehyde-2,4-DNPH · Formaldehyde-2,4-DNPH · p-Tolualdehyde-2,4-DNPH Butyraldehyde-2,4-DNPH · Hexaldehyde-2,4-DNPH · Valeraldehyde-2,4-DNPH Isovaleraldehyde-2,4-DNPH	1mL	47285-U	
ASTM 5578 METHOD DESCRIPTION: ANALYSIS OF ETHYLENE OXIDE IN AIR				
2-Bromoethanol	2000µg/mL in toluene	1mL	48874	
ASTM D5836 METHOD DESCRIPTION: STANDARD TEST METHOD FOR DETERMINATION OF 2,4-TDI AND 2,6-TDI IN WORKPLACE ATMOSPHERES				
	Individual solutions, 1000µg/mL in dimethyl sulfoxide			
N,N'-(2-Methyl-1,3-phenylene)bis[4-(2-pyridinyl)-1-piperazinecarboxyamide] (derivative of 2,6-TDIP)		1mL	48144	
N,N'-(4-Methyl-1,3-phenylene)bis[4-(2-pyridinyl)-1-piperazinecarboxyamide] (derivative of 2,4-TDIP)		1mL	48145	
N,N'-1,6-Hexanediylbis[4-(2-pyridinyl)-1-piperazinecarboxyamide] (derivative of 1,6-HDIP)		1mL	48146	
N,N'-(Methylenediphenylene)bis[4-(2-pyridinyl)-1-piperazinecarboxyamide] (derivative of 4,4´-MDIP)		1mL	48147	

RELATED INFORMATION

Order ASTM methods from:

ASTM (American Society for Testing and Materials)
100 Barr Harbor Drive
Conshohocken, PA 19428 USA
(phone 610-832-9500, fax 610-832-9555)

Order OSHA methods from:

AC GIH, Publications Section
6500 Glenway Avenue, Building D7
Cincinnati, OH 45211 USA
(phone 513-742-2020, FAX 513-742-3355)
organic methods - order number 4542
inorganic methods - order number 4545

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Air Monitoring Standards for General Use

The following standards are suitable for use with a wide range of chromatographic air sample determinations. The standards are quantitative formulations. Products include a Certificate of Analysis describing lot-specific production and analytical information. Free data packets are available for most of these products. Data packets contain data on raw materials and final production. Request data packet when ordering the standard; the order number is the same as that for the standard, preceded by the letters DP.

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
Acetone	2000µg/mL in methanol:water (90:10)	1mL	48358	
2-Butanone	2000µg/mL in methanol:water (90:10) For monitoring airborne methyl ethyl ketone	1mL	48877	
Ethylene Oxide	50mg/mL in methylene chloride	1mL	48891	
	2000µg/mL in methylene chloride	1mL	47949	
	50mg/mL in methanol For monitoring airborne ethylene oxide	1mL	48838	
Formaldehyde Oxazolidine	2000µg/mL in toluene For monitoring ORBO 24 solvent desorption tubes	1mL	48414	
Freon 113	1000µg/mL in methanol	1mL	48411	
	2000µg/mL in methanol	1mL	47944	
Freon 123	1000µg/mL in methanol	1mL	48412	
Freon Mix	5 analytes, 10,000µg/mL each in ethyl acetate Freon 11 Freon 12 Freon 21 Freon 22 Freon 114/114A (mixed isomers)	1mL	48420-U	

RELATED INFORMATION

Ordering Information for Air Monitoring Methods
Order IP, TO, and/or NIOSH methods from:

NTIS
5285 Port Royal Road
Springfield, VA 22161 USA
(phone 703-487-4650)

Compendium of Methods for the Determination of Air Pollutants in Indoor Air (IP Methods)

NTIS order number
PB 90-200-288/AS (April 1990)

Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air (TO Methods)

NTIS order number
PB 90-127-374 (June 1988)

NIOSH Manual of Analytical Methods (4th supplement)

NTIS order number
PB 91-152-660 (August 1990)

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



Air Monitoring Standards
CARB Methods

Analysis of Carbonyls in Ambient Air

California Air Resources Board (CARB) –The following quantitative formulations were developed to support the analysis of aldehydes in ambient air by CARB Method 1004. Analysis is of the dinitrophenylhydrazine (DNPH) derivatives by HPLC-UV.

Concentrations stated are of the equivalent carbonyl before derivatization, except where noted. The Certificate of Analysis accompanying these products states both DNPH derivatized and non-derivatized concentrations.

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
CARB Method 1004 DNPH Mix 1	13 analytes, 3µg/mL each (aldehyde equivalent) in acetonitrile Acetaldehyde-DNPH, Acetone-DNPH, Acrolein-DNPH, Benzaldehyde-DNPH, 2-Butanone-DNPH, n-Butyraldehyde-DNPH, Crotonaldehyde-DNPH, Formaldehyde-DNPH, Hexaldehyde-DNPH, Methacrolein-DNPH, Propionaldehyde-DNPH, m-Tolualdehyde-DNPH, Valeraldehyde-DNPH	1mL	47650-U	
CARB Method 1004 DNPH Mix 2	13 analytes, 30µg/mL each (aldehyde equivalent) in acetonitrile Acetaldehyde-DNPH, Acetone-DNPH, Acrolein-DNPH, Benzaldehyde-DNPH, 2-Butanone-DNPH, n-Butyraldehyde-DNPH, Crotonaldehyde-DNPH, Formaldehyde-DNPH, Hexaldehyde-DNPH, Methacrolein-DNPH, Propionaldehyde-DNPH, m-Tolualdehyde-DNPH, Valeraldehyde-DNPH	1mL	47651-U	
CARB Carbonyl-DNPH Mix 1	7 analytes (DNPH-derivative) in acetonitrile at the quantities indicated Acetaldehyde-DNPH, 1000µg/mL; Acetone-DNPH, 500µg/mL; Acrolein-DNPH, 500µg/mL; Benzaldehyde-DNPH, 500µg/mL; n-Butyraldehyde-DNPH, 500µg/mL; Formaldehyde-DNPH, 1500µg/mL; Propionaldehyde-DNPH, 500µg/mL	1mL	47649-U	

Single Component Carbonyl-DNPH Solutions

These solutions of DNPH derivatives are designed as quantitative calibration mixtures where a multicomponent solution is not su itable. At concentration indicated in 1mL acetonitrile, in an amber glass ampul.

SOLUTIONS	CAT. NO.	PRICE
Acetaldehyde-2,4-DNPH, 1000µg/mL	47340-U	
Acetone-2,4-DNPH, 1000µg/mL	47341	
Acrolein-2,4-DNPH, 1000µg/mL	47342	
Benzaldehyde-2,4-DNPH, 100µg/mL	47343	
2-Butanone-2,4-DNPH, 100µg/mL	47344	
n-Butyraldehyde-2,4-DNPH, 1000µg/mL	47345-U	
Crotonaldehyde-2,4-DNPH, 100µg/mL	47175-U	
Cyclohexanone-DNPH, 5000µg/mL	47673-U	
2,5-Dimethylbenzaldehyde-2,4-DNPH, 100µg/mL	47176	

SOLUTIONS	CAT. NO.	PRICE
Formaldehyde-2,4-DNPH, 100µg/mL	47177	
Glutaraldehyde-DNPH, 100µg/mL	47564-U	
Hexaldehyde-2,4-DNPH, 1000µg/mL	47178-U	
Isobutyraldehyde-2,4-DNPH, 100µg/mL	47886	
Isovaleraldehyde-2,4-DNPH, 1000µg/mL	47179	
Methacrolein-2,4-DNPH, 100µg/mL	47180-U	
Propionaldehyde-2,4-DNPH, 1000µg/mL	47181	
o-Tolualdehyde-2,4-DNPH, 100µg/mL	47182	
m-Tolualdehyde-2,4-DNPH, 100µg/mL	47183	
p-Tolualdehyde-2,4-DNPH, 100µg/mL	47184-U	
Valeraldehyde-2,4-DNPH, 100µg/mL	47185-U	

Analysis of Automobile Exhaust

The following standards were developed in response to European requests for working and calibration check standards for ambient analysis of carbonyl emissions from auto exhaust. Methods for this analysis are equivalent to CARB 1004. Concentrations stated are of the equivalent carbonyl before derivatization. The Certificate of Analysis accompanying these products states both DNPH derivatized and non-derivatized concentrations.

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
Carbonyl-DNPH Mix 1	13 analytes, 20µg/mL each (aldehyde equivalent) in acetonitrile, except where indicated Acetaldehyde-DNPH, Acetone-DNPH, Acrolein-DNPH, Benzaldehyde-DNPH, Butanone-DNPH, n-Butyraldehyde-DNPH, Crotonaldehyde-DNPH, Formaldehyde-DNPH (40µg/mL), Hexaldehyde-DNPH, Methacrolein-DNPH, Propionaldehyde-DNPH, p-Tolualdehyde-DNPH, Valeraldehyde-DNPH	1mL	47672-U	
Carbonyl-DNPH Mix 2	14 analytes, 2µg/mL each (aldehyde equivalent) in acetonitrile, except where indicated Acetaldehyde-DNPH, Acetone-DNPH, Acrolein-DNPH, Benzaldehyde-DNPH, 2-Butanone-DNPH, n-Butyraldehyde-DNPH, Crotonaldehyde-DNPH, Cyclohexanone-DNPH (5µg/mL), Formaldehyde-DNPH (4µg/mL), Hexaldehyde-DNPH, Methacrolein-DNPH, Propionaldehyde-DNPH, p-Tolualdehyde-DNPH, Valeraldehyde-DNPH	1mL	47671-U	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Compendium of Methods for the Determination of Toxic Organic Compounds in Air (TO)

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
TO-1 METHOD DESCRIPTION: VOLATILE ORGANIC COMPOUNDS				
EPA TO-1 Toxic Organics Mix 1A	9 analytes, 2mg/mL each in methanol n-Heptane, 1-Heptene, Benzene, Toluene, Ethylbenzene, Isopropylbenzene (Cumene), o-Xylene, m-Xylene, p-Xylene	1mL	48896	
EPA TO-1 Toxic Organics Mix 1B	14 analytes, 2mg/mL each in methanol Allyl chloride, Acrylonitrile, Chloroform, 1,2-Dichloroethane, 1,1,1-Trichloroethane, Carbon tetrachloride, 1,2-Dichloropropane, Trichloroethylene, 1,3-Dichloropropane, Ethylene dibromide, Bromoform, Tetrachloroethylene, Chlorobenzene, Bromobenzene	1mL	48897	
TO-2 METHOD DESCRIPTION: VOLATILE ORGANIC COMPOUNDS				
EPA TO-2 Toxic Organics Mix 2A	3 analytes, 2mg/mL each in methanol Methylene chloride, Vinyl chloride, Vinylidene chloride	1mL	48898	
TO-4 / TO-10 METHOD DESCRIPTION: ORGANOCHLORINE PESTICIDES BY CAPILLARY GC/ECD				
EPA Pesticide Mix	16 analytes at indicated concentrations in methanol:methylene chloride (98:2) Aldrin, 10µg/mL; α-BHC, 10µg/mL; β-BHC, 10µg/mL; γ-BHC (Lindane), 10µg/mL; δ-BHC, 10µg/mL; 4,4'-DDD, 60µg/mL; 4,4'-DDE, 20µg/mL; 4,4'-DDT, 60µg/mL; Dieldrin, 20µg/mL; Endosulfan I, 20µg/mL; Endosulfan II, 20µg/mL; Endosulfan sulfate, 60µg/mL; Endrin, 20µg/mL; Endrin aldehyde, 60µg/mL; Heptachlor, 10µg/mL; Heptachlor epoxide isomer B), 10µg/mL	1mL	48858-U	
TO-5 / TO-11 METHOD DESCRIPTION: ALDEHYDES AND KETONES BY HPLC/UV				
TO11/IP-6A Aldehyde/ Ketone-DNPH Mix	15 analytes, 15µg/mL each (aldehyde equivalent) in acetonitrile Acetaldehyde-2,4-DNPH; Acrolein-2,4-DNPH; Acetone-2,4-DNPH; Benzaldehyde-2,4-DNPH; Butyraldehyde-2,4-DNPH; Crotonaldehyde-2,4-DNPH; 2,5-Dimethylbenzaldehyde-2,4-DNPH; Formaldehyde-2,4-DNPH; Hexaldehyde-2,4-DNPH; Isovaleraldehyde-2,4-DNPH; Propionaldehyde-2,4-DNPH; Propionaldehyde-2,4-DNPH; m-Tolualdehyde-2,4-DNPH; o-Tolualdehyde-2,4-DNPH; p-Tolualdehyde-2,4-DNPH; Valeraldehyde-2,4-DNPH	1mL	47285-U	
TO-7 METHOD DESCRIPTION: N-NITROSODIMETHYLAMINE BY CAPILLARY GC/MS				
N-Nitrosodimethylamine	Neat	100mg	48552	
	200µg/mL in methanol	1mL	48670	
	5000µg/mL in methanol	1mL	40059	
TO-8 METHOD DESCRIPTION: CRESOL AND PHENOL BY HPLC/UV/EC/FI				
o-Cresol	5000µg/mL in methanol	1mL	40250-U	
m-Cresol	5000µg/mL in methanol	1mL	40251-U	
p-Cresol	5000µg/mL in methanol	1mL	40252-U	
Phenol	5000µg/mL in methanol	1mL	40063	
TO-13 METHOD DESCRIPTION: POLYNUCLEAR AROMATIC HYDROCARBONS BY GC/FID AND HPLC/UV				
TCL Polynuclear Aromatic Hydrocarbons Mix	16 analytes at indicated concentrations in acetonitrile:methanol (90:10) Acenaphthene, 1000µg/mL; Acenaphthylene, 500µg/mL; Anthracene, 20µg/mL; Benzo(a)anthracene, 50µg/mL; Benzo(b)fluoranthene, 20µg/mL; Benzo(k)fluoranthene, 20µg/mL; Benzo(ghi)perylene, 80µg/mL; Benzo(a)pyrene,50µg/mL; Chrysene, 50µg/mL; Dibenzo(a,h)anthracene, 200µg/mL; Fluoranthene, 50µg/mL; Fluorene, 100µg/mL; Indeno(1,2,3-cd)pyrene, 50µg/mL; Naphthalene, 500µg/mL; Phenanthrene, 40µg/mL; Pyrene, 100µg/mL	1mL	49156	
EPA 610 Polynuclear Aromatic Hydrocarbons Mixture SS	16 analytes at indicated concentrations in methanol:methylene chloride (50:50) Acenaphthene, 1000µg/mL; Acenaphthylene, 2000µg/mL; Anthracene, 100µg/mL; Benzo(a)anthracene, 100µg/mL; Benzo(a)pyrene, 100µg/mL; Benzo(b)fluoranthene, 200µg/mL; Benzo(k)fluoranthene, 100µg/mL; Benzo(ghi)perylene, 200µg/mL; Chrysene, 100µg/mL; Dibenzo(a,h)anthracene, 200µg/mL; Fluoranthene, 200µg/mL; Fluorene, 200µg/mL; Indeno(1,2,3-cd)pyrene, 100µg/mL; Naphthalene, 1000µg/mL; Phenanthrene, 100µg/mL; Pyrene, 100µg/mL	1mL 1mL	48743 4S8743	

SS Separate Source standards. Prepared from independently sourced raw materials and quality controlled independently.

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Chemical Standards

SUPELCO

Air Monitoring Standards
US EPA TO-14 Method

Air Monitoring Standards in Gas

TO-14 Method description: SUMA Canister Sampling with GC/MS Analysis of Volatile Organics in Ambient Air

Scott TO-14 gas blends are packaged in SCOTTY 104 high pressure, transportable, laboratory-size cylinders. A SCOTTY 104 cylinder measures only 12¼" high and 3¼" in diameter (31cm x 8.3cm), but contains 104 liters of gas at 1800psi – enough gas to deliver adequate calibration for 80 or more uses. Each cylinder is equipped with CGA 110/180 fittings, to plumb directly to your gas sampling system or through an appropriate regulator.

Where available, the components in Scott TO-14 gas calibration blends are traceable to NIST reference mixtures (NIST SRM 1804). All are certified for superior stability and accuracy. Shelf life: 1 year

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT.NO.	PRICE
TO-14 Calibration Mix 1	39 analytes, 100ppb each in nitrogen in a SCOTTY 104 cylinder, 1800psig	104 liters	41900-U	
	39 analytes, 1ppm each in nitrogen in a SCOTTY 104 cylinder, 1800psig	104 liters	509981	
	Benzene, Bromomethane, Carbon tetrachloride, Chlorobenzene, Chloroform, Chloromethane, 1,2-Dibromoethane, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 1,1-Dichloroethane, 1,2-Dichloroethane, 1,1-Dichloroethene, cis-1,2-Dichloroethene, 1,2-Dichloropropane, cis-1,3-Dichloropropene, trans-1,3-Dichloropropene, Ethyl chloride, Ethylbenzene, Halocarbon 12, Halocarbon 11, Halocarbon 113, Halocarbon 114, Hexachloro-1,3-butadiene, Methylene chloride, Styrene, 1,1,2,2-Tetrachloroethane, Tetrachloroethylene, Toluene, 1,2,4-Trichlorobenzene, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, Trichloroethene, 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene, Vinyl chloride, m-Xylene, o-Xylene, p-Xylene			
TO-14 Aromatics Subset Mix	14 analytes, 100ppb each in nitrogen in a SCOTTY 104 cylinder, 1800psig	104 liters	41901	
	Benzene, Chlorobenzene, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, Ethylbenzene, Styrene, Toluene, 1,2,4-Trichlorobenzene, 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene, m-Xylene, o-Xylene, p-Xylene			
TO-14 Chlorinated Hydrocarbons Subset Mix	19 analytes, 100ppb each in nitrogen in a SCOTTY 104 cylinder, 1800psig	104 liters	41902	
	Carbon tetrachloride, Chloroform, Chloromethane, 1,1-Dichloroethane, 1,2-Dichloroethane, 1,1-Dichloroethene, cis-1,2-Dichloroethene, 1,2-Dichloropropane, cis-1,3-Dichloropropene, trans-1,3-Dichloropropene, Ethyl chloride, Hexachloro-1,3-butadiene, Methylene chloride, Tetrachloroethylene, 1,1,2,2-Tetrachloroethane, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, Trichloroethene, Vinyl chloride			
TO-14 CFC/HCFC Subset Mix	4 analytes, 100ppb each in nitrogen in a SCOTTY 104 cylinder, 1800psig	104 liters	41903	
	Halocarbon 11, Halocarbon 113, Halocarbon 114			
TO-14 Reactive Subset Mix	3 analytes, 100ppb each in nitrogen in a SCOTTY 104 cylinder, 1800psig	104 liters	41911	
	1,3-Butadiene, 3-Chloropropene, 4-Ethyltoluene			
TO-14 GC/MS Tuning Standard Bromofluorobenzene	2ppm in nitrogen in a SCOTTY 104 cylinder, 1800psig	104 liters	41913	
JHAP-9 Mix*	9 analytes, 1ppm each in nitrogen in a SCOTTY 104 cylinder, 1800psig	104 liters	501123	
	9 analytes, 100ppb each in nitrogen in a SCOTTY 104 cylinder, 1800psig	104 liters	507970	
	Acrylonitrile, Benzene, 1,3-Butadiene, Chloroform, 1,2-Dichloroethane, Methylene chloride, Tetrachloroethylene, Trichloroethylene, Vinyl chloride			
JHAP-43 Mix	43 analytes, 1ppm each in nitrogen in a SCOTTY 104 cylinder, 1800psig	104 liters	500429	
	43 analytes, 100ppb each in nitrogen in a SCOTTY 104 cylinder, 1800psig	104 liters	500011	
	Acrylonitrile, Benzene, Bromomethane, 1,3-Butadiene, Carbon tetrachloride, Chlorobenzene, Chloroform, Chloromethane, 3-Chloropropylene (Allyl chloride), 1,2-Dibromoethane, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 1,1-Dichloroethane, 1,2-Dichloroethane, 1,1-Dichloroethene, cis-1,2-Dichloroethene, 1,2-Dichloropropane, cis-1,3-Dichloropropene, trans-1,3-Dichloropropene, Ethylbenzene, Ethyl chloride, 4-Ethyltoluene, Halocarbon 11, Halocarbon 113, Halocarbon 114, Halocarbon 12, Hexachloro-1,3-butadiene, Methylene chloride, Styrene, 1,1,2,2-Tetrachloroethane, Tetrachloroethylene, Toluene, 1,2,4-Trichlorobenzene, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, Trichloroethene, 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene, Vinyl chloride, m-Xylene, o-Xylene, p-Xylene			
BTEX Gas Mix	6 analytes, 10ppm each in nitrogen in a SCOTTY 48 cylinder, 300psi	48 liters	501883	
	Benzene, Ethylbenzene, Toluene, m-Xylene, o-Xylene, p-Xylene			

*This mix has been made available because of the renewal of the Japanese Air Pollution Prevention Law (effective April 1, 1997)

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Air Monitoring Standards
US EPA TO-14 Method, SCOTTY 104 Accessories



Pressure Regulator for Use with TO-14 Cylinders

Aluminum body with stainless steel diaphragm

- Inlet pressure rating 0-2000psig
- Delivery pressure 1-25psig
- CGA 180 / 1/8-inch NPT (F)
- Supplied with 1/8-inch Swagelok NPT to 1/8-inch tube

DESCRIPTION	CAT. NO.	PRICE
Model 26 Pressure Regulator		
with gauge	41910-U	
without gauge	41907	
High Pressure Gauge only		
0-2000psi	41908	



HPD Carrying Case with TO-14 Calibration Mix #1

DESCRIPTION	CAT. NO.	PRICE
Case with TO-14 Calibration Mix #1		
at 100ppb (41900-U)	507881	
at 1ppm (509981)	507938	
at 100ppb (41900-U) and Model 6 regulator with connector (509965)	507946	
at 1ppm (509981) and Model 6 regulator with syringe adapter (501115)	507954	
at 1ppm (509981) and Model 6 regulator with connector (509965)	507962	
Case only	509973	



Model 6 SCOTTY Regulator for SCOTTY 104 Cylinders

- Stainless steel body with 316L stainless steel/Elgiloy diaphragm
- Supply pressure gauge 0-3000psig
- Delivery pressure range 0-100psig
- CGA 110/180 connector
- Regulator supplied with 1/8" tube connector or syringe adapter

DESCRIPTION	CAT. NO.	PRICE
with connector	509965	
with syringe adapter	501115	



Stand for SCOTTY 104 Cylinder

Ensures your SCOTTY 104 cylinder will be stable on a bench-top or other surface.

DESCRIPTION	CAT. NO.	PRICE
Stand	41909	

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Scott Gas Standards

SCOTTY General Use Standards

Scott Specialty Gases

We offer an expanded line of pure gases and gas mixtures, manufactured for Supelco by Scott Specialty Gases.

Supelco warrants that the Scott calibration gas products listed below meet the analytical specifications for the period of time stated on the cylinder and/or the Certificate of Analysis. Shelf life 1 year, unless otherwise noted.



SPECIFICATIONS

SCOTTY 4

Contents: 4 liters, Pressure: 120psig, Outlet Fitting: Aerosol-type push button with applicator tube, Weight: ~100g, Dimensions: 2.5 x 8 in., D.O.T. Specs: 2Q

SCOTTY 14

Contents: 14 liters, Pressure: 240psig, Outlet Fitting: CGA-160-1/8" NPT F, Weight: 1.5 lb., Dimensions: 3 x 11 in., D.O.T. Specs: 4B240

SCOTTY 48

Contents: 48 liters, Pressure: 300psig, Outlet Fitting: CGA-165, Weight: 1.75 lb., Dimensions: 4 x 16.25 in., D.O.T. Specs: 39 NRC

SCOTTY 48-EL

Contents: 75 liters, Pressure: 480psig, Outlet Fitting: CGA-170, Weight: 1.75 lb., Dimensions: 4 x 16.25 in., D.O.T. Specs: 39 NRC

SCOTTY 104

Contents: 104 liters, Pressure: 1800psig, Outlet Fitting: CGA-180, Weight: 2.2 lb., Dimensions: 3.25 x 12.25 in., D.O.T. Specs: 3AL1800

GAS COMPOSITION AND CONCENTRATION	CYLINDER	CAT. NO.	PRICE
PURE GASES			
Air, zero (THC < 1ppm)	SCOTTY 4 SCOTTY 14 SCOTTY 48	501212 501220 501239	
Argon 99.995%	SCOTTY 4 SCOTTY 14	501247 501255	
Carbon dioxide 99.8%*	SCOTTY 14 SCOTTY 48	23402 501298	
Ethylene	SCOTTY 14	25881-U	
Hydrogen 99.99%	SCOTTY 14	300100	
Methane 99.0%	SCOTTY 14	22562	
Nitrogen	SCOTTY 4 SCOTTY 14	25877-U 25879-U	
Oxygen 99.6%	SCOTTY 14	300500	
TWO-COMPONENT MIXTURES			
Benzene in air (1ppm)	SCOTTY 48	303402-U	
Benzene in air (100ppm)	SCOTTY 48	303404	
1,3-Butadiene in nitrogen (10ppm)	SCOTTY 14 SCOTTY 48	303405 303406	
Carbon dioxide in helium (100ppm)*	SCOTTY 14	308200	
Carbon dioxide in nitrogen (100ppm)	SCOTTY 14 SCOTTY 48	308300 501301	
Carbon dioxide in nitrogen (1000ppm)	SCOTTY 14 SCOTTY 48	501336 501344	
Chlorine in nitrogen (10ppm)**	SCOTTY 104	501352	
Ethylene in air (10ppm)*	SCOTTY 14	501379	
Ethylene in helium (100ppm)	SCOTTY 14	22572	
Hydrogen in helium(100ppm)	SCOTTY 14	301200	
Hydrogen in nitrogen (1%)	SCOTTY 14 SCOTTY 48	501417 501425	
Hydrogen in nitrogen (100ppm)	SCOTTY 14	301300	
Methane in helium (100ppm)	SCOTTY 4 SCOTTY 14 SCOTTY 48	501441 307200 501468	
Methane in nitrogen (100ppm)	SCOTTY 14	307300-U	
Methane in nitrogen (1%)	SCOTTY 4 SCOTTY 14	501476 23443	
Nitrogen in helium (100ppm)	SCOTTY 14	303200	
Nitrous oxide in nitrogen (1ppm)	SCOTTY 14 SCOTTY 48	501514 501522	
Nitrous oxide in nitrogen (10ppm)	SCOTTY 48	25883-U	
Oxygen in helium (10ppm)	SCOTTY 4	25878-U	

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Scott Gas Standards
SCOTTY General Use Standards

GAS COMPOSITION AND CONCENTRATION	CYLINDER	CAT. NO.	PRICE
Oxygen in helium (100ppm)	SCOTTY 14	305200	
Oxygen in nitrogen (2%)	SCOTTY 14	501549	
	SCOTTY 48	501557	
Oxygen in nitrogen (6%)	SCOTTY 4	501565	
	SCOTTY 14	501573	
Oxygen in nitrogen (10%)	SCOTTY 14	25880-U	
1,1,1-Trichloroethane in nitrogen (10ppm)	SCOTTY 48	303408	
Trichloroethylene in nitrogen (10ppm)	SCOTTY 14	303400	
	SCOTTY 48	303401	
Vinyl chloride in nitrogen (1ppm	SCOTTY 14	22554	
	SCOTTY 48	501603	
Vinyl chloride in nitrogen (10ppm)	SCOTTY 14	22553	
Vinyl chloride in nitrogen (50ppm)	SCOTTY 14	22555-U	
Vinyl chloride in nitrogen (100ppm)	SCOTTY 14	22552	
Vinyl chloride in nitrogen (1000ppm)	SCOTTY 14	22556	
THREE-COMPONENT MIXTURES			
Carbon Dioxide and oxygen in nitrogen (1% / 20%)	SCOTTY 14	23441	
	SCOTTY 48	501638	
MULTI-COMPONENT MIXTURES			
Carbon monoxide, carbon dioxide, hydrogen & oxygen each at 0.5% in nitrogen	SCOTTY 14	23438	
	SCOTTY 48	501654	
Carbon monoxide, carbon dioxide, methane, ethane, ethylene & acetylene each at 1% in nitrogen	SCOTTY 4	501662	
	SCOTTY 14	23437	
	SCOTTY 48	23462	
Methane, carbon monoxide, carbon dioxide, hydrogen & oxygen each at 1% in nitrogen	SCOTTY 4	501670	
	SCOTTY 14	22561	
	SCOTTY 48	23463	
Carbon monoxide, carbon dioxide, nitrogen, & oxygen each at 5%, methane & hydrogen each at 4% in helium	SCOTTY 14	501697	
Carbon monoxide at 7%, carbon dioxide at 15% & oxygen at 5% in nitrogen	SCOTTY 14	23442	
Carbon monoxide & oxygen each at 7%, carbon dioxide at 15% and methane at 4.5% in nitrogen	SCOTTY 14	501743	
	SCOTTY 48	501751	
Branched paraffins, each at 15ppm: iso-butane, 2-methylbutane, 2,2-dimethylpropane, 2-methylpentane, 3-methylpentane, 2,2-dimethylbutane in nitrogen	SCOTTY 14	23445	
C1-C6 n-Paraffins, each at 15ppm: methane, ethane, propane, butane, pentane & hexane in nitrogen	SCOTTY 4	501778	
	SCOTTY 14	23444	
	SCOTTY 48	501786	
C1-C6 n-Paraffins, each at 100ppm: methane, ethane, propane, butane, pentane, hexane in nitrogen	SCOTTY 4	501840	
	SCOTTY 14	330300	
	SCOTTY 48	501859	
C1-C6 n-Paraffins, each at 100ppm: methane, ethane, propane, butane, pentane, hexane in helium	SCOTTY 4	501794	
	SCOTTY 14	330200	
	SCOTTY 48	501808	
C1-C6 n-Paraffins, each at 1000ppm: methane, ethane, propane, butane, pentane, hexane in helium	SCOTTY 4	501816	
	SCOTTY 14	501824	
	SCOTTY 48	501832	
C2-C4 Alkynes, each at 15ppm: acetylene, propyne, 1-butyne, 2-butyne in nitrogen	SCOTTY 4	22508	
C2-C6 Olefins, each at 100ppm: ethylene, propylene, 1-butene, 1-pentene, 1-hexene in nitrogen	SCOTTY 14	332300-U	
	SCOTTY 48	501875	
C2-C6 Olefins, each at 100ppm: ethylene, propylene, 1-butene, 1-pentene, 1-hexene in helium	SCOTTY 14	332200	
	SCOTTY 48	501867	
Methane, ethane, ethylene, acetylene, propane, propylene, propyne, n-butane each at 15ppm in nitrogen	SCOTTY 4	22566	
	SCOTTY 48	23470-U	
n-Butane, iso-butane, cis-2-butene, trans-2-butene, 1-butene, iso-butylene, 1,3-butadiene, ethyl acetylene each at 15ppm in nitrogen	SCOTTY 4	22567	
	SCOTTY 48	23471	
BTEX Mix**: benzene, ethylbenzene, toluene, m-xylene, o-xylene, p-xylene, each at 10ppm in nitrogen	SCOTTY 48	501883	
	SCOTTY 48-EL	25884-U	

* Pressure restricted due to either vapor pressure restriction or flammable oxidizer restriction.

** Maximum usable shelf life 6 months from date of manufacture. Supelco guarantees 4 months of usable shelf life from date of pu rchase.

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Scott Gas Standards

Natural Gas Standards, SCOTTY Accessories

Natural Gas Reference Standards

Prepared gravimetrically with weights traceable to the National Institute of Standards and Technology, then verified by analysis. In 14-liter SCOTTY 14 cylinders. Shelf life: 1 year.

COMPONENT (MOLE PERCENT)	GPA STANDARD	CALORIMETRIC STANDARD	HIGH ETHANE STANDARD	HELIUM-ENRICHED STANDARD
Helium	0.50	–	–	2.00
Nitrogen	5.00	2.50	9.00	1.60
Carbon dioxide	1.00	3.00	0.50	0.20
Methane	70.50	88.73	64.00	88.90
Ethane	9.00	3.50	12.50	3.00
Propane	6.00	1.00	7.00	1.70
Isobutane	3.00	0.40	3.00	1.00
n-Butane	3.00	0.40	3.00	1.00
Isopentane	1.00	0.15	0.50	0.30
n-Pentane	1.00	0.15	0.50	0.30
Neopentane	–	0.10	–	–
n-Hexane	–	0.05	–	–
n-Heptane	–	0.02	–	–

STANDARD	BTU	QTY.	CAT. NO.	PRICE
GPA	1298	785g	303100-U	
Calorimetric	1028	790g	303101	
High Ethane	1500	763g	303102	
Helium-Enriched	1083	774g	303103	



P000160

Syringe Adapter for SCOTTY 14 and 48 Cylinders

Withdraw calibration gas into a syringe, through a silicone rubber septum. A vent at the septum permits purging prior to filling the syringe. Constructed of chromium-plated brass. Maximum pressure 240psi (16.9kg/cm^2). 1/8" NPT male fitting.

DESCRIPTION	CAT. NO.	PRICE
Syringe Adapter	609010	
Additional Septa (pk. of 10)	608010	



P000158

Stand for SCOTTY 48 Cylinder

Stabilizes your cylinder on a benchtop or other surface.

DESCRIPTION	CAT. NO.	PRICE
Stand	500410	



P000159

Stand for SCOTTY 104 Cylinder

Ensures your SCOTTY 104 cylinder will be stable on a bench-top or other surface.

DESCRIPTION	CAT. NO.	PRICE
Stand	41909	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco



Model 24 and Model 26 SCOTTY Single-Stage, General Purpose Regulators for SCOTTY 14, 48 and 48-EL Cylinders

Designed for noncorrosive service. Gauge displays remaining cylinder pressure, regulator adjusts delivery pressure

- Brass body with acetal resin bonnet/Viton diaphragm
- Tamper resistant, locking control knob
- Inlet connection 1/4 inch AN flare (CGA-165 or CGA-160)
- Maximum inlet pressure 300psig
- Delivery pressure range 1-60psig, can be preset
- Miniature

DESCRIPTION	CAT. NO.	PRICE
Model 24 Single-Stage Regulator		
with CGA-160 (for SCOTTY 14)	507911	
with CGA-165 (for SCOTTY 48)	501395	
Model 26 Single-Stage Regulator		
with CGA-170 (for SCOTTY 48-EL)	25885-U	



Pressure Regulator
for SCOTTY 14 Cylinders

Reliable pressure regulation to 1psig (0.07kg/cm^2) indicated on a 0-60psi (4.2kg/cm^2) gauge. Easily connects to SCOTTY cylinders with the 1/8" NPT connector provided. You can also attach the syringe adapter (Cat. No. 609010) to the regulator for low pressure sample removal. Aluminum body with acetyl resin bonnet. Maximum inlet pressure: 400psi (28.1kg/cm^2)

DESCRIPTION	CAT. NO.	PRICE
Regulator	513010	

Order: 1.800.325.3010 Technical Service: 1.800.359.3041 Web: www.sigma-aldrich.com/supelco

Petroleum Standards
PNA / PONA / PIANO

P-N-A, P-O-N-A, P-I-A-N-O Analyses

Use these mixes to determine retention times and indices and monitor response factors for components of complex mixtures of hydrocarbons. These standards are complex mixes of known quantities of hydrocarbons, accurately prepared by weight to four decimal places.Typical values are listed here; exact values will differ slightly from lot to lot.

- Formulations are weight percent.
- Each mix includes a detailed data sheet listing components by weight percent, mole percent, and liquid volume percent, retention times and retention indices for each component, and other information.
- A chromatogram from a 100-meter Petrocol DH capillary column (including conditions) is provided.
- Products are supplied in crimp-top vials with hole caps and septa. The shelf life of the unopened, refrigerated mixes is 1 year

Quantitative Reference Standards

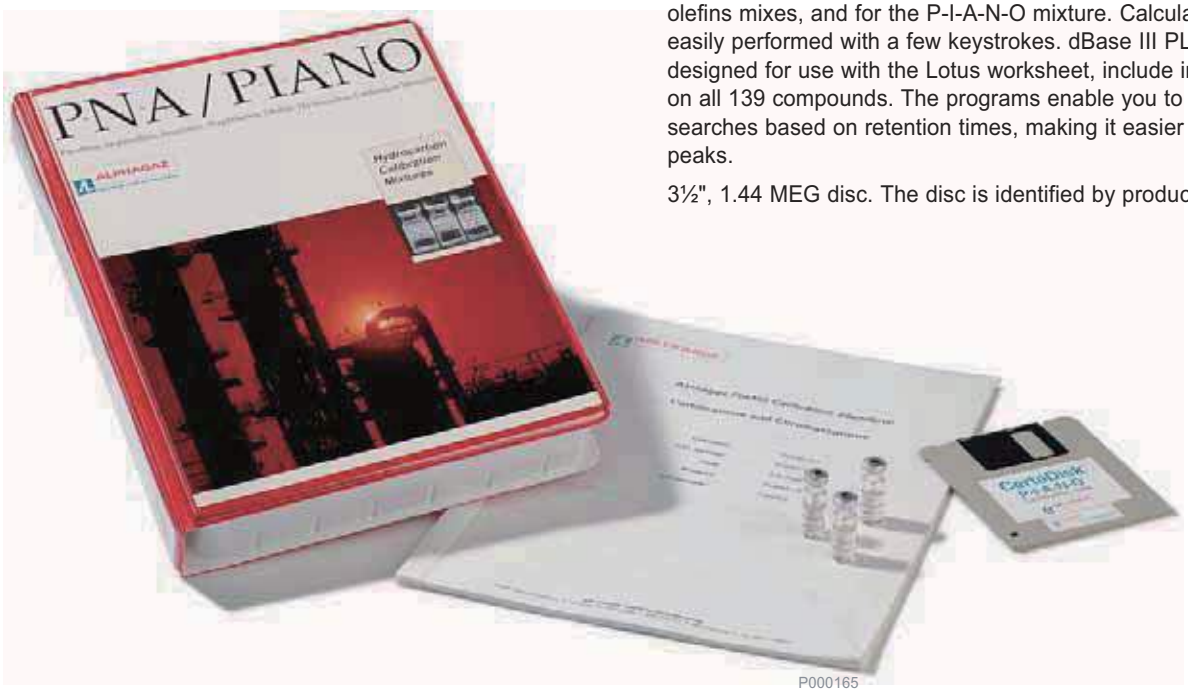
MIXES AND SOLUTIONS	COMPOSITION		QTY.	CAT. NO.	PRICE
n-Paraffins Mix■	11 n-paraffins (typical values shown)		0.1mL	44585-U	
	n-Pentane, 11.393%	n-Undecane, 7.645%			
	n-Hexane, 10.963%	n-Dodecane, 7.768 %			
	n-Heptane, 12.239%	n-Tridecane, 6.371%			
	n-Octane, 10.088%	n-Tetradecane, 5.903%			
	n-Nonane, 13.204%	n-Pentadecane, 7.723%			
	n-Decane, 6.703%				
Isoparaffins Mix■	37 isoparaffins (typical values shown)		0.1mL	44586-U	
	Isopentane, 2.553%	3-Methylheptane, 3.785%			
	2,3-Dimethylbutane, 1.438%	3-Ethylhexane, 2.927%			
	2-Methylpentane, 4.356%	2,5-Dimethylheptane, 3.081%			
	3-Methylpentane, 3.147%	3,5-Dimethylheptane (D), 0.378%			
	2,2-Dimethylpentane, 4.189%	3,3-Dimethylheptane, 3.258%			
	2,4-Dimethylpentane, 3.116%	3,5-Dimethylheptane (L), 0.378%			
	2,2,3-Trimethylbutane, 3.149%	2,3-Dimethylheptane, 1.540%			
	3,3-Dimethylpentane, 1.308%	3,4-Dimethylheptane (D), 1.722%			
	2-Methylhexane, 3.551%	3,4-Dimethylheptane (L), 2.022%			
	2,3-Dimethylpentane, 1.612%	2-Methyloctane, 5.093%			
	3-Methylhexane, 4.456%	3-Methyloctane, 2.731%			
	3-Ethylpentane, 1.600%	3,3-Diethylpentane, 3.335%			
	2,2-Dimethylhexane, 1.439%	2,2-Dimethyloctane, 3.126%			
	2,5-Dimethylhexane, 3.195%	3,3-Dimethyloctane, 1.718%			
	2,2,3-Trimethylpentane, 3.185%	2,3-Dimethyloctane, 1.646%			
	2,4-Dimethylhexane, 1.574%	2-Methylnonane, 3.343%			
	2,3-Dimethylhexane, 1.365%	3-Ethyloctane, 3.301%			
	2-Methylheptane, 4.641%	3-Methylnonane, 3.387%			
	4-Methylheptane, 3.377%				
Naphthenes Mix■	30 naphthenes (typical values shown)		0.1mL	44588	
	Cyclopentane, 5.805%	ccc-1,2,3-Trimethylcyclopentane, 1.622%			
	Methylcyclopentane, 8.728%	Isopropylcyclopentane, 1.853%			
	Cyclohexane, 5.758%	cis-1,2-Dimethylcyclohexane, 3.065%			
	1,1-Dimethylcyclopentane, 3.370%	n-Propylcyclopentane, 1.966%			
	cis-1,3-Dimethylcyclopentane, 1.962%	ccc-1,3,5-Trimethylcyclohexane, 2.983%			
	trans-1,3-Dimethylcyclopentane, 2.689%	1,1,4-Trimethylcyclohexane, 4.873%			
	trans-1,2-Dimethylcyclopentane, 3.087%	ctt-1,2,4-Trimethylcyclohexane, 1.501%			
	Methylcyclohexane, 8.992%	ctc-1,2,4-Trimethylcyclohexane, 3.510%			
	Ethylcyclopentane, 1.773%	1,1,2-Trimethylcyclohexane, 3.324%			
	ctc-1,2,4-Trimethylcyclopentane, 3.721%	Isobutylcyclopentane, 3.419%			
	ctc-1,2,3-Trimethylcyclopentane, 3.419%	Isopropylcyclohexane, 3.437%			
	cct-1,2,4-Trimethylcyclopentane, 1.438%	n-Butylcyclopentane, 3.420%			
	trans-1,4-Dimethylcyclohexane, 3.713%	Isobutylcyclohexane, 3.805%			
	1-Ethyl-1-methylcyclopentane, 1.634%	t-1-Methyl-2-propylcyclohexane, 3.576%			
	trans-1,2-Dimethylcyclohexane, 3.644%	t-1-Methyl-2-(4MP)cyclopentane, 1.636%			
Olefins Mix■	25 olefins (typical values shown)		0.1mL	44589	
	3-Methyl-1-butene, 1.478%	trans-3-Heptene, 2.173%			
	1-Pentene, 5.640%	cis-3-Heptene, 4.587%			
	2-Methyl-1-butene, 1.880%	trans-2-Heptene, 2.206%			
	2-Methyl-1,3-butadiene, 2.389%	cis-2-Heptene, 4.338%			
	trans-2-Pentene, 4.024%	1-Octene, 8.220%			
	cis-2-Pentene, 2.305%	trans-2-Octene, 2.206%			
	4-Methylpentene-1	cis-2-Octene, 4.766%			
	1-Hexene, 7.693%	1-Nonene, 9.192%			
	trans-2-Hexene, 1.744%	trans-3-Nonene, 2.256%			
	2-Methylpentene-2, 4.054%	cis-3-Nonene, 1.946%			
	cis-2-Hexene, 1.825%	trans-2-Nonene, 2.091%			
	1-Heptene, 8.716%	cis-2-Nonene, 1.881%			
	1-Decene, 7.665%				

■ For information on a kit containing these products, see the following page (Cat. No. 44594-U).

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Petroleum Standards
PNA / PONA / PIANO

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
Aromatics Mix	37 aromatics (typical values shown) Benzene, 3.139% Toluene, 4.563% Ethylbenzene, 1.570% m-Xylene, 2.939% p-Xylene, 2.982 % o-Xylene, 3.208% Isopropylbenzene, 3.127% n-Propylbenzene, 1.705% 1-Methyl-3-ethylbenzene, 2.903% 1-Methyl-4-ethylbenzene, 3.166% 1,3,5-Trimethylbenzene, 3.427% 1-Methyl-2-ethylbenzene, 4.460% 1,2,4-Trimethylbenzene, 4.315% tert-Butylbenzene, 2.667% Isobutylbenzene, 0.845% sec-Butylbenzene, 1.469% 1-Methyl-3-isopropylbenzene, 1.403% 1-Methyl-4-isopropylbenzene, 2.789% 1-Methyl-2-isopropylbenzene, 2.631% 1-Methyl-3-n-propylbenzene, 3.214% 1-Methyl-4-n-propylbenzene, 1.444% n-Butylbenzene, 2.894% 1,3-Dimethyl-5-ethylbenzene, 1.306% 1,2-Diethylbenzene, 3.063% 1-Methyl-2-n-propylbenzene, 1.449% 1,4-Dimethyl-2-ethylbenzene, 2.985% 1,2-Dimethyl-4-ethylbenzene, 2.706% 1,3-Dimethyl-2-ethylbenzene, 2.702% 1,2-Dimethyl-3-ethylbenzene, 2.956% 1,2,4,5-Tetramethylbenzene, 1.966% 2-Methylbutylbenzene, 1.432% n-Pentylbenzene, 1.466% t-1-Butyl,3,5-dimethylbenzene, 2.920% t-1-Butyl-4-ethylbenzene, 2.900% 1,3,5-Triethylbenzene, 1.850% 1,2,4-Triethylbenzene, 3.104% n-Hexylbenzene, 4.641%	0.1mL	44587	
P-I-A-N-O Mix	139 n-paraffins, isoparaffins, aromatics, naphthenes, and olefins A quantitative mix of the components in the five mixes described above and on the previous page. Data sheets for each class of compounds list weight percent, mole percent, and other information for each component. Approximate weight percentages: n-Paraffins, 18.9% Isoparaffins, 18.8% Aromatics, 23.3% Naphthenes, 20.5% Olefins, 18.5%	0.1mL	44593-U	
P-I-A-N-O Kit	One of each of the following mixes n-Paraffins Mix (44585-U) Isoparaffins Mix (44586-U) Naphthenes Mix (44588) Olefins Mix (44589) Aromatics Mix (44587) P-I-A-N-O Mix (44593-U)		44594-U	



P000165

RELATED INFORMATION

Included with P-I-A-N-O Mix and P-I-A-N-O Kit,
Data Disc Makes it Easier to Organize P-I-A-N-O Data

The P-I-A-N-O CertaDisc Certification Worksheet and Database can greatly simplify the task of organizing certification data. A worksheet (Lotus 1-2-3 format) contains complete certification data for the n-paraffins, isoparaffins, aromatics, naphthenes, and olefins mixes, and for the P-I-A-N-O mixture. Calculations are easily performed with a few keystrokes. dBase III PLUS programs, designed for use with the Lotus worksheet, include information on all 139 compounds. The programs enable you to perform searches based on retention times, making it easier to identify peaks.

3½", 1.44 MEG disc. The disc is identified by product lot number.

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Petroleum Standards
ASTM D2887, ASTM D3710

ASTM D2887

MIXES AND SOLUTIONS	QTY.	CAT. NO.	PRICE
ASTM D2887 Reference Gas Oil Sample, Lot 2 ▪	1 x 1mL	506419	
	6 x 1mL	48873	

▪ This sample is a petroleum fraction having a boiling range from 250°F to 850°F, evaluated in round-robin studies by the ASTM. Use this sample and the supplied ASTM boiling range consensus values to evaluate system performance.

ASTM D3710

Boiling Range Distribution of Gasoline (500°F maximum) These qualitative and quantitative hydrocarbon blends are prepared according to ASTM recommendations. Calibration mixes are either volume/volume or weight/weight formulations as indicated. Nominal concentration of actual values will differ from lot to lot. Qualitative calibration references are prepared to approxim weight/weight (±10%) specifications and, because of the presence of gases, are not intended for quantitative use. Ad calibrati references are accompanied by a data sheet.

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
ASTM D3710 Qualitative Calibration Mix	Each of the following components in the approximate proportions (w/w) indicated	1 x 1mL	506427	
		6 x 1mL	48884	
	n-Propane, 1.5% 2-Methylpropane, 1.5% n-Butane, 4 5% 2-Methylbutane, 9.7% n-Pentane, 7.6% 2-Methylpentane, 5.4% n-Hexane, 5.4% 2,4-Dimethylpentane, 5.4% n-Heptane, 9.7% Toluene, 10.8% n-Octane, 5.4% p-Xylene, 13.0% n-Propylbenzene, 4.3% n-Decane, 3.2% n-Butylbenzene, 3.2% n-Dodecane, 3.2% n-Tridecane, 2.2% n-Tetradecane, 2.2% n-Pentadecane, 2.2%			
ASTM D3710 Quantitative Calibration Mix	Each of the following components in the proportions (w/w) indicated	1 x 1mL	506435	
		6 x 1mL	48879	
	2-Methylbutane, 10.5% n-Pentane, 8.1% 2-Methylpentane, 5.8% n-Hexane, 5.8% 2,4-Dimethylpentane, 5.8% n-Heptane, 10.5% Toluene, 11.6% n-Octane, 5.8% p-Xylene, 14.0% n-Propylbenzene, 4.7% n-Decane, 3.5% n-Butylbenzene, 3.5% n-Dodecane, 3.5% n-Tridecane, 2.3% n-Tetradecane, 2.3% n-Pentadecane, 2.3%			
ASTM D2887/D5307 Column Resolution Test Mix	Each of the following components at 1% (w/v) in n-octane	6 x 1mL	48889	
	n-Hexadecane n-Octadecane			
ASTM D2887 Quantitative Calibration Solution	Prepared in carbon disulfide at 0.5 weight percent each component (except for nC16 and nC18, which are at 1 weight percent)	1 x 1mL	500631	
		6 x 1mL	500658	
	Use for assessing column resolution as well as for quantitative analyses. n-Pentane n-Hexane n-Heptane n-Octane n-Nonane n-Decane n-Undecane n-Dodecane n-Tetradecane n-Pentadecane n-Hexadecane n-Heptadecane n-Octadecane n-Eicosane n-Tetracosane n-Octacosane n-Dotriacontane n-Hexatriacontane n-Tetracontane n-Tetratetracontane			

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Petroleum Standards
ASTM D4815

ASTM D4815

Determination of Oxygenates (Ethers and Alcohols) in Gasoline by GC

Along with valve timing and peak identification mixes, one set of quantitative calibration mixes are available with the method-specified internal standard. All components used in preparing these standards have been analyzed for purity, water content, and presence of other method components to 0.01%. Blends have been prepared using precise gravimetric techniques exceeding the requirements of ASTM Method D4815. Corrections are made for common impurities. All calibration blends are provided with a chromatogram and data verifying the purity and identity of the raw materials.

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
D4815 Quantitative Calibration Mix 1 (With Internal Standard)	Each component at the nominal weight percent indicated Ethanol, 2.85 tert-Butanol, 0.095 Methyl tert-butyl ether, 19.00 tert-Pentanol, 1.19 isooctane:xylene (65:35), 71.87 DME (internal standard), 5.00	1mL	47205	
D4815 Quantitative Calibration Mix 2 (With Internal Standard)	Each component at the nominal weight percent indicated Ethanol, 0.095 tert-Butanol, 2.85 Methyl tert-butyl ether, 14.25 tert-Pentanol, 4.75 isooctane:xylene (65:35), 73.06 DME (internal standard), 5.00	1mL	47206	
D4815 Quantitative Calibration Mix 3 (With Internal Standard)	Each component at the nominal weight percent indicated Ethanol, 5.70 tert-Butanol, 5.70 Methyl tert-butyl ether, 9.50 tert-Pentanol, 2.38 isooctane:xylene (65:35), 71.73 DME (internal standard), 5.00	1mL	47207	
D4815 Quantitative Calibration Mix 4 (With Internal Standard)	Each component at the nominal weight percent indicated Ethanol, 8.55 tert-Butanol, 7.60 Methyl tert-butyl ether, 4.75 tert-Pentanol, 3.56 isooctane:xylene (65:35), 70.54 DME (internal standard), 5.00	1mL	47208	
D4815 Quantitative Calibration Mix 5 (With Internal Standard)	Each component at the nominal weight percent indicated Ethanol, 11.40 tert-Butanol, 11.40 Methyl tert-butyl ether, 0.095 tert-Pentanol, 0.095 isooctane:xylene (65:35), 72.01 DME (internal standard), 5.00	1mL	47209	
ASTM D4815 Valve Timing Mix	Each component at the nominal weight percent indicated Use for determining the proper backflush valve timing. Methylcyclopentane, 10.0 Diisopropyl ether, 10.0 Ethyl tert-butyl ether, 10.0 Methyl tert-butyl ether, 10.0 n-Hexane, 60.0	1mL	47212	
ASTM D4815 Qualitative Peak ID Mix	Each component at the nominal weight percent indicated Use for determining relative retention times of selected oxygenates. Methylcyclopentane, 4.0 Methanol, 7.3 Ethanol, 7.3 Isopropanol, 7.3 tert-Butanol, 7.3 n-Propanol, 7.3 Methyl tert-butyl ether, 4.0 sec-Butanol, 7.3 Diisopropyl ether, 4.0 Isobutanol, 7.3 Ethyl tert-butyl ether, 4.0 tert-Pentanol, 7.3 1,2-Dimethoxyethane (internal standard), 6.0 n-Butanol, 7.3 Benzene, 5.0 tert-Amyl methyl ether, 7.3	1mL	47213	
ASTM D4815 Quantitative Calibration Kit	Each of the following products Quantitative Calibration Mix 1 (47205) Quantitative Calibration Mix 2 (47206) Quantitative Calibration Mix 3 (47207) Quantitative Calibration Mix 4 (47208) Quantitative Calibration Mix 5 (47209) Valve Timing Mix (47212) Qualitative Peak ID Mix (47213)		47211	

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Petroleum Standards
ASTM D5134, Reference Materials

ASTM D5134

Detailed Analysis of Petroleum Naphthas Through n-Nonane

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
ASTM D5134 Qualitative Column Evaluation Mix	Nominal 0.5-1.0% by weight in 2-methylpentane Use this mix of hydrocarbons for assessing column performance. Toluene, 0.5% — 2,3,3-Trimethylpentane, 1% — 4-Methylheptane, 1% n-Heptane, 1% — 2-Methylheptane, 1% — n-Octane, 1%	1mL	502103	
ASTM D5134 Splitter Linearity Check Mix	Neat at 10% by weight, each component Use this quantitative mix of hydrocarbons to determine proper system performance and detector response factors. n-Hexane — Benzene — 2,4-Dimethylhexane n-Heptane — Toluene — 2-Methylheptane n-Octane — 2-Methylhexane — 2,4-Dimethylheptane n-Nonane	500mg	506753	
2,3,3-Trimethylpentane	Neat	500mg	502081	

ASTM D5134 Qualitative Reference Materials

These refinery reference materials are the actual materials used in the ASTM D5134 round-robin method validation stage. They ar referred to in the method, and are used for establishing component retention times for identification purposes. Each sample is accompa nied by a comprehensive data booklet containing an expanded detailed chromatogram from a Petrocol DH 50.2 column, with identifi ed peaks.

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
ASTM D5134 Qualitative Reference Alkylate Standard	Approximately 30 identified components. Neat fraction. Actual refinery alkylation product	6 x 1mL	48267-U	
ASTM D5134 Qualitative Reference Reformate Standard	Approximately 70 identified components. Neat fraction. Actual refinery reformate product	6 x 1mL	48266	
ASTM D5134 Qualitative Reference Naphtha Standard	Approximately 100 identified components. Neat fraction. Actual refinery naphtha product	6 x 1mL	48265-U	
ASTM D5134 Qualitative Reference Refinery Standards Kit	2 x 1mL each of the three qualitative reference standards (alkylate, naphtha, and reformate)		48268	

Highly Characterized Reference Materials

The following standards, taken from refinery process streams and exhaustively analyzed by GC/FID and GC/MS, are recommended for evaluating process performance, identifying sources of contamination, PIANO analysis, method development, and training. Each co mes with a comprehensive data packet containing quantitative and qualitative data and chromatograms using a 100-meter Petrocol DH column.

DESCRIPTION	QTY.	CAT. NO.	PRICE
Petroleum Refinery Reformate	1mL	47489	
Petroleum Refinery Pyrolysis Gasoline (Py Gas)	1mL	47490-U	
Petroleum Refinery Heavy Straight Run Naphtha	1mL	47488	

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Petroleum Standards

ASTM D5307, Molecular Weight Standards, ASTM D5441

ASTM D5307

Boiling Range Distribution of Crude Petroleum

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
ASTM D5307 Crude Oil Quantitative Standard	Equal weights of the hydrocarbons listed Use to determine detector response factors (slight warming of this mixture may be necessary to dissolve all components completely). n-Decane, n-Undecane, n-Dodecane, n-Tridecane, n-Tetradecane, n-Pentadecane, n-Hexadecane, n-Heptadecane, n-Octadecane, n-Eicosane, n-Tetracosane, n-Octacosane, n-Dotriacontane, n-Hexatriacontane, n-Tetracontane, n-Tetratetracontane	2mL	48179	
ASTM D5307 Crude Oil Qualitative Standard	Each of the hydrocarbons listed in the approximate proportions (w/w) indicated Combine with Cat. No. 48179 to prepare a calibration mixture covering C3 to C44 for calibrating retention times for boiling point correlation. n-Propane, 10%, n-Butane, 15%, n-Pentane, 15%, n-Hexane, 15%, n-Heptane, 15%, n-Octane, 15%, n-Nonane, 15%	1mL	48182	
ASTM D5307 Crude Oil Internal Standard	Equal weights of the hydrocarbons listed Add to the crude oil sample as the internal standard. n-Tetradecane, n-Pentadecane, n-Hexadecane, n-Heptadecane	25mL	48479	

High Molecular Weight Hydrocarbon Standards

For high temperature SIMDIS or GC analyses. Polywax materials are polyethylene waxes having average molecular weights of 500 and 655 Dalton, respectively. Ethylene oligomers range in carbon number from approximately C20 to C100+ and are useful for establishing retention times.

DESCRIPTION	CONC.	QTY.	CAT. NO.	PRICE
Pentacontane (nC50)	Neat	50mg	48595	
Hexacontane (nC60)	Neat	50mg	48893	
Polywax 500	Neat	5000mg	48475	
Polywax 500	10,000µg/mL in p-xylene	6 x 1mL	48480-U	
Polywax 655	Neat	5000mg	48477	
Polywax 655	10mg/mL in p-xylene	6 x 1mL	48482	

ASTM D5441

Purity of Methyl tert-butyl ether (MTBE) by GC

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
MTBE Quantitative Solutions and Neat Materials	For analyses of oxygenates in gasoline.			
tert-Amyl methyl ether	2000µg/mL in methanol	1mL	506737	
Methyl tert-butyl ether (MTBE)	Neat	1000mg	48027	
Methyl tert-butyl ether (MTBE)	2000µg/mL in methanol	1mL	48483	
MTBE Contaminant Standards ASTM D5441 MTBE Contaminants (High) Mix A	Each component at 1% w/w in MTBE Use to identify and determine response factors for the common impurities in MTBE. tert-Amyl methyl ether, tert-Butanol, tert-Butyl ethyl ether, Methanol, 2-Methylbutane, 2-Methyl-2-butene, Pentane, cis-2-Pentene, trans-2-Pentene, Triisobutylene (mixed isomers), 2,4,4-Trimethyl-1-pentene	1mL	47942	
ASTM D5441 MTBE Contaminants (Low) Mix B	Each component at 0.1% w/w in MTBE Use to identify and determine response factors for the common impurities in MTBE. tert-Amyl methyl ether, tert-Butanol, tert-Butyl ethyl ether, Methanol, 2-Methylbutane, 2-Methyl-2-butene, Pentane, cis-2-Pentene, trans-2-Pentene, Triisobutylene (mixed isomers), 2,4,4-Trimethyl-1-pentene	1mL	47943	

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Petroleum Standards
ASTM D5442, Paraffin Mixes

ASTM D5442

Analysis of Petroleum Waxes by GC Qualitative and quantitative mixes of n-paraffins used for determining column resolution, retention times, and response factors.

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
Retention Time Standards ASTM D5442 C16-C44 Retention Time Mix	Neat qualitative n-paraffins, each at 8.3 weight percent Use to establish retention times from C16 to C44 C16, C18, C20, C22, C24, C26, C28, C30, C32, C36, C40, C44	500mg	502251	
ASTM D5442 C12-C60 Retention Time Mix	Neat qualitative n-paraffins, each at 6.25 weight percent Use to establish retention times from C12 to C60 C12, C14, C16, C18, C20, C22, C24, C26, C28, C30, C32, C36, C40, C44, C50, C60	500mg	500623	
Quantitative Linearity Standards ASTM D5442 C16-C44 Linearity Standard	n-Paraffins, each at 0.01 weight percent Accurately prepared mix. Use to determine response factors from C16 to C44. C16, C18, C20, C22, C24, C26, C28, C30, C32, C36, C40, C44	1mL 6 x 1mL	502278 502286	
ASTM D5442 C12-C60 Linearity Standard	n-Paraffins, each at 0.01 weight percent Accurately prepared mix. Use to determine response factors from C12 to C60. C12, C14, C16, C18, C20, C22, C24, C26, C28, C30, C32, C36, C40, C44, C50, C60	1mL 6 x 1mL	502243 502235	

Aliphatic Hydrocarbons Kit

Kit contains the following neat compounds and mixtures. Each compound individually packaged in ampules or vials.

CHEMICAL NAME	CONCENTRATION	QTY.	CAT. NO.	PRICE
Aliphatic Hydrocarbons Kit	34 individual ampules and vials n-Pentane, 1.0g; n-Hexane, 1.0g; n-Heptane, 1.0g; n-Octane, 1.0g; n-Nonane, 1.0g; n-Decane, 1.0g; n-Dodecane, 1.0g; n-Tetradecane, 1.0g; n-Hexadecane, 1.0g; 1-Octene, 0.5g; 1-Decene, 0.5g; 1-Dodecene, 0.5g; 1-Tetradecene, 0.5g; 1-Hexadecene, 0.5g; 1-Octadecene, 0.5g; Isooctane, 1.0g; Squalane, 1.0g; Squalene, 1.0g; n-Octadecane, 1.0g; n-Eicosane, 1.0g; n-Eicosene, 0.5g; n-Docosane, 0.1g; n-Tricosane, 0.1g; n-Triacontane, 0.1g; n-Dotriacontane, 0.1g; n-Tetratricontane, 0.1g; n-Hexatriacontane, 0.1g; n-Tetratetracontane, 0.1g; n-Heneicosane, 0.1g; n-Tetracosane, 1.0g; n-Pentacosane, 0.1g; n-Hexacosane, 0.1g; n-Octacosane, 1.0g; n-Tetracontane, 0.1g	1	44575-U	

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Petroleum Standards
Paraffin Mixes, ASTM D5580

Qualitative n-Paraffin Mixes

For determining retention indices and retention times.

CHEMICAL NAME	CONCENTRATION	QTY.	CAT. NO.	PRICE
n-Paraffin Mix C5, C6, C7, C8	Neat, varied concentrations	500mg	47100	
n-Paraffin Mix C7, C8, C9, C10	Neat, varied concentrations	500mg	47101	
n-Paraffin Mix C10, C12, C14, C16	Neat, varied concentrations	500mg	47102	
n-Paraffin Mix C18, C20, C22, C24	2% (wt./wt.) each n-paraffin in n-octane	5mL	47108	
n-Paraffin Mix C22, C24, C28, C32	2% (wt./wt.) each n-paraffin in n-octane	5mL	47106	
n-Paraffin Mix C24, C28, C32, C36	2% (wt./wt.) each n-paraffin in n-octane	5mL	47107	

ASTM D5580

Aromatics in Gasoline -The following standards include calibration blends both with and without internal standard. The internal standard-free blends are packaged in quantities of approximately 9mL to facilitate reference standard preparation. All calibrants are provided with a chromatogram and data verifying the purity and identity of the raw material. All raw materials used are fully characterized, as described for ASTM D4815.

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
D5580 Quantitative Calibration Mix 4 (Without Internal Standard)	Each component at the nominal weight percent indicated Benzene, 2.00 Ethylbenzene, 5.00 1,2,4-Trimethylbenzene, 5.00 Toluene, 2.50 o-Xylene, 5.00 Isooctane, 80.50	9mL	47738-U	
D5580 Quantitative Calibration Mix 1 (With Internal Standard)	Each component at the nominal weight percent indicated Benzene, 0.09 o-Xylene, 0.90 Isooctane, 74.16 Toluene, 13.50 1,2,4-Trimethylbenzene, 0.90 2-Hexanone (int. std.), 10.00 Ethylbenzene, 0.45	1mL	47740-U	
D5580 Quantitative Calibration Mix 2 (With Internal Standard)	Each component at the nominal weight percent indicated Benzene, 0.45 o-Xylene, 2.25 Isooctane, 68.40 Toluene, 9.00 1,2,4-Trimethylbenzene, 9.00 2-Hexanone (int. std.), 10.00 Ethylbenzene, 0.90	1mL	47741-U	
D5580 Quantitative Calibration Mix 3 (With Internal Standard)	Each component at the nominal weight percent indicated Benzene, 0.90 o-Xylene, 9.00 Isooctane, 72.90 Toluene, 4.50 1,2,4-Trimethylbenzene, 0.45 2-Hexanone (int. std.), 10.00 Ethylbenzene, 2.25	1mL	47742-U	
D5580 Quantitative Calibration Mix 4 (With Internal Standard)	Each component at the nominal weight percent indicated Benzene, 1.80 o-Xylene, 4.50 Isooctane, 72.45 Toluene, 2.25 1,2,4-Trimethylbenzene, 4.50 2-Hexanone (int. std.), 10.00 Ethylbenzene, 4.50	1mL	47743-U	
D5580 Quantitative Calibration Mix 5 (With Internal Standard)	Each component at the nominal weight percent indicated Benzene, 4.50 o-Xylene, 0.45 Isooctane, 72.90 Toluene, 0.90 1,2,4-Trimethylbenzene, 2.25 2-Hexanone (int. std.), 10.00 Ethylbenzene, 9.00	1mL	47744-U	
D5580 Valve Timing Calibration Mix	Each component at the nominal weight percent indicated Benzene, 4.5 Ethylbenzene, 9.0 2-Hexanone (internal standard), 10.0 Toluene, 4.5 o-Xylene, 9.0 Isooctane, 63.0	1mL	47731-U	
D5580 Selectivity Check Standard	Each component at the nominal weight percent indicated n-Dodecane, 1.5 Isooctane, 98.5	1mL	47732-U	
D5580 Quantitative Calibration Kit	Each component at the nominal weight percent indicated Quantitative Calibration Mix 1 (47740-U) Quantitative Calibration Mix 2 (47741-U) Quantitative Calibration Mix 3 (47742-U) Quantitative Calibration Mix 4 (47743-U) Quantitative Calibration Mix 5 (47744-U) Valve Timing Calibration Mix (47731-U) Selectivity Check Standard (47732-U)	1mL of ea.	47734-U	
Internal Standard 2-Hexanone	Neat	5mL	47733-U	

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Petroleum Standards
ASTM D5769

ASTM D5769

Aromatics in Gasoline by GC/MS

MIXES AND SOLUTIONS	COMPOSITION	QTY.	CAT. NO.	PRICE
ASTM D5769/EPA Aromatics Internal Standard Mix	Each of the following components at the weight percent indicated Benzene-d_6, 40.0 Ethylbenzene-d_{10}, 40.0 Naphthalene-d_8, 20.0	1 x 5.0mL	47327	

WSPA RM-1 Gasoline Reference Material

This multipurpose reference material was developed by Scott Specialty Gases Inc. under the sponsorship of the Western States Petroleum Association (WSPA), based on specifications for California Phase II reformulated gasoline (RFG). Consensus values were established by 14 labs, including the California Air Resources Board (CARB) and are assured by WSPA. The specifications are shown below.

MIXES AND SOLUTIONS	QTY.	CAT. NO.	PRICE
WSPA RM-1 Gasoline Reference Material	6 x 20mL	502227	

ASTM METHOD	CONSTITUENTS	CONCENTRATION	UNITS
D4815	Oxygenate (Methyl tert-butyl ether)	2.07%	WO[1]
D5580	Total aromatics	27.7%	w/w
D5580	Benzene	0.982%	w/w
D1319	Olefins	5.42%	LV[2]
D2622/D5453	Sulfur	30.9ppm	w/w
D5191	Reid vapor pressure	6.59	psi

[1] Weight percent oxygen.
[2] Liquid volume.

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Food and Beverage Standards
USP Solvents, Phenolic Antioxidants

USP Solvent Standards

Described in US Pharmacopoeia methods for determining residual organic solvents in pharmaceutical preparations.

DESCRIPTION		QTY.	CAT. NO.	PRICE
International USP 467 Mix	8 analytes at concentrations indicated in methanol Acetonitrile (500µg/mL), 1,2-Dichloroethane (1000µg/mL), Methylene chloride (5000µg/mL) Benzene (1000µg/mL), Chloroform (500µg/mL), 1,4-Dioxane (1000µg/mL), Pyridine (1000µg/mL) Trichloroethene (1000µg/mL)	1mL	47632-U	
USP Organic Volatile Impurities Mix	5 analytes at concentrations indicated in dimethyl sulfoxide Benzene (1000µg/mL), 1,4-Dioxane (1000µg/mL), Trichloroethene (1000µg/mL) Chloroform (500µg/mL), Methylene chl oride (1000µg/mL)	4 x 1mL	47401	
USP Modified Organic Volatile Impurities Mix	5 analytes at concentrations indicated in methanol Benzene (1000µg/mL), 1,4-Dioxane (1000µg/mL), Trichloroethene (1000µg/mL) Chloroform (500µg/mL), Methylene chl oride (5000µg/mL)	1mL	47398	
USP 467 OVI Mix (High Concentration), 23rd Ed.	5 analytes at indicated concentrations in DMSO Benzene, 1000µg/mL, 1,4-Dioxane, 1000µg/mL, Trichloroethylene, 1000µg/mL Chloroform, 500µg/mL, Methylene chloride, 5000µg/mL	1mL 4 x 1mL	47538-U 47539-U	
USP 467 OVI Mix (Low Concentration), 23rd Ed.	5 analytes at indicated concentrations in DMSO Benzene, 100µg/mL, 1,4-Dioxane, 100µg/mL, Trichloroethylene, 100µg/mL Chloroform, 50µg/mL, Methylene chloride, 500µg/mL	1mL 4 x 1mL	47540-U 47541-U	
USP 467 OVI Mix (High Concentration), 24th Ed.	5 analytes at indicated concentrations in DMSO Benzene, 100µg/mL, 1,4-Dioxane, 3800µg/mL, Trichloroethylene, 800µg/mL Chloroform, 600µg/mL, Methylene chloride, 6000µg/mL	1mL	47545-U	
USP 467 OVI Mix (Low Concentration), 24th Ed.	5 analytes at indicated concentrations in DMSO Benzene, 20µg/mL, 1,4-Dioxane, 3800µg/mL, Trichloroethylene, 800µg/mL Chloroform, 600µg/mL, Methylene chloride, 6000µg/mL	1mL	47546-U	

Phenolic Antioxidants Kit

Antioxidants are added to food and other products to prevent rancidity caused by the oxidation of unsaturated fats. Supelco offers all of the antioxidants listed in the Association of Official Analytical Chemists (AOAC) Official Method 983.15 Phenolic Antioxidants in Oils, Fats, and Butter Oil. Individual antioxidants are available through our custom standards group. Each antioxidant is packaged neat, under nitrogen.

DESCRIPTION	CAS NO.	QTY.	CAT. NO.	PRICE
PHENOLIC ANTIOXIDANTS				
3,5-Di-tert-butyl-4-hydroxytoluene (BHT)	128-37-0	500mg	47168	
Phenolic Antioxidants Kits			47192	

Analyte	CAS No.	Quantity
Propyl gallate (PG)	121-79-9	500mg
2,4,5-Trihydroxybutrophenone (THBP)	1421-63-2	500mg
tert-Butylhydroquinone (TBHQ)	1948-33-0	500mg
Nordihydroguaiaretic acid (NDGA)	500-38-9	100mg
2- & 3-tert-Butyl-4- hydroxyanisole (BHA)	25013-16-5	500mg
2,6-Di-tert-butyl-4-hydroxymethyl-phenol (Ionox 100)	88-26-6	100mg
3,5-Di-tert-butyl-4-hydroxytoluene (BHT)	128-37-0	500mg
Lauryl gallate (Dodecyl gallate)	1166-52-5	500mg
Octyl gallate	1034-01-1	500mg
Ethoxyquin	91-53-2	500mg

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Chemical Standards
SUPELCO

Food and Beverage Standards
Vitamins

Vitamins

For use in HPLC, GC, and other traditional wet chemistry analyses.
All compounds have been thoroughly evaluated to ensure the utmost quality.

Vitamins – neat, unless otherwise noted.

DESCRIPTION	CAS NO.	QTY.	CAT. NO.	PRICE
WATER SOLUBLE VITAMINS				
Thiamine hydrochloride (B1)	67-03-8	1g	47858	
Riboflavin (B2)	83-88-5	1g	47861	
Pyridoxine hydrochloride (B6)	58-56-0	1g	47862	
L-Ascorbic acid	50-81-7	1g	47863	
Nicotinic acid	59-67-6	1g	47864	
Nicotinamide	98-92-0	1g	47865-U	
Folic acid	75708-92-8	500mg	47866	
Pantothenic acid (hemicalcium salt)	137-08-6	1g	47867	
D-Biotin	58-85-5	100mg	47868	
Cyanocobalamin (B12)	68-19-9	100mg	47869	
FAT SOLUBLE VITAMINS				
Retinol acetate	127-47-9	100mg	46958	
Retinol palmitate	79-81-2	100mg	46959-U	
D-α-Tocopherol succinate	4345-03-3	100mg	47782	
DL-α-Tocopherol	10191-41-0	100mg	47783	
rac-β-Tocopherol (50mg/mL in hexane)	148-03-8	1mL	46401-U	
δ-Tocopherol	119-13-1	100mg	47784	
γ-Tocopherol	54-28-4	10mg	47785	
DL-α-Tocopherol acetate	7695-91-2	100mg	47786	
Cholecalciferol (D3)	67-97-0	100mg	47763	
Ergocalciferol (D2)	50-14-6	100mg	47768	
Phylloquinone (K1)	84-80-0	100mg	47773	
Menaquinone (K2)	110232-49-8	100mg	47774	
Menadione (K3)	58-27-5	1000mg	47775	

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Mycotoxins

Our mycotoxin standards are specifically designed for use according to the Official Methods of the Association of Official Analytical Chemists (AOAC). We test all products by spectroscopy and/or HPLC against known standards and previous lots to ensure precision and uniformity, assuring that you are obtaining the finest mycotoxin standards available.

Ordering Note: Due to recent changes in U.S. and international laws, you could need a license to order aflatoxin standards. A company representative will notify you if a license is necessary.

Caution: Mycotoxins may be carcinogenic and, therefore, should be handled only by qualified personnel.

DESCRIPTION	CONCENTRATION/SOLVENT	QTY.	CAT. NO.	PRICE
AFLATOXIN STANDARDS – QUANTITATIVE STANDARDS DESIGNED FOR USE IN ACCORDANCE WITH AOAC METHOD 970.44.				
Aflatoxin B and Aflatoxin G Mixes				
Each ampul contains 1µg B_1, 1µg G_1, 0.3µg B_2, and 0.3µg G_2.	Benzene:acetonitrile (98:2)	5 x 1mL	46300-U■	
	Methanol	5 x 1mL	46304-U	
	Methanol	5mL	46303	
Single Component Aflatoxin Standards				
Aflatoxin B_1 [1162-65-8]	3µg/mL in benzene:acetonitrile (98:2)	1mL	46323-U	
Aflatoxin B_2 [7220-81-7]	3µg/mL in benzene:acetonitrile (98:2)	1mL	46324-U	
Aflatoxin G_1 [1165-39-5]	3µg/mL in benzene:acetonitrile (98:2)	1mL	46325-U	
Aflatoxin G_2 [7241-98-7]	3µg/mL in benzene:acetonitrile (98:2)	1mL	46326-U	
Aflatoxin M_1 [6795-23-9]	10µg/mL in acetonitrile	1mL	46319-U	
Aflatoxin M_2 [6885-57-0]	1µg/mL in acetonitrile	1mL	46910-U	
OTHER MYCOTOXINS				
Deoxynivalenol (DON) [51481-10-8]	200µg/mL in ethyl acetate:methanol (95:5) For use in AOAC Methods 986.17 and 986.16	1mL	46911	
Ochratoxin A [303-47-9]	50µg/mL in benzene:acetic acid (99:1)	1mL	46912	
Ochratoxin B [4825-86-9]	50µg/mL in benzene:acetic acid (99:1) Ochratoxin A and B solutions have been produced according to the guidelines in AOAC Method 973.37	1mL	46913-U	
Patulin [149-29-1]	100µg/mL in chloroform Prepared for use with AOAC Method 974.18	1mL	46914-U	
Zearalenone [17924-92-4]	50µg/mL in acetonitrile AOAC Method 976.22 contains methodology for detecting zearalenone in corn. Method 985.18 lists a method for detecting and quantifying zearalenone and α-zearalenol in corn.	1mL	46916-U	

■ Intended for use in accordance with AOAC Method 971.22.

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Chemical Standards

SUPELCO

Food and Beverage Standards
Carbohydrates/Organic Acids/Sugar Alcohols

Carbohydrates/Organic Acids/Sugar Alcohols

Prepared, tested, and packaged using rigorous manufacturing procedures.

NAME OF KIT	DESCRIPTION			CAT. NO.	PRICE
Monosaccharides Kit				47267	
	Analyte	CAS No.	Quantity		
	D-(-)Arabinose	28697-53-2	500mg		
	D-(+)Galactose	59-23-4	500mg		
	D-(+)Glucose (mixed anomers)	50-99-7	500mg		
	D-(+)Mannose (mixed anomers)	3458-28-4	500mg		
	D-Psicose (mixed anomers)	551-68-8	100mg		
	D-(-)Ribose	50-69-1	500mg		
	D-(+)Xylose	58-86-6	500mg		
Disaccharides Kit				47268-U	
	Analyte	CAS No.	Quantity		
	Isomaltose (mixed anomers)	499-40-1	100mg		
	α-Lactose	5989-81-1	500mg		
	Maltose	6363-53-7	500mg		
	Sucrose	57-50-1	500mg		
Oligosaccharides Kit				47265	
	Analyte	CAS No.	Quantity		
	Maltoheptaose (Dp7)	34620-78-5	100mg		
	Maltohexaose (Dp6)	34620-77-4	100mg		
	Maltopentaose (Dp5)	34620-76-3	100mg		
	Maltotetraose (Dp4)	34612-38-9	100mg		
	Stachyose (Dp4)	10094-58-3	100mg		
	Maltotriose (Dp3)	1109-28-0	100mg		
	D-(+)Melezitose (Dp3)	10030-67-8	100mg		
	D-(+)Raffinose (Dp3)	17629-30-0	100mg		
	Isomaltotriose (Dp3)	3371-50-4	100mg		
Organic Acids Kit				47264	
	Analyte	CAS No.	Quantity		
	Acetic acid	64-19-7	500mg		
	Adipic acid	124-04-9	500mg		
	L-Ascorbic acid	50-81-7	500mg		
	Benzoic acid	65-85-0	500mg		
	Butyric acid	107-92-6	500mg		
	Citric acid	77-92-9	500mg		
	Formic acid	64-18-6	500mg		
	Fumaric acid	110-17-8	500mg		
	Isobutyric acid	79-31-2	500mg		
	DL-Isocitric acid	1637-73-6	100mg		
	L-(+)Lactic acid	79-33-4	100mg		
	Maleic acid	110-16-7	500mg		
	D-Malic acid	636-61-3	100mg		
	Malonic acid	141-82-2	500mg		
	Oxalic acid	144-62-7	500mg		
	Phytic acid	123408-98-0	500mg		
	Propionic acid	79-09-4	500mg		
	(-)Quinic acid	77-95-2	500mg		
	Shikimic acid	138-59-0	100mg		
	Succinic acid	110-15-6	500mg		
	D-Tartaric acid	147-71-7	500mg		
Sugar Alcohols Kit				47266	
	Analyte	CAS No.	Quantity		
	D-(+)Arabitol	488-82-4	500mg		
	Dulcitol (Galactitol)	608-66-2	500mg		
	iso-Erythritol	149-32-6	500mg		
	Glycerol	56-81-5	500mg		
	Maltitol	585-88-6	500mg		
	D-Mannitol	69-65-8	500mg		
	Ribitol (Adonitol)	488-81-3	500mg		
	D-Sorbitol	50-70-4	500mg		

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Food and Beverage Standards
Alditol Acetates, Sweeteners, Antimicrobials

Alditol Acetates

These are quantitative standards. Concentrations of each component are selected to give a relatively uniform chromatogram for TLC, GC, or HPLC analysis.

MIX	COMPONENTS	QTY.	CAT. NO.	PRICE
Alditol Acetate Mix 1		1mL	47880-U	
	4 components, 50mg/mL total in chloroform			
	Rhamnitol acetate (25%) Ribitol acetate (25%)			
	Fucitol acetate (25%) Arabinitol acetate (25%)			
Alditol Acetate Mix 2		1mL	47881	
	4 components, 50mg/mL total in chloroform			
	Mannitol acetate (25%) Glucitol acetate (25%)			
	Galactitol acetate (25%) Inositol acetate (25%)			

Sweeteners

Sweeteners are classified into two main groups — caloric (nutritive) and non-caloric (non-nutritive). Nutritive sweeteners are metabolized by the body to provide energy. Non-nutritive sweetners are not metabolized by the body and are unchanged before excretion. The nutritive sweeteners are carbohydrates, or derivatives of carbohydrates, such as sugar alcohols.

The study of sweeteners is increasing, due to the dietary requirements of diabetics and concerns about obesity. We offer a variety of sweeteners that the food industry either is using or is evaluating for potential use. We have evaluated these standards to provide the highest quality for your analytical needs.

COMPOUND	CAS NO.	QTY.	CAT. NO.	PRICE
Acesulfame K	55589-62-3	1g	47134	
Aspartame	22839-47-0	500mg	47135	
Sodium cyclamate	139-05-9	1g	47827	
D-(+)Glucose	50-99-7	1g	47829	
Sodium saccharin	82385-42-0	1g	47839	
Saccharin (hemicalcium)	6381-91-5	1g	47840	
D-Sorbitol	50-70-4	1g	47841	
Xylitol	87-99-0	1g	47844	

Antimicrobials/Preservatives

These neat preservative standards have been evaluated to ensure that they are of the highest quality. We offer these standards in small quantities; there is no need to purchase a large quantity of chemicals, only to pay expensive disposal charges later.

Neat, each 1g.

COMPOUND	CAS NO.	QTY.	CAT. NO.	PRICE
Benzoic acid	65-85-0	1g	47849	
Sodium benzoate	532-32-1	1g	47850	
Methyl paraben	99-76-3	1g	47889	
Sorbic acid	110-44-1	1g	47845	
Potassium sorbate	590-00-1	1g	47848	

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Food and Beverage Standards
Lipids

Lipid Standards

Fatty Acid Methyl Esters (FAMEs)

A Word on Nomenclature - Common names are used in this catalog where brevity does not sacrifice clarity. Geneva names are used where possible.

Saturated and unsaturated fatty acids are named according to the number of carbon atoms of the parent hydrocarbon chain. Saturated fatty acids are named according to the modified Geneva system, by replacing the terminal "e" of the parent hydrocarbon with the suffix "oic" (e.g., decane to decanoic). The common names of most of these fatty acids are also listed.

Unsaturated fatty acids are named by replacing the "e" of the corresponding unsaturated hydrocarbon with the suffix "enoic" (e.g. to decenoic). The number of multiple double bonds is indicated by adding dienoic, and so on to the hydrocarbon name. For example, the 18 carbon chain acid with three double bonds is named octadecatrienoic.

Double bonds are also designated by position and geometric configuration. Naturally occurring fatty acids are usually of the *cis*-configuration, unless stated as *trans*. Octadecenoic acid with the double bond in the nine position has both *cis* (common name, oleic acid) and *trans* (elaidic acid) forms. The simplest way to name double-bond positions is to count carbons, starting with the carboxyl carbon, until you reach the double bond. Thus, oleic acid named by the Geneva system is *cis*-9-octadecenoic acid:

$$CH_3(CH_2)_7CH = \overset{9}{C}H(CH_2)_7\overset{1}{C}OOH,$$

and linoleic acid is *cis*-9,12-octadecadienoic acid:

$$CH_3(CH_2)_4CH = \overset{12}{C}HCH_2CH = \overset{9}{C}H(CH_2)_7\overset{1}{C}OOH.$$

In the product descriptions for lipid mixes, chain length, followed by the number of double bonds, is indicated in parentheses after the component names. For example, linolenic acid, which has a chain length of 18 and 3 double bonds, is listed as:

Linolenic acid (18:3)

C18 FAME Isomer Mix

MIX	COMPONENTS	WT. %	QTY.	CAT. NO.	PRICE
Linoleic Acid Methyl Ester cis/trans Isomer Mix	4 components, 10mg/mL in methylene chloride		1mL	47791	
	trans-9,trans-12-Octadecadienoic acid methyl ester	50			
	cis-9,trans-12-Octadecadienoic acid methyl ester	20			
	trans-9,cis-12-Octadecadienoic acid methyl ester	20			
	cis-9,cis-12-Octadecadienoic acid methyl ester	10			

C18 cis/trans Fatty Acids/FAMEs

10mg/mL in heptane.

DESCRIPTION	CAS NO.	QTY.	CAT. NO.	PRICE
cis-6-Octadecenoic methyl ester (Petroselinic)	2777-58-4	1mL	47198	
trans-6-Octadecenoic methyl ester (Petroselaidic)	–	1mL	47199	
cis-7-Octadecenoic methyl ester	2278-59-3	1mL	46900-U	
cis-9-Octadecenoic methyl ester (Oleic)	112-62-9	1mL	46902-U	
trans-9-Octadecenoic methyl ester (Elaidic)	2462-84-2	1mL	46903	
cis-11-Octadecenoic methyl ester (cis-Vaccenic)	1937-63-9	1mL	46904	
trans-11-Octadecenoic methyl ester (trans-Vaccenic)	6198-58-9	1mL	46905-U	
cis-12-Octadecenoic methyl ester	2733-86-0	1mL	46906	
trans-12-Octadecenoic methyl ester	20221-23-2	1mL	46907-U	
trans-13-Octadecenoic methyl ester	42199-38-2	1mL	46909	
cis-15-Octadecenoic methyl ester	10411-39-9	1mL	46953	
cis-9,12-Octadecedienoic methyl ester	112-63-0	1mL	46950-U	
trans-9,12-Octadecedienoic methyl ester	2566-97-4	1mL	46951-U	
cis-5,8,11,14,17-Eicosapentaenoic methyl ester	2734-47-6	1mL	47571-U	
cis-4,7,10,13,16,19-Docosahexaenoic methyl ester	301-01-9	1mL	47570-U	
cis-7,10,13,16,19-Docosapentaenoic methyl ester	108698-02-8	1mL	47563-U	

Highly Characterized Reference Oils

We offer highly characterized common reference oil samples for use as controls or check samples for fatty acid methyl ester (FAME) analyses. These samples provide an excellent means of standardizing your lipid procedures and comparing your results to others. A Certificate of Analysis is provided with each oil sample.

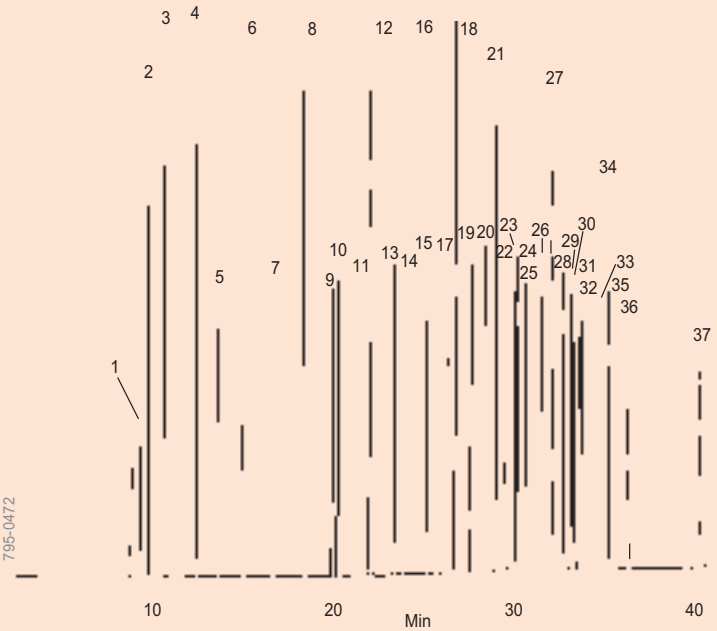
1g, packed in amber ampul under nitrogen.

DESCRIPTION	CAS NO.	WT.	CAT. NO.	PRICE
Canola oil	120962-03-0	1g	46961	
Coconut oil	8001-31-8	1g	46949	
Corn oil	8001-30-7	1g	47112-U	
Cottonseed oil	8001-29-4	1g	47113	
Flaxseed oil	8001-26-1	1g	47559-U	
Lard oil	8016-28-2	1g	47115-U	
Menhaden fish oil	8002-50-4	1g	47116	
Menhaden fish oil, partially hydrogenated (PHMO)	—	1g	47117	
Olive oil – refined	8001-25-0	1g	47118	
Palm oil	8002-75-3	1g	46962	
Peanut oil	8002-03-7	1g	47119	
Safflower oil	8001-23-8	1g	47120-U	
Soybean oil	8001-22-7	1g	47122	
Sunflower seed oil	8001-21-6	1g	47123	

Supelco 37 Component FAME Mix

This fatty acid methyl ester (FAME) reference standard is carefully prepared by weight. The weight percentage of each component is indicated. Each ampul contains 10mg/mL of the FAME reference standard mix in methylene chloride.

DESCRIPTION	QTY.	CAT. NO.	PRICE
Supelco 37 Component FAME Mix	1mL	47885-U	



Component FAME	Wt. %
1. Butyric (C4:0)	4
2. Caproic (C6:0)	4
3. Caprylic (C8:0)	4
4. Capric (C10:0)	4
5. Undecanoic (C11:0)	2
6. Lauric (C12:0)	4
7. Tridecanoic (C13:0)	2
8. Myristic (C14:0)	4
9. Myristoleic (C14:1)	2
10. Pentadecanoic (C15:0)	2
11. cis-10-Pentadecenoic (C15:1)	2
12. Palmitic (C16:0)	6
13. Palmitoleic (C16:1)	2
14. Heptadecanoic (C17:0)	2
15. cis-10-Heptadecenoic (C17:1)	2
16. Stearic (C18:0)	4
17. Elaidic (C18:1n9t)	2
18. Oleic (C18:1n9c)	4
19. Linolelaidic (C18:2n6t)	2
20. Linoleic (C18:2n6c)	2
21. Arachidic (C20:0)	4
22. γ-Linolenic (C18:3n6)	2
23. cis-11-Eicosenoic (C20:1)	2
24. Linolenic (C18:3n3)	2
25. Heneicosanoic (C21:0)	2
26. cis-11,14-Eicosadienoic (C20:2)	2
27. Behenic (C22:0)	4
28. cis-8,11,14-Eicosatrienoic (C20:3n6)	2
29. Erucic (C22:1n9)	2
30. cis-11,14,17-Eicosatrienoic (C20:3n3)	2
31. Arachidonic (C20:4n6)	2
32. Tricosanoic (C23:0)	2
33. cis-13,16-Docosadienoic (C22:2)	2
34. Lignoceric (C24:0)	4
35. cis-5,8,11,14,17-Eicosapentaenoic (C20:5n3)	2
36. Nervonic (C24:1)	2
37. cis-4,7,10,13,16,19-Docosahexaenoic (C22:6n3)	2

Column: SP-2560, 100m x 0.25mm ID, 0.20µm film
Cat. No.: 24056
Oven: 140°C (5 min) to 240°C at 4°C/min
Carrier: helium, 20cm/sec
Det.: FID, 260°C
Inj.: 1µL Cat. No. 47885-U, split 100:1, 260°C

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Chemical Standards

SUPELCO

Food and Beverage Standards
Lipids

AOCS Animal and Vegetable Reference Mixes

The quantitative mixes listed here conform to the requirements of American Oil Chemists' Society (AOCS) Method Ce 1-62. The composition of each mix is similar to the fatty acid distribution of certain oils (see Table 1).

RM-1 – Corn, cottonseed, kapok, poppyseed, rice, safflower, sesame, soybean, sunflower, and walnut oils

RM-2 – Hempseed, linseed, perilla, and rubberseed oils

RM-3 – Mustard seed, peanut, and rapeseed oils

Rapeseed Oil Reference Mix – Modern low erucic acid oils

RM-4 – Neatsfoot, olive, and teaseed oils

RM-5 – Babassu, coconut, ouri-curi, and palm kernel oils

RM-6 – Lard, beef tallow, mutton tallow, and palm oil

NHI/NIH Fatty Acid Methyl Ester Reference Mixes

Quantitative standards, identical in composition to those developed and distributed for several years by the National Institutes of Health (Horning, E.C.,et al., J. Lipid Research, 5:20-27, 1964). Each mix (see Table 1) was designed to test part of the chromatographic system to ensure its reliability for quantitative analyses.

GLC Standard Mixes

These quantitative mixes are useful for determining relative retention times and approximating response factors.

Table 1. Specifications for Quantitative Products
Each mix is carefully prepared by weight percent.

MIX	CAT. NO.	METHYL ESTER (% COMPOSITION BY WEIGHT)																			
Qty.: 100mg each, neat Storage Temp.: -0 C		C8:0 (caprylate)	C9:0 (nonanoate)	C10:0 (caprate)	C11:0 (undecanoate)	C12:0 (laurate)	C13:0 (tridecanoate)	C14:0 (myristate)	C15:0 (pentadecanoate)	C16:0 (palmitate)	C16:1 (palmitoleate)	C17:0 (heptadecanoate)	C18:0 (stearate)	C18:1 (oleate)	C18:2 (linoleate)	C18:3 (linolenate)**	C19:0 (nonadecanoate)	C20:0 (arachidate)	C20:1 (eicosenoate)	C21:0 (heneicosanoate)	C22:0 (behenate)	C22:1 (erucate)	C24:0 (lignocerate)
PRICE																							
RM-1	O7006-1AMP									6.0			3.0	35.0	50.0	3.0		3.0					
RM-2	O7131-1AMP									7.0			5.0	18.0	36.0	34.0							
RM-3	O7256-1AMP							1.0		4.0			3.0	45.0	15.0	3.0		3.0			3.0	20.0	3.0
Rapeseed	O7756-1AMP							1.0		4.0			3.0	60.0	12.0	5.0		3.0	1.0		3.0	5.0	3.0
RM-4	O7381-1AMP									11.0			3.0	80.0	6.0								
RM-5	O7506-1AMP	7.0		5.0		48.0		15.0		7.0			3.0	12.0	3.0								
RM-6	O7631-1AMP							2.0		30.0	3.0		14.0	41.0	7.0	3.0							
PRICE																							
NHI-C	O8256-1AMP	1.5		3.0		6.0		12.0		19.4			24.9					33.2					
NHI-D	O8381-1AMP							11.8		23.6	6.9		13.1	44.6									
NHI-F	O8631-1AMP							2.5		4.2			7.3					13.6			25.4		47.0
NHI-A	O7881-1AMP							25.0		10.0			65.0										
NHI-B	O8131-1AMP							4.0		40.0			56.0										
NHI-E	O8506-1AMP	6.3		9.1		12.1		23.3		49.2													
PRICE																							
GLC-10	1891-1AMP									20.0			20.0	20.0	20.0	20.0							
GLC-20	1892-1AMP									20.0			20.0	20.0		20.0		20.0					
GLC-30	1893-1AMP	20.0		20.0		20.0		20.0		20.0													
GLC-40	1895-1AMP									25.0			25.0					25.0			25.0		
GLC-50	1894-1AMP										25.0			25.0					25.0			25.0	
GLC-70	1897-1AMP	20.0	20.0	20.0	20.0	20.0																	
GLC-80	1898-1AMP						20.0	20.0	20.0	20.0		20.0											
GLC-90	1896-1AMP						20.0		20.0			20.0					20.0			20.0			
GLC-100	1899-1AMP												20.0				20.0	20.0		20.0	20.0		

**Stability problems arise with international shipment of mixtures containing linolenate. When ordering such mixtures from outs ide the continental US or central Europe, please check with your local dealer regarding ordering practices.

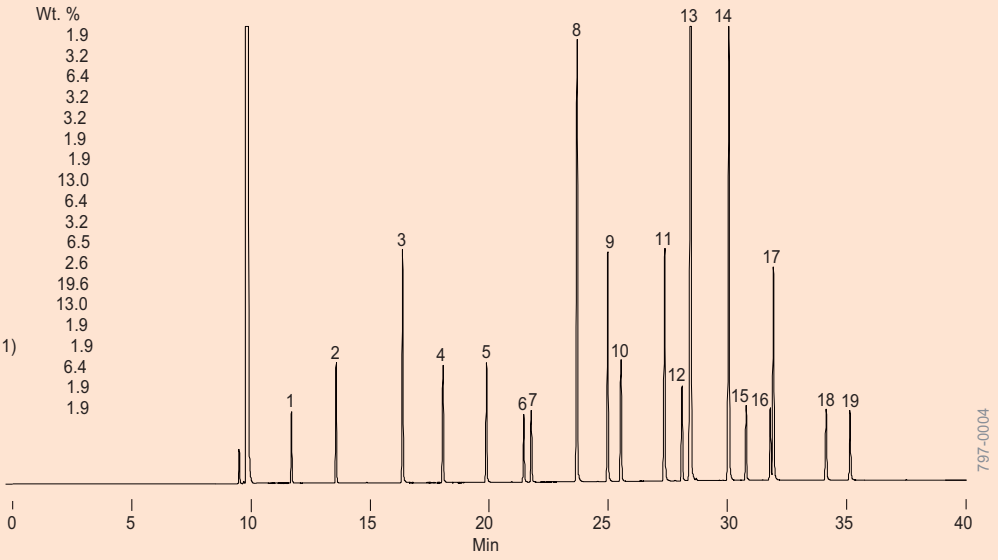
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Grain Fatty Acid Methyl Ester Mix

This fatty acid methyl ester (FAME) mixture is carefully prepared by weight. The weight percentage of each component is indicat
Each ampul contains 10mg/mL of the FAME reference standard mix in methylene chloride.

DESCRIPTION	QTY.	CAT. NO.	PRICE
Grain Fatty Acid Methyl Ester Mix	1mL	47801	

	Component FAME	Wt. %
1.	Caprylic (C8:0)	1.9
2.	Capric (C10:0)	3.2
3.	Lauric (C12:0)	6.4
4.	Tridecanoic (C13:0)	3.2
5.	Myristic (C14:0)	3.2
6.	Myristoleic (C14:1n9c)	1.9
7.	Pentadecanoic (C15:0)	1.9
8.	Palmitic (C16:0)	13.0
9.	Palmitoleic (C16:1n9c)	6.4
10.	Heptadecanoic (C17:0)	3.2
11.	Stearic (C18:0)	6.5
12.	Elaidic (C18:1n9t)	2.6
13.	Oleic (C18:1n9c)	19.6
14.	Linoleic (C18:2n6c)	13.0
15.	Arachidic (C20:0)	1.9
16.	cis-11-Eicosenoic (C20:1)	1.9
17.	Linolenic (C18:3n3)	6.4
18.	Behenic (C22:0)	1.9
19.	Erucic (C22:1n9)	1.9



Column: SP-2560, 100m x 0.25mm ID, 0.20µm film
Cat. No.: 24056
Oven: 140°C (5 min) to 240°C at 4°C/min
Carrier: helium, 20cm/sec
Det.: FID, 260°C
Inj.: 1µL, 260°C, split 100:1

Polyunsaturated Fatty Acid (PUFA) Methyl Esters

These are complex qualitative standard mixtures. Because they are extracted from natural materials, relative peak sizes and com
may vary from lot to lot.

DESCRIPTION	QTY.	CAT. NO.	PRICE
PUFA NO. 1			
Marine Source	100mg	47033	
Typically contains each FAME listed			
C14:0, C16:0, C16:1 ω7, C18:1 ω9, C18:1 ω7, C18:2 ω6, C18:4 ω3, C20:1 ω9, C20:5 ω3, C22:1 ω11, C22:1 ω9, C22:5 ω3, C22:6 ω3			
PUFA NO. 2			
Animal Source	100mg	47015-U	
Typically contains each FAME listed			
C14:0, C16:0, C16:1 ω7, C18:0, C18:1 ω9, C18:1 ω7, C18:2 ω6, C18:3 ω6, C18:3 ω3, C20:3 ω6, C20:4 ω6, C20:5 ω3, C22:4 ω6, C22:5 ω3, C22:6 ω3			
PUFA NO. 3			
From Menhaden Oil	100mg	47085-U	
Typically contains each FAME listed			
C14:0, C16:0, C16:1 ω7, C16:2 ω4, C16:4 ω1, C18:0, C18:1 ω9, C18:1 ω7, C18:2 ω6, C18:2 ω4, C18:3 ω4, C18:3 ω3, C18:4 ω3, C20:1 ω9, C20:4 ω6, C20:4 ω3, C20:5 ω3, C22:5 ω3, C22:6 ω3			

Note: In the ω-x classification, carbon atoms are numbered from the terminal methyl group to the first carbon of the ethylenic bond.
X denotes the position at the double bond closest to the terminal methyl group.

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Food and Beverage Standards
Lipids

Qualitative Methyl Ester Mixes

These mixes are prepared from unsaturated medium-chain fatty acids. They are useful for establishing retention times and for pe identification. All components are 99% pure by GLC and/or TLC, unless otherwise stated.

MIXES AND SOLUTIONS	COMPONENTS	QTY.	CAT. NO.	PRICE
SATURATED FAMES				
Fatty Acid Methyl Esters, Saturated Straight Chains Kit	10 individually packaged FAMEs, each 1g Caproic (6:0) Caprylic (8:0) Capric (10:0) Lauric (12:0) Myristic (14:0) Palmitic (16:0) Stearic (18:0) Arachidic (20:0) Behenic (22:0) Lignoceric (24:0)		ME10-1KT	
Fatty Acid Methyl Esters, Saturated Straight Chains Kit	19 individually packaged FAMEs, each 1g Caproic (6:0) Heptanoic (7:0) Caprylic (8:0) Nonanoic (9:0) Capric (10:0) Undecanoic (11:0) Lauric (12:0) Tridecanoic (13:0) Myristic (14:0) Pentadecanoic (15:0) Palmitic (16:0) Heptadecanoic (17:0) Stearic (18:0) Nonadecanoic (19:0) Arachidic (20:0) Heneicosanoic (21:0) Behenic (22:0) Tricosanoic (23:0) Lignoceric (24:0)		ME19-1KT	
Fatty Acid Methyl Esters, Saturated Straight Chains Kit	7 individually packaged FAMEs, each 100mg Pentacosanoic (25:0) Hexacosanoic (26:0) Heptacosanoic (27:0) Octacosanoic (28:0) Nonacosanoic (29:0) Triacontanoic (30:0) Hentriacontanoic (31:0), approx. 98% pure		ME7-1KT	
UNSATURATED FAMES				
Fatty Acid Methyl Esters, Unsaturated Kit	14 individually packaged FAMEs in the amounts indicated Myristoleic (14:1), 100mg Palmitoleic (16:1), 100mg Petroselinic (18:1), 100mg Oleic (18:1), 1g Elaidic (18:1), 500mg cis-Vaccenic (18:1,cis), 100mg Linoleic (18:2), 1g Linolelaidic (18:2), 100mg Linolenic (18:3, trans), 100mg cis-11-Eicosenoic (20:1), 100mg Arachidonic (20:4), 100mg Erucic (22.1), 100mg cis-4,7,10,13,16,19-Docosa-hexaenoic (22:6), 100mg Nervonic (24:1), 100mg		ME14-1KT	
Fatty Acid Methyl Ester Mix	4 components, approx. 10mg each 11-Eicosenoic (20:1) 11,14-Eicosadienoic (20:2) (98% pure) Arachidonic (20:4) 5,8,11,14,17-Eicosapentaenoic (20:5)	40mg	18912-1AMP	
Fatty Acid Methyl Ester Mix	5 components, approx. 10mg each 11-Eicosenoic (20:1) 11,14-Eicosadienoic (20:2) (98% pure) 11,14,17-Eicosatriaenoic (20:3) (97-99% pure) Arachidonic (20:4) 5,8,11,14,17-Eicosapentaenoic (20:5)	50mg	18913-1AMP	

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MIXES AND SOLUTIONS	COMPONENTS	QTY.	CAT. NO.	PRICE
UNSATURATED FAMES (CONTD.)				
Fatty Acid Methyl Ester Mix	6 components, total of 100mg neat mixture weight percentages indicated Stearic acid m.e. (C18:0), 10% Oleic acid m.e. (C18:1, cis-9), 20% Elaidic acid m.e. (C18:1, trans-9), 20% Linoleic acid m.e. (C18:2 cis-9,12), 20% Linolelaidic acid m.e. (C18:2, trans-9,12), 20% Arachidic acid m.e. (C20:0), 10%	100mg	18916-1AMP	
Fatty Acid Methyl Ester Mix	10 components, total of 100mg neat mixture weight percentages indicated Myristic acid m.e. (C14:0), 4% Palmitic acid m.e. (C16:0), 10% Stearic acid m.e. (C18:0), 6% Oleic acid m.e. (C18:1, cis-9), 25% Elaidic acid m.e. (C18:1, trans-9), 10% Linoleic acid m.e. (C18:2 cis-9,12), 34% Linolelaidic acid m.e. (C18:2, trans-9,12), 2% Linolenic acid m.e. (C18:3, cis-9,12,15), 5% Arachidic acid m.e. (C20:0), 2% Behenic acid m.e. (C22:0), 2%	100mg	18917-1AMP	
Fatty Acid Methyl Ester Mix R: 36/37/38 S: 26-36	14 components, total of 100mg neat mixture weight percentages indicated Caprylic acid m.e. (C8:0), 8% Capric acid m.e. (C10:0), 8% Lauric acid m.e. (C12:0), 8% Myristic acid m.e. (C14:0), 8% Palmitic acid m.e. (C16:0), 11% Palmitoleic acid m.e. (C16:1, cis-9), 5% Stearic acid m.e. (C18:0), 8% Oleic acid m.e. (C18:1, cis-9), 5% Linoleic acid m.e. (C18:2 cis-9,12), 5% Linolenic acid m.e. (C18:3, cis-9,12,15), 5% Arachidic acid m.e. (C20:0), 8% Behenic acid m.e. (C22:0), 8% Erucic acid m.e. (C22:1, cis-13), 5% Lignoceric acid m.e. (C24:0), 8%	100mg	18918-1AMP	
Fatty Acid Methyl Ester Mix R: 36/37/038 S: 26-36	37 components, total of 100mg neat mixture weight percentages indicated Butyric acid m.e. (C4:0), 4% Caproic acid m.e. (C6:0), 4% Caprylic acid m.e. (C8:0), 4% Capric acid m.e. (C10:0), 4% Undecanoic acid m.e. (C11:0), 2% Lauric acid m.e. (C12:0), 4% Tridecanoic acid m.e. (C13:0), 2% Myristic acid m.e. (C14:0), 4% Myristoleic acid m.e. (C14:0, cis-9), 2% Pentadecanoic acid m.e. (C15:0), 2% cis-10 Pentadecenoic acid m.e. (C15:1) (approx. 98%), 2% Palmitic acid m.e. (C16:0), 6% Palmitoleic acid m.e. (C16:1, cis-9), 2% Heptadecanoic acid m.e. (C17:0), 2% cis-10 Heptadecenoic acid m.e. (C17:1), 2% Stearic acid m.e. (C18:0), 4% Oleic acid m.e. (C18:1, cis-9), 4% Elaidic acid m.e. (C18:1, trans-9), 2% Linoleic acid m.e. (C18:2 cis-9,12), 2% Linolelaidic acid m.e. (C18:2, trans-9,12), 2% Linolenic acid m.e. (C18:3, cis-9,12,15), 2% g-Linolenic acid m.e. (C18:3, cis-6,9,12), 2% Arachidic acid m.e. (C20:0), 4% cis-11-Eicosenoic acid m.e. (C20:1), 2% cis-11,14-Eicosadienoic acid m.e. (C20:2), (98%), 2% cis-11,14,17-Eicosatrienoic acid m.e. (C20:3) (97-99%), 2% cis-8,11,14-Eicosatrienoic acid m.e. (C20:3), 2% Arachidonic acid m.e. (C20:4, cis-5,8,11,14), 2% cis-5,8,11,14,17-Eicosapentaenoic acid m.e. (C20:5), 2% Heneicosanoic acid m.e. (C21:0), 2% Behenic acid m.e. (C22:0), 4% Erucic acid m.e. (C22:1, cis-13), 2% cis-13,16-Docosadienoic acid m.e. (C22:2), 2% cis-4,7,10,13,16,19-Docosahexaenoic acid m.e. (C22:6), 2% Tricosanoic acid m.e. (C23:0), 2% Lignoceric acid m.e. (C24:0), 4% Nervonic acid m.e. (C24:1, cis-15), 2%	100mg	18919-1AMP	
Fatty Acid Methyl Ester Mix	19 components, total of 100mg neat mixture weight percentages indicated Caprylic acid m.e. (C8:0), 1.9% Capric acid m.e. (C10:0), 3.2% Lauric acid m.e. (C12:0), 6.4% Tridecanoic acid m.e. (C13:0), 3.2% Myristic acid m.e. (C14:0), 3.2% Myristoleic acid m.e. (C14:0, cis-9), 1.9% Pentadecanoic acid m.e. (C15:0), 1.9% Palmitic acid m.e. (C16:0), 13.0% Palmitoleic acid m.e. (C16:1, cis-9), 6.4% Heptadecanoic acid m.e. (C17:0), 3.2% Stearic acid m.e. (C18:0), 6.5% Oleic acid m.e. (C18:1, cis-9), 19.6% Elaidic acid m.e. (C18:1, trans-9), 2.6% Linoleic acid m.e. (C18:2 cis-9,12), 13.0% Linolenic acid m.e. (C18:3, cis-9,12,15), 6.4% Arachidic acid m.e. (C20:0), 1.9% cis-11-Eicosenoic acid m.e. (C20:1), 1.9% Behenic acid m.e. (C22:0), 1.9% Erucic acid m.e. (C22:1, cis-13), 1.9%	100mg	18920-1AMP	

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Chemical Standards

SUPELCO

Food and Beverage Standards
Lipids

Qualitative Fatty Acid Mixes

These mixes are prepared from unsaturated medium-chain fatty acids. They are useful for establishing retention times and for peak identification. All components are 99% pure by GLC and/or TLC, unless otherwise stated.

MIXES AND SOLUTIONS	COMPONENTS	QTY.	CAT. NO.	PRICE
SATURATED FATTY ACIDS				
Fatty Acids, Even Carbon Straight Chains Kit	10 individually packaged fatty acids in the amounts indicated Caproic acid (C6:0), 10mL; Caprylic acid (C8:0), 10mL; Capric acid (C10:0), 10g; Lauric acid (C12:0), 10g; Myristic acid (C14:0), 10g; Palmitic acid (C16:0), 10g; Stearic acid (C18:0), 10g; Arachidic acid (C20:0), 10g; Behenic acid (C22:0), 10g; Lignoceric acid (C24:0), 10g		EC10-1KT	
Fatty Acids, Even Carbon Straight Chains Kit	10 individually packaged fatty acids in the amounts indicated Caproic acid (C6:0), 10mL; Caprylic acid (C8:0), 10mL; Capric acid (C10:0), 10g; Lauric acid (C12:0), 10g; Myristic acid (C14:0), 10g; Palmitic acid (C16:0), 10g; Stearic acid (C18:0), 5g; Arachidic acid (C20:0), 5g; Behenic acid (C22:0), 5g; Lignoceric acid (C24:0), 1g		EC10A-1KT	
Fatty Acids, Odd Carbon Straight Chains Kit	9 individually packaged fatty acids, 1g each Heptanoic acid (C7:0) (approx. 98% pure); Nonanoic acid (C9:0) (97-99% pure); Undecanoic acid (C11:0); Tridecanoic acid (C13:0); Pentadecanoic acid (C15:0); Heptadecanoic acid (C17:0); Nonadecanoic acid (C19:0); Heneicosanoic acid (C21:0); Tricosanoic acid (C23:0)		OC9-1KT	
Volatile Acid Standard Mix	10 components, 10mM each in 100mL deionized water Formic acid; Acetic acid; Propionic acid; Isobutyric acid; Butyric acid; Isovaleric acid; n-Valeric acid; Isocaproic acid (4-Methyl-n-valeric acid); Hexanoic acid (n-Caproic acid); Heptanoic acid	100mL	46975-U	
UNSATURATED FATTY ACIDS				
Fatty Acid Mix	4 fatty acids, approx. 10mg each 6,9,12,15-Octadecatetraenoic acid (18:4) (90% pure) Arachidonic acid (20:4) 5,8,11,14,17-Eicosapentaenoic acid (20:5) 4,7,10,13,16,19-Docosahexaenoic acid (22:6)	40mg	17824-1AMP	
Fatty Acids, Unsaturated Kit	10 individually packaged fatty acids, 100mg each Palmitoleic acid (16:1); Elaidic acid (18:1, trans); Oleic acid (18:1); Petroselinic acid (18:1); Linoleic acid (18:2); Linolenic acid, ~98% (18:3); Arachidonic acid (20:4); Erucic acid (22:1); Docosahexaenoic acid (22:6); Nervonic acid (24:1)		UN10-1KT	

Mono-, Di-, and Triglycerides

These standards are approximately equal weight mixtures. They are qualitative standards, useful in determining relative retention times and establishing approximate response factors.

Each mix is prepared by weight, and the composition verified by gas and/or thin layer liquid chromatography. The weight percent of each component is indicated. Each product contains 100mg total weight of lipid unless otherwise indicated.

MIXES AND SOLUTIONS	COMPONENTS	QTY.	CAT. NO.	PRICE
QUALITATIVE MIXES				
Triglyceride Mix	5 components, approx. 20mg each Tricaprylin (8:0); Tricaprin (10:0); Trilaurin (12:0); Trimyristin (14:0); Tripalmitin (16:0)	100mg	17811-1AMP	
Triglyceride Mix	3 components, approx. 33 1/3 mg each Triolein (18:1, cis-9); Trielaidin (18:1, trans-9); Tripetroselinin (18:1, cis-6)	100mg	17818-1AMP	
Olive Oil Standard Mix▲	5 components at the concentrations indicated Trilinolein (18:2), 2% 1,2-Dilinoleoyl-3-oleoyl-rac-glycerol (18:2, 18:2, 18:1), 4% Triolein (18:1), 60% 1,2-Dioleoyl-3-palmitoyl-rac-glycerol (18:1, 18:1, 16:0), 30% 1,2-Dioleoyl-3-stearoyl-rac-glycerol (18:1, 18:1, 18:0), 4%	50mg	TRI5-1AMP	
Mono-, Di-, and Triglyceride Mix	4 components, approx. 10mg each Monoolein (18:1); 1,2-Diolein (18:1); 1,3-Diolein (18:1); Triolein (18:1)	40mg	1787-1AMP	

▲ Component percentages are target values. Actual composition may vary from lot to lot. Lot specific analysis is available upon request from our Technical Service department.

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MIXES AND SOLUTIONS	COMPONENTS	CAT. NO.	PRICE
QUALITATIVE MIXES (CONTD.)			
Triglycerides Kit	10 individually packaged triglycerides, 50mg each Trilaurin (C12:0) 1,2-Dilauroyl-3-myristoyl-rac-glycerol (C12:0/C12:0/C14:0) 1,2-Dimyristoyl-3-lauroyl-rac-glycerol (C14:0/C14:0/C12:0) Trimyristin (C14:0) 1,2-Dimyristoyl-3-palm itoyl-rac-glycerol (C14:0/C14:0/C16:0) 1,2-Dipalmitoyl-3-myristoyl-rac-glycerol (C16:0/C16:0/C14:0) Tri palmitin (C16:0) 1,2-Distearoyl-3-myristoyl-rac-glycerol (C18:0/C18:0/C14:0) 1,2-Distearoyl-3-palmitoyl-rac-glycerol (C18:0/C18:0/C16:0) T ristearin (C18:0)	TRI10-1KT	
Triglycerides Kit	19 individually packaged triglycerides in quantities indicated Shipped in dry ice. Triacetin (C2:0), 100mg Tributyrin (C4:0), 100mg Tricaproin (C6:0), 1mL Tricaprylin (C8:0), 0.5mL Tricaprin (C10:0), 100mg Trilaurin (C12:0), 100mg Trimyristin (C14:0), 1g Tripalmitin (C16:0), 100mg Tripalmitolein (C16:1, cis-9), approx. 98%, 100mg Tripetroselinin (C18:1, cis-6), 100mg Tristearin (C18:0), 100mg Triolein (C18:1, cis-9), 100mg Trielaidin (C18:1, trans-9), 100mg Trilinolein (C18:2, cis-9,12), 100mg Trilinolenin (C18:3, cis-9,12,15), approx. 98%, 100mg Triarachidin (C20:0), 100mg Tri-cis-11-eicosenoin (C20:1), 100mg Tribehenin (C22:0), 100mg Trierucin (C22:1, cis-13), 100mg	TRI19-1KT	
Triglycerides, Saturated, Even Carbon Chains Kit	11 individually packaged triglycerides in quantities indicated Triacetin (2:0), 100mg Tributyrin (4:0), 100mg Tricaproin (6:0), 1mL Tricaprylin (8:0), 1mL Tricaprin (10:0), 100mg Trilaurin (12:0), 100mg Trimyristin (14:0), 100mg Tripalmitin (16:0), 100mg Tristearin (18:0), 100mg Triarachidin (20:0), 100mg Tribehenin (22:0), 100mg	TRI11-1KT	
Mono-, Di-, and Triglycerides Kit	12 individually packaged glycerides, 100mg each 1-Monolauroyl-rac-glycerol (12:0) Dilaurin (12:0) Trilaurin (12:0) 1-Monomyristoyl-rac-glycerol (14:0) Dimyristin (14:0) Trimyristin (14:0) 1-Monopalmitoyl-rac-glycerol (16:0) Dipalmitin (16:0) Tripalmitin (16:0) 1-Monostearoyl-rac-glycerol (18:0) Distearin (18:0) Tristearin (18:0)	MDT12-1KT	
Phospholipid Mixture for HPLC R: 45-46-23/24/25-36/37/38 S: 45-26-36/37/39-23	4 components in 2.0mL of a chloroform solution L- α-Phosphatidylcholine, 1.5mg/mL L- α-Phosphatidylethanolamine, 1.2mg/mL L- α-Phosphatidylinositol, ammonium salt, 0.9mg/mL L- α-Lysophosphatidylcholine, 0.3mg/mL	P3817-1VL	

Sterols

Sterols make up the majority of the unsaponifiable matter in vegetable and animal fats. Animal fats contain mostly cholesterol, whereas most vegetable fats contain only traces of this sterol. Plant sterols are collectively called phytosterols.

These standards are not corrected for purity. Packed in amber ampul under nitrogen.

DESCRIPTION	CAS NO.	CONCENTRATION	QTY.	CAT. NO.	PRICE
5-α-Cholestane	481-21-0	10mg/mL in chloroform	1mL	47124	
Campesterol	474-62-4	100µg/mL in chloroform	1mL	47126	
Cholesterol	57-88-5	10mg/mL in chloroform	1mL	47127-U	
Dihydrocholesterol	80-97-7	10mg/mL in chloroform	1mL	47129	
Ergosterol	57-87-4	10mg/mL in chloroform	1mL	47130-U	
Stigmasterol	83-48-7	10mg/mL in chloroform	1mL	47132	
β-Sitosterol	83-46-5	100µg/mL in chloroform	1mL	47133	

*Purity approx. 60%.

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Chemical Standards

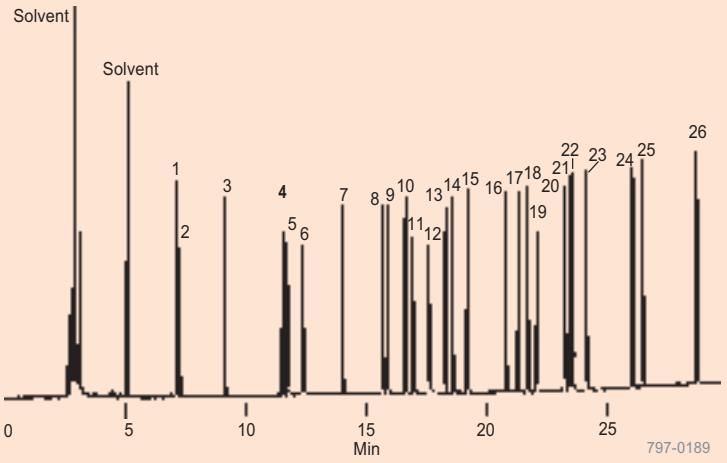
SUPELCO

Bacterial Identification Standards
Lipids

Standard for Bacteria Identification

This is a qualitative standard of bacterial acid methyl esters in methyl caproate (10mg/mL total concentration).

DESCRIPTION	QTY.	CAT. NO.	PRICE
Bacterial Acid Methyl Ester (BAME)	1mL	47080-U	



1. 11:0 Me. undecanoate
2. 2-OH 10:0 Me. 2-hydroxydecanoate
3. 12:0 Me. dodecanoate
4. 13:0 Me. tridecanoate
5. 2-OH 12:0 Me. 2-hydroxydodecanoate
6. 3-OH 12:0 Me. 3-hydroxydodecanoate
7. 14:0 Me. tetradecanoate
8. i-15:0 Me. 13-methyltetradecanoate
9. a-15:0 Me. 12-methyltetradecanoate
10. 15:0 Me. pentadecanoate
11. 2-OH 14:0 Me. 2-hydroxytetradecanoate
12. 3-OH 14:0 Me. 3-hydroxytetradecanoate
13. i-16:0 Me. 14-methylpentadecanoate
14. $16:1^{9}$ Me. cis-9-hexadecenoate
15. 16:0 Me. hexadecanoate
16. i-17:0 Me. 15-methylhexadecanoate
17. $17:0^{\Delta}$ Me. cis-9,10- methylenehexadecanoate
18. 17:0 Me. heptadecanoate
19. 2-OH 16:0 Me. 2-hydroxyhexadecanoate
20. $18:2^{9,12}$ Me. cis-9,12-octadecadienoate
21. $18:1^{9}$ Me. cis-9-octadecenoate
22. $18:1^{9}$ Me. trans-9-octadecenoate
23. 18:0 Me. o ctadecanoate
24. $19:0^{\Delta}$ Me. cis-9,10- methyleneoctadecanoate
25. 19:0 Me. nonadecanoate
26. 20:0 Me. eicosanoate

Column: SPB-1, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 24028
Oven: 150°C (4 min) to 250°C (5 min) at 4°C/min
Carrier: helium, 20cm/sec (150°C)
Det.: FID
Inj.: 1µL

Water Soluble Fatty Acid (WSFA) Mixes

MIXES AND SOLUTIONS	COMPONENTS	QTY.	CAT. NO.	PRICE
WSFA-2	0.1% of each fatty acid in water (weight percent) Acetic acid (C2) Propionic acid (C3) Butyric acid (C4) Isobutyric acid (iC4) Valeric acid (C5) Isovaleric acid (iC5)	5mL	47056	
WSFA-4	0.1% of each fatty acid in water (weight percent) Acetic acid (C2) Propionic acid (C3) Butyric acid (C4) Isobutyric acid (iC4) Valeric acid (C5) 2-Methylbutyric acid (2-methyl C4) Isovaleric acid (iC5)	5mL	47058	

Other Qualitative Standards

MIXES AND SOLUTIONS	COMPONENTS	QTY.	CAT. NO.	PRICE
Volatile Acid Standard Mix	10 components, 10mM each in deionized water Formic acid Acetic acid Propionic acid Isobutyric acid Butyric acid n-Valeric acid Isocaproic acid (4-Methyl-n-valeric acid) Hexanoic acid (n-Caproic acid) Isovaleric acid Heptanoic acid	100mL	46975-U	
Nonvolatile Acid Standard Mix	8 components, 1 meq of each in deionized water Pyruvic acid Lactic acid Oxalacetic acid Oxalic acid Methyl malonic acid Malonic acid Fumaric acid Succinic acid	100mL	46985-U	

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Acylation Reagents

Acylation, an alternative to silylation, is the conversion of compounds that contain active hydrogens (-OH, -SH and -NH) into esters, thioesters, and amides through the action of a carboxylic acid or derivative. The presence of a carbonyl group adjacent to the halogenated carbons enhances electron capture detector (ECD) response.

Acylation has many benefits:

- It improves stability of compounds by protecting unstable groups.
- It may confer volatility on substances such as carbohydrates or amino acids, which have so many polar groups that they are nonvolatile and normally decompose on heating.
- It assists in separations not possible with underivatized compounds.
- Compounds are detectable at very low levels with an ECD.

Perfluoro Acid Anhydrides – Acylation reduces the polarity of amino, hydroxyl, and thiol groups to form perfluoroacyl derivatives, which are both stable and highly volatile. Fluorinated anhydride derivatives are used primarily for ECD, but also can be used for flame ionization detection (FID). They react with alcohols, phenols, and amines to produce stable derivatives. Fluorinated anhydrides are used in derivatizing samples for drug of abuse confirmation.

The anhydrides and acyl halide reagents form acid byproducts, which must be removed in GC analysis to prevent destructive effects on the column. Acylations with anhydride reagents are normally performed in pyridine, tetrahydrofuran, or some other solvent capable of accepting the acid byproduct. Amine bases also may be used as catalysts/acid acceptors.

Perfluoroacylimidazoles – Perfluoroacylimidazoles offer advantages over anhydrides in preparing perfluoroacyl derivatives. The reactions are smooth and quantitative, and produce no acid byproducts that must be removed from the system before injection. The activated amide reagents yield no acid byproducts, giving only imidazole and N-methyltrifluoroacetamide, respectively. The perfluoroacylimidiazoles react with hydroxyl groups, both primary and secondary amines, and quantitatively acylate indole alkylamines.

General Acylation Reagents – N-methylbis(trifluoroacetamide) reacts with amines at room temperature. Hydroxyl derivatizations are slower; heat is recommended.

Acronyms for Acylation Reagents

ACRONYM	CHEMICAL NAME	CAS NO.
HFBA	Heptafluorobutyric anhydride	336-59-4
MBTFA	N-Methylbis (trifluoroacetamide)	685-27-8
PFPA	Pentafluoropropionic anhydride	356-42-3
TFAA	Trifluoroacetic anhydride	407-25-0
TFAI	1-(Trifluoroacetyl) imidazole	1546-79-8

Acylation Reagents

DESCRIPTION	QTY.	CAT. NO.	PRICE
Acetic Anhydride	10 x 2mL	33085	
HFBA	10 x 1mL	33170-U	
MBTFA	5mL	394939-5ML	
PFPA	10 x 1mL	33167	
	25mL	33168	
TFAA	10 x 1mL	33165-U	
	25mL	33164	
TFAI	5mL	394920-5ML	

RELATED INFORMATION

Bulletin 909 contains detailed information on selecting a suitable derivatization reagent for most applications. Request a free copy of Bulletin 909 by phone or fax, or see our website.

No.	Subject
T196909	derivatization reagents

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Derivatization Reagents
Alkylation Reagents

Alkylation Reagents

Alkylation involves the addition of an alkyl group (aliphatic or aliphatic-aromatic) to an active functional (H) group. Replacement of hydrogen with an alkyl group is important because of the decreased polarity of the derivative as compared with the parent compound. This reagent is used to modify compounds containing acidic hydrogens such as carboxylic acids and phenols.

The resulting products are ethers, esters, thioethers, thioesters, n-alkyl amines, and n-alkyl amides. Alkylation of weakly acidic groups (alcohols) requires strongly basic catalysts (sodium methoxide, potassium methoxide). More acidic OH groups, as in phenols and carboxylic acids, require less basic catalysts (hydrogen chloride, boron trifluoride).

DMF-Dialkyl acetals – Dimethylformamide dialkyl acetals are used to esterify acids to their methyl esters. Hydroxyl groups are not methylated with this reagent. Carboxylic acids, phenols, and thiols quickly react to give the corresponding alkyl derivatives. N,N-dimethylformamide dimethyl acetals are moisture sensitive.

Diazoalkales – Diazomethane reacts rapidly with unesterified fatty acids in the presence of a small amount of methanol, which catalyses the reaction to form methyl esters. The yield is high and the side reactions are minimal. Diazomethane is a yellow gas which is usually used as an ethereal solution, with some methanol present; the elimination of gaseous nitrogen drives the reaction. Diazomethane is carcinogenic, highly toxic, potentially explosive, and unstable. Diazomethane is not ideal for esterification of phenols because the phenolic hydroxyl groups are also methylated at a slower rate, which may lead to mixtures of partially methylated products.

Esterification and Transesterification Reagents – Esterification is the reaction of an acid with an alcohol in the presence of a catalyst to form an ester. The process involves the condensation of the carboxyl group of the acid and the hydroxyl group of the alcohol with the elimination of water. Esterification is best done in the presence of a catalyst (e.g., hydrogen chloride), which is usually dried to remove water.

Esterification is the most popular alkylation method. Alkyl esters offer excellent stability, and provide quick and quantitative samples for GC analysis.

Transesterification is the displacement of the alcohol from an ester by another alcohol. This has been widely used for the making of higher alcohols from those of lower alcohols. Transesterification can be performed with an acidic or basic catalyst using anhydrous methanol to react with fats and oils.

General Alkylation Reagents – Pentafluorobenzyl bromide is convenient for making esters and ethers and has been used in trace analysis. This reagent is a strong lachrymator and should be handled only in a hood. Hexacyclooctadecane and pentafluorobenzylbromide are reagents for preparing pentafluorobenzyl phenol derivatives for US EPA Method 604. Esterate-M is used in the preparation of methyl and other esters of long chain fatty acids by reaction with dimethylformamide dialkylacetals. Aldehydes and ketones are conveniently derivatized by forming oximes with o-alkylhydroxylamine HCl reagents. O-methylhydroxylamine HCl has been used with ketosteroids, prostaglandins, saccharides, aldoacids, and ketoacids. N-butylboronic acid reacts with 1,2- or 1,3-diols with α- or β-hydroxy acids to form 5- or 6-member ring nonpolar boronate derivatives. They are prepared simply by adding n-butylboronic acid to a solution of the hydroxy compound in dimethylformamide.

Acronyms for Alkylation Reagents

ACRONYM	CHEMICAL NAME	CAS NO.
Diazald	N-Methyl-N-nitroso-p-toluenesulfonamide	—
Diazald-N-methyl- ^{13}C	N-Methyl-^{13}C-N-nitroso-p-toluenesulfonamide	60858-95-9
Diazald-N-methyl-^{13}C-N-methyl-d_3	N-Methyl-^{13}C-d_3-N-nitroso-p-toluenesulfonamide	102832-11-1
DMF-DBA	N,N-Dimethylformamide di-tert-butyl acetal	36805-97-7
DMF-DEA	N,N-Dimethylformamide diethyl acetal	1188-33-6
DMF-DMA	N,N-Dimethylformamide dimethyl acetal	4637-24-5
DMF-DPA	N ,N-Dimethylformamide dipropyl acetal	6006-65-1
DMP	2,2-Dimethoxypropane	77-76-9
Esterate M	2meq DMF-DMA in 1mL pyridine	—
MNNG	1-Methyl-3-nitro-1-nitrosoguanidine	70-25-7
NBB	n-Butylboronic acid	4426-47-5
PFBBr	Pentafluorobenzyl bromide	1765-40-8
TMAH	Trimethylanilinium	—

RELATED INFORMATION

Bulletin 909 contains detailed information on selecting a suitable derivatization reagent for most applications. Request a free copy of Bulletin 909 by phone or fax, or see our website.

No.	Subject
T196909	derivatization reagents

Alkylation Reagents

DESCRIPTION	CAT. NO.	PRICE
DMF-Dialkylacetals		
DMF-DBA		
10 x 1mL	395005-10X1ML	
5mL	395005-5ML	
25mL	395005-25ML	
DMF-DEA (1,1-Diethoxytrimethylamine)		
10 x 1mL	394971-10X1ML	
5mL	394971-5ML	
25mL	394971-25ML	
DMF-DMA		
10 x 1mL	394963-10X1ML	
5mL	394963-5ML	
25mL	394963-25ML	
DMF-DPA		
10 x 1mL	394998-10X1ML	
5mL	394998-5ML	
25mL	394998-25ML	
Diazoalkales		
Diazald		
25g	D28000-25G	
100g	D28000-100G	
500g	D28000-500G	
1kg	D28000-1KG	
MNNG, 97%		
10g	129941-10G	
25g	129941-25G	
(Trimethylsilyl)diazomethane (2.0M solution in hexanes)		
5mL	362832-5ML	
25mL	362832-25ML	

DESCRIPTION	CAT. NO.	PRICE
Esterification Reagents*		
BCl_3-2-Chloroethanol (11% w/w)		
10 x 1mL	33056-U	
BCl_3-Methanol (12% w/w)		
20 x 1mL	33353	
20 x 2mL	33089-U	
400mL	33033	
BF_3-Butanol (10% w/w)		
10 x 5mL	33126-U	
100mL	33125-U	
BF_3-Methanol (10% w/w)		
20 x 1mL	33356	
19 x 2mL	33020-U	
10 x 5mL	33040-U	
5mL	264121-5ML	
250mL	264121-250ML	
400mL	33021	
BF_3-PrOH (14% w/w)		
5g	156825-5G	
100g	156825-100G	
500g	156825-500G	
Methanolic Base		
0.5N, 30mL	33352	
0.5N, 100mL	33080	
Methanolic HCl		
0.5N, 20 x 1mL	33354	
0.5N, 10 x 5mL	33095	
3N, 20 x 1mL	33355	
3N, 10 x 3mL	33051	
3N, 400mL	33050-U	
Methanolic H_2SO_4 (10% v/v)		
6 x 5mL	506516	
TMAH, 0.2M in methanol		
10 x 1mL	33358-U	
10mL	33097-U	
General Alkylation Reagents*		
DMP (2,2-Dimethoxypropane)		
25g	33053	
Esterate M		
25mL	33140	
Hexaoxacyclooctadecane (18 crown 6)		
25g	33003-U	
O-Methoxyamine HCl		
5g	33045-U	
Pentafluorobenzyl bromide		
5g	33001	

*Product specification sheets are available for most of these reagents. Information includes properties, features and benefits, typical derivatization procedure, mechanism, toxicity, hazards, and stability. For free literature, request a copy by phone or see our Web site.

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Derivatization Reagents
Silyl Reagents



Chemical Standards

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Silyl Reagents*

Silyl refers to trimethylsilyl $Si(CH_3)_3$, or TMS. Silylation is the introduction of a silyl group into a molecule, usually in substitution for active hydrogen.

Replacement of active hydrogen by a silyl group reduces polarity of the compound and decreases hydrogen bonding. The silylated derivative is thus more volatile. Also, stability is enhanced because the number of reactive sites containing active hydrogen has been reduced. Silylated compounds are less polar, detection is enhanced, and the derivatives are thermally more stable.

The greatest use of silylation has been in GC. Many hydroxy and amino compounds regarded as nonvolatile or unstable at 200-300°C have been successfully chromatographed after silylation.

Silyl reagents are influenced by both the solvent system and the addition of a catalyst. The use of a catalyst (e.g., trimethylchlorosilane, pyridine) increases the reactivity of the silyl reagent. It is important to determine the reaction times and reaction temperatures when developing derivatization procedures. The conversion rate for the derivative must be known in order to achieve quantitative analysis of the unknown sample. The reagents generally are moisture sensitive, and are sealed to prevent deactivation from moisture during storage. These silyl reagents are suitable for general use but, if used in excess, can cause difficulties with flame ionization detectors.

The trimethylsilyl group is the most popular and versatile silyl group for GC analysis. Introduction of this group enables better GC separation and the application of special detection techniques.

Acronyms for Silylation Reagents

ACRONYM	CHEMICAL NAME	CAS NO.
BSA	N,O-Bis(trimethylsilyl)acetamide	10416-59-8
BSTFA	Bis(trimethylsilyl) trifluoroacetamide	25561-30-2
DMDCS	Dimethyldichlorosilane	75-78-5
HMDS	1,1,1,3,3,3-Hexamethyldisilazane	999-97-3
MTBSTFA	N-(tert-Butyldimethylsilyl)-N-methyltrifluoroacetamide	77377-52-7
TBDMCS	t-Butyldimethylchlorosilane	18162-48-6
TFA	Trifluoroacetic acid	76-05-1
TMCS	Trimethylchlorosilane	75-77-4
TMSDEA	Trimethylsilyldiethylamine (N,N-Diethyl-1,1,1 -trimethylsilylamine)	996-50-9
TMSI	Trimethylsilylimidazole	18156-74-6

DESCRIPTION	CAT. NO.	PRICE
BSA, DERIVATIZATION GRADE		
144 x 0.1mL	33035-U	
20 x 1mL	33036	
25mL	33037-U	
BSA + TMCS, 5:1 (SYLON BT)		
20 x 1mL	33018	
25mL	33019-U	
BSA + TMCS + TMSI, 3:2:3 (SYLON BTZ)		
144 x 0.1mL	33151	
20 x 1mL	33030	
25mL	33031-U	
BSTFA, DERIVATIZATION GRADE		
144 x 0.1mL	33084	
20 x 1mL	33024	
25mL	33027	
BSTFA + TMCS, 99:1 (SYLON BFT)		
144 x 0.1mL	33154-U	
20 x 1mL	33148	
25mL	33155-U	
50mL	33149-U	
HMDS		
30mL	33350-U	
100mL	33011	
HMDS + TMCS, 3:1 (SYLON HT)		
20 x 1mL	33046	
REACTA-SIL CONCENTRATE (HMDS:TMCS, 2:1)		
25mL	394610-25ML	
HMDS + TMCS + PYRIDINE, 3:1:9 (SYLON HTP)		
20 x 1mL	33038	
25mL	33039	
N-METHYL-N-(TRIMETHYLSILYL)TRIFLUOROACETAMIDE		
10 x 1mL	394866-10X1ML	
5mL	394866-5ML	
25mL	394866-25ML	

DESCRIPTION	CAT. NO.	PRICE
MTBSTFA, DERIVATIZATION GRADE		
10 x 1mL	394882-10X1ML	
5mL	394882-5ML	
25mL	394882-25ML	
MTBSTFA + TBDMCS, 99:1		
10 x 1mL	375934-10X1ML	
5mL	375934-5ML	
25mL	375934-25ML	
TFA		
10 x 1mL	33077	
25mL	33075	
100mL	33076	
TMCS, DERIVATIZATION GRADE		
100mL	33014	
TMSI, DERIVATIZATION GRADE		
25mL	33068-U	
TMSI + PYRIDINE, 1:4 (SYLON TP)		
20 x 1mL	33159-U	
25mL	33156-U	
T-BUTYLDIMETHYLSILYLIMIDAZOLE-DIMETHYLFORMAMIDE		
10 x 1mL	33092-U	

Silyl Reagents for Deactivating Glassware and Chromatographic Supports

Note: All Supelco glass GC columns have been silane treated.

DESCRIPTION	CAT. NO.	PRICE
DMDCS		
100mL	33009	
5% DMDCS in Toluene (Sylon CT)		
400mL	33065-U	
Rejuv-8 Silylating Agent		
25mL	33059-U	

* Product specification sheets are available for most of these reagents. Information includes properties, features and benefits, typical derivatization procedure, mechanism, toxicity, hazards, and stability. For free literature, request a copy by phone or see our Web site.

Derivatization Reagents
Sampler Kits, HPLC Reagent, Literature

Derivatization Reagent Sampler Kits for GC

Our derivatization reagent sampler kits enable you to determine the best reagent for a specific application, without the cost of purchasing, storing, and ultimately disposing of large volumes of individual reagents. Because of our purity specifications and reaction efficiency checks, we can guarantee consistently high reactivity from every lot of each reagent. Documentation detailing the chemistry and lot purity of the reagent, a tested derivatization procedure, and handling and storing recommendations is available for most reagents.

Each of our four kits incorporates a group of related reagents.

Derivatization Reagent Sampler Kits

DESCRIPTION	COMPOSITION	CAT. NO.	PRICE
Acylation Sampler Kit	3 x 1mL of each of the following (except as noted): Acetic anhydride (3 x 2mL) Heptafluorobutyric anhydride Pentafluoropropionic anhydride Trifluoroacetic anhydride	505862	
FID Alkylation Sampler Kit	3 x 1mL of each of the following: BF_3-Methanol Methanolic Base Methanolic HCl (0.5N) Methanolic HCl (3N) TMAH, 0.2M in methanol	505854	
ECD Alkylation Sampler Kit	3 x 1mL of each of the following (except as noted): BCl_3-2-Chloroethanol, 11% w/w BCl_3-Methanol, 12% w/w Hexaoxacyclooctadecane, 18 crown 6 (1 gram) Pentafluorobenzylbromide	505870	
Silylation Sampler Kit	3 x 1mL of each of the following: BSA BSTFA BSTFA + TMCS, 99:1 (Sylon BFT) HMDS + TMCS, 3:1 (Sylon HT) TMSI	505846	

RELATED INFORMATION

Free Technical Literature

Reagent	Product Specification Sheet
Acetic Acid	T497121
• BCl_3 Methanol	T496123
• BCl_3-2Chloroethanol	T496122
• BF_3 Butanol	T496124
• BF_3 Methanol	T496125
BSA	T496017
BSA + TMCS, 5:1 (Sylon BT)	T496018
BSA + TMCS + TMSI, 3:2:3 (Sylon BTZ)	T496019
BSTFA	T496020
BSTFA + TMCS, 99:1 (Sylon BFT)	T496021
DMDCS	T496022
• 5% DMDCS in Toluene (Sylon CT)	T496023
HMDS	T496024
HMDS + TMCS, 3:1 (Sylon HT)	T496025
HMDS + TMCS + Pyridine, 3:1:9 (Sylon HTP)	T496026
• Methanolic Base	T497007
• Methanolic HCl	T497099
• Methanolic Sulfuric Acid	T497018
N-t-Butyldimethylsilylimidazole	T496065
Perfluoro Acid Anhydrides	T497104
PFBBr & 18 Crown 6	T497103
• Rejuv 8	T496066
TFA	T496027
TMCS	T496028
TMSI	T496029
TMSI + Pyridine, 1:4 (Sylon TP)	T496030

Bulletin 909 contains detailed information on selecting a suitable derivatization reagent for most applications. Request a free copy of publication number T196909 by phone or see our Web site.

Certificates of Analysis, containing lot specific data, are available for many Supelco reagents free of charge. These certificates, as well as product specification sheets (see table above), contain information about the reagent: use, physical properties, benefits, typical procedures for derivatizing a compound, toxicity, hazards, storage and stability, and reaction mechanism. To obtain free copies, contact our Order Processing department, or refer to Literature, Free Technical in the index.

• Only product specification sheets are available for these reagents.

Derivatization Reagent for HPLC

Dabsyl chloride (4-Dimethylamino-azobenzene-4-sulphonyl chloride)

Precolumn reagent used in HPLC for derivatizing amino acids. Dabsyl-amino acids can be separated by reversed phase HPLC and detected in the visible region.

DESCRIPTION	QTY.	CAT. NO.	PRICE
Dabsyl chloride	500mg	502219	



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Biocides
ProClin and Kathon Preservatives

ProClin and Kathon Preservatives

- Broad-spectrum antimicrobial activity controls bacteria, yeast, and fungi
- Compatible with key enzymes
- Do not inhibit antibody binding
- Excellent stability
- Effective at pH 2-8.5
- Less toxic than thimerosal
- Easy-to-use liquid formulations

ProClin and Kathon CG/ICP preservatives are highly effective biocides for controlling microorganisms in biological media. ProCl preservatives are for *in vitro* diagnostic products; Kathon preservatives are for use in research laboratories and industrial laboratories. Suitable media include reagents, control solutions, calibration solutions, buffers, and mobile phases. At concentrations as low as 0.02%, these preservatives eradicate bacteria, fungi, and yeast for extended periods of time. Both preservatives offer excellent stability and compa stability with most enzyme systems, as well as low toxicity.

ProClin and Kathon CG/ICP preservatives are an excellent choice for replacing thimerosal, sodium azide, and gentamicin as preserva

Mechanism of Action

The active components in ProClin and Kathon CG/ICP preservatives are two isothiazolones: 2-methyl-4-isothiazolin-3-one and 5-chloro-2-methyl-4-isothiazolin-3-one. These active components have a unique mechanism of action that both inhibits microbe grow and causes cell death. Within minutes after contacting a microorganism, the active components penetrate the cell membrane and inhibit specific enzymes in the cell, inhibiting growth, macromolecule synthesis, and respiration, and causing intracellular levels to decline rapidly. With energy production disrupted, the cell can no longer synthesize chemicals for routine operation or repa Ultimately the cell dies. The target enzymes are within the central metabolic cycle of the cell, the Krebs cycle (pyruvate dehydrogenase, α-ketoglutarate dehydrogenase, succinate dehydrogenase, NADH dehydrogenase), affording microbes little chance to develop resistance.

Biocides for *in vitro* Diagnostic Manufacturing

ProClin Evaluation Kits - The evaluation kits are designed for investigating, on a small scale, the suitability of ProClin preservatives in new product development. Each kit contains 5mL each of three different manufactured lots of ProClin preservative for testing co tency in performance from lot to lot. Also included is a Certificate of Analysis for each lot of preservative, and an instruction booklet.

CHARACTERISTICS OF PROCLIN PRESERVATIVES

	ProClin 150	ProClin 200	ProClin 300	ProClin 950
Composition				
Active Ingredients[1]	1.5%	1.5%	3.0%	9.5% [2]
Matrix	water	water	propylene glycol	dipropylene glycol
Stabilizer	23-25% Mg salts	3% Mg salts	alkyl carboxylate	none
Recommended Level of Use (as supplied, %)	0.04-0.10	0.04-0.10	0.02-0.05	0.05-0.10
Shelf Life	3 years	3 years	3 years	24 months [3]
Applications	in vitro diagnostic kits and kit components, calibration solutions, control solutions, organic reagents. Only ProClin 5000 recommended for use in serum-based solutions.			

[1] 5-Chloro-2-methyl-4-isothiazolin-3-one and 2-methyl-4-isothiazolin-3-one.
[2] 2-Methyl-4-isothiazolin-3-one only.
[3] Recent introduction, collection of stability data is ongoing.

DESCRIPTION	QTY.	CAT. NO.	PRICE
PROCLIN EVALUATION KITS			
ProClin 150	3 x 5mL	48121	
ProClin 300	3 x 5mL	48125	
ProClin Variety Kit*	3 x 5mL	48119-U	

* Contains 5mL each of ProClin 150, ProClin 200, and ProClin 300 preservatives.

Biocides
ProClin and Kathon Preservatives

Restrictions on the Use of Biocides

The sale and use of biocides in the United States are closely regulated by federal laws.

- ProClin preservatives are labeled for use only as preservatives for in vitro clinical diagnostic reagents. Such in vitro diagnostic reagents are considered medical devices and are regulated by the US Food and Drug Administration (US FDA) under the Food, Drug & Cosmetic Act. Any other application is prohibited.
- Kathon CG/ICP preservatives are intended for non-medical applications only. These preservatives are regulated under the Federal Insecticide, Fungicide, and Rodenticide Act, which is administered by the US Environmental Protection Agency (US EPA). Any diagnostic application is prohibited.

Special Note -To help you meet regulatory compliance, a company representative will contact you prior to shipment of your first trial order.

DESCRIPTION	CAT. NO.	PRICE
PROCLIN 150 PRESERVATIVE		
50mL	48122	
400mL	48123	
3.6 liters	48124	
15 liters	48061	
PROCLIN 200 PRESERVATIVE		
50mL	48171-U	
400mL	500380	
3.6 liters	500399	
15 liters	500402	
PROCLIN 300 PRESERVATIVE		
50mL	48126	
400mL	48127	
2.0 liters	48090-U	
3.6 liters	48128	
18 liters	48060-U	
PROCLIN 950 PRESERVATIVE		
5mL	46885-U	
50mL	46878-U	
400mL	46879-U	
3.6 liters	46883-U	
17 liters	46884-U	

Biocides for All Non-Diagnostic Applications

Kathon Preservatives - 1.5% total active ingredients in water with magnesium salts as a stabilizer.
Available in North America only.

DESCRIPTION	CAT. NO.	PRICE
KATHON CG/ICP PRESERVATIVE		
23-25% Salts		
3 x 5mL*	500119	
50mL	500127	
400mL	500135	
3.6 liters	500143	
KATHON CG/ICP II PRESERVATIVE		
3-5% Salts		
50mL	48175-U	
400mL	48178-U	

* Evaluation kit: 5mL from each of 3 manufacturing lots.

RELATED INFORMATION

Literature No.	Title
T196902	ProClin Preservatives: Mechanisms and Stability
T395077	Efficacy Tests for ProClin Preservative (ARL)
T496039	ProClin 150 Preservative for Diagnostic Reagents: Product Specifications (AWT)
T498169	ProClin 200 Preservative for Diagnostic Reagents
T496050	ProClin 300 Preservative for Diagnostic Reagents: Product Specifications (AWW)
T196903	ProClin 300 Preservative for Diagnostic Reagents: Theory
T401185	ProClin 950 Preservative for Diagnostic Reagents
T196904	Determination of ppm Levels of ProClin 300 Preservatives in Water-Dilutable Samples by HPLC
T197912	Kathon CG/ICP Preservative for Media Biocide Applications (BDN)

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Chemical Standards
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Risk and Safety Phrase Index

EU Risk Phrases

EU Hazard Symbols

E

Explosive

O

Oxidizing

F+

Extremely Flammable

F

Highly Flammable

T+

Very Toxic

T

Toxic

C

Corrosive

Xn

Harmful

Xi

Irritant

N

Dangerous for the Environment

713-1283-1291

EU Risk and Safety Phrases

Some hazardous products listed in the Supelco catalog are marked with R and S numbers as assigned to the Risk and Safety phrases under EU legislation.

RISK PHRASES

INDICATION OF PARTICULAR RISKS

R1	Explosive when dry
R2	Risk of explosion by shock, friction, fire or other sources of ignition
R3	Extreme risk of explosion by shock, friction, fire or other sources of ignition
R4	Forms very sensitive explosive metallic compounds
R5	Heating may cause an explosion
R6	Explosive with or without contact with air
R7	May cause fire
R8	Contact with combustible material may cause fire
R9	Explosive when mixed with combustible material
R10	Flammable
R11	Highly flammable
R12	Extremely flammable
R13	Extremely flammable liquified gas
R14	Reacts violently with water
R15	Contact with water liberates highly flammable gases
R16	Explosive when mixed with oxidizing substances
R17	Spontaneously flammable in air
R18	In use, may form flammable/explosive vapor-air mixture
R19	May form explosive peroxides
R20	Harmful by inhalation
R21	Harmful in contact with skin
R22	Harmful if swallowed
R23	Toxic by inhalation
R24	Toxic in contact with skin
R25	Toxic if swallowed
R26	Very toxic by inhalation
R27	Very toxic in contact with skin
R28	Very toxic if swallowed
R29	Contact with water liberates toxic gas
R30	Can become highly flammable in use
R31	Contact with acids liberates toxic gas
R32	Contact with acids liberates very toxic gas
R33	Danger of cumulative effects
R34	Causes burns
R35	Causes severe burns
R36	Irritating to eyes
R37	Irritating to respiratory system
R38	Irritating to skin
R39	Danger of very serious irreversible effects
R40	Possible risk of irreversible effects
R41	Risk of serious damage to eyes
R42	May cause sensitization by inhalation
R43	May cause sensitization by skin contact
R44	Risk of explosion if heated under confinement
R45	May cause cancer
R46	May cause heritable genetic damage
R47	May cause birth defects
R48	Danger of serious damage to health by prolonged exposure
R49	May cause cancer by inhalation
R50	Very toxic to aquatic organisms
R51	Toxic to aquatic organisms
R52	Harmful to aquatic organisms
R53	May cause long-term adverse effects in the aquatic environment
R54	Toxic to flora
R55	Toxic to fauna
R56	Toxic to soil organisms
R57	Toxic to bees
R58	May cause long-term adverse effects in the environment
R59	Dangerous for the ozone layer

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RISK PHRASES

COMBINATION OF PARTICULAR RISKS

R14/15	Reacts violentlywith water, liberating highly flammable gases
R15/29	Contact with water liberates toxic highly flammable gas
R20/21	Harmful by inhalation and in contact with skin
R20/22	Harmful by inhalation and if swallowed
R20/21/22	Harmful by inhalation, in contact with skin and if swallowed
R21/22	Harmful in contact with skin and if swallowed
R23/24	Toxic by inhalation and in contact with skin
R23/25	Toxic by inhalation and if swallowed
R23/24/25	Toxic by inhalation, in contact with skin and if swallowed
R24/25	Toxic in contact wi th skin and if swallowed
R26/27	Very toxic by inhalation and in contact with skin
R26/28	Very toxic by inhalation and if swallowed
R26/27/28	Very toxic by inhalation, in contact with skin and if swallowed
R27/28	Very toxic in contact with skin and if swallowed
R36/37	Irritating to eyes and respiratory system
R36/38	Irritating to eyes and skin
R36/37/38	Irritating to eyes, respiratory system and skin
R37/38	Irritating to respirator y system and skin
R39/23	Toxic: danger of very serious irreversible effects through inhalation
R39/24	Toxic: danger of very serious irreversible effects in contact with skin
R39/25	Toxic: danger of very serious irreversible effects if swallowed
R39/23/24	Toxic: danger of very serious irreversible effects through inhalation and in contact with skin
R39/23/25	Toxic: danger of very serious irreversible effects through inhalation and if swallowed
R39/24/25	Toxic: danger of very serious irreversible effects in contact with skin and if swallowed
R39/23/24/25	Toxic: danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed
R39/26	Very toxic: danger of very serious irreversible effects through inhalation
R39/27	Very toxic: danger of very serious irreversible effects in contact with skin
R39/28	Very toxic: danger of very serious irreversible effects if swallowed
R39/26/27	Very toxic: danger of very serious irreversible effects through inhalation and in contact with skin
R39/26/28	Very toxic: danger of very serious irreversible effects through inhalation and if swallowed
R39/27/28	Very toxic: danger of very serious irreversible effects in contact with skin and if swallowed
R39/26/27/28	Very toxic: danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed
R40/20	Harmful: possible risk of irreversible effects through inhalation
R40/21	Harmful: possible risk of irreversible effects in contact with skin
R40/22	Harmful: possible risk of irreversible effects if swallowed
R40/20/21	Harmful: possible risk of irreversible effects through inhalation and in contact with skin
R40/20/22	Harmful: possible risk of irreversible effects through inhalation and if swallowed
R40/21/22	Harmful: possible risk of irreversible effects in contact with skin and if swallowed
R40/20/21/22	Harm ful: possible risk of irreversible effects through inhalation, in contact with skin and if swallowed
R42/43	May cause sensitization by inhalation and skin contact
R48/20	Harmful: danger of serious damage to health by prolonged exposure through inhalation
R48/21	Harmful: danger of serious damage to health by prolonged exposure in contact with skin
R48/22	Harmful: danger of serious damage to health by prolonged exposure if swallowed
R48/20/21	Harmful: danger of serious damage to health by prolonged exposure through inhalation and in contact with skin
R48/20/22	Harmful: danger of serious damage to health by prolonged exposure through inhalation and if swallowed
R48/21/22	Harmful: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed
R48/20/21/22	Harmful : danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed
R48/23	Toxic: danger of serious damage to health by prolonged exposure through inhalation
R48/24	Toxic: danger of serious damage to health by prolonged exposure in contact with skin
R48/25	Toxic: danger of serious damage to health by prolonged exposure if swallowed
R48/23/24	Toxic: danger of serious damage to health by prolonged exposure through inhalation and in contact with skin
R48/23/25	Toxic: danger of serious damage to health by prolonged exposure through inhalation and if swallowed
R48/24/25	Toxic: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed
R48/23/24/25	Toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed
R50/53	Very toxic: may cause long-term adverse effects to aquatic organisms
R51/53	Toxic: may cause long-term adverse effects to aquatic organisms

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Risk and Safety Phrase Index

EU Risk Phrases

SAFETY PHRASES

INDICATION OF SAFETY PRECAUTIONS REQUIRED

S1 Keep locked up
S2 Keep out of reach of children
S3 Keep in a cold place
S4 Keep away from living quarters
S5 Keep contents under ... (appropriate liquid to be specified by the manufacturer)
S6 Keep under ... (inert gas to be specified by the manufacturer)
S7 Keep container tightly closed
S8 Keep container dry
S9 Keep container in a well-ventilated place
S12 Do not keep the container sealed
S13 Keep away from food, drink and animal feeding stuffs
S14 Keep away from .. (incompatible materials to be indicated by the manufacturer)
S15 Keep away from heat
S16 Keep away from sources of ignition - No Smoking
S17 Keep away from combustible material
S18 Handle and open container with care
S20 When using do not eat or drink
S21 When using do not smoke
S22 Do not breathe dust
S23 Do not breathe gas/fumes/vapor/spray (appropriate wording to be specified by the manufacturer)
S24 Avoid contact with skin
S25 Avoid contact with eyes
S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice
S27 Take off immediately all contaminated clothing
S28 After contact with skin, wash immediately with plenty of .. (to be specified by the manufacturer)
S29 Do not empty into drains
S30 Never add water to this product
S33 Take precautionary measures against static discharges
S34 Avoid shock and friction
S35 This material and its container must be disposed of in a safe way
S36 Wear suitable protective clothing
S37 Wear suitable gloves
S38 In case of insufficient ventilation, wear suitable respiratory equipment
S39 Wear eye/face protection
S40 To clean the floor and all objects contaminated by this material use .. (to be specified by the manufacturer)
S41 In case of fire and/or explosion do not breathe fumes
S42 During fumigation/spraying wear suitable respiratory equipment (appropriate wording to be specified)
S43 In case of fire use .. (indicate in the space the precise type of fire fighting equipment. If water increases the risk, add - Never use water)
S44 If you feel unwell, seek medical advice (show the label where possible)
S45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible)
S46 If swallowed seek medical advice immediately and show this container or label
S47 Keep at temperature not exceeding ... °C (to be specified by the manufacturer)
S48 Keep wetted with ... (appropriate material to be specified by the manufacturer)
S49 Keep only in the original container
S50 Do not mix with ... (to be specified by the manufacturer)
S51 Use only in well-ventilated areas
S52 Not recommended for interior use on large surface areas
S53 Avoid exposure - obtain special instructions before use
S54 Obtain the consent of pollution control authorities before discharging to wastewater treatment plants
S55 Treat using the best available techniques before discharge into drains or the aquatic environment
S56 Do not discharge into drains or the environment, dispose to an authorised waste collection point
S57 Use appropriate containment to avoid environmental contamination
S58 To be disposed of as hazardous waste
S59 Refer to manufacturer/supplier for information on recovery/recycling
S60 This material and/or its container must be disposed of as hazardous waste

Combination of safety precautions required

S1/2 Keep locked up and out of reach of children
S3/7/9 Keep container tightly closed in a cool, well-ventilated place
S3/9 Keep in a cool, well-ventilated place
S3/9/14 Keep in a cool, well-ventilated place away from ... (incompatible materials to be indicated by the manufacturer)
S3/9/14/49 Keep only in the original container in a cool, well-ventilated place away from ... (incompatible materials to be indicated by the manufacturer)
S3/9/49 Keep only in the original container in a cool, well-ventilated place
S3/14 Keep in a cool place away from ... (incompatible materials to be indicated by the manufacturer)
S7/8 Keep container tightly closed and dry
S7/9 Keep container tightly closed and in a well-ventilated place
S20/21 When using do not eat, drink or smoke
S24/25 Avoid contact with skin and eyes
S36/37 Wear suitable protective clothing and gloves
S36/37/39 Wear suitable protective clothing, gloves and eye/face protection
S36/39 Wear suitable protective clothing and eye/face protection
S37/39 Wear suitable gloves and eye/face protection
S47/49 Keep only in the original container at temperature not exceeding ... °C (to be specified by the manufacturer)

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Risk and Safety Phrase Index
EU Hazardous Products

Hazardous Products - The following products are classified as hazardous under European Union (EU) legislation. The Risk and Safety (R and S) phrases are listed on the previous three pages.

CAS NO.	CHEMICAL NAME	RISK STATEMENTS	SAFETY STATEMENTS
50-29-3	4,4'-DDT	23/24/25-33-45-46	22-26-36/37/39-45
50-32-8	Benzo(a)pyrene	20/21/22-45-46-61	22-36/37/39-45-53
51-03-6	Piperonyl butoxide	23/24/25-40	26-45
51-28-5	2,4-Dinitrophenol	11-23/24/25-36/37/38	16-26-36/37/39
53-19-0	2,4'-DDD	20/21/22-36/37/38-45-46	36/37/39-45
53-70-3	Dibenzo(a,h)anthracene	20/21/22-45-46	22-36/37/39-45
55-38-9	Fenthion	21-25-50/53	1/2
56-23-5	Carbon tetrachloride	20/21/22-36/37/38-45-46	23-26-36/37/39-45
56-38-2	Parathion	27/28-50/53	28-36/37-45-60-61
56-55-3	Benzo(a)anthracene	23/24/25-45-46	36/37/39-45-53
57-74-9	Chlordane	21/22-40-50/53	2
58-89-9	γ-BHC (Lindane)	26/27/28-33-45-46	26-36/37/39-45
59-50-7	4-Chloro-3-methylphenol	36/37/38	26-37/39
60-29-7	Ether	12-19-20/21/22-36/37/38-40	3/7-16-29-33-37/39
60-57-1	Dieldrin	26/27/28-40-60	22-36/37/39-45
62-53-3	Aniline	23/24/25-36/37/38-40-41	23-26-36/37/39-45
62-73-7	Dichlorvos	24/25	23-36/37-45
62-75-9	N-Nitrosodimethylamine	26/2728-36/37/38-45-46	23-36/37/39-45
63-25-2	Carbaryl	22	2/22/24
64-17-5	Ethyl alcohol	11-20/22-36/38	7-16-24-45
67-56-1	Methyl alcohol	23/25-36/38	7-16-24-45
67-63-0	2-Propanol	11-36/37/38-41	16-26-36
67-64-1	Acetone	11-37/38-41	3/7-16-26-36
67-66-3	Chloroform (Trichloromethane)	23/24/25-36/37/38-45-46	23-26-36/37/39-45
67-68-5	Methyl sulfoxide	36/37/38	23-26-36
67-72-1	Hexachloroethane	20/21/22-36/37/38-45	26-36/37/39-45
68-12-2	N,N-Dimethylformamide	20/21/22-36/37/38-45	23-26-36/37/39-45
71-23-8	1-Propanol	11-20/21/22-36/37/38-41	3/7-16-26-36
71-36-3	1-Butanol	Data Not Available	Data Not Available
71-43-2	Benzene	11-36/37/38-45-46-48/23/24/25	16-36/37/39-45-53
71-55-6	1,1,1-Trichloroethane (Methyl chloroform)	20/21/22-40	23-26-36
72-20-8	Endrin	24-28-50/53	22-36/37-45-60-61
72-43-5	Methoxychlor	20/21/22-40	36
72-54-8	4,4'-DDD	23/24/25-45-46	26-27-28-36/37/39-45
72-55-9	4,4'-DDE	20/21/22-45-46	36/37/39-45
74-88-4	Iodomethane	23/24/25-42/43-45-46	
88-75-5	2-Nitrophenol	20/21/22-36/37/38	26-36
89-63-4	4-Chloro-2-nitroaniline	20/21/22-36/37/38	26-36
91-20-3	Naphthalene	11-20/21/22-36/37/38-43-45	16-26-36/37/39-45
91-58-7	2-Chloronaphthalene	20/21/22-36/37/38	26-36
91-94-1	3,3'-Dichlorobenzidine	23/24/25-36/37/38-45-46	22-26-36/37/39-45
92-87-5	Benzidine	26/27/28-45-46	36/37/39-45-53
93-72-1	Silvex (2,4,5-TP)	11-36/37/38-45-63	16-23-36/37/39-45
94-74-6	4-Chloro-o-tolyloxyacetic acid	22- 38-41	2
94-75-7	2,4-D acid	23/24/25-41-45-46-63	22-26-36/37/39-45
95-47-6	o-Xylene (1,2-Dimethylbenzene)	10-20/21/22-36/37/38-60	16-26-36-45
95-50-1	1,2-Dichlorobenzene (o-Dichlorobenzene)	20/21/22-36/37/38-40-43	26-36/37/39
95-51-2	2-Chloroaniline	23/24/25-40-41	26-27-36/37/39-45
95-53-4	o-Toluidine (2-Methyl aniline)	23/24/25-36/37/38-45-46	23-26-36/37/39-45
95-57-8	2-Chlorophenol	20/21/22-34	26-27-36/37/39
95-63-6	1,2,4-Trimethylbenzene (Pseudocumene)	10-37	7/9
95-74-9	3-Chloro-4-methylaniline	20/21/22-36/37/38	26-28-36/37/39-45
95-76-1	3,4-Dichloroaniline	23/24/25-34-40-42/43	22-26-36/37/39-45
95-80-7	2,4-Diaminotoluene	23/24/25-36/37/38-45-46	26-27-28-36/37/39-45
96-16-8	α,α,α-Trifluorotoluene (Benzotrifluoride)	Data Not Available	Data Not Available
96-22-0	3-Pentanone	11-36/37/38	16-26-36/37/39
98-82-8	Isopropylbenzene (Cumene)	10-37	Data Not Available
98-95-3	Nitrobenzene	26/27/28-33-36/37/38	23-26-36/37/39-45
99-87-6	p-Isopropyltoluene (p-Cymene)	10	Data Not Available
99-88-7	4-Isopropylbenzene	36/37/38	26-36
100-02-7	4-Nitrophenol	20/21/22-36/37/38-40	26-36
100-41-4	Ethylbenzene	10-36/37/38-41	16-26-36
100-47-0	Benzonitrile	21/22-38-41	26-27-36/37/39-45
101-05-3	Anilazine	36/38	2-22
101-55-3	4-Bromophenylphenyl ether	Data Not Available	Data Not Available
103-65-1	n-Propylbenzene	10-37	Data Not Available
104-51-8	n-Butylbenzene	10	23-24/25
105-67-9	2,4-Dimethylphenol	23/24/25-34	26-27-28-36/37/39-45
106-42-3	p-Xylene (1,4-Dimethylbenzene)	10-20/21/22-36/37/38-60	16-26-36-45
106-46-7	1,4-Dichlorobenzene (p-Dichlorobenzene)	20/21/22-36/37/38-45	22-26-36/37/39-45

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Risk and Safety Phrase Index
EU Hazardous Products

CAS NO.	CHEMICAL NAME	RISK STATEMENTS	SAFETY STATEMENTS
107-02-8	Acrolein	11-45-26/27/28-34	16-29-33-45
107-06-2	1,2-Dichloroethane (Ethylene dichloride)	11-23/24/25-36/37/38-45-46	16-23-26-36/37/39-45
107-13-1	Acrylonitrile	11-45-46-26/27/28-34	16-26-27-36/37/39
108-05-4	Vinyl acetate (Ethenyl acetate)	11-20/21/22-36/37/38-45-46	16-27-36/37/39-45
108-10-1	2-Methyl-2-pentanone	11-20/21/22-36/37/38	16-26-33-36/37/39
108-38-3	m-Xylene (1,3-Dimethylbenzene)	10-20/21/22-60	16-26-36-45
108-60-1	Bis(2-chlorisopropyl)ether	20/21/22-40	22-36/37/39-45
108-67-8	1,3,5-Trimethylbenzene (Mesitylene)	10-37	Data Not Available
108-86-1	Bromobenzene	10-38	Data Not Available
108-88-3	Toluene	11-23/24/25	16-26-36/37/39-45
108-90-7	Chlorobenzene	10-20/21/22-36/37/38-40	16-26-36/37/39
108-95-2	Phenol	23/24/25-34	26-27-28-36/37/39-45
109-66-0	Pentane	11-20/22-36/37/38	16-26-33-36/37
109-69-3	1-Chlorobutane	11	3/7-16-29-33
109-86-4	2-Methoxyethanol	10-20/21/22-36/37/38-61	16-23-26-36/37/39
109-99-9	Tetrahydrofuran	11-19-22-36/37/38	16-26-33-36
110-49-6	2-Methoxyethyl acetate	10-20/21/22-36/37/38-61	16-26-36/37/39-45
110-54-3	Hexane	11-20/21/22-36/37/38-48	16-26-36-45
110-71-4	Ethylene glycol dimethyl ether	11-20/21/22-40	16-23-36
110-75-8	2-Chloroethyl vinyl ether	11-20/21/22-36/37/38	16-26-36/37/39-45
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BioMediaPlus
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Carbosieve
Carbotrap
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CLOT
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CP
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DAX
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Thermo-O-Ring
Thermoseal
Tightsep
TightSpec
Trizma
Unichrom
Visi-1
Visidry
Visiprep
VOCARB
VOCOL

Patents and Other Information

Capillary Column Butt Connector
US Pat. No. 4,529,230.

Carbosieve Adsorbent
German Pat. No. 1935500. Patent holder — Badische Anilin-& Soda-Fabrik Aktiengesellschaft.

Carboxen-564 Adsorbent
US Pat. No. 4,839,331.

Carboxen-1006 Adsorbent
US Pat. No. 4,839,331.

CElect Capillary Electrophoresis Columns
US Pat. No. 5,192,406.

Fused Silica Columns
Manufactured under HP US Pat. No. 4,293,415.

GenElute Agarose Spin Columns
Patent pending.

2-Inch Guard Column
Patent pending.

Heatless Concentrator
US Pat. Nos. D312,691; D312,875; D312,876.

Merlin Microseal Septum and Nut
US Pat. No. 4,954,149.

Nanochem Resin
OMI purifiers contain Nano-chem resin, licensed exclu-sively to Supelco for use in chromatographic appli-cations. Nanochem is a regis-tered trademark of Matheson Gas Products.

PLOT Columns
US Pat. No. 5,599,445; 5,607,580.

Porozorb Cartridges
Porozorb Cartridges are not for clinical or diagnostic use.
Use of Porozorb Cartridges is limited to investigative applications only. Sterility and pyrogen-free certification are dependent on and limited to results from a single testing procedure. Liability is limited to replacement of the product. Determination of appropriate cartridge purity for a particular application, and techniques used to achieve this purity, are the pur chaser'sresponsibility. Equilibrate the cartridge with matrix buffer prior to use.

Solid Phase Microextraction (SPME)
Technology licensed exclusively to Supelco. US patent #5,691,206; European patent #0523092.

Other Trademarks and Registered Trademarks

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KEL-F, Fluorad

Aalborg Instruments & Controls, Inc.
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Ace Glass, Inc.
Ace, Ace-Thred

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Anasorb, Hydrar, Graphpac-GB, Graphpac-GC

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Sep-Pak

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bollé, Eclipse, Willson

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email:carrabba@proaxix.com

µTAS 2002 - 6th International Conference on Miniaturized Chemical and Biochemical Analysis Systems
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California Society of Separation Science
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AAPS Annual Meeting & Exposition
November 8-14, Metro Toronto Convention Center, Canada
American Association of Pharmaceutical Scientists
tel: 703-243-2800 fax: 703-243-9650
web: http://www.aaps.org
email:aaps@aaps.org

EAS - Eastern Analytical Symposium
November 18-21, Somerset, NJ
Eastern Analytical Symposium & Exposition, Inc.
tel: 610-485-4633 fax: 610-485-9467
web: http://www.eas.org
email:easinfo@aol.com

2003



WCBP 2003 - 7th Symposium on the Analysis of Well Characterized Biotechnology Pharmaceuticals
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California Society of Separation Science
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HPCE 2003 - 16th International Symposium on Microscale Separations and Analysis
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PittCon 2003
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225rd ACS National Meeting
March 23-27, New Orleans, LA
American Chemical Society
tel: 202-872-4396 fax: 202-872-6128
web: http://www.acs.org
email:natlmtgs@acs.org

HPLC 2003, - 27th International Symposium & Exhibit on High Performance Liquid Phase Separations & Related Techniques
June 15-20, Nice, France
tel: 33 014453 72 20 fax: 33 014453 72 22
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226rd ACS National Meeting
September 7-11, New York, NY
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2004



HPCE 2004 - 17th International Symposium on Microscale Separations and Analysis
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227th ACS National Meeting
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228rd ACS National Meeting
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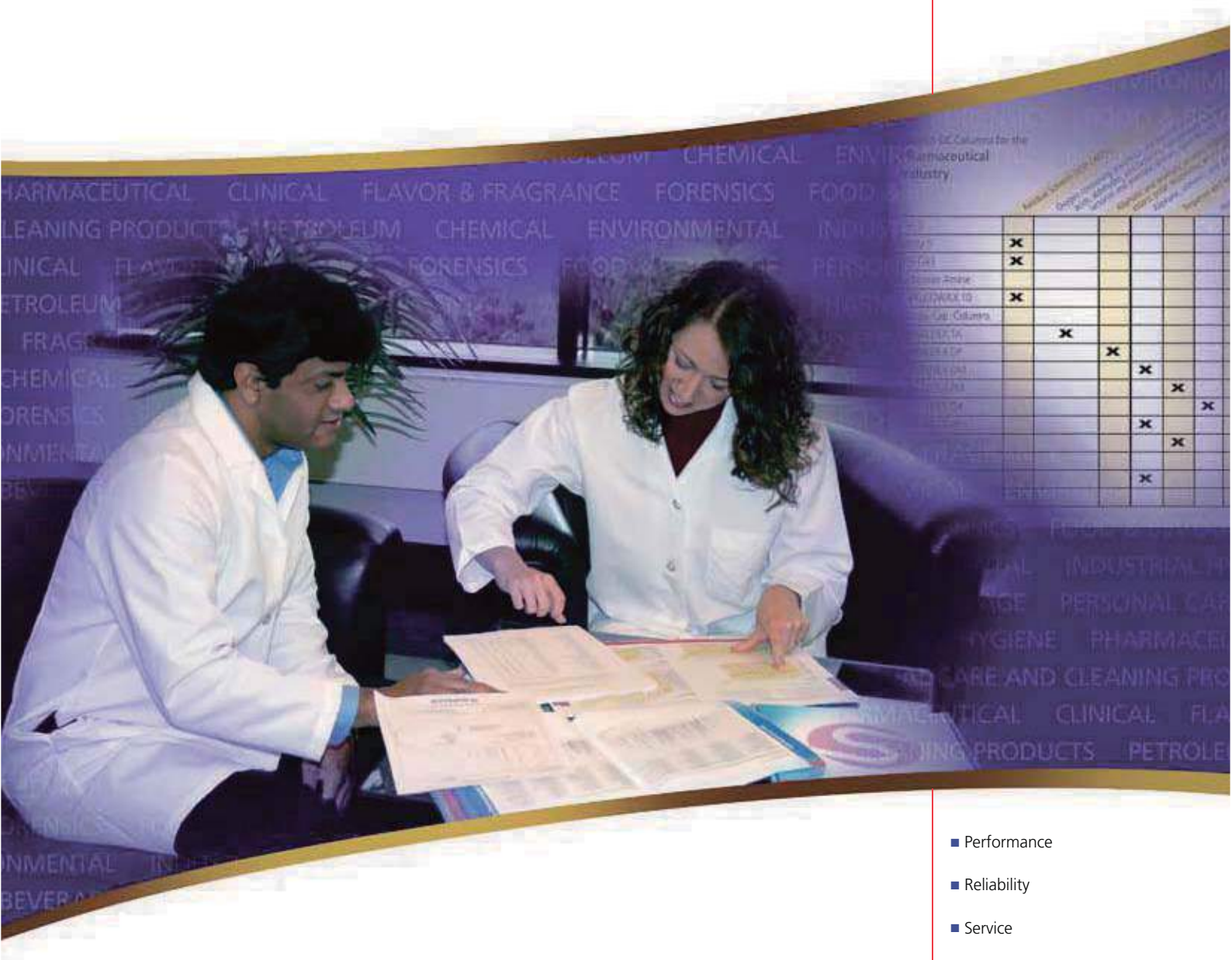
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GC Column Selection Guide

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The History of Supelco and the Capillary Column

Supelco began in 1966 in a tiny garage in a small central Pennsylvania (USA) town manufacturing packed gas chromatography (GC) columns. Walt Supina and Nick Pelick knew exactly what they wanted to do, make quality products that serve customers' needs, back every product with excellent technical service, and maintain steady growth by creating new products through a strong research and development program. By 1977, glass capillary GC columns were being manufactured and in 1982, production began on fused silica capillary GC columns.

Supelco has had a long history of providing specialty products for specific applications. In 1983, the first special purpose fused silica capillary GC column was introduced. Since then, an impressive list of special purpose fused silica capillary GC columns has followed.

Supelco is still dedicated to the development of leading-edge technology to meet the needs of our customers. We strive to demonstrate the belief that our customers' needs come first. Our goal is to offer only the finest products, backed by the most reliable technical service offered anywhere in the world. That was our philosophy in the beginning, and with over forty years in business, it remains our philosophy today.

Providing total customer fulfillment through the quality of our product and service is reflected in our ISO 9001 registration. We test every capillary column we manufacture according to strict quality assurance processes, and guarantee satisfactory performance.

Year Introduced	Special Purpose Fused Silica Capillary GC Column
1983	SP™-2560
1984	SPB™-608, SUPELCOWAX™ 10
1985	SP-2331
1986	VOCOL™
1987	Sup-Herb™, SP-2380
1988	Petrocol™ DH, Nukol™
1989	Petrocol DH 150, Petrocol 2887
1990	Omegawax™ 320, Petrocol DH 50.2
1991	Omegawax 250, SPB-1 SULFUR, Petrocol EX2887, Carbowax Amine
1993	α-DEX™ 120, β-DEX 110, γ-DEX 120, SAC™-5, TCEP
1994	β-DEX 120, OVI-G43, Carboxen™-1006 PLOT, Mol Sieve 5A PLOT, Supel-Q™ PLOT, SCOT Columns
1995	SPB-624, SPB-PUFA, Petrocol DH Octyl, SPB-Octyl, PTA-5
1996	α-DEX 225, β-DEX 225, γ-DEX 225, α-DEX 325, β-DEX 325, γ-DEX 325, Omegawax 530, SPB-1000
1997	SPB-HAP, Carboxen-1010 PLOT
2003	Equity®-1701, Alumina chloride PLOT, Alumina sulfate PLOT
2005	SLB™-5ms
2007	CHIRALDEX™ column line, Omegawax 100
2008	SLB-IL100, MET-Biodiesel



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How to Use this Guide

This brochure was assembled to provide the gas chromatographer a valuable resource. Novice and expert users alike should both find this reference guide useful.

An optimized chromatographic separation begins with selecting the proper column. A section explaining **how to choose a capillary column** (page 4) is included in this brochure. Step-by-step instructions cover topics such as proper phase selection, the importance of phase polarity, non-bonded versus bonded phases, column internal diameter (I.D.), film thickness considerations, phase ratio (β), and column length.

Want additional information beyond what this brochure provides? Listings of **Supelco product literature and additional reading** (page 7) recommend many published GC articles written by gas chromatography experts and researchers.

The main purpose of this brochure is to assist the chromatographer in identifying the proper column phase for their application. This can be accomplished by referring to the twelve easy-to-read **column phase selection guides** (page 8). These guides detail common applications performed in ten distinct industries plus two applications that are independent of any industry.

Need to switch to a Supelco column from a column from a different manufacturer? A **cross-reference chart** (page 15) will be helpful. This chart list Supelco columns along with comparable columns from several other manufacturers.

Looking for information or specifications for a particular phase? A section on **capillary column phases** (page 16) includes many of the most popular phases and provides application, USP code, polymer, and temperature limit information. This section is organized primarily in order of increasing phase polarity to assist in phase selection when performing method development.

A brief listing of the most commonly requested **catalog numbers** (page 22) is included. If you need a dimension not listed, please contact your local Sales office (page 24) or Supelco Technical Service to inquire.

Supelco Technical Service chemists are a valuable resource for providing guidance with the selection and use of capillary columns. Supelco Technical Service can be reached at 800-359-3041 (US and Canada only), 814-359-3041, or at *techservice@sial.com*

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How to Choose a Capillary Column

An optimized chromatographic separation begins with the column. The selection of the proper capillary column for any application should be based on four significant factors: stationary phase, column I.D., film thickness, and column length. The practical effects of these factors on the performance of the column are discussed briefly on the next few pages, in order of importance. Note that this information is general. Specific situations may warrant exceptions to these guidelines.

Factor 1 – Stationary Phase

Choosing a stationary phase is the most important step in selecting a column. A stationary phase is the film coated on the inner wall of a capillary column, and should be selected based on the application to be performed. The differences in the chemical and physical properties of injected organic compounds and their interactions with the stationary phase are the basis of the separation process. When the strength of the analyte-phase interactions differs significantly for two compounds, one is retained longer than the other. How long they are retained in the column (retention time) is a measure of these analyte-phase interactions.

Changing the chemical features of the stationary phase alters its physical properties. Two compounds that co-elute (do not separate) on a particular stationary phase might separate on another phase of a different chemistry, if the difference in the analyte-phase interactions is significant. This is the reason for providing a wide variety of capillary column phases. Each phase provides a specific combination of interactions for each chemical class of analytes.

Established Applications

Gas chromatography, first established in the 1950's, is a mature analytical technique with many established applications. Therefore, it is probable that literature, such as written methodology or journals, exists stating which stationary phases have successfully been used for a given application. Additionally, column manufacturers routinely publish phase selection charts, such as those on pages 8-14. Charts like these are conveniently arranged by industry to simplify the process of selecting the proper phase. First, find the chart that matches your industry or area of interest. Then, locate the application within that chart to identify a recommended column phase.

New Applications

For new applications, there is often no existing reference to provide guidance. In these 'method development' instances, one must have some knowledge of the chemistry of the compounds

Phase Polarity

This is the single most important characteristic in selecting a capillary column because it dictates selectivity, or the ability of the column to separate sample components. Phase selection is based on the general chemical principle that "likes dissolves like." A non-polar column is best for the analyses of non-polar compounds. Polar columns most effectively separate polar compounds.

Non-polar compounds are generally composed only of carbon and hydrogen atoms and contain carbon-carbon single bonds. Normal hydrocarbons (n-alkanes) are the most common non-polar compounds analyzed by capillary gas chromatography. Non-polar capillary columns separate these compounds very well. Interaction between non-polar compounds and a non-polar phase are dispersive, meaning that they are governed by Van der Waals forces. These are intermolecular attractions that increase with the size of the compound. Thus, larger compounds with higher boiling points have longer retention. Elution order generally follows the boiling points of the compounds.

Polar compounds are composed primarily of carbon and hydrogen atoms, but also contain one or more atoms of bromine, chlorine, fluorine, nitrogen, oxygen, phosphorus, or sulfur. Alcohols, amines, carboxylic acids, diols, esters, ethers, ketones, and thiols are typical polar compounds analyzed by capillary GC. Intermediate polar or polar capillary columns separate these compounds well. In addition to dispersive interactions, interactions between polar compounds and the phase include dipole, π-π, and/or acid-base interactions. Separations are determined by differences in the overall effects of these interactions.

Polarizable compounds are compounds composed of carbon and hydrogen, but contain one or more double or triple carbon-carbon bonds. These compounds include alkenes, alkynes, and aromatic (benzene-ring containing) hydrocarbons. Highly polar capillary columns are generally used to separate these compounds.

Phase Polarity Based on Compound Polarity

Compound Polarity	Compound Examples	Recommended Phases
Non-Polar		
C and H atoms only C-C bonds	alkanes	Petrocol, SPB-Octyl, Equity-1, SPB-1, SLB-5ms, Equity-5, SPB-5
Polar		
Primarily C and H atoms; Also contain Br, Cl, F, N, O, P, S	alcohols, amines, carboxylic acids, diols, esters, ethers, ketones, thiols	SPB-624, OVI-G43, VOCOL, SPB-20, Equity-1701, SPB-35, SPB-50, SPB-225, PAG, Omegawax, SPB-1000, Nukol, SUPELCOWAX 10
Polarizable		
C and H atoms only C=C or C≡C bonds	alkenes, alkynes, aromatic hydrocarbons	SP-2330, SP-2331, SP-2380, SP-2560, SP-2340, TCEP



Bonded/Non-Bonded Phases

Bonded phases are immobilized/chemically bonded (crosslinked) within the tubing, while non-bonded phases are simply coated on the wall. Generally a bonded phase is preferred, because it has less bleed during use, can be used to higher temperatures, and, when necessary, can be rinsed with solvents to remove accumulated non-volatile materials. When a bonded phase is not available, such as for the highly polar phases, look for a stabilized phase. These phases are not as permanent as bonded phases (cannot be rinsed), but have greater thermal stability than non-bonded phases. For some applications, the only choice is a non-bonded phase. In these instances, extra care must be taken so the maximum temperature limit is not exceeded.

to be analyzed. Phase selection is based on the general chemical principle that "likes dissolves like." A non-polar column is the recommended starting point for the analyses of non-polar compounds. Likewise, polar columns are usually recommended for the separation of polar compounds. The "Phase Polarity" insert (see Page 4) describes several recommended phases for each group of compound polarities.

Factor 2 – Column I.D.

The current range of commercially available capillary column internal diameters enables the balancing of two factors: efficiency (number of theoretical plates) and sample capacity (amount of any one sample component that can be applied to the column without causing the desired sharp peak to overload). Optimizing one of these factors requires a sacrifice from the other. The ideal I.D. for a given application is dependent on the analytical needs.

High efficiency is observed chromatographically as narrow and well-resolved peaks. The efficiency of a capillary column, measured in plates (N) or plates per meter (N/m), increases as the I.D. of the column decreases. This is one of the basic principles behind Fast GC (see "Fast GC Brochure" insert for further details). If the sample to be analyzed contains many analytes, or has analytes that elute closely together, the most narrow I.D. capillary column that is practical should be selected. Note that very narrow bore columns, such as 0.10 or 0.18 mm I.D., may require specialized equipment, such as a GC with a pressure regulator that allows a higher column head pressure.

Sample capacity increases with column I.D., and the greatest capacity is provided from wide bore columns (0.53 mm I.D.). Wide bore columns can accommodate a larger mass of each analyte in a sample than narrow bore capillary columns. Exceeding the sample capacity of a column will result in skewed peaks and decreased resolution. Therefore, if the samples to be analyzed contain compounds at high concentrations, or represent a wide range of concentrations, then a wide bore column should be considered. If the proper I.D. is chosen, the column should allow the system to provide sufficient sensitivity for the minor components without being overloaded with the major components. The analyst must decide if the loss in efficiency resulting from using a wide bore column is problematic for their application. Note that the nature of the sample components and the polarity of the phase will affect sample capacity. Non-polar phases have higher capacities for non-polar analytes, and polar phases have higher capacities for polar analytes.

The effects of column I.D. on efficiency and sample capacity are represented in Table 1. As shown, 0.25 mm I.D. columns provide adequate plates/meter for most applications while allowing acceptable sample capacity. Because of this compromise between efficiency and sample capacity, 0.25 mm is the most popular I.D. for capillary GC columns. Columns with a smaller or larger I.D. allow the user to optimize either efficiency or sample capacity, based on the requirements of their application.

Table 1. Effects of Column I.D.

Internal Diameter (mm)	Efficiency: Plates/Meter (N/m)	Efficiency: Total Plates (N)	Capacity Each Analyte (ng)
0.53	1,300	39,000	1000-2000
0.32	2,300	69,000	400-500
0.25	2,925	87,750	50-100
0.20	3,650	109,500	<50
0.18	4,050	121,500	<50
0.10	7,300	219,000	<10

Theoretical values for 30 m long columns, calculated @ a k' = 6.00 and 85% coating efficiency

Factor 3 – Film Thickness

As listed in Table 2, the benefits of decreasing film thickness are sharper peaks, (which may increase resolution) and reduced column bleed; both resulting in increased signal-to-noise. Additionally, the column's maximum operating temperature will be increased. The drawbacks are increased analyte interaction with the tubing wall, and decreased analyte capacity. Decreasing film thickness also allows

Fast GC Brochure

The brochure *"Fast GC: A Practical Guide for Increasing Sample Throughput without Sacrificing Quality"* (T407096 JTW) contains valuable information concerning Fast GC principles that is not covered in this space. Included are practical considerations, theoretical discussions, a listing of columns in Fast GC dimensions, twenty-six chromatograms, a listing of related products designed to maximize performance, plus a list of literature for additional reading. A copy of this brochure can be obtained at no-charge by contacting Supelco Technical Service at 800-359-3041 (US and Canada only), 814-359-3041, or at **techservice@sial.com**





analytes to elute with shorter retention times and at lower temperatures, which may be desirable or undesirable, depending on the application.

Thinner film columns, i.e. 0.10 to 0.25 µm, should be used for analytes with high (>300 °C) boiling points (such as pesticides, PCBs, FAMEs, phthalate esters, and other semivolatile compounds), or for trace analyses.

The benefits of increasing the film thickness are reduced analyte-tubing interaction and increased sample capacity. The drawbacks of increasing the film thickness are increased peak widths (which may reduce resolution), increased column bleed, and a reduced maximum operating temperature for the column. Increasing film thickness also leads to increased analyte retention (may also increase resolution, specifically for compounds with low k') and increased elution temperature. Depending on the application, these last effects may be either desirable or undesirable.

Thick film columns, i.e. 1 to 5 µm, are best suited for analytes with low boiling points (such as volatile organic compounds and gases). These types of analytes are retained longer on the thicker film, which may eliminate the need for subambient oven conditions. A thicker film will also increase capacity, thus making the column more compatible for higher concentration samples than a thinner film column.

Table 2. Effects of Film Thickness

	0.10 to 0.25 µm film	1 to 5 µm film
Benefits	Sharper peak shape May increase resolution Decreased column bleed Increased signal-to-noise Increased max. temp.	Reduced interaction w/tubing Increased analyte capacity
Drawbacks	Increased interaction w/tubing Decreased analyte capacity	Increased peak width May decrease resolution Increased column bleed Decreased max. temp.
Other	Decreased retention Decreased elution temp.	Increased retention May increase resolution Increased elution temperature
Uses	High boiling point analytes Semivolatiles Trace analyses	Low boiling point analytes Volatiles, gases High analyte concentrations

Phase Ratio (β)

Effects of phase film thickness are interdependent with column I.D. The phase ratio, beta (β), expresses the ratio of the gas volume and the stationary phase volume in a column:

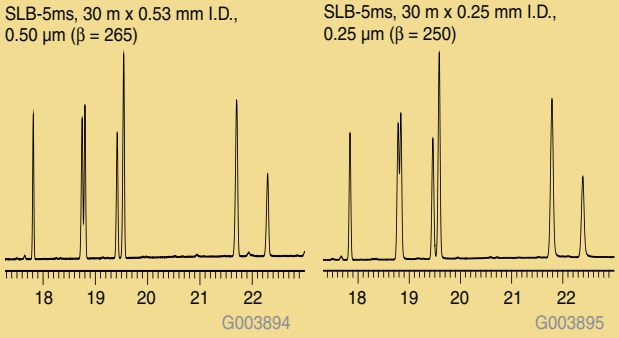
$$\beta = \frac{\text{column radius (µm)}}{\text{2 x film thickness (µm)}}$$

In contrast to relative terms ("thick film" and "thin film"), β values establish a distinct ranking for columns. As a general rule, select columns by β values as follows:

β Value	Uses
<100	Highly volatile, low molecular weight compounds
100-400	General purpose analyses Wide range of compounds
>400	High molecular weight compounds Trace analyses

β values are also useful when changing column I.D. and film thickness combinations for a particular analysis, because columns with the same phase ratio will provide very similar retention times and elution order under the same analytical conditions.

Columns With Similar β Values



Factor 4 – Column Length

The last of the four significant factors to consider when selecting a column is length. A longer column will provide greater resolution than a shorter column. However, there are practical limits to increasing column length. With an isothermal analysis, a 60 m column does in fact increase resolution by almost 40%, relative to a 30 m column, but will increase the analysis time and also the head pressure required to move analytes through the column. Selecting a column length is a compromise between speed and head pressure on one side, and resolution on the other. Table 3 summarizes the effects of column length on various performance and operating parameters of 0.25 mm I.D. columns.

It should be stressed that doubling column length will NOT double resolution (resolution only increases according to the square root of the column length). If resolution between a critical pair is less than 1, doubling column length will not bring it to baseline (resolution value of at least 1.5). Increasing column length to increase resolution should be considered as a last resort. A more effective approach to increasing resolution is to reduce column I.D.

Shorter columns, such as those <15 m, are generally used when great resolution is not required, such as for screening purposes or for simple samples whose components are dissimilar in chemical nature. However, if column I.D. is decreased along with length, resolution can be maintained, or in some cases, actually increased.

Generally a 30 m column provides the best balance of resolution, analysis time, and required column head pressure. In some cases, a 30 m column with a thicker film may be as useful as a 60 m column for achieving a separation.

Use a 60 m column when higher resolution is required. Samples that are highly complex or contain volatile analytes are commonly analyzed on 60 m columns.



Very long, >100 m, columns are also available for use when there is a need for extremely high resolution, such as in the detailed analysis of very complex samples (such as gasoline). Due to the extreme length of these columns, high head pressures are required to maintain column flow.

Very long, 100 m or longer, columns are also available for use when there is a need for extreme resolving ability for highly complex samples (such as gasoline). Longer columns also reduce the optimum linear velocity for an analysis.

Table 3. Effects of Column Length

Column Length (m)	Inlet Pressure (psi)	Peak 1 Retention (min)	Peak 1/2 Resolution (R)	Efficiency: Total Plates (N)
15	5.9	8.33	0.8	43,875
30	12.0	16.68	1.2	87,750
60	24.9	33.37	1.7	175,500

Theoretical values for 0.25 mm I.D. columns with 85% coating efficiency, 145 °C isothermal analyses, helium at 21 cm/sec, k'(peak 1) = 6.00

Fused Silica Tubing Inner/Outer Diameters

Tubing I.D.	Tubing I.D. Range	Tubing O.D. Range
0.10 mm ▲	0.094 – 0.106 mm	0.349 – 0.369 mm
0.10 mm ▼	0.094 – 0.106 mm	0.290 – 0.310 mm
0.18 mm ▲	0.174 – 0.186 mm	0.349 – 0.369 mm
0.18 mm ▼	0.174 – 0.186 mm	0.330 – 0.350 mm
0.20 mm ◆	0.194 – 0.206 mm	0.349 – 0.370 mm
0.25 mm ◆	0.244 – 0.256 mm	0.349 – 0.370 mm
0.32 mm ◆	0.314 – 0.326 mm	0.425 – 0.450 mm
0.53 mm ◆	0.526 – 0.546 mm	0.640 – 0.680 mm
0.75 mm ◆	0.737 – 0.758 mm	0.875 – 0.925 mm

▲ Analytical columns with non-polar or intermediate polarity stationary phases.

▼ Analytical columns with polar stationary phases. Guard columns regardless of deactivation.

◆ Analytical columns regardless of polarity. Guard columns regardless of deactivation.

Product Literature

The following list of Supelco-published literature provides additional GC column information. To obtain any of these literature pieces at no-charge, either visit our web site at sigma-aldrich.com/gc, or contact Supelco Technical Service at 800-359-3041 (US and Canada only), 814-359-3041, or at *techservice@sial.com*

Title	Identification
GC Column Literature	
SLB-5ms Capillary GC Columns	T405130 (IKA)
Dioxin & PCB Analysis	(JXB)
Petroleum/Chemical Application Guide	T109858 (AYD)
Free and Total Glycerin in B100 Biodiesel	T107943 (JLH)
Alumina PLOT Capillary GC Columns	T403145 (GFE)
Carboxen PLOT Capillary GC Columns	T403146 (GFF)
Mol Sieve 5A PLOT Capillary GC Columns	T403147 (GFG)
Supel-Q PLOT Capillary GC Columns	T403148 (GFH)
Fatty Acid/FAME Application Guide	T408126 (KUK)
Analyzing Fatty Acids by Capillary GC	T110855 (AYC)
37-Component FAME Mix on Four Capillary Columns	T196907 (AZC)
Capillary Column Choices for Residual Solvents	T103933 (FLX)
CHIRALDEX Chiral Capillary GC Columns	T407123 (JCH)
Chiral Cyclodextrin Capillary GC Columns	T194877 (AXA)
Supelco Columns for USP Methods (Poster)	T403109 (FWK)
Fast GC Brochure	T407096 (JTW)
Equity Capillary GC Columns	T402049 (FAQ)
General Purpose Non-Polar Capillary GC Columns	T405132 (IKC)
General Purpose Polar Capillary GC Columns	T405131 (IKB)
General Purpose Intermediate Polarity Capillary GC Columns	T405133 (IKD)
Capillary GC Troubleshooting Guide	T112853 (AIP)
Installation/Maintenance of 0.25 & 0.32 mm I.D. Columns	T195895 (DLV)
Installation/Maintenance of 0.53 mm I.D. Columns	T195897
Packed GC Column Application Guide	T195890 (AYT)
Sulfur Gases by Packed GC	T100722 (AXP)
Permanent Gases and Light Hydrocarbons by Packed GC	T396112 (BYL)
Packed GC Troubleshooting Guide	T109792 (AIS)

Title	Identification
Related Product Literature	
GC Accessories and Gas Purification/Management	T407103 (JWE)
Capillary Injector Products for Agilent Technologies GCs	T401027 (DWM)
Molded Thermogreen LB-2 Septa	T407082 (JQV)
Capillary GC Inlet Liner Selection Guide	T196899 (BBB)
FocusLiner™ Inler Liners	T408101 (KOX)
Selecting The Appropriate Inlet Liner (Poster)	T404081 (HCH)
The Supelco Guide to Leak-Free Connections	T100741 (AXR)
Selecting Purifiers for Gas Chromatography	T197918 (BIT)
Gas Management Systems for GC	T196898 (AYW)
Gas Generators	T407110 (JXP)
Purge-and-Trap Troubleshooting Guide	T197916 (BIN)
A Tool for Selecting an Adsorbent for Thermal Desorption	T402025 (EQF)
Carbon Adsorbent Kits	T406044 (IPS)
Syringes for Chromatographic & Analytical Applications	T406108 (JCS)
Vials	(IXH)
Vial Selection Guide (Poster)	T405074 (IBV)
Supelco Solid Phase Extraction Products	T402150 (FEB)
Discovery Ag-Ion SPE for cis/trans FAME Fractionation	T406062 (IRV)
Solid Phase Microextraction Application Guide (CD-ROM)	T199925 (CJQ)
SPME: Theory and Optimization of Conditions	T198923 (BQT)
Solid Phase Microextraction Troubleshooting Guide	T101928 (EDV)
A Practical Guide to Quantitation with SPME	T101929 (EDW)
Derivatization Reagents	T407138 (KDI)

Additional Reading

The following is a list of GC literature written by gas chromatography experts and researchers. Consult these references to learn more about the many facets of gas chromatography.

1. Harold McNair and James Miller, "Basic Gas Chromatography" (1997), Wiley, ISBN 0-471-17261-8.
2. David Grant, "Capillary Gas Chromatography" (1996), Wiley, ISBN 0-471-95377-6.
3. Dean Rood, "A Practical Guide to the Care, Maintenance, and Troubleshooting of Capillary Gas Chromatographic Systems" (1991), Hüthig, ISBN 3-7785-1898-4.
4. Konrad Grob, "Split and Splitless Injection in Capillary GC" (1993), Hüthig, ISBN 3-7785-2151-9.
5. Konrad Grob, "On-Column Injection in Capillary Gas Chromatography" (1991), Hüthig, ISBN 3-7785-2055-5.
6. William McFadden, "Techniques of Combined Gas Chromatography/Mass Spectrometry: Applications in Organic Analysis" (1988), Robert E. Krieger Publishing Company, ISBN 0-89464-280-4.
7. Marvin McMaster and Christopher McMaster, "GC/MS: A Practical User's Guide" (1998), Wiley-VCH, ISBN 0-471-24826-6.
8. Janusz Pawliszyn, "Solid Phase Microextraction: Theory and Practice" (1997), Wiley-VCH, ISBN 0-471-19034-9.



Column Selection by Industry

Supelco has developed the most extensive line of special purpose columns designed for industry specific applications. These columns are manufactured to deliver high resolution, great analyte response, low bleed, and long column life; allowing analysts to achieve the analytical performance they require. The easy-to-read phase selection charts on the next several pages are conveniently arranged by industry to simplify the process of selecting the proper phase. First, find the chart that matches your industry. Then, locate the application within that industry to identify a recommended phase.

The stationary phase also dictates the minimum and maximum temperatures at which a column can be used. Therefore, it is critical to ensure the selected stationary phase can withstand the temperature requirements of the GC method. Temperature limitations can be located in the capillary column phase section on pages 16 to 21.

Environmental Industry

The environmental columns offered here can be used with many specific methods for the analyses of volatiles, semivolatiles, pesticides, PCBs, herbicides, and dioxins.

Supelco GC Columns for the **Environmental Industry**

	GC-MS Volatiles	GC Volatiles	GC-MS Semivolatiles	GC Semivolatiles	GC-MS Dioxins	GC-MS PCB Congeners	GC-MS PBDE Congeners	Toxic Organics - TO-1/TO-2	Toxic Organics - TO-4/TO-10	Toxic Organics - TO-9	Toxic Organics - TO-13	Toxic Organics - TO-14/TO-15/TO-17	Hazardous Air Pollutants
SPB-Octyl						X							
SPB-HAP													X
Equity-1								X				X	
SLB-5ms			X	X	X	X	X		X	X	X		
SPB-624	X	X											
VOCOL	X	X											
SPB-608				X					X				
Sup-Herb				X									
Equity-1701				X					X				
SPB-50				X									
SPB-225					X					X			
SP-2331					X					X			
SLB-IL100						X							

Industrial Hygiene Industry

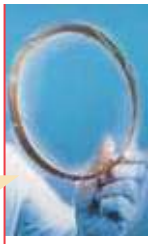
These columns can be used with methodologies for determining indoor air quality as well as outdoor organic compounds.

Supelco GC Columns for the **Industrial Hygiene Industry**

	Indoor Air Quality - EPA IP-8	Indoor Air Quality - NIOSH 1003	Indoor Air Quality - NIOSH 1403	Indoor Air Quality - NIOSH 1500/1501	Indoor Air Quality - NIOSH 2530	Indoor Air Quality - NIOSH 2542	Indoor Air Quality - NIOSH 5503	Indoor Air Quality - OSHA 53	Indoor Air Quality - OSHA 56	Indoor Air Quality - OSHA 62	Indoor Air Quality - OSHA 80	Toxic Organics - TO-1/TO-2	Toxic Organics - TO-4/TO-10	Toxic Organics - TO-9	Toxic Organics - TO-13	Toxic Organics - TO-14/TO-15/TO-17	Hazardous Air Pollutants
SPB-HAP																	X
Equity-1			X	X		X		X	X			X				X	
SLB-5ms	X				X		X			X			X	X	X		
VOCOL		X															
SPB-608													X				
Equity-1701													X				
SPB-225														X			
SUPELCOWAX 10										X							
SP-2331														X			

Pharmaceutical Industry

Use these columns for analyses of residual solvents, basic drugs, small chiral molecules of interest to this industry, and for methods following specific monographs.



Supelco GC Columns for the **Pharmaceutical Industry**

	Residual Solvents [USP <467>]	Oxygen containing analytes in the form of alcohols, ketones, acids, aldehydes, and lactones; halogenated compounds; lactones and aromatic amines; epoxides, styrene oxide; furans	Aliphatic and aromatic amines; aliphatic and some aromatic esters; polar racemates; amino acids; amines	Aliphatic, olefenic, and aromatic enantiomers	Terpenes and tertiary amines	Heterocyclic amines	Small molecules, such as alcohols, aldehydes, ketones, esters, and flavor compounds	Basic Compounds	Individual USP/NF Monographs
PTA-5								X	
Equity-5	X								
OVI-G43	X								
Carbowax Amine								X	
SUPELCOWAX 10	X								
Various Cap. Columns									X
CHIRALDEX TA		X							
CHIRALDEX DP			X						
CHIRALDEX DM				X					
CHIRALDEX PM					X				
CHIRALDEX DA						X			
CHIRALDEX PH				X					
Supelco DEX 110, 120					X				
Supelco DEX 225							X		
Supelco DEX 325				X					
Various Pkd. Columns									X

Clinical Industry

Use these columns for the analyses of antihistamines, basic drugs, cold/sinus medications, steroids, and tricyclic antidepressants from biological samples.

Supelco GC Columns for the **Clinical Industry**

	Antiepileptics	Antihistamines	Basic Drug Screen	Benzodiazepines (acetic anhydride)	Benzodiazepines (TBDMS)	Cold and Sinus Medications	Phenothiazines	Steroids	Sympathomimetic Amines	Sympathomimetic Amines (HFBA)	Sympathomimetic Amines (TFAA)	Tricyclic Antidepressants
Equity-1				X				X				
SLB-5ms			X				X	X		X	X	
PTA-5		X	X			X			X			
SAC-5								X				
SPB-20	X											
SPB-35			X		X							
Equity-1701	X											X
Carbowax® Amine		X	X			X			X			
SP-2510 Packed Column	X											

NOTE: Parentheses indicate analytes analyzed as the specified derivative.



Flavor & Fragrance Industry

Volatiles, essential oils, and small chiral molecules of interest to this industry can be analyzed using the following columns.

Supelco GC Columns for the **Flavor & Fragrance Industry**

	Flavor & Fragrance Volatiles	Essential Oils	Oxygen containing analytes in the form of alcohols, ketones, acids, aldehydes, and lactones; halogenated compounds; lactones and aromatics amines; epoxides; styrene oxide; furans	Aliphatic and aromatic amines; aliphatic and some aromatic esters; polar racemates; amino acids; amines	Aliphatic, olefenic, and aromatic enantiomers	Terpenes and tertiary amines	Heterocyclic amines	Small molecules, such as alcohols, aldehydes, ketones, esters, and flavor compounds
SLB-5ms	X	X						
SUPELCOWAX 10	X	X						
CHIRALDEX TA			X					
CHIRALDEX DP				X				
CHIRALDEX DM					X			
CHIRALDEX PM						X		
CHIRALDEX DA							X	
CHIRALDEX PH					X			
Supelco DEX 110, 120						X		
Supelco DEX 225								X
Supelco DEX 325					X			

Forensics Industry

Use these columns for the analyses of accelerants from arson samples, or for blood alcohols, drugs of abuse, and glycols from biological samples.

Supelco GC Columns for the **Forensics Industry**

	Accelerants	Blood Alcohols	Drugs of Abuse - Barbiturates	Drugs of Abuse - Basic Drug Screen	Drugs of Abuse - Cannabinoids (TMS)	Drugs of Abuse - Cocaine (TMS)	Drugs of Abuse - Drug Screen (TBDMS)	Drugs of Abuse - Drug Screen (TMS)	Drugs of Abuse - GHB (MTBSTFA)	Drugs of Abuse - Inhalants	Drugs of Abuse - Ketamines (MBTFA)	Drugs of Abuse - LSD (TMS)	Drugs of Abuse - MDMA/Ecstasy (HFBPC)	Drugs of Abuse - Opiates (TMS)	Drugs of Abuse - Phencyclidine [PCP]	Drugs of Abuse - Steroids	Drugs of Abuse - Tryptamines	Glycols
Equity-1	X	X																
SLB-5ms	X		X	X	X	X			X		X	X	X	X	X		X	
PTA-5				X														
SAC-5																X		
Equity-5										X						X		
VOCOL		X								X								
SPB-35			X	X			X	X										
Equity-1701			X															
SPB-1000																		X
Nukol																		X
Carbowax Amine				X														

NOTE: Parentheses indicate analytes analyzed as the specified derivative.



Food & Beverage Industry

Supelco is the recognized leader in specialty columns for the Food & Beverage industry. These columns are written into many methods, and are considered the benchmark columns in the industry. Analytes such as free fatty acids, fatty acid methyl esters, alcohols, trigylcerides, glycols, and sterols can be separated on these special purpose columns.

Supelco GC Columns for the
Food & Beverage Industry

	Alcoholic Beverage Analyses	Sulfur Compounds in Alcoholic Beverages	Solvents	Free Fatty Acids	Polyunsaturated FAMEs by Chain Length	Omega-3 and Omega-6 FAMEs	cis/trans FAME Isomers	Triglycerides	Glycols	Preservatives [Phenolic Antioxidants]	Sterols	Sugars as Alditol Acetates	Pesticide Residues
SPB-1 SULFUR		X											
SLB-5ms			X							X	X		X
MET-Biodiesel								X					
SAC-5											X		
SPB-624	X		X									X	
SPB-20	X		X							X			
SPB-608													X
Sup-Herb													X
Equity-1701	X		X									X	X
SPB-50										X			X
SPB-PUFA					X	X							
Nukol	X		X	X	X	X			X				
SPB-1000	X		X	X	X	X			X				
Omegawax					X	X							
SUPELCOWAX 10	X	X	X		X	X							
SP-2380							X					X	
SP-2560							X						
SLB-IL100					X	X	X						
Supel-Q PLOT		X											

Personal Care and Cleaning Products Industry

Commercial products, such as shampoos, cosmetics, and rug cleaners, must continuously be monitored to ensure that they do not contain items hazardous to the user. These columns can be used for this purpose.

Supelco GC Columns for the
Personal Care and Cleaning Products Industry

	Alkalis	Coloring Compounds	Fragrance Compounds	Glycols	Preservatives [Phenolic Antioxidants]	Solvents in Cleaning Products	Surfactants [Anionic]	Surfactants [Nonionic]
Equity-1								X
SLB-5ms		X	X			X		X
PTA-5	X							
SPB-20					X			
SPB-50					X			
SPB-1000		X	X	X		X	X	
Nukol		X	X	X		X	X	
Carbowax Amine	X							
SUPELCOWAX 10		X	X			X		

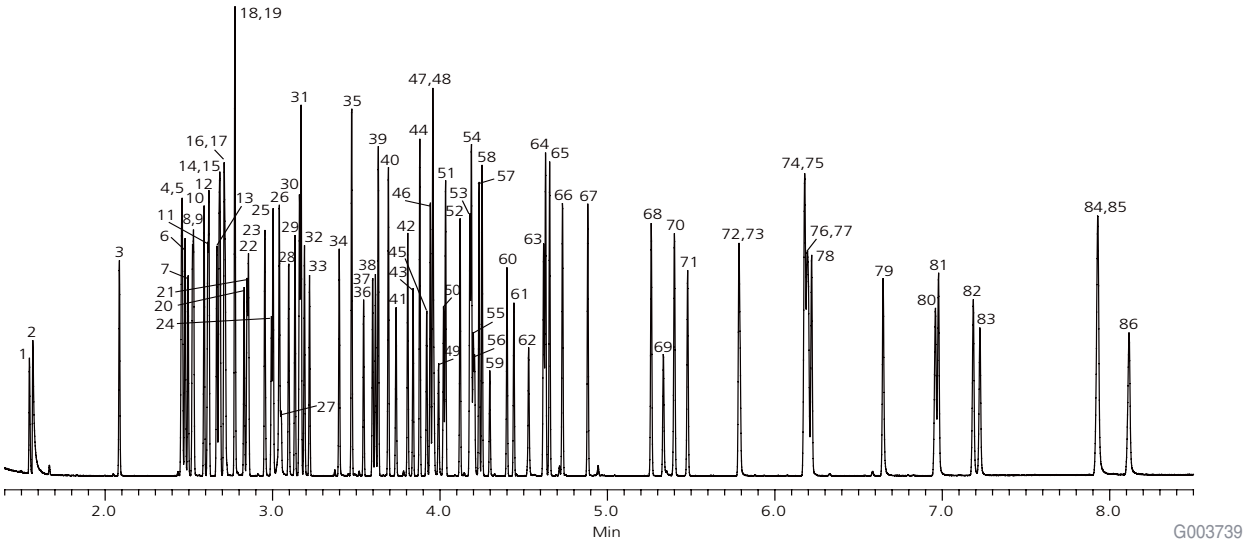


Petroleum Industry

This family of columns can be used for analyses such as purity, boiling point composition, aromatics, light hydrocarbons, fluorocarbons, and sulfur-containing compounds in petroleum products.

Supelco GC Columns for the
Petroleum Industry

	Detailed Hydrocabon Analyses [DHA]	Simulated Distillation [Sim Dis]	Aromatics	$H_2/O_2/N_2/CO/CH_4/CO_2$	$H_2/N_2/CO/CH_4/CO_2$	$H_2/O_2/N_2/CO/CH_4$	O_2/Argon	C1-C3 Hydrocarbons	C1-C5 Alkanes, Alkenes, and Alkynes	C1-C12 Hydrocarbon	Fluorocarbons	Sulfur Compounds	Process Analyzers	Natural Gas Liquids / Natural Gas	Biodiesel Glycerin Impurity
Petrocol DH Octyl	X														
Petrocol DH 50.2	X													X	
Petrocol DH	X													X	
Petrocol DH 150	X													X	
Petrocol 2887		X													
Petrocol EX2887		X													
SPB-1 SULFUR												X			
MET-Biodiesel															X
HT-5		X													
SP-2380			X												
SLB-IL100			X												
TCEP			X												
Alumina sulfate PLOT								X	X						
Alumina chloride PLOT								X	X		X				
Carboxen-1010 PLOT				X	X	X		X							
Carboxen-1006 PLOT					X			X							
Mol Sieve 5A PLOT						X	X	X							
Supel-Q PLOT			X					X		X	X	X			
Bentone 34/DNDP SCOT			X										X		
BMEA SCOT													X		
Squalane SCOT													X		
TCEP SCOT													X		
Fluorocol™ Packed Column											X				
GPA Packed Columns														X	
Micropacked Columns													X		



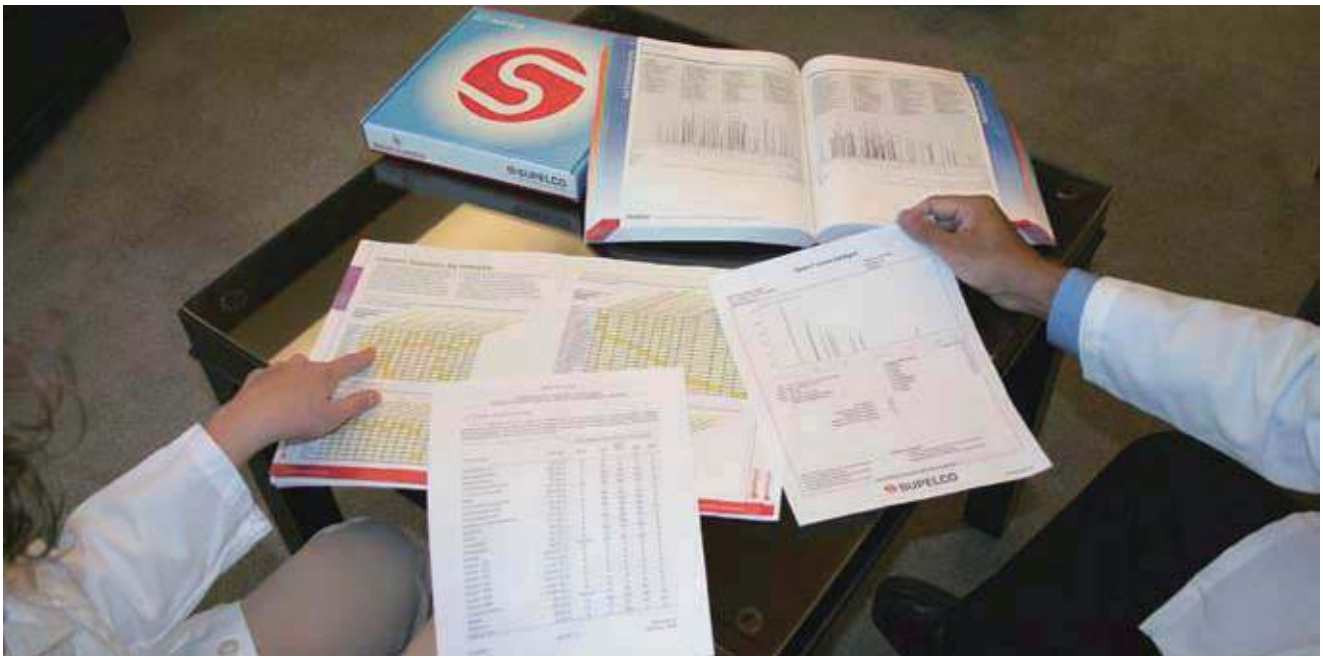


Chemical Industry

These special purpose columns can be selected for analyses such as solvents, aromatics, light hydrocarbons, freons, sulfur-containing compounds, glycols, or basic compounds.

Supelco GC Columns for the Chemical Industry

	Solvents on a Nonpolar Column	Solvents on a Polar Column	Aromatics	$H_2/O_2/N_2/CO/CH_4/CO_2$	$H_2/N_2/CO/CH_4/CO_2$	$H_2/O_2/N_2/CO/CH_4$	O_2/Argon	C1-C3 Hydrocarbons	C1-C5 Alkanes, Alkenes, and Alkynes	C1-C12 Hydrocarbons	Freons	Sulfur Compounds	Acidic Compounds / Glycols	Basic Compounds	Process Analyzers
SPB-1 SULFUR	X											X			
SLB-5ms	X		X												
PTA-5														X	
SPB-1000		X											X		
Nukol		X											X		
Carbowax Amine														X	
SUPELCOWAX 10		X	X												
SLB-IL100			X												
TCEP			X												
Alumina sulfate PLOT								X	X						
Alumina chloride PLOT								X	X		X				
Carboxen-1010 PLOT				X	X	X		X							
Carboxen-1006 PLOT					X			X							
Mol Sieve 5A PLOT						X	X	X							
Supel-Q PLOT			X					X		X	X	X			
Bentone 34/DNDP SCOT			X												X
BMEA SCOT															X
Squalane SCOT															X
TCEP SCOT															X
Fluorocol Packed Column											X				
Micropacked Columns															X





Column Selection by Application

In addition to the industry specific selection charts on the preceding pages, these two easy-to-read phase selection charts highlight choices for two applications that are independent of any industry. Simply locate the application to identify a recommended column phase.

The stationary phase also dictates the minimum and maximum temperatures at which a column can be used. Therefore, it is critical to ensure the selected stationary phase can withstand the temperature requirements of the GC method. Temperature limitations can be located in the capillary column phase section on pages 16 to 21.

Fast GC Applications

Applying the principles of Fast GC is an effective way to increase sample throughput by decreasing the analysis time. These columns have all the characteristics necessary for developing a successful Fast GC method.

Supelco GC Columns for **Fast GC Applications**

	Environmental Volatiles	Environmental Semivolatiles	Environmental Pesticides and PCBs	Petroleum Aromatics	Food & Beverage Omega-3 and -6 FAMEs	Food & Beverage cis/trans FAME Isomers	General Purpose Polar	General Purpose Nonpolar
SPB-624	X							
VOCOL	X							
SLB-5ms		X	X					
Equity-1701			X					
SLB-IL100				X	X	X		
TCEP				X				
Omegawax 100					X			
SP-2560						X		
SUPELCOWAX 10							X	
Equity-1								X
SPB-1								X
Equity-5								X
SPB-5								X

General Purpose Applications

Supelco's general purpose columns are tested to ensure they meet acceptable values for general chromatographic parameters such as retention, efficiency, and selectivity. These columns are recommended for applications that do not fall under those covered by our special purpose, industry specific columns.

Supelco GC Columns for **General Purpose Applications**

	Nonpolar Column	Intermediate Polarity Column	Polar Column	High Polarity Column
SPB-Octyl	X			
Equity-1	X			
SPB-1	X			
Equity-5	X			
SPB-5	X			
SPB-20		X		
SPB-35		X		
Equity-1701		X		
SPB-50		X		
SPB-225			X	
PAG			X	
SUPELCOWAX 10			X	
SP-2330				X
SP-2380				X
SP-2340				X



Cross-Reference Chart

Table 4. Supelco Capillary GC Columns with Comparable Columns from Other Manufacturers

Supelco	Agilent	Grace	Macherey-Nagel	Phenomenex®	Restek	SGE	Varian
TRADITIONAL (phases by increasing phase polarity)							
Petrocol DH Octyl	-	-	-	-	-	-	-
SPB-Octyl	-	-	-	-	-	-	CP-Sil 2 CB
SPB-HAP	-	-	-	-	-	-	-
Petrocol DH 50.2	DB-Petro, HP-PONA	-	-	-	-	BP1 PONA	-
Petrocol DH	DB-Petro	AT-Petro	-	-	Rtx-1PONA	BP1 PONA	CP-Sil PONA CB
Petrocol DH 150	-	-	-	-	-	-	-
Petrocol 2887, Petrocol EX2887	DB-2887	AT-2887	-	-	Rtx-2887	-	CP-SimDist
SPB-1 SULFUR	-	AT-Sulfur	-	-	-	-	CP-Sil 5 CB for Sulfur
Equity-1, SPB-1	DB-1, HP-1	AT-1	Optima-1	ZB-1	Rtx-1	BP1	CP-Sil 5 CB
SLB-5ms	DB-5ms, HP-5ms	AT-5ms	Optima-5 MS	ZB-5ms	Rtx-5Sil MS	BPX5	VF-5ms
MET-Biodiesel	-	-	-	-	MXT-BiodieselTG	-	Select Biodiesel for Triglycerides
HT-5 (aluminum clad)	DB-5ht	-	-	ZB-5ht	-	HT-5	VF-5ht
PTA-5	-	AT-Amine	-	-	Rtx-5 Amine	-	CP-Sil 8 CB for Amines
SAC-5	-	-	-	-	-	-	-
Equity-5, SPB-5	DB-5, HP-5	AT-5	Optima-5	ZB-5	Rtx-5	BP5	CP-Sil 8 CB
SPB-624	DB-624, DB-VRX	AT-624	Optima-624	ZB-624	Rtx-624	BP624	CP-Select 624 CB
OVI-G43	HP-Fast Residual Solvent	-	-	-	Rtx-G43	-	-
VOCOL	DB-502.2, HP-VOC	AT-502.2	-	-	Rtx-502.2, Rtx-Volatiles	-	-
SPB-20	-	AT-20	-	-	Rtx-20	-	-
Equity-1701	DB-1701	AT-1701	Optima-1701	ZB-1701	Rtx-1701	BP10	CP-Sil 19 CB
SPB-608	DB-608	AT-Pesticide	-	-	-	-	-
Sup-Herb	-	-	-	-	-	-	-
SPB-35	DB-35, HP-35	AT-35	-	ZB-35	Rtx-35	-	-
SPB-50	DB-17, HP-50	AT-50	Optima-17	ZB-50	-	-	CP-Sil 24 CB
SPB-225	DB-225	AT-225	Optima-225	-	Rtx-225	BP225	CP-Sil 43 CB
SPB-PUFA	-	-	-	-	-	-	-
PAG	-	-	-	-	-	-	-
SPB-1000, Nukol	DB-FFAP, HP-FFAP	AT-1000, AT-AquaWax-DA	Optima-FFAP	ZB-FFAP	Stabilwax-DA	BP21	CP-FFAP CB
Carbowax Amine	CAM	AT-CAM	-	-	Stabilwax-DB	-	CP-Wax 51 for Amines
Omegawax	-	AT-FAME	-	-	FAMEWAX	-	-
SUPELCOWAX 10	DB-WAX	AT-WAX, AT-AquaWax	Optima-WAX	ZB-WAX	Rtx-WAX, Stabilwax	BP20	CP-Wax 52 CB
SP-2330	HP-88	-	-	-	Rtx-2330	-	-
SP-2331	DB-Dioxin	-	-	-	Rtx-Dioxin2	-	CP-Sil 88 for Dioxins
SP-2380	-	AT-Silar 90	-	-	-	-	-
SP-2560	-	-	-	-	Rt-2560	-	CP-Sil 88 for FAME
SP-2340	-	AT-Silar 100	-	-	-	-	CP-Sil 88
SLB-IL100	-	-	-	-	-	-	-
TCEP	-	-	-	-	Rt-TCEP	-	CP-TCEP
CHIRAL PHASES							
CHIRALDEX	-	-	-	-	-	-	-
α-DEX	-	-	FS-LIPODEX	-	-	-	-
β-DEX	CycloSil-B	-	FS-LIPODEX, FS-HYDRODEX	-	Rt-βDEX	CYDEX-B	-
γ-DEX	-	-	FS-LIPODEX	-	Rt-γDEX	-	-
PLOT COLUMNS							
Alumina sulfate PLOT	HP-PLOT Al2O3 "S"	-	-	-	-	-	CP-Al_2O_3 PLOT Na_2SO_4
Alumina chloride PLOT	HP-PLOT Al2O3 "KCl"	-	-	-	-	-	CP-Al_2O_3 PLOT KCl
Carboxen-1010 PLOT	-	-	-	-	-	-	CP-CarboPLOT P7
Carboxen-1006 PLOT	GS-Carbon PLOT	Carbograph VOC	-	-	-	-	CP-CarboBOND
Mol Sieve 5A PLOT	HP-PLOT Molesieve	AT-Mole Sieve	-	-	Rt-Msieve 5A	-	CP-Molsieve 5A
Supel-Q PLOT	HP-PLOT Q	AT-Q	-	-	Rt-QPLOT	-	CP-PoraPLOT Q
SCOT COLUMNS							
SCOT Columns	-	-	-	-	-	-	-



Capillary Columns by Phase

Looking for information or specifications for a particular phase? This section includes the most popular phases and provides application, USP code, polymer, and temperature limit information. Where two maximum temperatures are listed (i.e. 200/220 °C), the first is for isothermal oven analyses, whereas the second is for oven temperature programmed analyses. Where only one maximum temperature is listed, it can be used for either isothermal or temperature programmed oven analyses.

This section is organized primarily in order of increasing phase polarity to assist in phase selection when performing method development. Other, less popular, phases are available. However, these are not listed here due to space constraints. To learn more about any phases listed, or to inquire about a phase not listed, contact Supelco Technical Service at 800-359-3041 (US and Canada only), 814-359-3041, or at *techservice@sial.com*

TRADITIONAL PHASES

(By increasing phase polarity)

Petrocol DH Octyl

- **Application:** This column, for detailed analyses of petroleum products, is known within the petroleum and chemical industries for its unique selectivity. Baseline separations of benzene/1-methylcyclopentene and toluene/2,3,3-trimethylpentane that are possible with this column are not obtainable with classical poly(dimethylsiloxane) columns.
- **USP Code:** None
- **Phase:** Bonded; poly(50% n-octyl/ 50% methylsiloxane)
- **Temperature Limits:** -60 °C to 220 °C

SPB-Octyl

- **Application:** The low polarity of this column approaches squalane, making it substantially less polar than that of the widely used non-polar poly(dimethylsiloxane) columns. This column offers unique selectivity compared to non-polar and intermediate polarity columns, and can be used for confirmational analyses of PCB-containing samples.
- **USP Code:** None
- **Phase:** Bonded; poly(50% n-octyl/ 50% methylsiloxane)
- **Temperature Limits:** -60 °C to 260 °C

SPB-HAP

- **Application:** This column was developed to provide the best resolution of very volatile hazardous air pollutants. The thick film helps to focus analytes on the column, possibly eliminating the need to employ cryogenic focusing techniques.
- **USP Code:** This column meets USP G1, G2, and G9 requirements.
- **Phase:** Bonded; poly(dimethylsiloxane)
- **Temperature Limits:** -60 °C to 300 °C

Petrocol DH 50.2, DH, DH 150

- **Application:** These highly reproducible columns have considerable theoretical plate numbers and are designed for detailed analyses of petroleum products for PIANO, PONA, and PNA-type analytes. The 100 m version includes an extensive retention index data sheet of 400+ analytes.
- **USP Code:** These columns meet USP G1, G2, and G9 requirements.
- **Phase:** Bonded; poly(dimethylsiloxane)
- **Temperature Limits:** -60 °C to 320 °C

Petrocol 2887, EX2887

- **Application:** These columns are designed for ASTM Method D2887 (simulated distillation [SIM DIS] of petroleum fractions). Choose Petrocol 2887 for samples having boiling points up to 1000 °F. Use Petrocol EX2887 for samples having boiling points greater than 1000 °F.
- **USP Code:** These columns meet G1, G2, and G9 requirements.
- **Phase:** Bonded; poly(dimethylsiloxane)
- **Temperature Limits:**
  Petrocol 2887: Subambient to 350 °C
  Petrocol EX2887: Subambient to 380 °C

SPB-1 SULFUR

- **Application:** A specialized version of the SPB-1, this column was developed for analyses of sulfur gases and other volatile sulfur compounds. The column displays relatively low column bleed, which makes it compatible for use with sulfur-specific detectors.
- **USP Code:** This column meets USP G1, G2, and G9 requirements.
- **Phase:** Bonded; poly(dimethylsiloxane)
- **Temperature Limits:** -60 °C to 300 °C

Equity-1

- **Application:** This column is designed for general purpose applications where a non-polar column is required. Analytes will be separated primarily according to boiling point.
- **USP Code:** This column meets USP G1, G2, and G9 requirements.
- **Phase:** Bonded; poly(dimethylsiloxane)
- **Temperature Limits:**
  -60 °C to 325/350 °C for 0.10 - 0.32 mm I.D.
  -60 °C to 300/320 °C for 0.53 mm I.D. (≤1.5 µm)
  -60 °C to 260/280 °C for 0.53mm I.D. (>1.5 µm)

SPB-1

- **Application:** This column is often used for traditional general purpose applications, where a non-polar column is required. Analytes will be separated primarily according to boiling point.
- **USP Code:** This column meets USP G1, G2, and G9 requirements.
- **Phase:** Bonded; poly(dimethylsiloxane)
- **Temperature Limits:** -60 °C to 320 °C



SLB-5ms

- **Application:** The 5% phenyl equivalent phase provides a boiling point elution order with a slight increase in selectivity, especially for aromatic compounds. The low bleed characteristics, inertness, and durable nature make it the column of choice for environmental analytes (such as semivolatiles, pesticides, PCBs, and herbicides) or anywhere a low bleed non-polar column is required.
- **USP Code:** This column meets USP G27 and G36 requirements.
- **Phase:** Bonded and highly crosslinked; silphenylene polymer virtually equivalent in polarity to poly (5% diphenyl/95% dimethylsiloxane)
- **Temperature Limits:**
  -60 °C to 340/360 °C for 0.10 - 0.32 mm I.D.
  -60 °C to 330/340 °C for 0.53 mm I.D.

MET-Biodiesel

- **Application:** This rugged metal column was designed specifically for the determination of free and total glycerin in B100 biodiesel samples. A guard is integrated, thereby providing protection with a leak-free connection (the guard and analytical column are one continuous piece of tubing; there is no union between the guard and analytical column).
- **USP Code:** None
- **Phase:** Bonded; proprietary
- **Temperature Limits:** -60 °C to 380/430 °C

HT-5 (aluminum clad)

- **Application:** This column offers the highest maximum temperature of any commercially available column. It is well suited for simulated distillation (SIM DIS) analyses of petroleum samples.
- **USP Code:** None
- **Phase:** Bonded; siloxane-carborane equivalent in polarity to poly(5% diphenyl/ 95% dimethylsiloxane)
- **Temperature Limits:** 10 °C to 460/480 °C

PTA-5

- **Application:** This column is designed for analyses of amines and other basic analytes.
- **USP Code:** None
- **Phase:** Bonded; base-modified poly(5% diphenyl/ 95% dimethylsiloxane)
- **Temperature Limits:** -60 °C to 320 °C

SAC-5

- **Application:** This column is an application specific non-polar column, designed for reproducible analyses of plant sterols, cholesterol, and other animal sterols.
- **USP Code:** None
- **Phase:** Bonded; poly(5% diphenyl/ 95% dimethylsiloxane)
- **Temperature Limits:** -60 °C to 320 °C

Equity-5

- **Application:** This popular column is designed for general purpose applications where a non-polar column is required. The low phenyl content provides thermal stability compared to 100% poly(dimethylsiloxane) columns.
- **USP Code:** This column meets USP G27 and G36 requirements.
- **Phase:** Bonded; poly(5% diphenyl/ 95% dimethylsiloxane)
- **Temperature Limits:**
  -60 °C to 325/350 °C for 0.10 - 0.32 mm I.D.
  -60 °C to 300/320 °C for 0.53 mm I.D. (≤1.5 µm)
  -60 °C to 260/280 °C for 0.53 mm I.D. (>1.5 µm)

SPB-5

- **Application:** This non-polar general purpose column provides primarily a boiling point elution order with a slight increase in selectivity, especially for aromatic compounds.
- **USP Code:** This column meets USP G27 and G36 requirements.
- **Phase:** Bonded; poly(5% diphenyl/ 95% dimethylsiloxane)
- **Temperature Limits:** -60 °C to 320 °C

SPB-624

- **Application:** This column is specially tested for separation, efficiency, and low bleed. It is designed for purge-and-trap analyses of volatile halogenated, non-halogenated, and aromatic contaminants from environmental samples.
- **USP Code:** This column meets USP G43 requirements.
- **Phase:** Bonded; proprietary
- **Temperature Limits:**
  Subambient to 250 °C for ≤0.32 mm I.D.
  Subambient to 230 °C for 0.53 mm I.D.

OVI-G43

- **Application:** This column is specially prepared and tested to meet the requirements of United States Pharmacopoeia and European Pharmacopoeia methods for determining residual solvents in pharmaceutical preparations.
- **USP Code:** This column meets USP G43 requirements.
- **Phase:** Bonded; poly(6% cyanopropylphenyl/ 94% dimethylsiloxane)
- **Temperature Limits:** -20 °C to 260 °C

VOCOL

- **Application:** This intermediate polarity column, designed for analyses of volatile organic compounds (VOCs), offers great retention and resolution of highly volatile compounds. Use this column in direct injection ports or coupled to purge-and-trap systems.
- **USP Code:** None
- **Phase:** Bonded; proprietary
- **Temperature Limits:**
  Subambient to 250 °C (≤1.8 µm)
  Subambient to 230 °C (>1.8 µm)



SPB-20

- **Application:** This column has intermediate polarity due to the higher (20%) phenyl content, producing a different elution order of polar compounds for confirmational information. It is often used for analyses of aromatic analytes.
- **USP Code:** This column meets USP G32 requirements.
- **Phase:** Bonded; poly(20% diphenyl/ 80% dimethylsiloxane)
- **Temperature Limits:** -25 °C to 300 °C

Equity-1701

- **Application:** Increased phase polarity, due to cyanopropy-lphenyl functional group substitution, offers unique selectivity compared to other phases. This column works well with systems employing ECD, NPD, and MSD detectors, and is often used for alcohols, oxygenates, pharmaceuticals, pesticides, and PCB applications.
- **USP Code:** This column meets G46 requirements
- **Phase:** Bonded; poly(14% cyanopropylphenyl/ 86% dimethylsiloxane)
- **Temperature Limits:**
  Subambient to 280 °C for 0.10 - 0.32 mm I.D.
  Subambient to 260 °C for 0.53 mm I. D

SPB-608

- **Application:** This column is specially tested with low concentrations of 18 chlorinated pesticides, using an ECD detector. In addition to selectivity and efficiency, it is also tested to ensure minimum breakdown of 4,4′-DDT and endrin. This column is also suitable for use in herbicide analyses.
- **USP Code:** None
- **Phase:** Bonded; proprietary
- **Temperature Limits:** Subambient to 300 °C

Sup-Herb

- **Application:** This is a specially tested intermediate polarity column for analyses of herbicides, specifically for US EPA Method 507.
- **USP Code:** None
- **Phase:** Bonded; proprietary
- **Temperature Limits:** Subambient to 300 °C

SPB-35

- **Application:** With a phenyl content of 35%, this column offers a higher polarity option compared to columns containing a lower phenyl content. This column is useful for analyses of polar compounds because they are retained longer relative to non-polar compounds.
- **USP Code:** This column meets USP G42 requirements.
- **Phase:** Bonded; poly(35% diphenyl/ 65% dimethylsiloxane)
- **Temperature Limits:** 0 °C to 300 °C

SPB-50

- **Application:** This column has the highest phenyl content of the common phenyl-containing series of phases. The column is useful for analyses of polar analytes and provides useful confirmational information. It also offers additional selectivity for polynuclear aromatic hydrocarbon isomers over columns with lower phenyl content.
- **USP Code:** This column meets USP G3 requirements.
- **Phase:** Bonded; poly(50% diphenyl/ 50% dimethylsiloxane)
- **Temperature Limits:** 30 °C to 310 °C

SPB-225

- **Application:** Supelco offers the broadest range of cyanopropyl columns in the industry, such as this interme-diate polarity column.
- **USP Code:** This column meets USP G7 and G19 requirements.
- **Phase:** Bonded; poly(50% cyanopropylphenyl/ 50% dimethylsiloxane)
- **Temperature Limits:** 45 °C to 220/240 °C

SPB-PUFA

- **Application:** This column provides the necessary polarity for analyses of polyunsaturated fatty acids (PUFAs) as fatty acid methyl esters (FAME). This column is specifically tuned to provide highly reproducible analyses.
- **USP Code:** This column meets USP G18 requirements.
- **Phase:** Bonded; poly(alkylene glycol)
- **Temperature Limits:** 50 °C to 220 °C

PAG

- **Application:** This column fills the polarity space between a 50% phenyl substituted column and a classical wax-type column, due to its polarity being slightly lower than a wax-type column. It is well suited for analyses of FAMEs and alcohols.
- **USP Code:** This column meets USP G18 requirements.
- **Phase:** Bonded; poly(alkylene glycol)
- **Temperature Limits:** 30 °C to 220 °C

SPB-1000

- **Application:** The incorporation of acid functional groups into the phase lends an acidic character to this column, useful for analyses of volatile acidic compounds. It offers great performance for analyses of glycols. It is the recommended column for ethylene glycol analysis.
- **USP Code:** This column meets USP G25 and G35 requirements.
- **Phase:** Bonded; acid-modified poly(ethylene glycol)
- **Temperature Limits:** 60 °C to 200/220 °C

Nukol

- **Application:** The incorporation of acid functional groups into the phase lends an acidic character to this column, useful for analyses of volatile acidic compounds. Difficult to analyze carboxylic acids (free fatty acids) can be analyzed with excellent peak shape and minimal adsorption.
- **USP Code:** This column meets USP G25 and G35 requirements.
- **Phase:** Bonded; acid-modified poly(ethylene glycol)
- **Temperature Limits:** 60 °C to 200/220 °C



Carbowax Amine

- **Application:** This specially prepared base-deactivated column is designed for analyses of primary, secondary, and tertiary amines, as well as other volatile basic compounds.
- **USP Code:** None.
- **Phase:** Non-bonded; base-modified poly(ethylene glycol)
- **Temperature Limits:** 60 °C to 200 °C

Omegawax

- **Application:** This column allows highly reproducible analyses of fatty acid methyl esters (FAMEs), specifically the omega-3 and -6 fatty acids. It is tested to ensure reproducible FAME equivalent chain length (ECL) values and resolution of key components.
- **USP Code:** This column meets USP G16 requirements.
- **Phase:** Bonded; poly(ethylene glycol)
- **Temperature Limits:** 50 °C to 280 °C

SUPELCOWAX 10

- **Application:** This column is based on one of the most widely used polar phases, Carbowax 20M, and is a polar column suitable for analyses of fatty acid methyl esters (FAMEs), food, flavor and fragrance compounds, alcohols, and aromatics. Additionally, this column is a great choice when a polar general purpose column is required.
- **USP Code:** This column meets USP G16 requirements.
- **Phase:** Bonded; poly(ethylene glycol)
- **Temperature Limits:** 35 °C to 280 °C

SP-2330

- **Application:** Supelco offers the broadest range of biscyanopropyl phases in the industry. This column is a highly specialized column that offers both polar and polarizable features due to the substitution of biscyanopropyl and phenyl groups onto the polymer backbone. It can be used for both high and low temperature separations for analytes such as geometric isomers of fatty acid methyl esters (FAMEs), dioxins, and aromatic compounds
- **USP Code:** This column meets USP G8 requirements.
- **Phase:** Non-bonded; poly(80% biscyanopropyl/ 20% cyanopropylphenyl siloxane)
- **Temperature Limits:** Subambient to 250 °C

SP-2331

- **Application:** A highly polar cyanosiloxane column specially tested for analyses of dioxins, specifically tetrachlorodibenzodioxin (TCDD) isomers. Because the phase is stabilized, it has a maximum temperature slightly higher than non-bonded cyanosiloxane columns.
- **USP Code:** None
- **Phase:** Stabilized; proprietary
- **Temperature Limits:** Subambient to 275 °C

SP-2380

- **Application:** A highly polar cyanosiloxane column commonly used for separation of geometric (cis/trans) fatty acid methyl ester (FAME) isomers as a group. Also useful when a highly polar general purpose column with good thermal stability is required.
- **USP Code:** This column meets USP G48 requirements.
- **Phase:** Stabilized; poly(90% biscyanopropyl/ 10% cyanopropylphenyl siloxane)
- **Temperature Limits:** Subambient to 275 °C

SP-2560

- **Application:** This highly polar biscyanopropyl column was specifically designed for the separation of geometric-positional (cis/trans) isomers of fatty acid methyl esters (FAMEs). It is extremely effective for FAME isomer applications.
- **USP Code:** This column meets USP G5 requirements.
- **Phase:** Non-bonded; poly(biscyanopropyl siloxane)
- **Temperature Limits:** Subambient to 250 °C

SP-2340

- **Application:** This non-bonded column offers the highest polarity in its class. As with all general purpose biscyanopropyl columns, it is highly effective for both high and low temperature separations of geometric isomers of fatty acid methyl esters (FAMEs), dioxins, carbohydrates, and aromatic compounds.
- **USP Code:** This column meets USP G5 requirements.
- **Phase:** Non-bonded; poly(biscyanopropyl siloxane)
- **Temperature Limits:** Subambient to 250 °C

SLB-IL100

- **Application:** This highly polar column exemplifies some of the desired characteristics that ionic liquid columns are predicted to possess. Namely, a higher maximum temperature compared to non-ionic liquid columns with similar polarity/selectivity. This column is applicable for applications such as analyses of aromatic hydrocarbons in gasoline and also of fatty acid methyl esters (FAMEs).
- **USP Code:** None
- **Phase:** Non-bonded; 1,9-di(3-vinyl-imidazolium) nonane bis(trifluoromethyl) sulfonyl imidate
- **Temperature Limits:** Subambient to 230 °C

TCEP

- **Application:** The unique chemistry of the phase allows for specialized separations. It is often used for analyses of alcohols and aromatics in mineral spirits, aliphatic constituents in gasoline, impurities in individual aromatics, and oxygenates.
- **USP Code:** None
- **Phase:** Non-bonded; 1,2,3-tris(2-cyanoethoxy)propane
- **Temperature Limits:** Subambient to 145 °C



CHIRAL PHASES

Chiral GC phases consist of derivatives of α-, β-, or γ-cyclodextrin for the separation of enantiomers. These phases can routinely separate a variety of underivatized non-aromatic enantiomers and several aromatic enantiomers that remain difficult to resolve by HPLC. These phases specifically and effectively separate many of these types of molecules, including thousands of compounds that are starting materials or intermediates for chiral synthesis, biochemical and pharmaceutical intermediates and metabolites, environmental contaminants, flavors, etc.

CHIRALDEX

- **Application:** These columns are used for analyses of enantiomers to determine biological activity (pharmaceutical industry), aroma (flavor & fragrance and food & beverage industries), whether hazardous (environmental industry), and purity (chemical industry).
- **USP Code:** None
- **Phase:** Sixteen specialized phase chemistries comprised of complex derivatives of cyclodextrins that impart a broad range of selectivities
- **Temperature Limits:**
  TA Phases: -5 °C to 180 °C
  All Other Phases: -5 °C to 220 °C

Supelco DEX

- **Application:** These columns are used for analyses of enantiomers to determine biological activity (pharmaceutical industry), aroma (flavor & fragrance and food & beverage industries), whether hazardous (environmental industry), and purity (chemical industry).
- **USP Code:** None
- **Phase:** Ten unique phases comprised of derivatives of cyclodextrins that are able to perform many enantiomeric separations
- **Temperature Limits:** 30 °C to 230 °C



PLOT COLUMNS

PLOT (Porous Layer Open Tubular) technology permits a uniform layer of solid adsorbent particles to be attached to the inside wall of fused silica tubing. The use of porous adsorbents in these columns allows for gas-solid chromatography to be performed. A proprietary and patented procedure is used to fix particles to the fused silica tubing, and ensures they will not be dislodged in normal use.

Alumina sulfate PLOT

- **Application:** This highly dependable column has the necessary selectivity for the separation of alkanes, alkenes, and alkynes in mixtures of C1-C4 hydrocarbons. It provides elution of acetylene after n-butane and the elution of methyl acetylene after n-pentane and 1,3-butadiene. The polymer surface is deactivated to reduce peak tailing.
- **USP Code:** None
- **Phase:** Sulfate-deactivated alumina
- **Temperature Limits:** Subambient to 180 °C

Alumina chloride PLOT

- **Application:** This column allows for the separation of C1-C4 hydrocarbons. Because this column is slightly less polar than the Alumina sulfate PLOT, it provides a different elution order pattern when alkane, alkene, and alkyne mixtures of light hydrocarbons are analyzed. It also provides excellent separation of many common fluorinated compounds, such as freons.
- **USP Code:** None
- **Phase:** Chloride-deactivated alumina
- **Temperature Limits:** Subambient to 180 °C

Carboxen-1010 PLOT

- **Application:** This column is ideal for the separation of all major components in permanent gas (helium, hydrogen, oxygen, nitrogen, carbon monoxide, methane, and carbon dioxide) and light hydrocarbons (C2-C3) in the same analysis. It is the only column commercially available that is able to separate all major components in permanent gas. This column can also separate oxygen from nitrogen at subambient temperatures.
- **USP Code:** None
- **Phase:** Carbon molecular sieve
- **Temperature Limits:** Subambient to 250 °C



Carboxen-1006 PLOT

- **Application:** This column is ideal for the separation of many permanent gas components (such as helium, hydrogen, nitrogen, carbon monoxide, methane, and carbon dioxide), and light hydrocarbons (C2-C3) in the same analysis. It is ideal for resolving formaldehyde/water/methanol (formalin) mixtures and monitoring impurities in ethylene. This column can be used with high flow rates and rapid temperature programs to ensure excellent, fast separations.
- **USP Code:** None
- **Phase:** Carbon molecular sieve
- **Temperature Limits:** Subambient to 250 °C

Mol Sieve 5A PLOT

- **Application:** This column can be used for the separation of many permanent gas components, such as oxygen, nitrogen, carbon monoxide, and methane, in less than five minutes. More difficult separations, such as argon from oxygen, can be achieved by using subambient temperatures. These columns possess the strongest adsorption strength of any PLOT column.
- **USP Code:** None
- **Phase:** Aluminosilicate
- **Temperature Limits:** Subambient to 300 °C

Supel-Q PLOT

- **Application:** This column exhibits very little bleed, even at its maximum temperature, and effectively resolves carbon dioxide and C1-C4 hydrocarbons at above ambient temperatures. It is also suitable for analyses of sulfur gases, alcohols, ketones, aldehydes, and many polar compounds. Gasoline and other petroleum fractions can be analyzed as well.
- **USP Code:** None
- **Phase:** Divinylbenzene
- **Temperature Limits:** Subambient to 250 °C

SCOT COLUMNS

SCOT (Support Coated Open Tubular) technology permits a uniform layer of support particles that have been coated with liquid phase to be deposited onto the inner wall of stainless steel tubing. This technology allows access to many phases that are inaccessible to conventional wall coated open tubular capillary column manufacturing technology. These columns combine the sensitivity and excellent sample resolution of capillary GC with the extensive stationary phase library of packed column GC.

Bentone 34/DNDP SCOT

- **Application:** Use for analyses of xylene isomers.
- **USP Code:** None
- **Phase:** Bentone 34/di-n-decyl phthalate
- **Temperature Limits:** 10 °C to 150 °C

BMEA SCOT

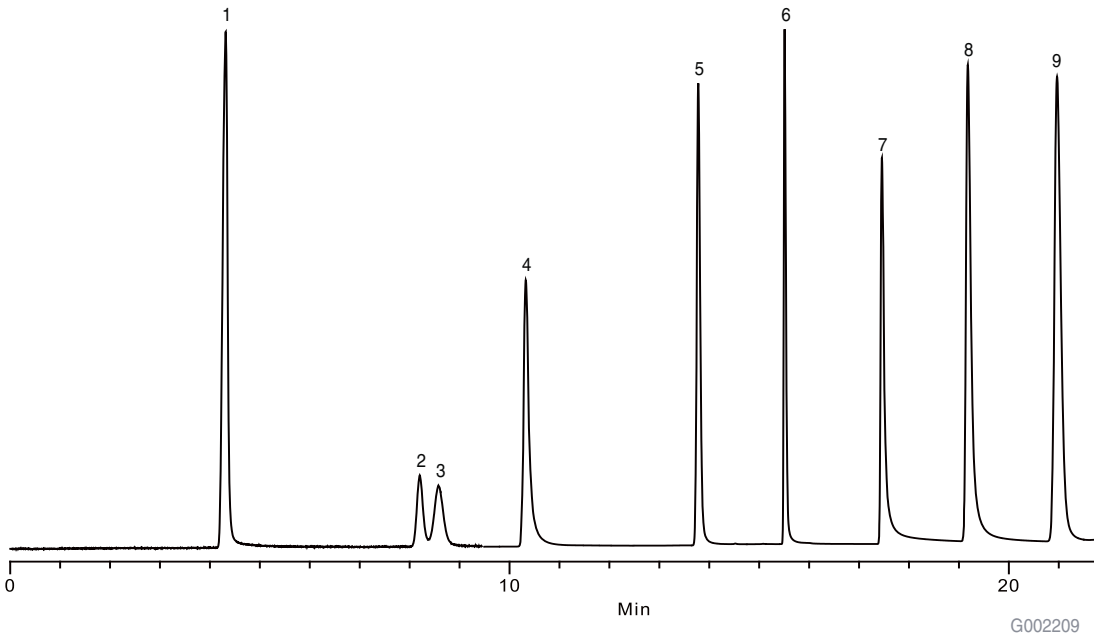
- **Application:** Use for analyses of olefins.
- **USP Code:** None
- **Phase:** bis-methoxyethyladipate
- **Temperature Limits:** Ambient to 100 °C

Squalane SCOT

- **Application:** Use for boiling point separations.
- **USP Code:** None
- **Phase:** Squalane
- **Temperature Limits:** 20 °C to 120 °C

TCEP SCOT

- **Application:** Use for analyses of aromatic analytes.
- **USP Code:** None
- **Phase:** 1,2,3-tris(2-cyanoethoxy)propane
- **Temperature Limits:** 0 °C to 150 °C





Catalog Numbers (Common Dimensions of Popular Phases)

Table 5. Traditional Phases (by increasing phase polarity)

Phase	I.D. (mm)	Length (m)	d_f (µm)	Beta Value	Cat. No.
SPB-Octyl	0.25	30	0.25	250	24218-U
Petrocol DH 50.2	0.20	50	0.50	100	24133-U
Petrocol DH	0.25	100	0.50	125	24160-U
Petrocol DH 150	0.25	150	1.00	63	24155
SPB-1 SULFUR	0.32	30	4.00	20	24158
Equity-1	0.10	15	0.10	250	28039-U
Equity-1	0.25	30	0.25	250	28046-U
Equity-1	0.25	60	0.25	250	28047-U
Equity-1	0.32	30	0.25	320	28055-U
SPB-1	0.25	30	0.25	250	24028
SPB-1	0.32	30	0.25	320	24044
SPB-1	0.32	30	1.00	80	24045-U
SPB-1	0.32	60	1.00	80	24047
SPB-1	0.53	30	1.50	88	25303
SPB-1	0.53	30	3.00	44	25341-U
SPB-1	0.53	30	5.00	27	25345-U
SLB-5ms	0.10	10	0.10	250	28465-U
SLB-5ms	0.10	15	0.10	250	28466-U
SLB-5ms	0.18	20	0.18	250	28564-U
SLB-5ms	0.18	20	0.36	125	28576-U
SLB-5ms	0.25	30	0.25	250	28471-U
SLB-5ms	0.25	60	0.25	250	28472-U
SLB-5ms	0.32	30	0.25	320	28482-U
MET-Biodiesel	0.53	14	0.16	828	28668-U
HT-5 (aluminum clad)	0.32	25	0.10	800	25003
PTA-5	0.25	30	0.50	125	24277
PTA-5	0.53	30	3.00	44	25439
SAC-5	0.25	30	0.25	250	24156
Equity-5	0.25	30	0.25	250	28089-U
Equity-5	0.25	60	0.25	250	28090-U
Equity-5	0.25	30	0.50	125	28092-U
Equity-5	0.32	30	0.25	320	28097-U
Equity-5	0.53	30	5.00	27	28279-U
SPB-5	0.20	30	0.20	250	24166
SPB-5	0.25	30	0.25	250	24034
SPB-5	0.32	15	0.25	320	24101-U
SPB-5	0.32	30	0.25	320	24048
SPB-5	0.53	30	0.50	265	25317
SPB-5	0.53	30	1.50	88	25305-U
SPB-5	0.53	30	5.00	27	25347
SPB-5	0.53	60	5.00	27	25351
SPB-624	0.18	20	1.00	45	28662-U
SPB-624	0.25	30	1.40	45	24255
SPB-624	0.25	60	1.40	45	24256
SPB-624	0.32	60	1.80	44	24251
SPB-624	0.53	30	3.00	44	25430
SPB-624	0.53	75	3.00	44	25432
OVI-G43	0.53	30	3.00	44	25396
VOCOL	0.18	20	1.00	45	28463-U
VOCOL	0.25	30	1.50	42	24205-U
VOCOL	0.25	60	1.50	42	24154
VOCOL	0.32	60	1.80	44	24217-U
VOCOL	0.32	60	3.00	27	24157
VOCOL	0.53	30	3.00	44	25320-U
VOCOL	0.53	60	3.00	44	25381
VOCOL	0.53	105	3.00	44	25358
SPB-20	0.25	30	1.00	63	24196-U
Equity-1701	0.10	15	0.10	250	28343-U
Equity-1701	0.25	30	0.25	250	28372-U
SPB-608	0.25	30	0.25	250	24103-U
SPB-608	0.53	30	0.50	265	25312
SPB-50	0.25	30	0.25	250	24181
SPB-1000	0.53	30	0.50	265	25445
Nukol	0.25	30	0.25	250	24107



Phase	I.D. (mm)	Length (m)	d_f (µm)	Beta Value	Cat. No.
Nukol	0.53	15	0.50	265	25326
Nukol	0.53	30	0.50	265	25327
Carbowax Amine	0.53	30	1.00	133	25353
Omegawax 100	0.10	15	0.10	250	23399-U
Omegawax 250	0.25	30	0.25	250	24136
Omegawax 320	0.32	30	0.25	320	24152
SUPELCOWAX 10	0.10	15	0.10	250	24343
SUPELCOWAX 10	0.25	30	0.25	250	24079
SUPELCOWAX 10	0.25	60	0.25	250	24081
SUPELCOWAX 10	0.25	30	0.50	125	24284
SUPELCOWAX 10	0.32	30	0.25	320	24080-U
SUPELCOWAX 10	0.32	60	0.25	320	24082
SUPELCOWAX 10	0.32	30	0.50	160	24084
SUPELCOWAX 10	0.32	60	0.50	160	24085-U
SUPELCOWAX 10	0.32	30	1.00	80	24211
SUPELCOWAX 10	0.32	60	1.00	80	24212
SUPELCOWAX 10	0.53	30	0.50	265	25325
SUPELCOWAX 10	0.53	30	1.00	133	25301-U
SUPELCOWAX 10	0.53	60	1.00	133	25391
SUPELCOWAX 10	0.53	30	2.00	63	25375-U
SUPELCOWAX 10	0.53	60	2.00	53	25376
SP-2330	0.25	30	0.20	313	24019
SP-2331	0.25	60	0.20	313	24104-U
SP-2331	0.32	60	0.20	400	24105-U
SP-2380	0.25	30	0.20	313	24110-U
SP-2380	0.25	60	0.20	313	24111
SP-2380	0.25	100	0.20	313	24317
SP-2380	0.32	30	0.20	400	24116-U
SP-2560	0.18	75	0.14	321	23348-U
SP-2560	0.25	100	0.20	313	24056
SP-2560	0.25	100	0.20	313	23362-U▲
SP-2340	0.25	60	0.20	313	24023
SLB-IL100	0.10	15	0.08	313	28882-U
SLB-IL100	0.18	20	0.14	313	28883-U
SLB-IL100	0.25	30	0.20	313	28884-U
SLB-IL100	0.25	60	0.20	313	28886-U
SLB-IL100	0.32	30	0.26	313	28887-U
SLB-IL100	0.32	60	0.26	313	28888-U
TCEP	0.25	60	0.44	142	24153

❒Plus an integrated 2 m x 0.53 mm I.D. guard.
▲Wound onto a 5 inch cage to fit an Agilent 6850 GC.

Table 6. Chiral Phases

Phase	I.D. (mm)	Length (m)	d_f (µm)	Beta Value	Cat. No.
CHIRALDEX G-TA	0.25	30	0.12	500	73033AST
CHIRALDEX G-DP	0.25	30	0.12	500	78033AST
CHIRALDEX B-DM	0.25	30	0.12	500	77023AST
CHIRALDEX B-PM	0.25	30	0.12	500	76023AST
CHIRALDEX Bonded B-PM	0.25	30	0.12	500	66023AST
CHIRALDEX B-DA	0.25	30	0.12	500	72023AST
CHIRALDEX B-PH	0.25	30	0.12	500	71023AST
β-DEX 120	0.25	30	0.25	250	24304
β-DEX 225	0.25	30	0.25	250	24348
β-DEX 325	0.25	30	0.25	250	24308

Table 7. PLOT Columns

Phase	I.D. (mm)	Length (m)	Cat. No.
Alumina sulfate PLOT	0.53	30	28323-U
Alumina chloride PLOT	0.53	30	28328-U
Carboxen-1010 PLOT	0.53	30	25467
Carboxen-1006 PLOT	0.53	30	25461
Mol Sieve 5A PLOT	0.53	30	25463
Supel-Q PLOT	0.53	30	25462

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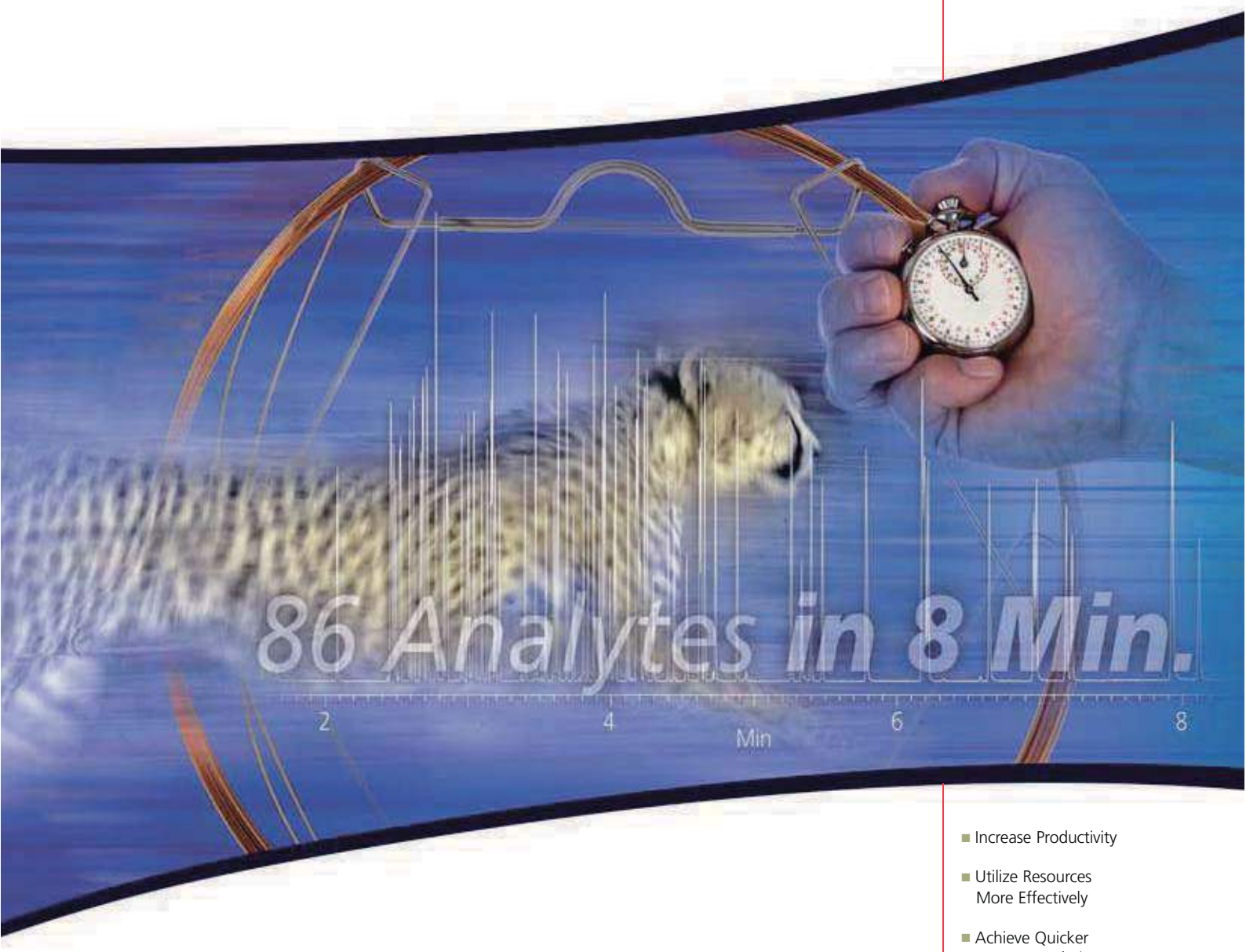
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A Practical Guide for Increasing Sample Throughput without Sacrificing Quality



The cheetah *(Acinonyx jubatus)* – world's fastest land animal with a top speed over 65 miles per hour (105 kilometers per hour). This is accomplished by a combination of many physiological adaptations, all designed to maximize speed:

Long, sleek body for fluid movements. Lightweight bones for reduced weight. Small collarbone and vertical shoulder blades on a flexible spine for great reach with the legs. Specialized muscles and long, slender legs for great swing of the limbs. Powerful back legs for long strides. Paws with flat, hard pads and short, straight, always-visible claws for extra grip. Long, muscular tail for balance. Large nostrils for maximum oxygen intake. Large heart, arteries, and lungs for efficient oxygen circulation. Flat face, short muzzle, and elongated eyes for great wide-angle vision.

The cheetah – nature's fastest land animal.

Dear Colleague,

Gas chromatography is, by far, the most suitable method for the analysis of complex volatile and semi-volatile mixtures. Since its introduction over 50 years ago, there has been enormous progress in both instrumental design and column technology. Amongst all GC methods, the most commonly applied is still conventional capillary gas chromatography. Although such an approach is more than fine in many applications, in others a series of limitations exist. One of the most common complaints is that "the separation of the compounds of interest takes just too long".

In the last 15-20 years there has been an ever-present increasing interest within the chromatographic community for faster GC methods. This is obviously related to the fact that the number of samples subjected to GC analysis has risen greatly. Nowadays, in routine analytical applications, sample throughput is often one of the most important considerations in choosing an analytical method.

Gas chromatographic analytical procedures consist essentially of 4 separate steps:

- sample preparation
- sample injection, separation and detection
- GC oven cooling time and re-equilibration
- data elaboration

The first two steps have generally a greater impact on analytical time-costs, selectivity, sensitivity, ruggedness, precision, and accuracy. For this reason, both have been subjected to a great deal of development.

Considering the GC separation step, a high number of methods have been introduced in the last decades. In our opinion, the employment of narrow bore columns as a route towards fast GC is the best way to (greatly) reduce GC run times. If a correct method optimization procedure is pursued, conventional GC chromatographic profiles are reproduced or even improved, while analysis times are decreased by 5-10 times. A former disadvantage, the need for drastic experimental conditions, has been entirely overcome by the introduction of suitable GC instrumentation. The commercial availability of narrow bore columns with a wide variety of stationary phases makes high-speed gas chromatography an easy option for all.

Regards,

Peter Quinto Tranchida[1]
Luigi Mondello[1]
Roberto Ferrari[2]

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2. Sigma-Aldrich s.r.l.

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Trademarks

Adobe – **Adobe Systems Incorporated;** Agilent – **Agilent Technologies;** AutoSystem, Clarus, PerkinElmer – **PerkinElmer Corp.;** Equity, Omegawax, OMI, SLB, SP, SPB, Supelcarb, Supelco, SUPELCOWAX, Supelpure, Thermogreen, Therm-O-Ring, VOCARB, VOCOL – **Sigma-Aldrich Biotechnology LP;** Viton – **E.I. duPont de Nemours & Co., Inc.;** FocusLiner – **SGE International Pty Ltd.;** Shimadzu – **Shimadzu Corp.;** Swagelok – **Swagelok Co.;** TRACE – **Thermo Electron Corp.;** Varian – **Varian Associates Corp.**



Practical and Theoretical Aspects of Fast GC

History

The function of a gas chromatography (GC) system is to provide the most adequate conditions required for the separation of sample components in minimal time. Conventional GC methods use capillary columns typically 30 m long with a 0.25 mm internal diameter (I.D.). These well-established methods produce effective results but present a substantial limitation: the cost in time. In fact, satisfactory separations of complex samples may take an hour or more. The implementation of faster GC methods is, therefore, particularly important for laboratories with a high daily sample throughput and/or where there is a need for quick and correct results.

At the beginning of the 1960's, Desty demonstrated the potential of small diameter columns [1]. Due to the lack of automated injection systems, a narrow sample band was manually injected onto the capillary column. Following this primordial narrow I.D. column experiment, other techniques to increase sample throughput were developed and introduced. These include multicapillary columns [2], short capillary columns [3], wide-bore columns operated under vacuum at the outlet [4], and accelerated temperature programs [5]. It should be noted, though, that the narrow I.D. column route is certainly the best option for rapid GC analysis of medium to highly complex samples [6-7]. The drastic instrumental requirements (rapid automated injection, high head pressures and split flows, accelerated oven temperature ramp rates, and fast detector acquisition rates) are now generally met by modern GC systems.

What is Fast GC?

The primary aim of Fast GC is to maintain (compared to conventional GC) sufficient resolving power in a shorter time. Fast GC uses column and instrument improvements in combination with optimized run conditions to provide 3- to 10-times faster analysis times, while still providing acceptable resolution. Fast GC can be accomplished by manipulating a number of the analysis parameters, such as column length, column I.D., stationary phase, film thickness, carrier gas, linear velocity, oven temperature, and ramp rate. Fast GC is typically performed using short, 0.10 mm or 0.18 mm I.D. capillary columns with hydrogen carrier gas and rapid oven temperature ramp rates. Based solely on column internal diameter (I.D.), capillary GC can be grouped into three types.

- Conventional GC: ≥0.25 mm I.D. columns.
- Fast GC: 0.10 to 0.18 mm I.D. columns (can be performed on most conventional GCs).
- Ultra-Fast GC: ≤0.050 mm I.D. columns (may require a special GC).

Why Use Fast GC?

GC is a popular and powerful analytical tool, but often suffers from long analysis times. Speed of analysis is important to many of today's GC analysts as they look for ways to improve sample throughput. Without sacrificing the quality of the analysis, there is little that is more valuable than sample throughput. Benefits of increasing sample throughput include:

1. **Decreased costs** – Less people and/or instruments are required to do the same amount of work.
2. **Increased revenue** – More customer samples can be processed in the same amount of time.
3. **Increased revenue** – Customers may be willing to pay more to get their results faster (surcharge for quick turn-around).

Fast GC Principles

Decrease analysis time by using:

- Short columns (slight decrease in efficiency will be observed)
- High carrier gas linear velocity (slight decrease in efficiency may be observed)
- Rapid oven temperature ramp rate (slight decrease in efficiency may be observed)

The decrease in efficiency can be offset by using:

- Narrow I.D. columns
- Low film thickness
- Hydrogen carrier gas

The overall result is a shorter analysis time with acceptable resolution. Basically, Fast GC works because we use a shorter column (to reduce analysis time) with a narrow I.D. (used to offset the loss of efficiency of the shorter column). Note that the above parameters must be optimized together! Changing only one may decrease analysis time, but will likely cause a loss of resolution.

How to Perform Fast GC (Practical)

Column Dimension Considerations – A Fast GC column is typically 20 m or shorter in length with a 0.10 to 0.18 mm I.D. Short column lengths result in short analysis times. A narrow I.D. results in increased efficiency, necessary to offset the decrease caused by the short length. In addition to increased efficiency, narrow I.D. columns also provide better signal-to-noise ratios, leading to better sensitivity. The decrease in column I.D. reduces resistance to mass transfer into the gaseous phase. Compared to conventional columns, less band broadening occurs in narrow I.D. columns due to the fact that analytes are diluted in a smaller volume of carrier gas.

Stationary Phase Considerations – Any stationary phase can be used. However, selection of a stationary phase should be based on the application to be performed and/or the retention mechanism of the phase. For example, polar analytes retain longer on polar phases. Therefore, switching to a less polar phase may allow shorter analysis times. Of course, the stationary phase selected must be able to perform any critical separations. Regardless of the stationary phase, a thin film should be used to ensure the rapid partitioning of analytes back into the carrier gas stream. Thin films limit partitioning into the stationary phase, resulting in less band broadening.

Carrier Gas Considerations – Nitrogen, helium and hydrogen are the typical carrier gases for GC. However, hydrogen is the best choice for Fast GC due to its high diffusivity and high optimal linear velocity. Obviously, safety precautions and detector requirements must be considered. Regardless of the carrier gas being used, increasing linear velocity will decrease the speed of analysis. However, loss of efficiency can occur if the speed is increased much higher than its optimal linear velocity. Hydrogen has a flatter Golay curve than other carrier gases. Therefore, it can be used at a linear velocity above optimal with little observed loss of efficiency.

Oven Temperature Considerations – For isothermal analyses, the use of a higher oven temperature will decrease analysis time. For oven temperature programmed analyses, a faster oven temperature ramp rate will decrease analysis time. To achieve the desired ramp rate, a GC equipped with either a 220 V oven heater or an insert (to reduce the volume of space that must be heated) may be required. Theoretical dictations have shown that a temperature ramp rate of 10 °C per void time should be used to attain an optimum separation [12]. With faster ramp rates, analytes may not partition into the stationary phase long enough for satisfactory resolution. With slower ramp rates, resolution is achieved but with a long analysis time.

Head Pressure Considerations – As column I.D. decreases, the backpressure experienced by the GC system increases. Therefore, it is important to ensure that the GC system can handle the increased pressure requirement. Theoretical head pressure values for various column dimensions are shown in Table 1. This table illustrates why Fast GC columns are typically 20 m or shorter in length.

Table 1. Head Pressures for 0.10 mm I.D. Columns

	Carrier Gas Linear Velocity							
	Helium				Hydrogen			
Column (L x I.D.)	20	30	40	50	40	50	60	70
5 m x 0.10 mm	12	19	25	32	12	15	18	21
10 m x 0.10 mm	25	39	54	69	25	31	38	45
20 m x 0.10 mm	54	84	115	146	52	66	81	96
40 m x 0.10 mm	115	177	239	302	111	141	171	201

Values calculated @ 160 °C

Sample Capacity Considerations – A narrow I.D. column with a thin film has limited sample capacity. That is, compared to a conventional column, a smaller amount of sample can be introduced onto the column before peak shapes become distorted. Therefore, high split ratios may be required to prevent column overload. One might conclude erroneously that the smaller amount of sample results in a loss of sensitivity. Due to the generation of narrower peaks, the sensitivity level compared to conventional GC methods is maintained.

Detection Considerations – Fast GC applications typically produce rapid and narrow peaks. Consequently, detector capabilities become an important consideration, as rapid elution necessitates detectors with fast acquisition rates. The use of a low acquisition rate may lead to incorrect peak quantitation. The use of a high acquisition rate may result in increased noise and decreased sensitivity. As a general rule, 10 data points per upper half of the peak are sufficient for proper peak re-construction.

Instrument Considerations – To make the most out of the speed and efficiency of short, narrow I.D. columns, an instrument should have fast injection speed, a split/splitless injection port, fast oven temperature ramp rate capability, high-speed detectors, and fast data handling. All major instrument manufacturers make GCs that are designed for, or are compatible with, Fast GC.

Why Fast GC Works (Theory)

Narrow I.D. Columns Have Increased Efficiency

It is intuitive that just decreasing column length will decrease analysis times. However, efficiency (peak sharpness and analyte resolution) could be adversely affected unless other parameters of the analysis are adjusted. By decreasing the I.D. of the column, efficiency, measured as the number of plates, is increased. Table 2 shows typical plate numbers generated by capillary columns of various internal diameters. Narrow I.D. columns (<0.25 mm I.D.) offer a greater number of plates/meter than wider I.D. columns, thus shorter lengths can be used while maintaining or improving on the theoretical efficiency of the system. It is a rule-of-thumb in GC that a 10 m x 0.10 mm I.D., 0.10 µm column possesses the same resolving power as a 25 m x 0.25 mm I.D., 0.25 µm column (~100,000 theoretical plates), if both are operated under ideal conditions.

A decrease in column length results in shorter analysis times (desirable) but also results in decreased efficiency (undesirable).

Table 2. Increased Plates/Meter with Narrow I.D. Columns

Column I.D. (mm)	Plates/Meter (N/m)	Total Plates (N)
0.32	2300	69000
0.25	2925	87750
0.20	3650	109500
0.18	4050	121500
0.10	7300	219000

Theoretical values for 30 m long columns, calculated @ a k' = 6.00 and 85% coating efficiency.

Figures 1-3. Increased Efficiency as Column I.D. Decreases

oven: 40 °C (2 min.), 22 °C/min. to 240 °C, 10 °C/min. to 330 °C (1 min.)
inj.: 250 °C
det.: FID, 330 °C
carrier: helium, 30 cm/sec @ 200 °C, set using methane
injection: 0.5 µL (0.53 and 0.25 mm I.D. columns) and 0.10 µL (0.10 mm I.D. column), splitless (0.75 min.)
liner: 4 mm I.D., single taper (0.53 and 0.25 mm I.D. columns) and 2 mm I.D., straight (0.10 mm I.D. column)
sample: 72 component semivolatile standard and 8 surrogate compounds, plus 6 internal standards, in methylene chloride

1. Di-n-octyl phthalate
2. Benzo(b)fluoranthene
3. Benzo(k)fluoranthene
4. Benzo(a)pyrene
5. Perylene-d_{12}
6. Indeno(1,2,3-cd)pyrene
7. Dibenzo(a,h)anthracene
8. Benzo(ghi)perylene

Figure 1. SLB-5ms, 30 m x 0.53 mm I.D., 0.50 µm

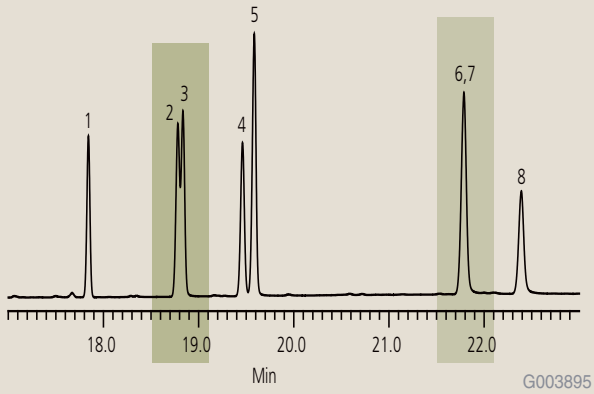


Figure 2. SLB-5ms, 30 m x 0.25 mm I.D., 0.25 µm

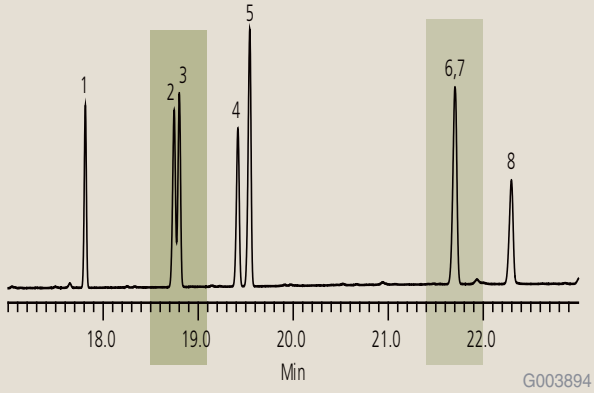
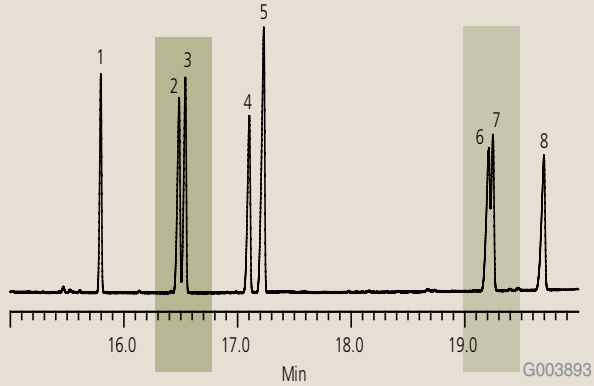


Figure 3. SLB-5ms, 15 m x 0.10 mm I.D., 0.10 µm



The decrease in column I.D. results in increased efficiency (desirable) and is necessary to offset the decrease in efficiency caused by the decrease in column length. Figures 1-3 illustrate that the high efficiency of a 0.10 mm I.D. column provides better resolution of sample components with a decrease in analysis time, relative to 0.53 and 0.25 mm I.D. columns. The increase in the number of plates/meter as column I.D. decreases makes it possible for the 15 m x 0.10 mm I.D. column to have a greater number of total plates (N) than both of the 30 m columns. As a result, the 0.10 mm I.D. column exhibits better resolution than either the 0.53 or 0.25 mm I.D. columns.

Narrow I.D. Columns Allow A Faster Linear Velocity

In GC, linear velocity ($\bar{u}$, typically expressed in cm/sec) refers to the speed at which the carrier gas travels through the column. Because the analytes are carried through the column by the carrier gas, a faster carrier gas causes the analytes to also travel faster through the column, resulting in shorter analysis times. However, there is an optimal linear velocity (expressed as $\bar{u}_{opt}$) where column efficiency is greatest. As linear velocity deviates from optimal, efficiency (peak sharpness and analyte resolution) suffers. At a linear velocity less than optimal, analytes spend too much time in the stationary phase (great resolution but poor peak shapes and long analysis times). At a linear velocity greater than optimal, analytes do not spend enough time in the stationary phase (short analysis times but poor peak shapes and inadequate resolution). To achieve shorter analysis times, it is a balancing act to use a linear velocity as fast as possible without deviating too far above optimal.

The height equivalent to a theoretical plate (HETP, typically expressed in mm) is a measure of column efficiency. HETP specifies the column length necessary where the partitioning of analytes between the carrier gas and the stationary phase is at equilibrium. Lower HETP values result in less band broadening and greater efficiency, observed as sharper peaks and greater resolution.

How narrow I.D. columns allow a faster linear velocity becomes clear when linear velocity is plotted against HETP. In capillary GC terminology, this type of plot is known as a Golay curve. Optimal linear velocity is specified at the point where the curve is the lowest. As shown in Figure 4, optimal linear velocity increases as column I.D. decreases. For example, linear velocity is optimal at 30 cm/sec with a 0.512 mm I.D. column and 40 cm/sec with a 0.18 mm I.D. column. Therefore, narrow I.D. columns may be operated at a higher carrier gas linear velocity, allowing for shorter analysis times. Additionally, narrow I.D. columns have flatter curves. This allows the use of a linear velocity higher than optimal with little decrease in efficiency. For example, a linear velocity of 60 cm/sec (1.5X higher than optimal) can be used with a 0.18 mm I.D. column with little observed decrease in efficiency. Attempting the same with the 0.512 mm I.D. column (45 cm/sec which is 1.5X higher than optimal), results in a measurable decrease in efficiency.

Figure 4. Helium Golay Curves Relative to Column I.D.

From P. Sandra and C. Bicchi, "Capillary Gas Chromatography in Essential Oil Analyses," Huethig, 1987

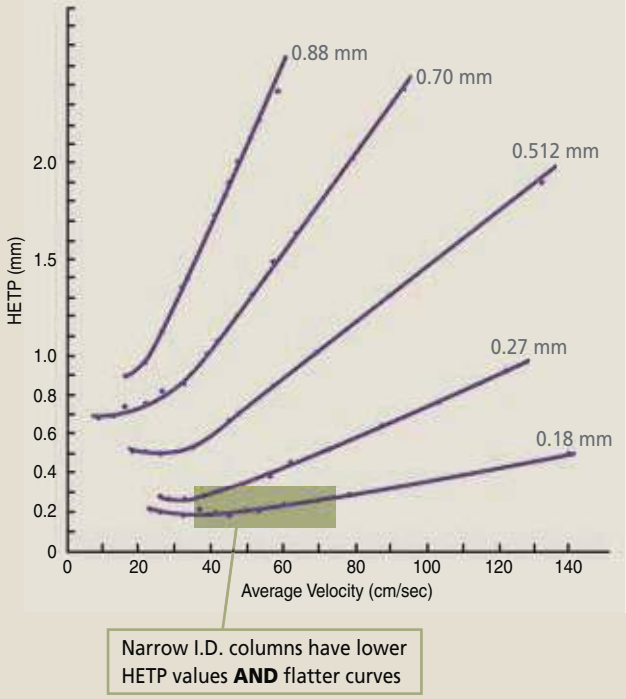
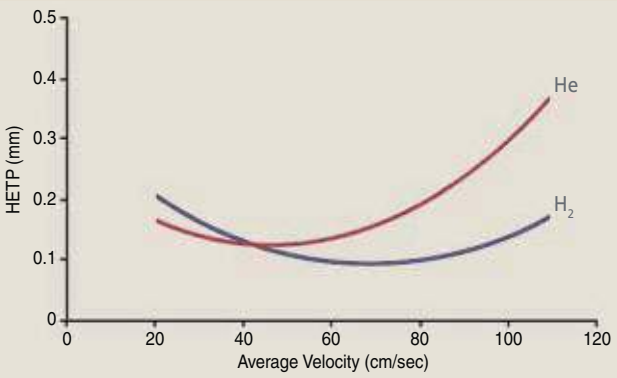


Figure 5. Helium and Hydrogen Golay Curves on a 0.10 mm I.D. Column



Hydrogen Carrier Gas Increases Efficiency and Decreases Time

The great influence of the carrier gas choice is illustrated in Figure 5 by comparing the helium and hydrogen Golay curves on a 0.10 mm I.D. column. The helium curve has a minimum HETP of 0.109 mm at a 45 cm/sec linear velocity. The hydrogen curve has a minimum HETP of just 0.093 mm at an impressive 70 cm/sec linear velocity.

As stated earlier, HETP specifies the column length necessary where the partitioning of analytes between the carrier gas and the stationary phase is at equilibrium. Lower HETP values result in less band broadening and greater efficiency. Because hydrogen has a lower HETP value than any of the other GC carrier gas choices, its use results in the greatest column efficiency, observed as sharper peaks and greater resolution. Of all GC carrier gas choices, hydrogen has the highest optimal linear velocity. If operating exactly at optimal linear velocities, hydrogen results in the fastest analysis times. Because hydrogen also has the flattest curve, the GC can be operated with an even higher linear velocity without a significant gain in HETP.

Hydrogen has several features (lower HETP, higher optimal linear velocity, and flatter Golay curve) that result in desirable benefits (increased efficiency and decreased analysis times) when compared to other GC carrier gas choices. Obviously, safety precautions and detector requirements must be considered before switching to hydrogen.



Supelco Fast GC Columns

Gas chromatography is a popular and powerful analytical tool, but often suffers from long analysis times. By applying the principles of Fast GC (improved instruments, Fast GC column dimensions, and optimized run conditions), decreased analysis times can be achieved, saving the analyst time and money while still achieving superior resolution. Fast GC analyses are typically 3- to 10-times faster and are performed using 0.10 mm or 0.18 mm I.D. columns with column lengths typically less than 20 meters. Supelco offers an impressive line-up of columns in Fast GC dimensions; eighteen columns are available in eleven popular stationary phases. These include special purpose (SPB™-624, VOCOL™, SLB™-5ms, Equity®-1701, TCEP, Omegawax™ 100, SP™-2560) as well as general purpose polar (SUPELCOWAX™ 10) and non-polar (Equity-1, SPB-1, Equity-5, SPB-5) columns, with the characteristics necessary for developing a successful Fast GC method.

- For environmental volatiles, choose SPB-624 or VOCOL
- For environmental semivolatiles, choose SLB-5ms
- For environmental pesticides and PCBs, choose SLB-5ms or Equity-1701
- For petroleum aromatics, choose TCEP
- For food and beverage omega 3 and 6 FAMEs, choose Omegawax 100
- For food & beverage cis/trans FAME isomers, choose SP-2560
- For general purpose polar applications, choose SUPELCOWAX 10
- For general purpose nonpolar applications, choose Equity-1, SPB-1, Equity-5, or SPB-5

Supelco Fast GC Columns

Phase	I.D. (mm)	Length (m)	df (µm)	Beta Value	Cat. No.
SPB-624	0.18	20	1.0	45	**28662-U**
VOCOL	0.18	20	1.0	45	**28463-U**
SLB-5ms	0.10	10	0.10	250	**28465-U**
		15	0.10	250	**28466-U**
	0.18	20	0.18	250	**28564-U**
		12	0.30	150	**28566-U**
		30	0.30	150	**28575-U**
		20	0.36	125	**28576-U**
Equity-1701	0.10	15	0.10	250	**28343-U**
TCEP	0.10	15	0.18	139	**28348-U**
Omegawax 100	0.10	15	0.10	250	**23399-U**
SP-2560	0.18	75	0.14	321	**23348-U**
SUPELCOWAX 10	0.10	5	0.10	250	**25025-U**
		10	0.10	250	**25026-U**
		15	0.10	250	**24343**
Equity-1	0.10	15	0.10	250	**28039-U**
SPB-1	0.10	15	0.10	250	**24338**
Equity-5	0.10	15	0.10	250	**28083-U**
SPB-5	0.10	15	0.10	250	**24341**

Comparable Fast GC Column Cross Reference Chart

Competitor columns listed only if offered in Fast GC dimensions (0.10-0.18 mm I.D.).

Supelco	Agilent	Alltech	Macherey-Nagel	Phenomenex	Quadrex	Restek	SGE	Varian
SPB-624	DB-624 DB-VRX	---	---	---	---	Rtx-624	---	CP-Select 624 CB VF-624ms
VOCOL	---	---	---	---	---	Rtx-502.2	---	---
SLB-5ms	DB-5ms	---	---	ZB-5ms	007-5MS	Rtx-5Sil MS Rxi-5ms	BPX5	VF-5ms
Equity-1701	DB-1701	AT-1701	---	---	007-1701	Rtx-1701	---	CP-Sil 19 CB
TCEP	---	---	---	---	---	---	---	---
Omegawax 100	DB-WAX	---	Permabond CW 20M	ZB-WAXplus	---	---	BP20	CP-Wax 52 CB
SP-2560	---	---	---	---	---	---	---	---
SUPELCOWAX 10	DB-WAX	AT-WAX	Permabond CW 20M	ZB-WAXplus	007-CW	Rtx-WAX	BP20	CP-Wax 52 CB
Equity-1, SPB-1	DB-1	AT-1	Optima 1	---	007-1	Rtx-1	BP1	CP-Sil 5 CB
Equity-5, SPB-5	DB-5	AT-5	Optima 5	---	007-5	Rtx-5	---	CP-Sil 8 CB

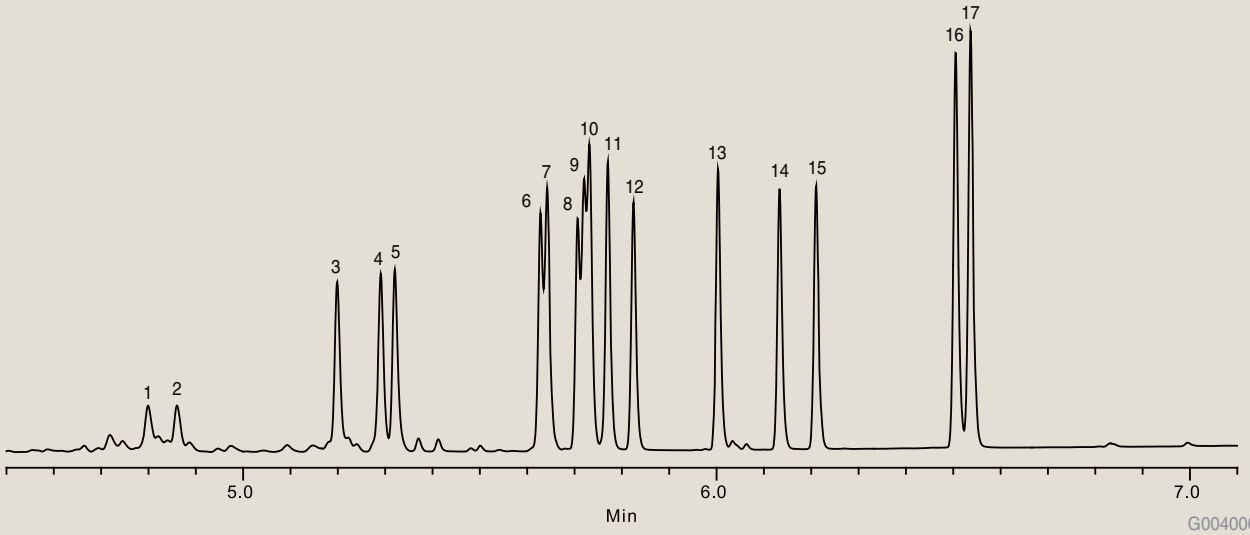
Fast GC Applications

Dioxins and Furans

Dioxin and Furan Congeners on the SLB-5ms

column: SLB-5ms, 15 m x 0.10 mm I.D., 0.10 µm (28466-U)
oven: 150 °C (1 min.), 35 °C/min. to 340 °C (1 min.)
inj.: 250 °C
det.: ECD, 340 °C
carrier gas: hydrogen, 45 cm/sec, constant
injection: 1 µL, splitless (1 min.)
liner: 4 mm I.D., single taper
sample: 17-component 2,3,7,8-substituted dioxin standard, 100-500 ppb in n-nonane

1. 2,3,7,8-TCDF, 100 ppb
2. 2,3,7,8-TCDD, 100 ppb
3. 1,2,3,7,8-PCDF, 250 ppb
4. 2,3,4,7,8-PCDF, 250 ppb
5. 1,2,3,7,8-PCDD, 250 ppb
6. 1,2,3,4,7,8-HxCDF, 500 ppb
7. 1,2,3,6,7,8-HxCDF, 500 ppb
8. 2,3,4,6,7,8-HxCDF, 250 ppb
9. 1,2,3,4,7,8-HxCDD, 500 ppb
10. 1,2,3,6,7,8-HxCDD, 500 ppb
11. 1,2,3,7,8,9-HxCDD, 250 ppb
12. 1,2,3,7,8,9-HxCDF, 250 ppb
13. 1,2,3,4,6,7,8-HpCDF, 250 ppb
14. 1,2,3,4,6,7,8-HpCDD, 250 ppb
15. 1,2,3,4,7,8,9-HpCDF, 250 ppb
16. OCDD, 500 ppb
17. OCDF, 500 ppb

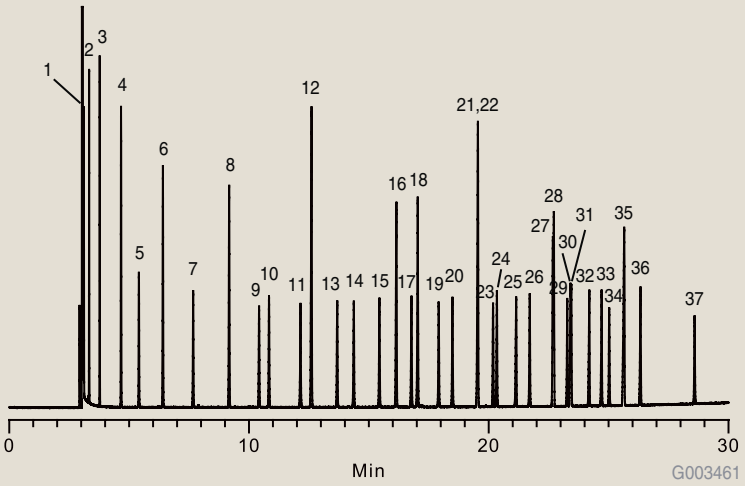


FAMEs

37-Component FAME Mix on the SP-2560

column: SP-2560, 75 m x 0.18 mm I.D., 0.14 µm (23348-U)
oven: 140 °C (5 min.), 4 °C/min. to 240 °C (2 min.)
inj.: 250 °C
det.: FID, 250 °C
carrier gas: hydrogen, 40 cm/sec @ 175 °C
injection: 1 µL, split 100:1
liner: 4 mm I.D split, cup design
sample: 37-component FAME mix at concentrations listed in methylene chloride (47885-U)

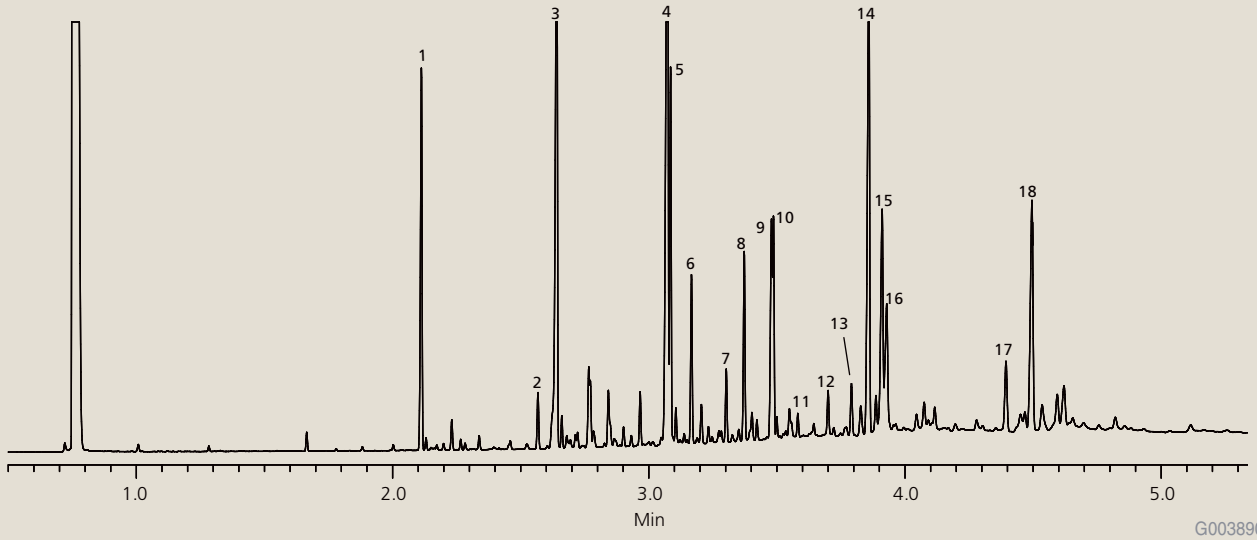
1. Butyric Acid Methyl Ester (C4:0) at 4 wt %
2. Caproic Acid Methyl Ester (C6:0) at 4 wt %
3. Caprylic Acid Methyl Ester (C8:0) at 4 wt %
4. Capric Acid Methyl Ester (C10:0) at 4 wt %
5. Undecanoic Acid Methyl Ester (C11:0) at 2 wt %
6. Lauric Acid Methyl Ester (C12:0) at 4 wt %
7. Tridecanoic Acid Methyl Ester (C13:0) at 2 wt %
8. Myristic Acid Methyl Ester (C14:0) at 4 wt %
9. Myristoleic Acid Methyl Ester (C14:1) at 2 wt %
10. Pentadecanoic Acid Methyl Ester (C15:0) at 2 wt %
11. cis-10-Pentadecenoic Acid Methyl Ester (C15:1) at 2 wt %
12. Palmitic Acid Methyl Ester (C16:0) at 6 wt %
13. Palmitoleic Acid Methyl Ester (C16:1) at 2 wt %
14. Heptadecanoic Acid Methyl Ester (C17:0) at 2 wt %
15. cis-10-Heptadecenoic Acid Methyl Ester (C17:1) at 2 wt %
16. Stearic Acid Methyl Ester (C18:0) at 4 wt %
17. Elaidic Acid Methyl Ester (C18:1n9t) at 2 wt %
18. Oleic Acid Methyl Ester (C18:1n9c) at 4 wt %
19. Linolelaidic Acid Methyl Ester (C18:2n6t) at 2 wt %
20. Linoleic Acid Methyl Ester (C18:2n6c) at 2 wt %
21. Arachidic Acid Methyl Ester (C20:0) at 4 wt %
22. γ-Linolenic Acid Methyl Ester (C18:3n6) at 2 wt %
23. Linolenic Acid Methyl Ester (C18:3n3) at 2 wt %
24. cis-11-Eicosenoic Acid Methyl Ester (C20:1) at 2 wt %
25. Heneicosanoic Acid Methyl Ester (C21:0) at 2 wt %
26. cis-11,14-Eicosadienoic Acid Methyl Ester (C20:2) at 2 wt %
27. cis-8,11,14-Eicosatrienoic Acid Methyl Ester (C20:3n6) at 2 wt %
28. Behenic Acid Methyl Ester (C22:0) at 4 wt %
29. cis-11,14,17-Eicosatrienoic Acid Methyl Ester (C20:3n3) at 2 wt %
30. Erucic Acid Methyl Ester (C22:1n9) at 2 wt %
31. Arachidonic Acid Methyl Ester (C20:4n6) at 2 wt %
32. Tricosanoic Acid Methyl Ester (C23:0) at 2 wt %
33. cis-13,16-Docasadienoic Acid Methyl Ester (C22:2) at 2 wt %
34. cis-5,8,11,14,17-Eicosapentaenoic Acid Methyl Ester (C20:5n3) at 2 wt %
35. Lignoceric Acid Methyl Ester (C24:0) at 4 wt %
36. Nervonic Acid Methyl Ester (C24:1) at 2 wt %
37. cis-4,7,10,13,16,19-Docasahexaenoic Acid Methyl Ester (C22:6n3) at 2 wt %



PUFA I (Marine Source) FAMEs on the Omegawax 100

column: Omegawax 100, 15 m x 0.10 mm I.D., 0.10 µm (23399-U)
oven: 140 °C, 40 °C/min. to 280 °C (2 min.)
inj.: 250 °C
det.: FID, 280 °C
carrier gas: hydrogen, 50 cm/sec constant
injection: 0.2 µL, 200:1 split
liner: 4 mm I.D., split, cup design
sample: PUFA No. I - Marine Source (47033), diluted to 50 mg/mL in methylene chloride

1. C14:0
2. C16:0
3. C16:1n7
4. C18:1n9
5. C18:1n7
6. C18:2n6
7. C18:3n3
8. C18:4n3
9. C20:1n11
10. C20:1n9
11. C20:1n7
12. C20:4n6
13. C20:4n3
14. C20:5n3
15. C22:1n11
16. C22:1n9
17. C22:5n3
18. C22:6n3

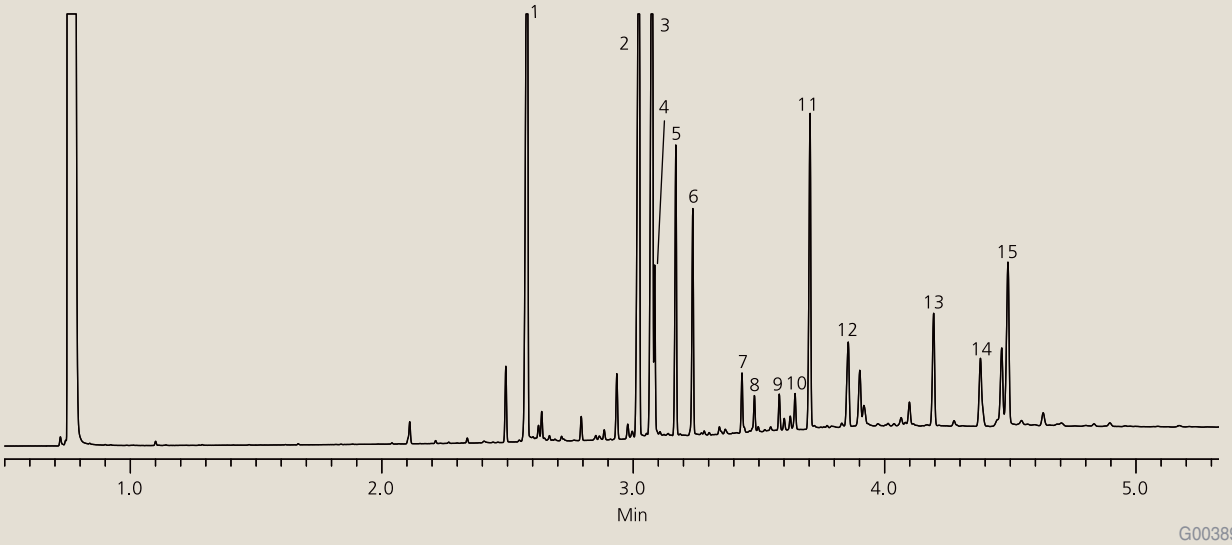


G003890

PUFA II (Animal Source) FAMEs on the Omegawax 100

column: Omegawax 100, 15 m x 0.10 mm I.D., 0.10 µm (23399-U)
oven: 140 °C, 40 °C/min. to 280 °C (2 min.)
inj.: 250 °C
det.: FID, 280 °C
carrier gas: hydrogen, 50 cm/sec constant
injection: 0.2 µL, 200:1 split
liner: 4 mm I.D., split, cup design
sample: PUFA No. II – Animal Source (47015-U), diluted to 50 mg/mL in methylene chloride

1. C16:0
2. C18:0
3. C18:1n9
4. C18:1n7
5. C18:2n6
6. C18:3n6
7. C20:0
8. C20:1n9
9. C20:2n9
10. C20:3n6
11. C20:4n6
12. C20:5n3
13. C22:5n6
14. C22:5n3
15. C22:6n3

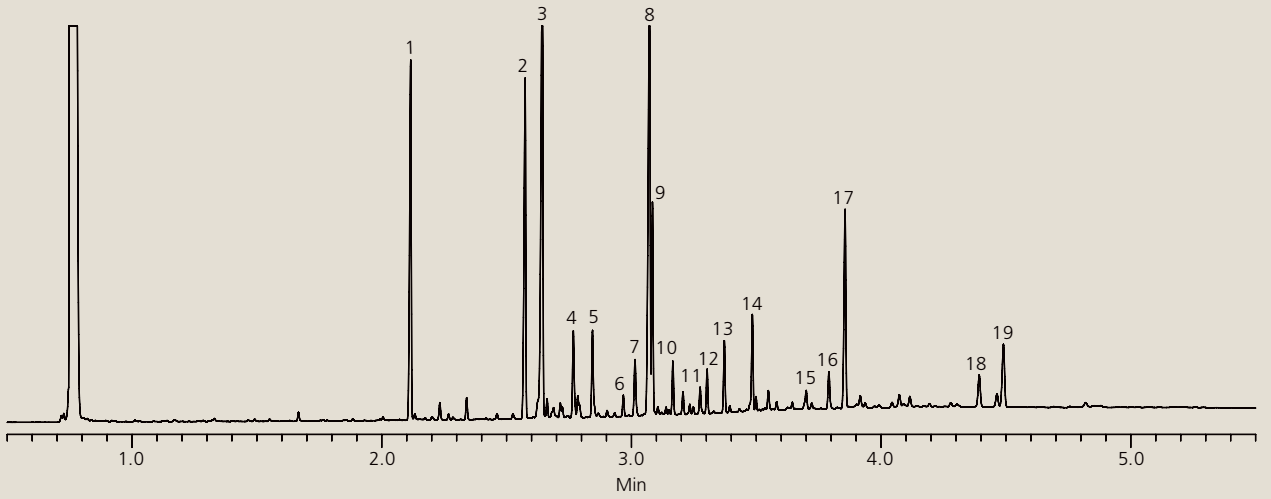


G003892

PUFA III (Menhaden Oil) FAMEs on the Omegawax 100

column: Omegawax 100, 15 m x 0.10 mm I.D., 0.10 µm (23399-U)
oven: 140 °C, 40 °C/min. to 280 °C (2 min.)
inj.: 250 °C
det.: FID, 280 °C
carrier gas: hydrogen, 50 cm/sec constant
injection: 0.2 µL, 200:1 split
liner: 4 mm I.D., split, cup design
sample: PUFA No. III – Menhaden Oil (47085-U), diluted to 50 mg/mL in methylene chloride

1. C14:0
2. C16:0
3. C16:1n7
4. C16:2n4
5. C16:3n4
6. C16:4n1
7. C18:0
8. C18:1n9
9. C18:1n7
10. C18:2n6
11. C18:3n4
12. C18:3n3
13. C18:4n3
14. C20:1n9
15. C20:4n6
16. C20:4n3
17. C20:5n3
18. C22:5n3
19. C22:6n3



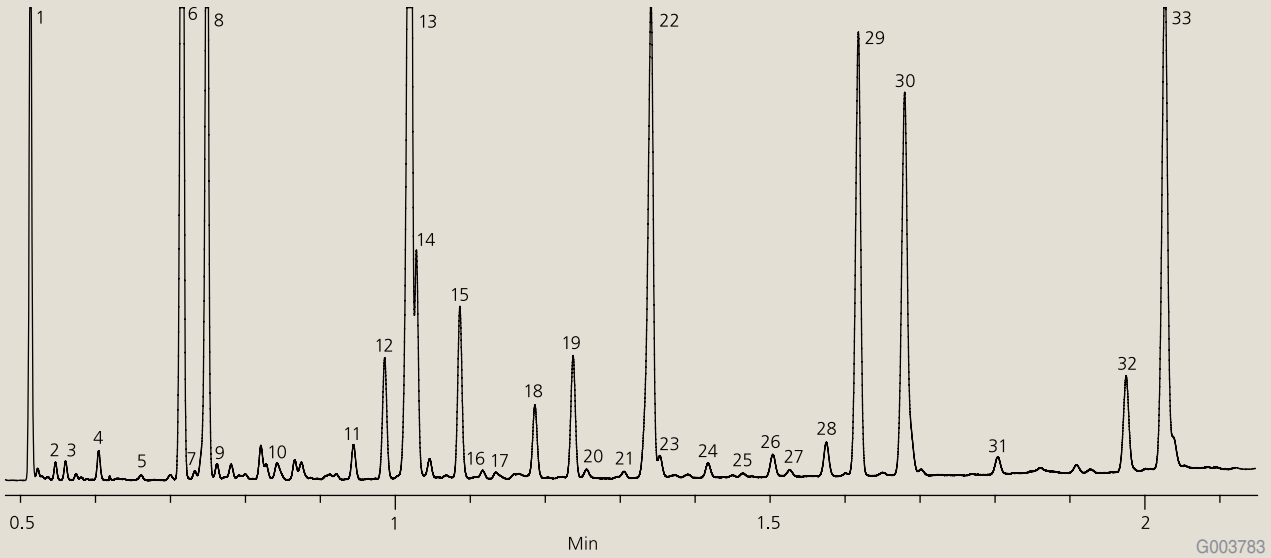
G003891

Cod Liver Oil FAMEs on the SUPELCOWAX 10

Chromatogram courtesy of Prof. Luigi Mondello (Univ. of Messina, Italy)

column: SUPELCOWAX 10, 10 m x 0.10 mm I.D., 0.10 µm (25026-U)
oven: 180 °C , 40 °C/min. to 270 °C (0.5 min.)
inj.: 280 °C
det.: FID, 280 °C
carrier gas: hydrogen, 100 cm/sec constant
injection: 0.2 µL, 200:1 split
sample: cod liver oil FAMEs in hexane

1. C14:0
2. C15:0 anteiso
3. C15:0 iso
4. C15:0
5. C16:0 iso
6. C16:0
7. C16:1ω9
8. C16:1ω7
9. C16:1ω5
10. C16:3ω4
11. C16:4ω4
12. C18:0
13. C18:1ω9
14. C18:1ω7
15. C18:2ω6
16. C18:2ω4
17. C18:3ω6
18. C18:3ω3
19. C18:4ω3
20. C18:4ω1
21. C20:0
22. C20:1ω9
23. C20:1ω7
24. C20:2ω6
25. C20:3ω6
26. C20:4ω6
27. C20:3ω3
28. C20:4ω3
29. C20:5ω3
30. C22:1ω9
31. C21:5ω3
32. C22:5ω3
33. C22:6ω3

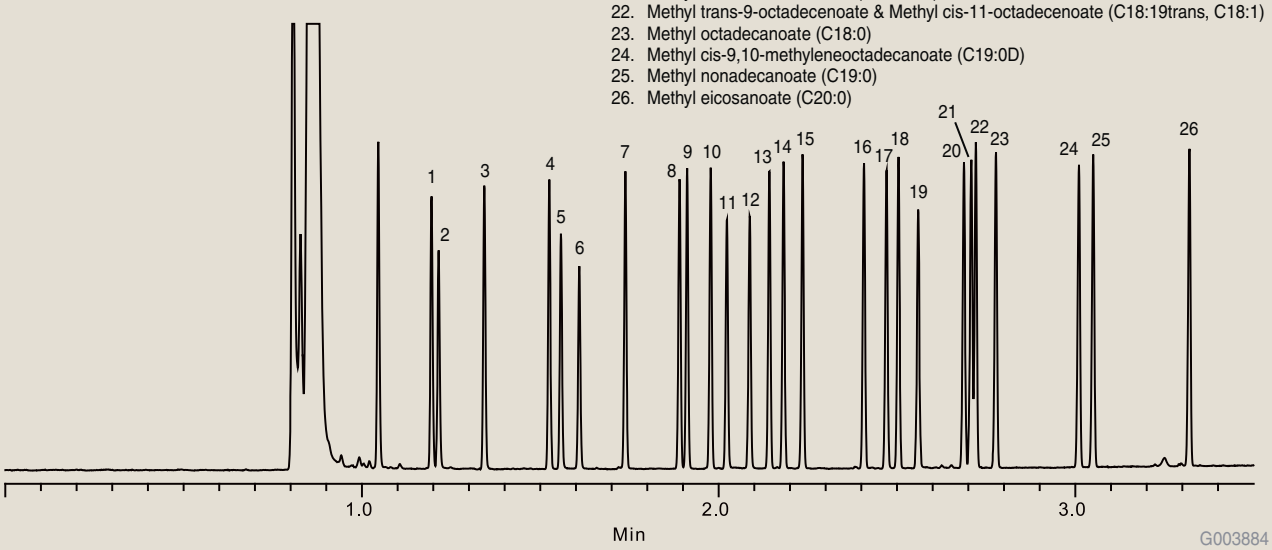


G003783

Bacterial Acid Methyl Esters (BAMEs) on the Equity-1

column: Equity-1, 15 m x 0.10 mm I.D., 0.10 µm (28039-U)
oven: 175 °C, 30 °C/min. to 275 °C (1 min.)
inj.: 280 °C
det.: FID, 280 °C
carrier gas: hydrogen, 45 cm/sec constant
injection: 0.5 µL, split 200:1
liner: 4 mm I.D., split, cup design
sample: Bacterial Acid Methyl Ester (BAME) Mix (47080-U)

1. Methyl undecanoate (C11:0)
2. Methyl 2-hydroxydecanoate (2-OH C10:0)
3. Methyl dodecanoate (C12:0)
4. Methyl tridecanoate (C13:0)
5. Methyl 2-hydroxydodecanoate (2-OH C12:0)
6. Methyl 3-hydroxydodecanoate (3-OH C12:0)
7. Methyl tetradecanoate (C14:0)
8. Methyl 13-methyltetradecanoate (iC15:0)
9. Methyl 12-methyltetradecanoate (a-C15:0)
10. Methyl pentadecanoate (C15:0)
11. Methyl 2-hydroxytetradecanoate (2-OH C14:0)
12. Methyl 3-hydroxytetradecanoate (3-OH C14:0)
13. Methyl 14-methylpentadecanoate (iC16:0)
14. Methyl cis-9-hexadecenoate (C16:19)
15. Methyl hexadecanoate (C16:0)
16. Methyl 15-methylhexadecanoate (iC17:0)
17. Methyl cis-9,10-methylenehexadecanoate (C17:0D)
18. Methyl heptadecanoate (C17:0)
19. Methyl 2-hydroxyhexadeanoate (2-OH C16:0)
20. Methyl cis-9,12-octadienoate (C18:29,12)
21. Methyl cis-9-octadecenoate (c18:19cis)
22. Methyl trans-9-octadecenoate & Methyl cis-11-octadecenoate (C18:19trans, C18:1)
23. Methyl octadecanoate (C18:0)
24. Methyl cis-9,10-methyleneoctadecanoate (C19:0D)
25. Methyl nonadecanoate (C19:0)
26. Methyl eicosanoate (C20:0)

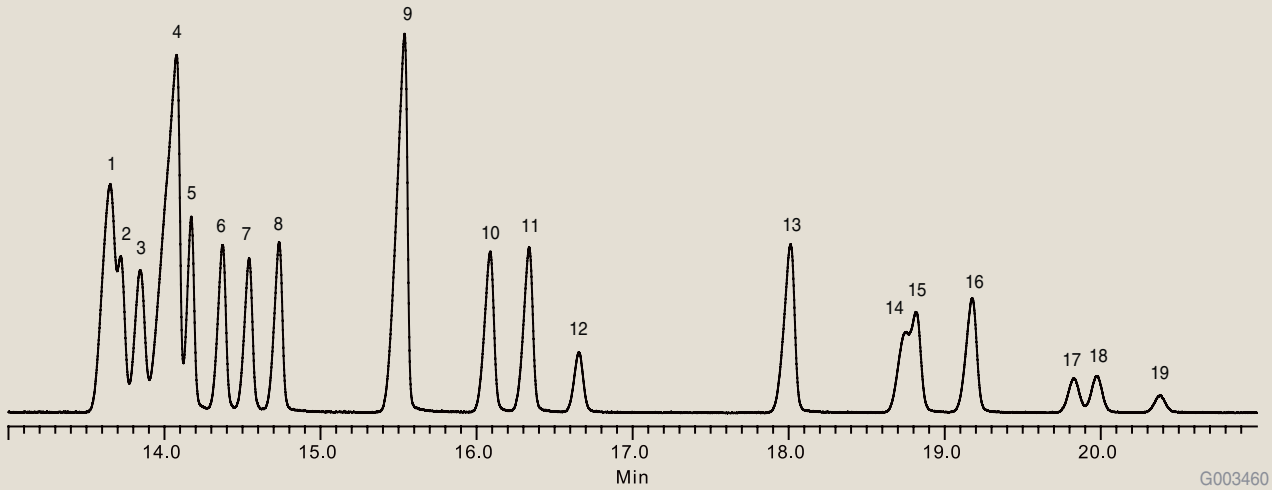


G003884

C18:1, C18:2, and C18:3 cis/trans Isomers on the SP-2560

column: SP-2560, 75 m x 0.18 mm I.D., 0.14 µm (23348-U)
oven: 180 °C, isothermal
inj.: 220 °C
det.: FID, 220 °C
carrier gas: hydrogen, 25 cm/sec. @ 180 °C
injection: 0.5 µL, 100:1 split
liner: 4 mm I.D. split, cup design
sample: mixture of C18:1, C18:2, and C18:3 FAMEs in methylene chloride

1. C18:1 Δ 7t and C18:1 Δ 6t
2. C18:1 Δ 9t
3. C18:1 Δ 11t
4. C18:1 Δ 12t, 18:1 Δ 6c, C18:1 Δ 7c and C18:1 Δ 13t
5. C18:1 Δ 9c
6. C18:1 Δ 11c
7. C18:1 Δ 12c
8. C18:1 Δ 13c
9. C18:2 Δ 9t, 12t
10. C18:2 Δ 9c, 12t
11. C18:2 Δ 9t, 12c
12. C18:2 Δ 9c, 12c
13. C18:3 Δ 9t, 12t, 15t
14. C18:3 Δ 9t, 12t, 15c
15. C18:3 Δ 9t, 12c, 15t
16. C18:3 Δ 9c, 12t, 15t and C18:3 Δ 9c, 12c, 15t
17. C18:3 Δ 9c, 12t, 15c
18. C18:3 Δ 9t, 12c, 15c
19. C18:3 Δ 9c, 12c, 15c



G003460

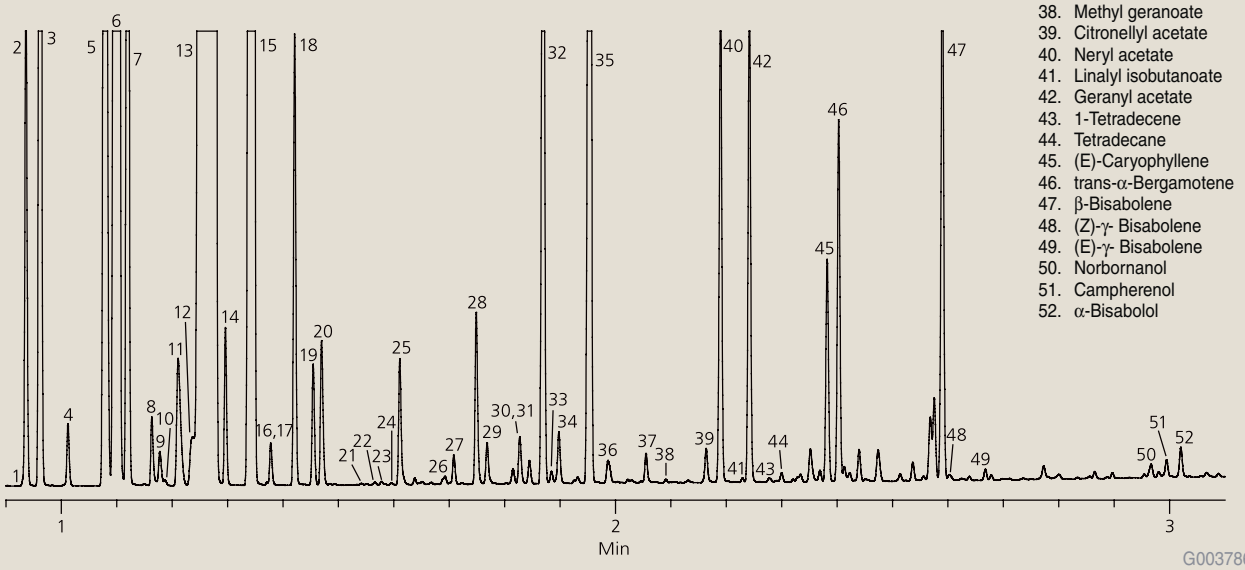
Foods, Flavors, and Fragrances

Lemon Essential Oil on the SLB-5ms

Chromatogram courtesy of Prof. Luigi Mondello (Univ. of Messina, Italy)

column: SLB-5ms, 10 m x 0.10 mm I.D., 0.10 µm (28465-U)
oven: 40 °C, 50 °C/min. to 320 °C
inj.: 320 °C
det.: FID, 320 °C
carrier gas: hydrogen, 81.5 cm/sec constant
injection: 0.4 µL, 300:1 split
sample: lemon essential oil in hexane

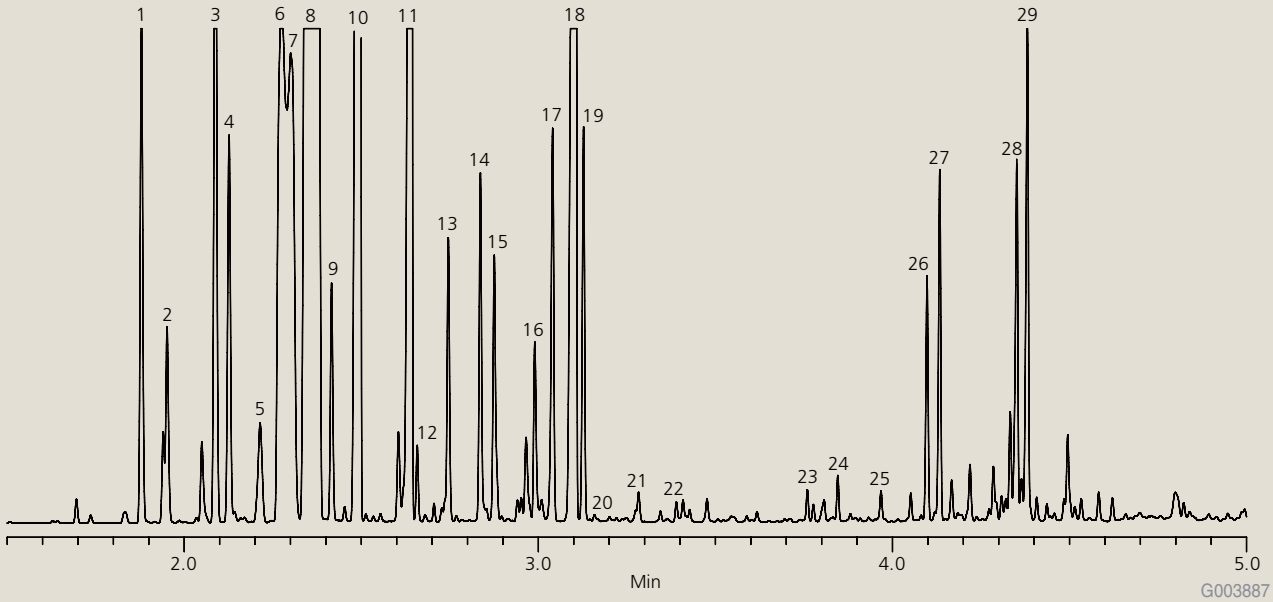
1. Tricyclene
2. α-Thujene
3. α-Pinene
4. Camphene
5. Sabinene
6. β-Pinene
7. Myrcene
8. Octanal
9. α-Phellandrene
10. δ-3-Carene
11. α-Terpinene
12. π-Cymene
13. Limonene
14. (E)-β-Ocimene
15. γ-Terpinene
16. cis-Sabinene hydrate
17. Octanol
18. Terpinolene
19. Linalool
20. Nonanal
21. cis-Limonene oxide
22. trans-Limonene oxide
23. (E)-Myroxide
24. Camphor
25. Citronellal
26. Borneol
27. Terpinen-4-ol
28. α-Terpineol
29. Decanal
30. Citronellol
31. Nerol
32. Neral
33. Carvone
34. Geraniol
35. Geranial
36. Perilla aldehyde
37. Undecanal
38. Methyl geranoate
39. Citronellyl acetate
40. Neryl acetate
41. Linalyl isobutanoate
42. Geranyl acetate
43. 1-Tetradecene
44. Tetradecane
45. (E)-Caryophyllene
46. trans-α-Bergamotene
47. β-Bisabolene
48. (Z)-γ- Bisabolene
49. (E)-γ- Bisabolene
50. Norbornanol
51. Campherenol
52. α-Bisabolol



Distilled Lime Oil on the Equity-1

column: Equity-1, 15 m x 0.10 mm I.D., 0.10 µm (28039-U)
oven: 75 °C (1 min.), 35 °C/min. to 200 °C (1 min.)
inj.: 250 °C
det.: FID, 250 °C
carrier gas: helium, 45 cm/sec constant
injection: 0.10 µL, 300:1 split
liner: 2 mm I.D., straight
sample: distilled lime oil, neat

1. α-Pinene
2. Camphene
3. β-Pinene
4. Myrcene
5. α-Phellandrene
6. 1,4-Cineole
7. α-Terpinene
8. π-Cymene
9. δ-Limonene
10. γ-Terpinene
11. Terpinolene
12. Linalool
13. α-Fencyl alcohol
14. Terpinen-1-ol
15. β-Terpineol
16. Borneol
17. Terpinen-4-ol
18. α-Terpineol
19. γ-Terpineol
20. Decanal
21. Neral
22. Geranial
23. Neral acetate
24. Geranyl acetate
25. Dodecanal
26. β-Carophyllene
27. trans-α-Bergamotene
28. trans-α-Farnesene
29. β-Bisabolene



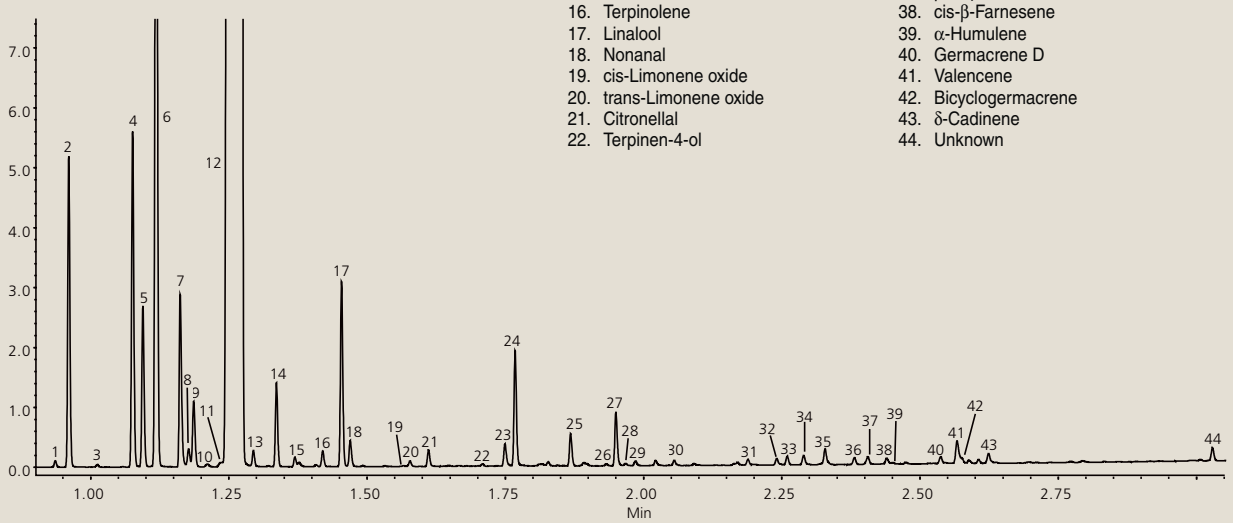


Sweet Orange Essential Oil on the SLB-5ms

Chromatogram courtesy of Prof. Luigi Mondello (Univ. of Messina, Italy)

column: SLB-5ms, 10 m x 0.10 mm I.D., 0.10 µm (28465-U)
oven: 40 °C , 50 °C/min. to 320 °C.
inj: 320 °C
det: FID, 320 °C
carrier gas: hydrogen, 81.5 cm/sec constant
injection: 0.4 µL, 300:1 split
sample: sweet orange essential oil in hexane

1. α-Thujene
2. α-Pinene
3. Camphene
4. Sabinene
5. β-Pinene
6. Myrcene
7. Octanal
8. α-Phellandrene
9. δ-3-Carene
10. α-Terpinene
11. π-Cymene
12. Limonene
13. (E)-β-Ocimene
14. γ-Terpinene
15. Octanol
16. Terpinolene
17. Linalool
18. Nonanal
19. cis-Limonene oxide
20. trans-Limonene oxide
21. Citronellal
22. Terpinen-4-ol
23. α-Terpineol
24. Decanal
25. Neral
26. 2-(E)-Decenal
27. Geranial
28. Perilla aldehyde
29. Perilla alcohol
30. Undecanal
31. Neryl acetate
32. α-Copaene
33. Geranyl acetate
34. β-Cubebene + β-Elemene
35. Dodecanal
36. (E)-Caryophyllene
37. β-Copaene
38. cis-β-Farnesene
39. α-Humulene
40. Germacrene D
41. Valencene
42. Bicyclogermacrene
43. δ-Cadinene
44. Unknown



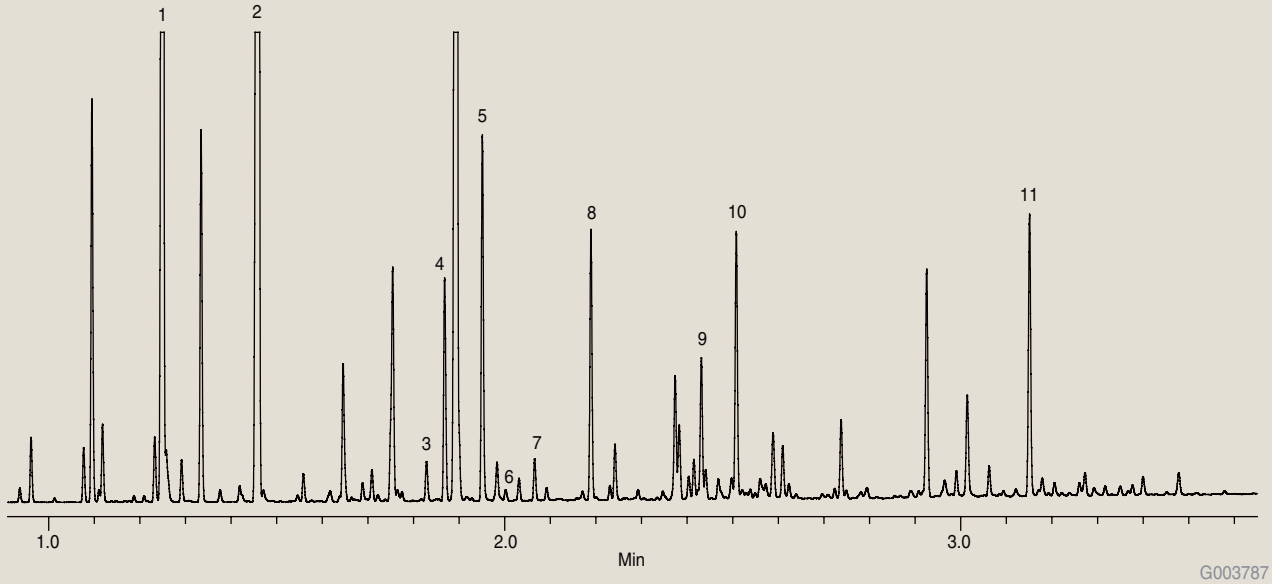
G003840

Allergens in Commercial Perfume on the SLB-5ms

Chromatogram courtesy of Prof. Luigi Mondello (Univ. of Messina, Italy)

column: SLB-5ms, 10 m x 0.10 mm I.D., 0.10 µm (28465-U)
oven: 40 °C , 50 °C/min. to 320 °C
inj.: 320 °C
det.: FID, 320 °C
carrier gas: hydrogen, 81.5 cm/sec constant
injection: 0.2 µL, 500:1 split
sample: neat perfume

1. Limonene
2. Linalool
3. Citronellol
4. Neral
5. Geranial
6. Hydroxycitronellal
7. Cinnamyl alcohol
8. Eugenol
9. Coumarin
10. α-Isomethylionone
11. Hexyl cinnamylaldehyde



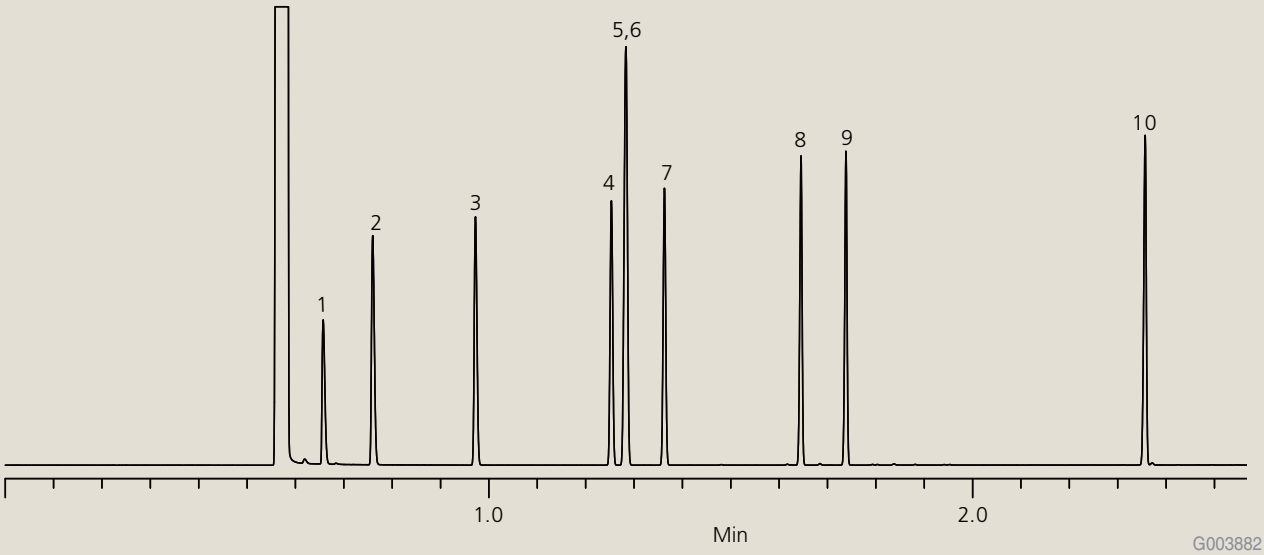
G003787

Hydrocarbons

Underground Storage Tank (UST) Gasoline Range Organics (GRO) on the Equity-1

column: Equity-1, 15 m x 0.10 mm I.D., 0.10 µm (28039-U)
oven: 75 °C, 40 °C/min. to 110 °C, 7.5 °C/min. to 190 °C
inj.: 200 °C
det.: FID, 250 °C
carrier gas: hydrogen, 57 cm/sec @ 75 °C
injection: 0.5 µL, 200:1 split
liner: 4 mm I.D., split, cup design
sample: UST Modified GRO Mix, each analyte at 1000 ppm in methanol (48167)

1. MTBE
2. Benzene
3. Toluene
4. Ethyl benzene
5. m-Xylene
6. p-Xylene
7. o-Xylene
8. 1,3,5-Trimethylbenzene
9. 1,2,4-Trimethylbenzene
10. Naphthalene

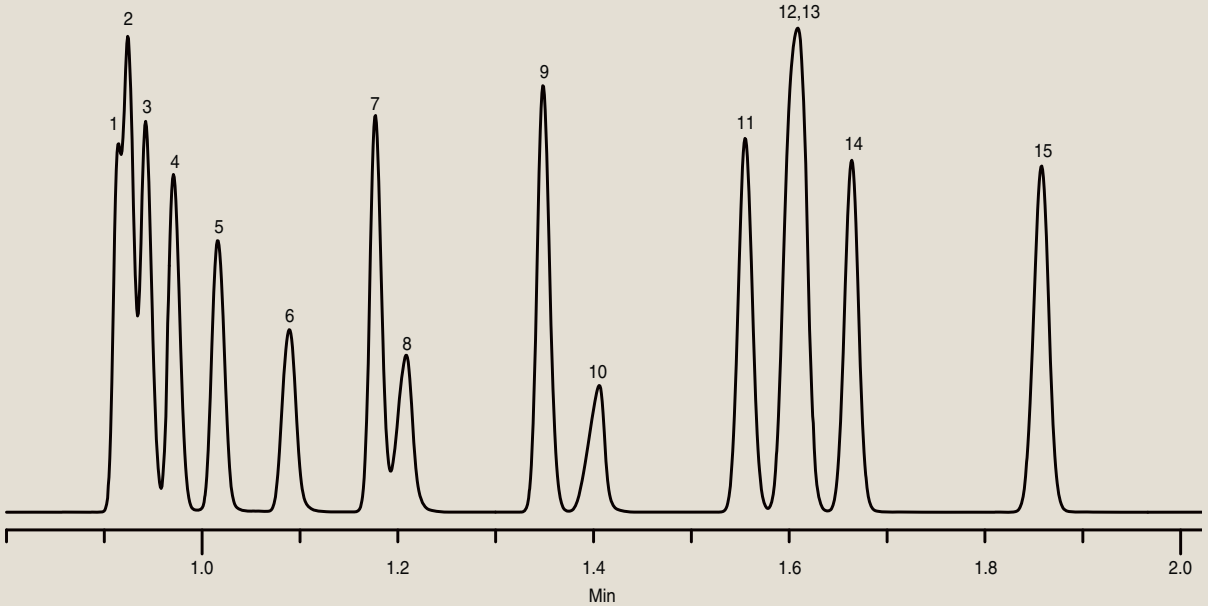


G003882

C6-C13 Alkanes, BTEX, and Cumene on the TCEP

column: TCEP, 15 m x 0.10 mm I.D., 0.18 µm (28348-U)
oven: 100 °C
inj.: 170 °C
det.: FID, 170 °C
carrier gas: hydrogen, 40 cm/sec
injection: 0.04 µL, 200:1 split
liner: 4 mm I.D., split, cup design
sample: neat mix, equal volumes of each analyte

1. Hexane
2. Heptane
3. Octane
4. Nonane
5. Decane
6. Undecane
7. Dodecane
8. Benzene
9. Toluene
10. Tridecane
11. Ethyl benzene
12. m-Xylene
13. p-Xylene
14. Cumene
15. o-Xylene

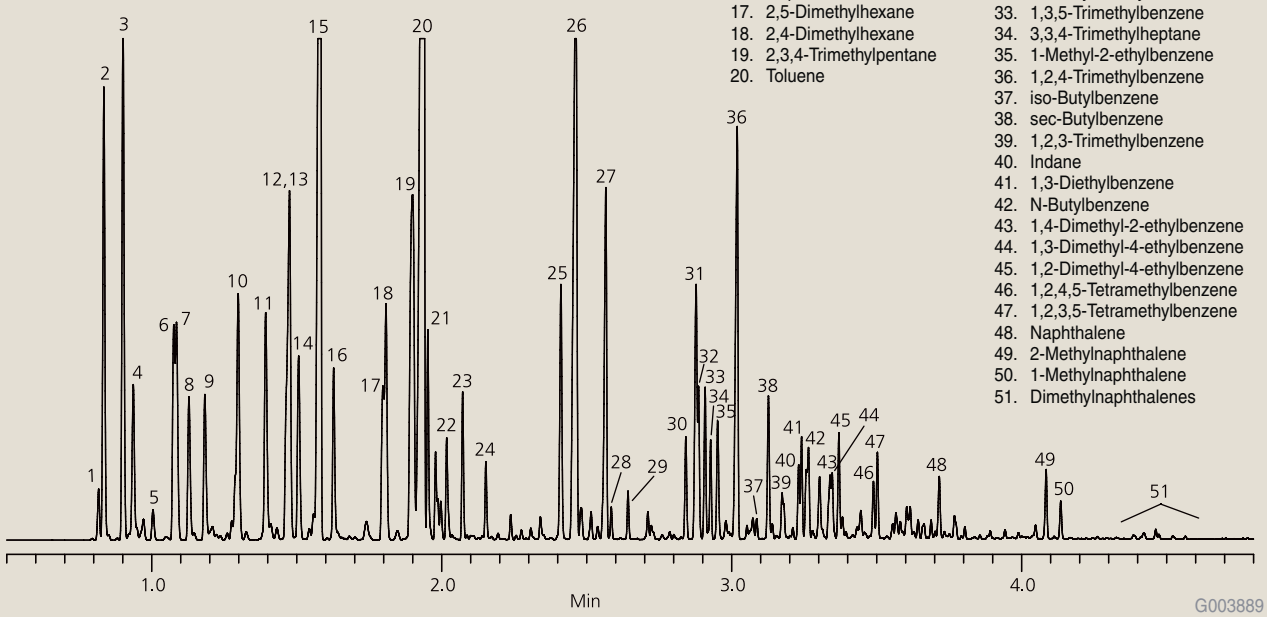


G003909

Unleaded Gasoline on the Equity-1

column: Equity-1, 15 m x 0.10 mm I.D., 0.10 µm (28039-U)
oven: 40 °C (1 min.), 45 °C/min. to 150 °C (2 min.)
inj.: 175 °C
det.: FID, 175 °C
carrier gas: hydrogen, 45 cm/sec constant
injection: 0.1 µL, 300:1 split
liner: 2 mm I.D., straight
sample: unleaded gasoline (refinery standard), neat

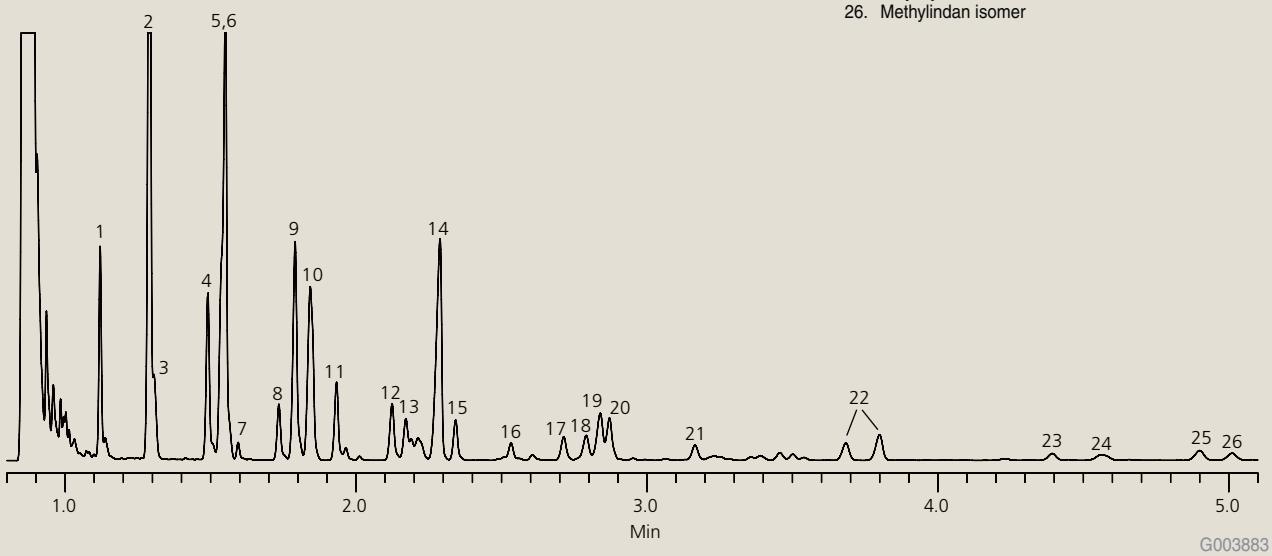
1. Isobutane
2. Butane
3. Isopentane
4. Pentane
5. 2,2-Dimethylbutane
6. 2,3-Dimethylbutane
7. 2-Methylpentane
8. 3-Methylpentane
9. Hexane
10. 2,4-Dimethylpentane
11. Benzene
12. 2-Methylhexane
13. 2,3-Dimethylpentane
14. 3-Methylhexane
15. Isooctane
16. Heptane
17. 2,5-Dimethylhexane
18. 2,4-Dimethylhexane
19. 2,3,4-Trimethylpentane
20. Toluene
21. 2,3-Dimethylhexane
22. 2-Methylheptane
23. 3-Methylheptane
24. Octane
25. Ethylbenzene
26. m-/p-Xylene
27. o-Xylene
28. Nonane
29. iso-Propylbenzene
30. Propylbenzene
31. 1-Methyl-3-ethylbenzene
32. 1-Methyl-4-ethylbenzene
33. 1,3,5-Trimethylbenzene
34. 3,3,4-Trimethylheptane
35. 1-Methyl-2-ethylbenzene
36. 1,2,4-Trimethylbenzene
37. iso-Butylbenzene
38. sec-Butylbenzene
39. 1,2,3-Trimethylbenzene
40. Indane
41. 1,3-Diethylbenzene
42. N-Butylbenzene
43. 1,4-Dimethyl-2-ethylbenzene
44. 1,3-Dimethyl-4-ethylbenzene
45. 1,2-Dimethyl-4-ethylbenzene
46. 1,2,4,5-Tetramethylbenzene
47. 1,2,3,5-Tetramethylbenzene
48. Naphthalene
49. 2-Methylnaphthalene
50. 1-Methylnaphthalene
51. Dimethylnaphthalenes



Unleaded Gasoline on the TCEP

column: TCEP, 15 m x 0.10 mm I.D., 0.18 µm (28348-U)
oven: 100 °C
inj.: 220 °C
det.: FID, 220 °C
carrier gas: hydrogen, 43 cm/sec
injection: 0.2 µL, 500:1 split
liner: 4 mm I.D., split, cup design
sample: unleaded gasoline (refinery grade)

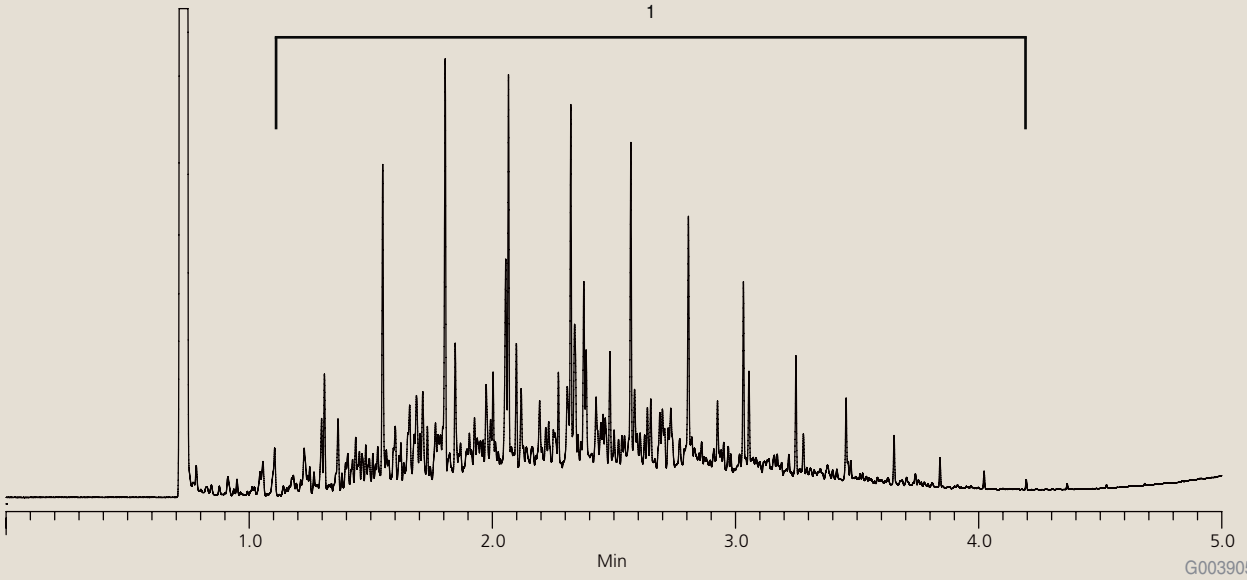
1. Benzene
2. Toluene
3. Tridecane
4. Ethyl benzene
5. m-Xylene
6. p-Xylene
7. Cumene
8. Propyl benzene
9. o-Xylene
10. Ethyl toluene isomer
11. Mesitylene
12. Ethyl toluene isomer
13. Propyl toluene isomer
14. 1,2,4-Trimethyl benzene
15. Ethyl xylene isomer
16. Propyl toluene isomer
17. Ethyl xylene isomer
18. Ethyl xylene isomer
19. 1,2,3-Trimethyl benzene
20. Ethyl xylene isomer
21. Indan
22. Tetramethyl benzene isomers
23. Methylindan isomer
24. Pentamethyl benzene
25. Ethyl xylene isomer
26. Methylindan isomer



Fuel Oil #2 on the Equity-1

column: Equity-1, 15 m x 0.10 mm I.D., 0.10 µm (28039-U)
oven: 80 °C, 50 °C/min. to 325 °C
inj.: 250 °C
det.: FID, 350 °C
carrier gas: hydrogen, 45 cm/sec constant
injection: 0.3 µL, 100:1 split, 0.02 min. pre-injection dwell time
liner: 2 mm I.D., straight
sample: no.2 fuel oil standard, 20 mg/mL in methanol (47515-U)

1. Fuel Oil #2 pattern

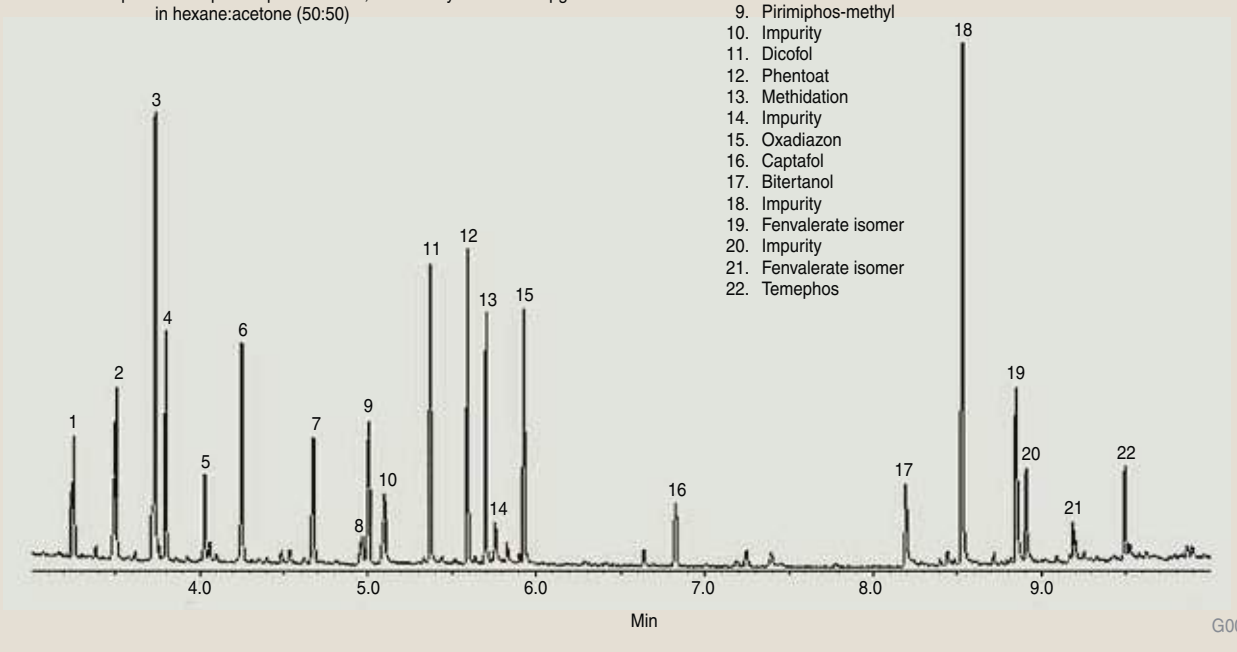


Pesticides/PCBs

17-Component Pesticide Mix on the SLB-5ms

column: SLB-5ms, 10 m x 0.10 mm I.D., 0.10 µm (28465-U)
oven: 40 °C (1 min.), 80 °C/min. to 160 °C, 5 °C/min. to 340 °C (2 min.)
inj.: 280 °C
MSD interface: 280 °C
scan range: 45-470 m/z
carrier gas: helium, 0.52 mL/min.
injection: 0.5 µL, 10:1 split
sample: 17-component pesticide mix, each analyte at 0.8-2.0 µg/mL in hexane:acetone (50:50)

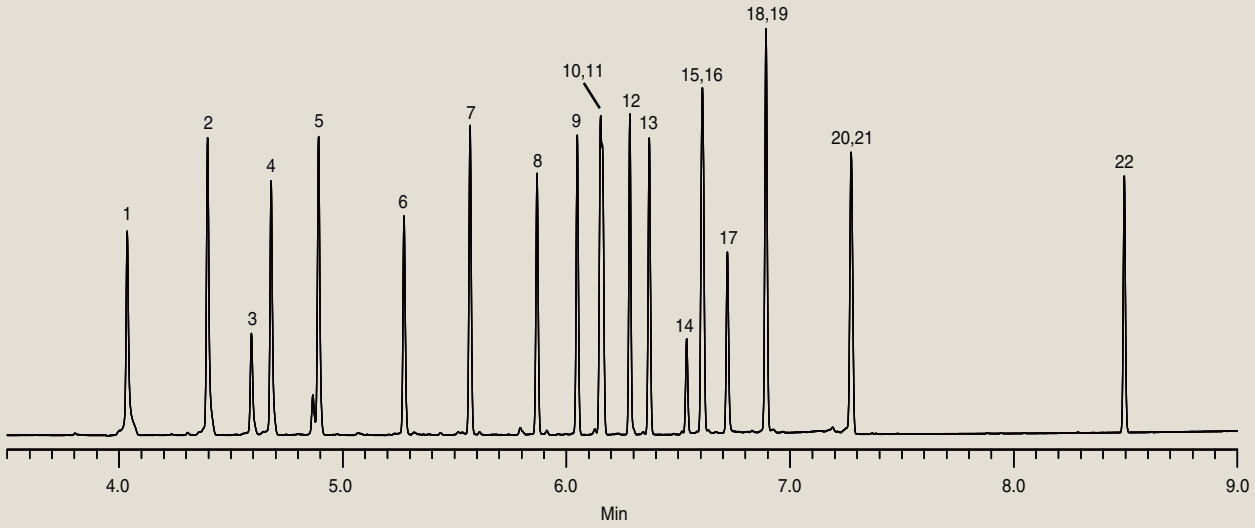
1. Chloreneb
2. Molinate
3. Cycloate
4. Sulfotep
5. Dimethoat
6. Fonofos
7. Prothoate
8. Impurity
9. Pirimiphos-methyl
10. Impurity
11. Dicofol
12. Phentoat
13. Methidation
14. Impurity
15. Oxadiazon
16. Captafol
17. Bitertanol
18. Impurity
19. Fenvalerate isomer
20. Impurity
21. Fenvalerate isomer
22. Temephos



US EPA Method 8081 Organochlorine Pesticides on the SLB-5ms

column: SLB-5ms, 15 m x 0.10 mm I.D., 0.10 µm (28466-U)
oven: 100 °C, 25 °C/min. to 325 °C
inj.: 225 °C
det.: ECD, 300 °C
carrier gas: hydrogen, 40 cm/sec constant
injection: 2 µL, splitless (0.75 min.)
liner: 4 mm I.D., single taper
sample: 50 ppb of a 22-component chlorinated pesticide standard in n-hexane

1. Tetrachloro-m-xylene (surr.)
2. α-BHC
3. β-BHC
4. γ-BHC
5. δ-BHC
6. Heptachlor
7. Aldrin
8. Heptachlor epoxide
9. γ-Chlordane
10. Endosulfan I
11. α-Chlordane
12. 4,4'-DDE
13. Dieldrin
14. Endrin
15. 4,4'-DDD
16. Endosulfan II
17. Endrin aldehyde
18. 4,4'-DDT
19. Endosulfan sulfate
20. Methoxychlor
21. Endrin ketone
22. Decachlorobiphenyl (surr.)

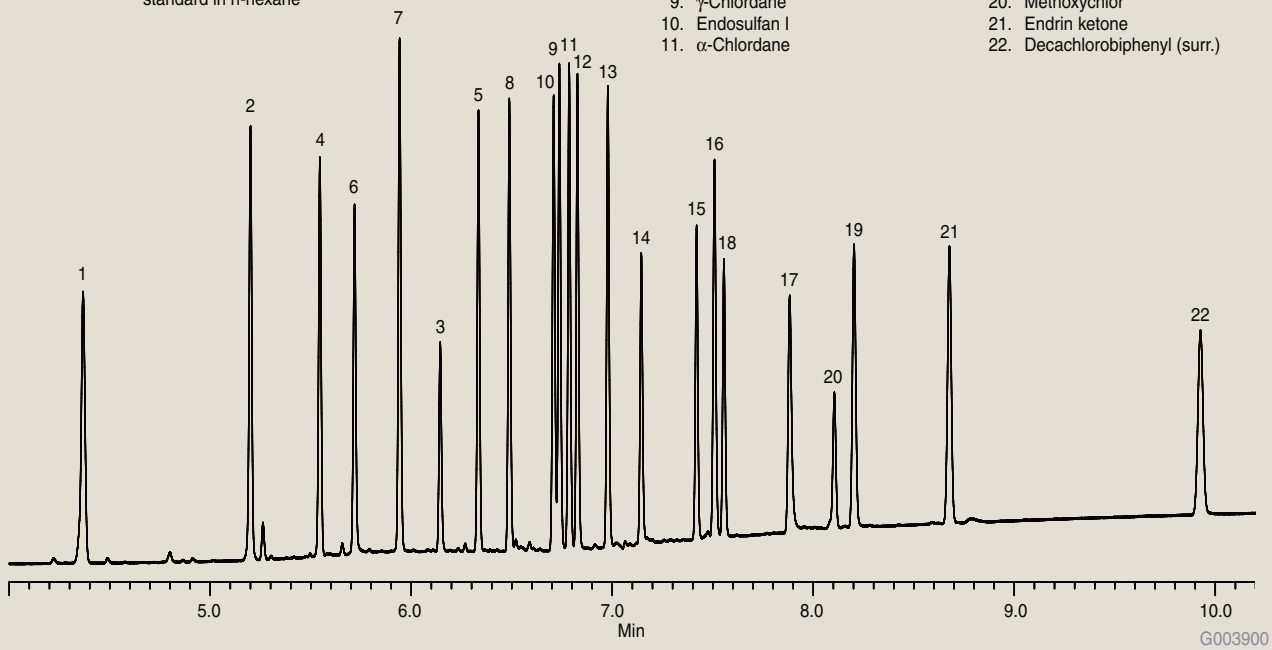


G003899

US EPA Method 8081 Organochlorine Pesticides on the Equity-1701

column: Equity-1701, 15 m x 0.10 mm I.D., 0.10 µm (28343-U)
oven: 100 °C, 25 °C/min. to 280 °C
inj.: 225 °C
det.: ECD, 300 °C
carrier gas: hydrogen, 40 cm/sec constant
injection: 2 µL, splitless (0.75 min.)
liner: 4 mm I.D., single taper
sample: 50 ppb of a 22-component chlorinated pesticide standard in n-hexane

1. Tetrachloro-m-xylene (surr.)
2. α-BHC
3. β-BHC
4. γ-BHC
5. δ-BHC
6. Heptachlor
7. Aldrin
8. Heptachlor epoxide
9. γ-Chlordane
10. Endosulfan I
11. α-Chlordane
12. 4,4'-DDE
13. Dieldrin
14. Endrin
15. 4,4'-DDD
16. Endosulfan II
17. Endrin aldehyde
18. 4,4'-DDT
19. Endosulfan sulfate
20. Methoxychlor
21. Endrin ketone
22. Decachlorobiphenyl (surr.)

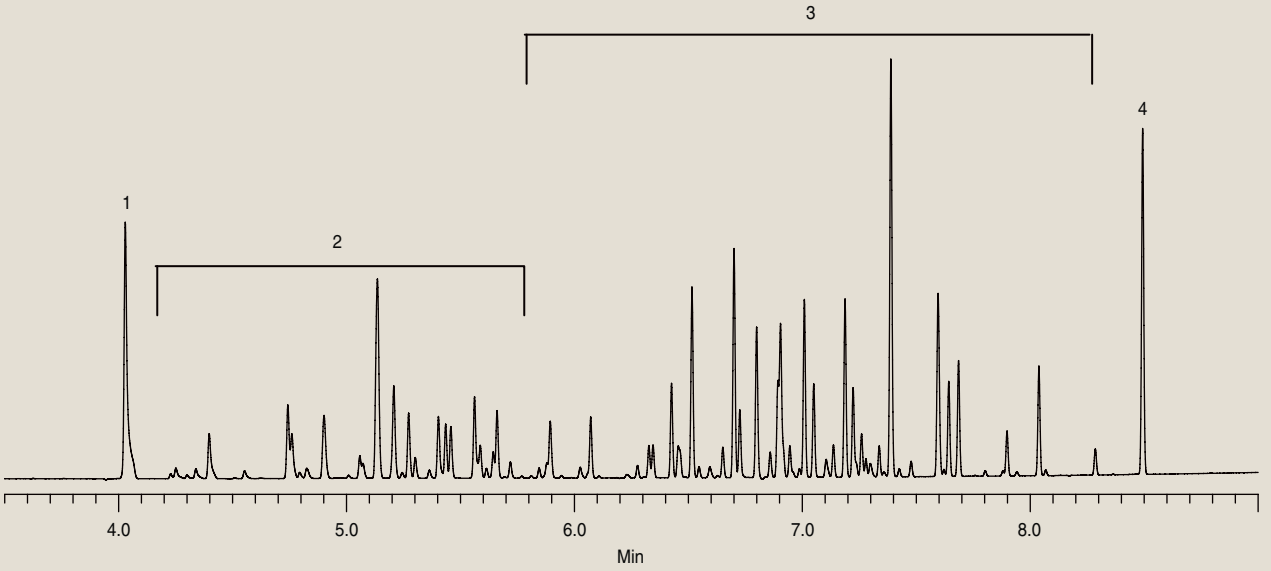


G003900

US EPA Method 8082 PCBs as Aroclors on the SLB-5ms

column: SLB-5ms, 15 m x 0.10 mm I.D., 0.10 µm (28466-U)
oven: 80 °C (0.5 min.), 50 °C/min. to 200 °C, 35 °C/min. to 360 °C (2 min.)
inj.: 225 °C
det.: ECD, 360 °C
carrier gas: hydrogen, 40 cm/sec constant
injection: 2 µL, splitless (0.75 min.)
liner: 4 mm I.D., single taper
sample: Aroclor standard mix 1 (46846-U) diluted to 500 ppb / 50 ppb (Aroclors / surrogates) in n-hexane

1. Tetrachloro-m-xylene (surr.)
2. Aroclor 1016
3. Aroclor 1260
4. Decachlorobiphenyl (surr.)

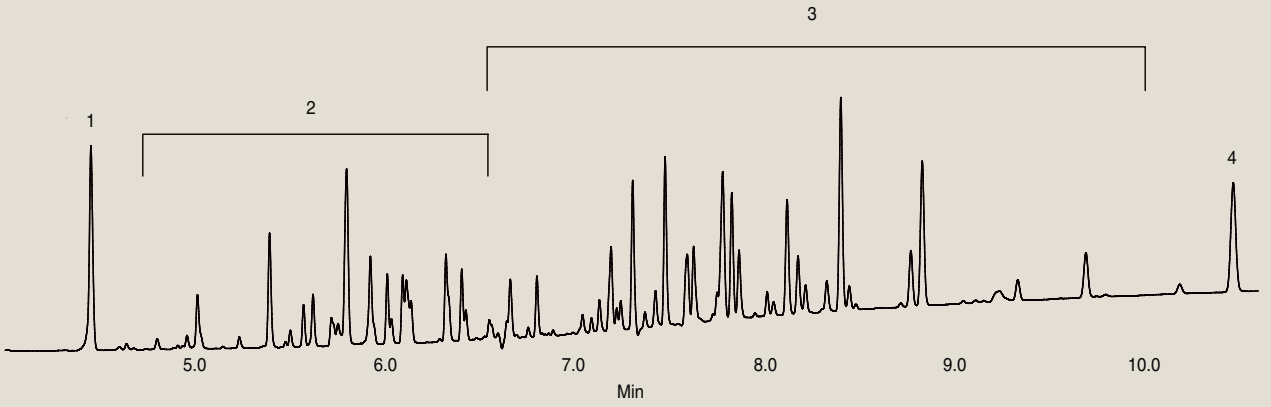


G003897

US EPA Method 8082 PCBs as Aroclors on the Equity-1701

column: Equity-1701, 15 m x 0.10 mm I.D., 0.10 µm (28343-U)
oven: 90 °C, 35 °C/min. to 280 °C (3 min.)
inj.: 250 °C
det.: ECD, 280 °C
carrier gas: hydrogen, 50 cm/sec constant
injection: 2 µL, splitless (0.75 min.)
liner: 4 mm I.D., single taper
sample: Aroclor standard mix 1 (46846-U) diluted to 200 ppb / 20 ppb (Aroclors / surrogates) in n-hexane

1. Tetrachloro-m-xylene (surr.)
2. Aroclor 1016
3. Aroclor 1260
4. Decachlorobiphenyl (surr.)



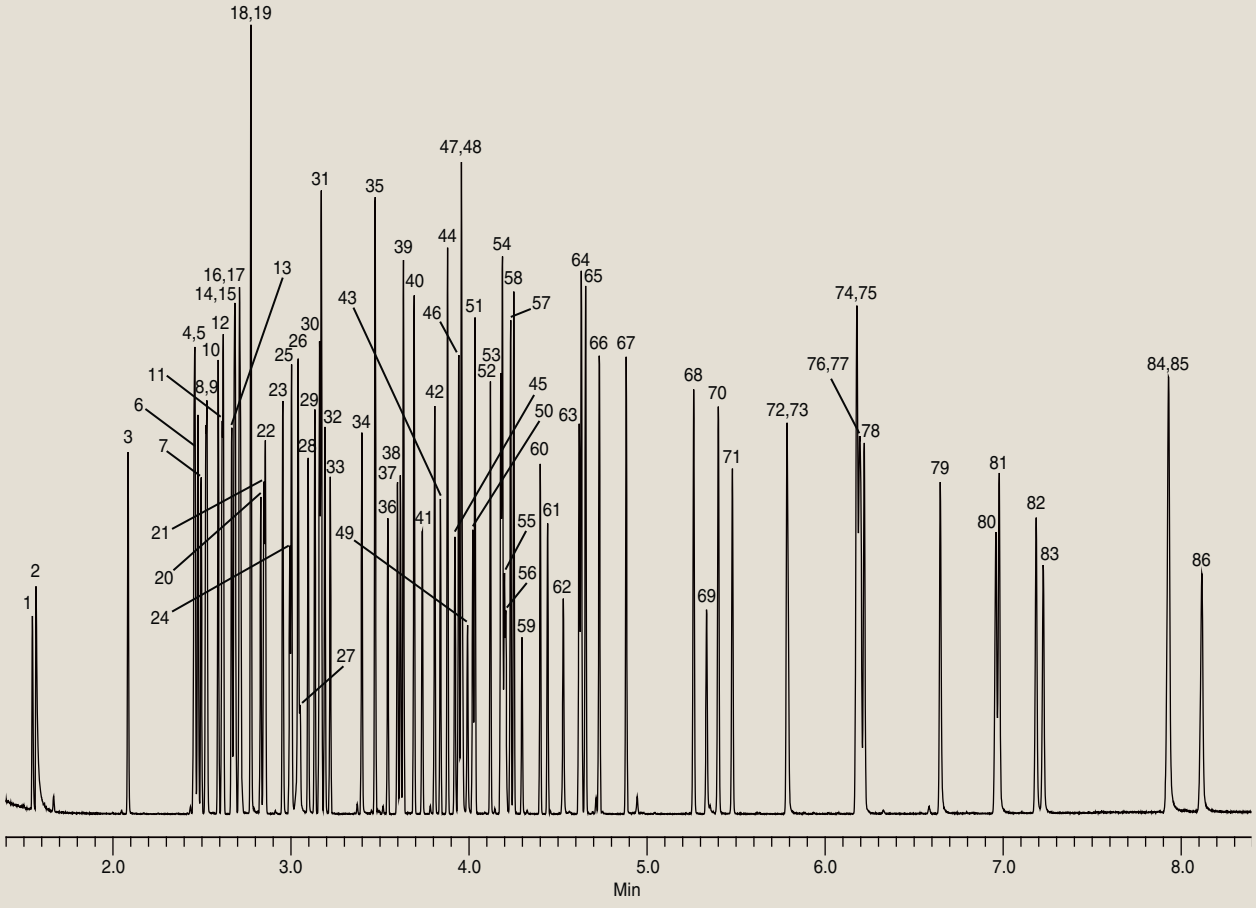
G003881

Semivolatiles

US EPA Method 8270 Semivolatiles on the SLB-5ms (0.18 µm)

column: SLB-5ms, 20 m x 0.18 mm I.D., 0.18 µm (28564-U)
oven: 40 °C (0.7 min.), 55 °C/min. to 240 °C, 28 °C/min. to 330 °C (2 min.)
inj.: 250 °C
MSD interface: 330 °C
scan range: m/z 40-450
carrier gas: helium, 40 cm/sec, constant
injection: 0.5 µL, 10:1 split
liner: 2 mm I.D., fast FocusLiner inlet liner with taper (2879501-U)
sample: 80-component semivolatile standard at 50 ppm plus 6 internal standards (at 40 ppm) in methylene chloride

1. N-nitrosodimethylamine
2. Pyridine
3. 2-Fluorophenol (surr.)
4. Phenol-d_6 (surr.)
5. Phenol
6. Aniline
7. Bis(2-chloroethyl)ether
8. 2-Chlorophenol-d_4 (surr.)
9. 2-Chlorophenol
10. 1,3-Dichlorobenzene
11. 1,4-Dichlorobenzene-d_4 (I.S.)
12. 1,4-Dichlorobenzene
13. Benzyl alcohol
14. 1,2-Dichlorobenzene-d_4 (surr.)
15. 1,2-Dichlorobenzene
16. 2-Methylphenol
17. Bis(2-chloroisopropyl)ether
18. N-nitroso-di-n-propylamine
19. 4-Methylphenol
20. Hexachloroethane
21. Nitrobenzene-d_5 (surr.)
22. Nitrobenzene
23. Isophorone
24. 2-Nitrophenol
25. 2,4-Dimethylphenol
26. Bis(2-chloroethoxy)methane
27. Benzoic acid
28. 2,4-Dichlorophenol
29. 1,2,4-Trichlorobenzene
30. Naphthalene-d_8 (I.S.)
31. Naphthalene
32. 4-Chloroaniline
33. Hexachlorobutadiene
34. 4-Chloro-3-methylphenol
35. 2-Methylnaphthalene
36. Hexachlorocyclopentadiene
37. 2,4,6-Trichlorophenol
38. 2,4,5-Trichlorophenol
39. 2-Fluorobiphenyl (surr.)
40. 2-Chloronaphthalene
41. 2-Nitroaniline
42. Dimethyl phthalate
43. 2,6-Dinitrotoluene
44. Acenaphthylene
45. 3-Nitroaniline
46. Acenaphthene-d_{10} (I.S.)
47. Acenaphthene
48. 2,4-Dinitrophenol
49. 4-Nitrophenol
50. Dibenzofuran
51. 2,4-Dinitrotoluene
52. Diethyl phthalate
53. 4-Chlorophenyl phenyl ether
54. Fluorene
55. 4-Nitroaniline
56. 2-Methyl-4,6-dinitrophenol
57. N-Nitrosodiphenylamine
58. Azobenzene
59. 2,4,6-Tribromophenol (surr.)
60. 4-Bromophenyl phenyl ether
61. Hexachlorobenzene
62. Pentachlorophenol
63. Phenanthrene-d_{10} (I.S.)
64. Phenanthrene
65. Anthracene
66. Carbazole
67. Di-n-butyl phthalate
68. Fluoranthene
69. Benzidine
70. Pyrene
71. Terphenyl-d_{14} (surr.)
72. 3,3'-Dimethylbenzidine
73. Butylbenzyl phthalate
74. 3,3'-Dichlorobenzidine
75. Benzo(a)anthracene
76. Bis(2-ethylhexyl)phthalate
77. Chrysene-d_{12} (I.S.)
78. Chrysene
79. Di-n-octyl phthalate
80. Benzo(b)fluoranthene
81. Benzo(k)fluoranthene
82. Benzo(a)pyrene
83. Perylene-d_{12} (I.S.)
84. Indeno(1,2,3-cd)pyrene
85. Dibenzo(a,h)anthracene
86. Benzo(g,h,i)perylene

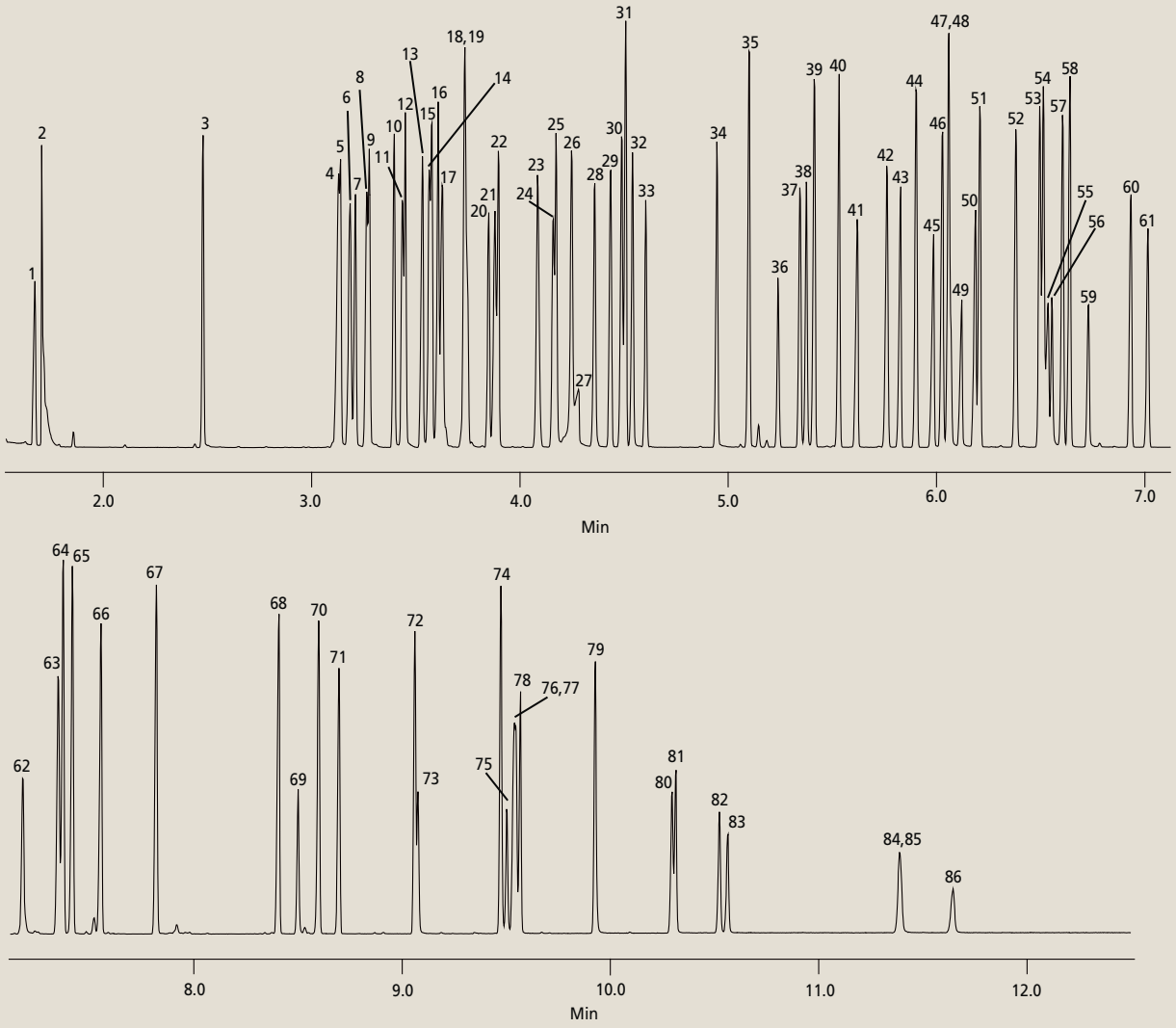


G003739

US EPA Method 8270 Semivolatiles on the SLB-5ms (0.36 µm)

column: SLB-5ms, 20 m x 0.18 mm I.D., 0.36 µm (28576-U)
oven: 50 °C (0.50 min.), 28 °C/min. to 250 °C, 35 °C/min. to 340 °C (5 min.)
inj.: 250 °C
MSD interface: 340 °C
scan range: m/z 40-450
carrier gas: helium, 1.4 mL/min. constant
injection: 0.50 µL, reduced pressure to 20 psi at injection (0.1 min.)
(splitter open at 0.75 min.)
liner: 2 mm I.D., straight
sample: 80-component semivolatile standard at 50 ppm, plus
6 internal standards (at 40 ppm) in methylene chloride

1. N-Nitrosodimethylamine
2. Pyridine
3. 2-Fluorophenol (surr.)
4. Phenol-d_6 (surr.)
5. Phenol
6. Aniline
7. Bis(2-chloroethyl)ether
8. 2-Chlorophenol-d_4 (surr.)
9. 2-Chlorophenol
10. 1,3-Dichlorobenzene
11. 1,4-Dichlorobenzene-d_4 (I.S.)
12. 1,4-Dichlorobenzene
13. Benzyl alcohol
14. 1,2-Dichlorobenzene-d_4 (surr.)
15. 1,2-Dichlorobenzene
16. 2-Methylphenol
17. Bis(2-chloroisopropyl)ether
18. 4-Methylphenol
19. N-Nitroso-di-n-propylamine
20. Hexachloroethane
21. Nitrobenzene-d_5 (surr.)
22. Nitrobenzene
23. Isophorone
24. 2-Nitrophenol
25. 2,4-Dimethylphenol
26. Bis(2-chloroethoxymethane)
27. Benzoic acid
28. 2,4-Dichlorophenol
29. 1,2,4-Trichlorobenzene
30. Naphthalene-d_8 (I.S.)
31. Naphthalene
32. 4-Chloroaniline
33. Hexachlorobutadiene
34. 4-Chloro-3-methylphenol
35. 2-Methylnaphthalene
36. Hexachlorocyclopentadiene
37. 2,4,6-Trichlorophenol
38. 2,4,5-Trichlorophenol
39. 2-Fluorobiphenyl (surr.)
40. 2-Chloronaphthalene
41. 2-Nitroaniline
42. Dimethyl phthalate
43. 2,6-Dinitrotoluene
44. Acenaphthylene
45. 3-Nitroaniline
46. Acenaphthene-d_{10} (I.S.)
47. Acenaphthene
48. 2,4-Dinitrophenol
49. 4-Nitrophenol
50. 2,4-Dinitrotoluene
51. Dibenzofuran
52. Diethyl phthalate
53. 4-Chlorophenyl phenyl ether
54. Fluorene
55. 4-Nitroaniline
56. 2-Methyl-4,6-dinitrophenol
57. N-Nitrosodiphenylamine
58. Azobenzene
59. 2,4,6-Tribromophenol (surr.)
60. 4-Bromophenyl phenyl ether
61. Hexachlorobenzene
62. Pentachlorophenol
63. Phenanthrene-d_{10} (I.S.)
64. Phenanthrene
65. Anthracene
66. Carbazole
67. Di-n-butyl phthalate
68. Fluoranthene
69. Benzidine
70. Pyrene
71. Terphenyl-d_{14} (surr.)
72. Butylbenzyl phthalate
73. 3,3'-Dimethylbenzidine
74. Bis(2-ethylhexyl)phthalate
75. 3,3'-Dichlorobenzidine
76. Benzo(a)anthracene
77. Chrysene-d_{12} (I.S.)
78. Chrysene
79. Di-n-octyl phthalate
80. Benzo(b)fluoranthene
81. Benzo(k)fluoranthene
82. Benzo(a)pyrene
83. Perylene-d_{12} (I.S.)
84. Indeno(1,2,3-cd)pyrene
85. Dibenzo(a,h)anthracene
86. Benzo(g,h,i)perylene



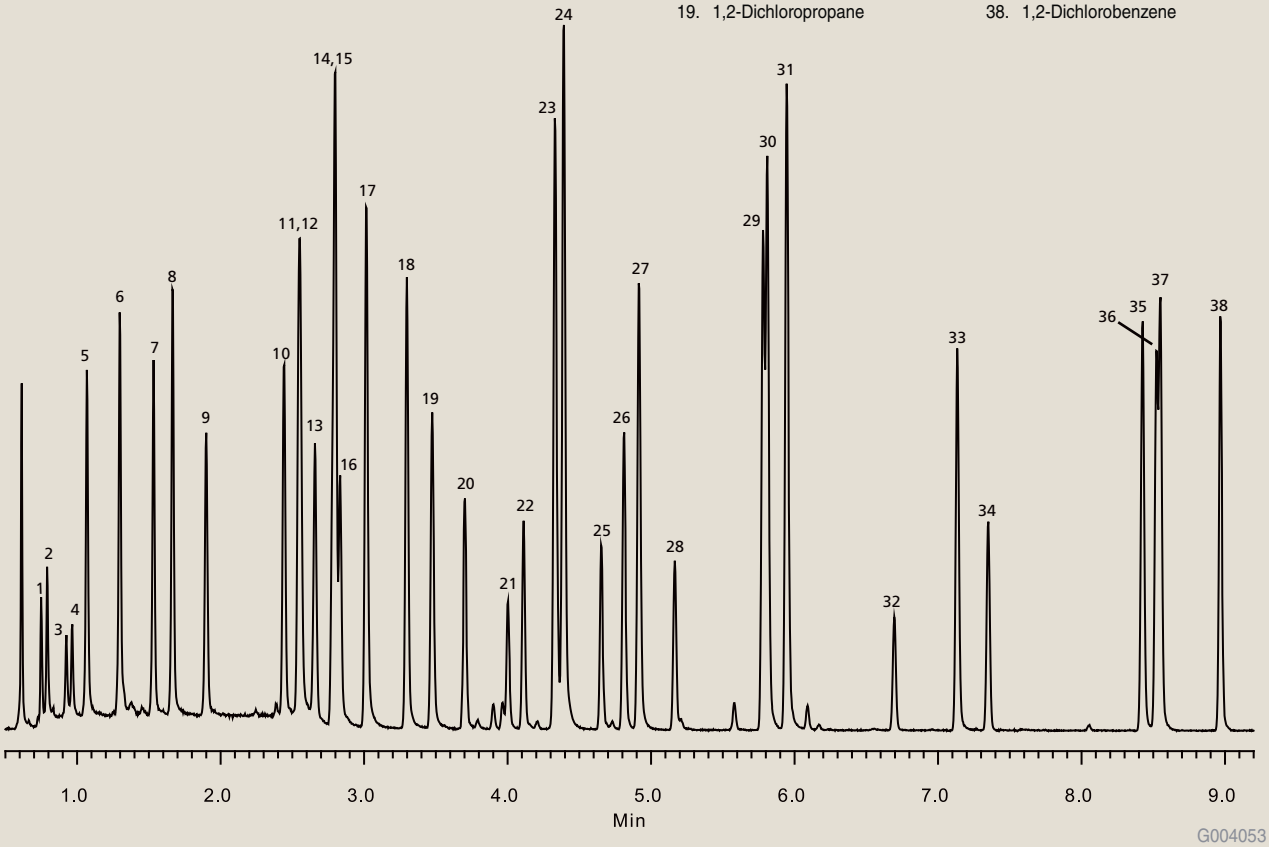
G003901

Volatiles

US EPA Method 624 Volatiles on the SPB-624

sample/matrix:	each analyte at 50 ppb in 5 mL water
purge trap:	VOCARB® 3000 "K" (24940-U)
purge:	40 mL/min. at 25 °C for 11 min.
dry purge:	2 min.
desorption temp.:	210 °C for 2 min.
desorption flow:	150 mL/min.
bake.:	260 °C for 10 min.
transfer line/valve temp.:	110 °C
column:	SPB-624, 20 m x 0.18 mm I.D., 1.0 µm (28662-U)
oven:	40 °C (1 min.), 11 °C/min. to 125 °C, 35 °C/min. to 230 °C (2 min.)
inj.:	150 °C
MSD interface:	200 °C
scan range:	m/z = 35-400
carrier gas:	helium, 1.5 mL/min.
injection:	100:1 split
liner:	0.75 mm I.D. SPME

1. Chloromethane
2. Vinyl Chloride
3. Bromomethane
4. Chloroethane
5. Trichlorofluoromethane
6. 1,1-Dichloroethene
7. Methylene chloride
8. trans-1,2-Dichloroethene
9. 1,1-Dichloroethane
10. Chloroform
11. Dibromofluoromethane (surr.)
12. 1,1,1-Trichloroethane
13. Carbon tetrachloride
14. 1,2-Dichloroethane-d4 (surr.)
15. Benzene
16. 1,2-Dichloroethane
17. Fluorobenzene (I.S.)
18. Trichloroethene
19. 1,2-Dichloropropane
20. Bromodichloromethane
21. 2-Chloroethyl vinyl ether
22. cis-1,3-Dichloropropene
23. Toluene-d8 (surr.)
24. Toluene
25. trans-1,3-Dichloropropene
26. 1,1,2-Trichloroethane
27. Tetrachloroethene
28. Dibromochloromethane
29. Chlorobenzene-d5 (I.S.)
30. Chlorobenzene
31. Ethylbenzene
32. Bromoform
33. 4-Bromofluorobenzene (surr.)
34. 1,1,2,2-Tetrachloroethane
35. 1,3-Dichlorobenzene
36. 1,4-Dichlorobenzene-d4 (I.S.)
37. 1,4-Dichlorobenzene
38. 1,2-Dichlorobenzene

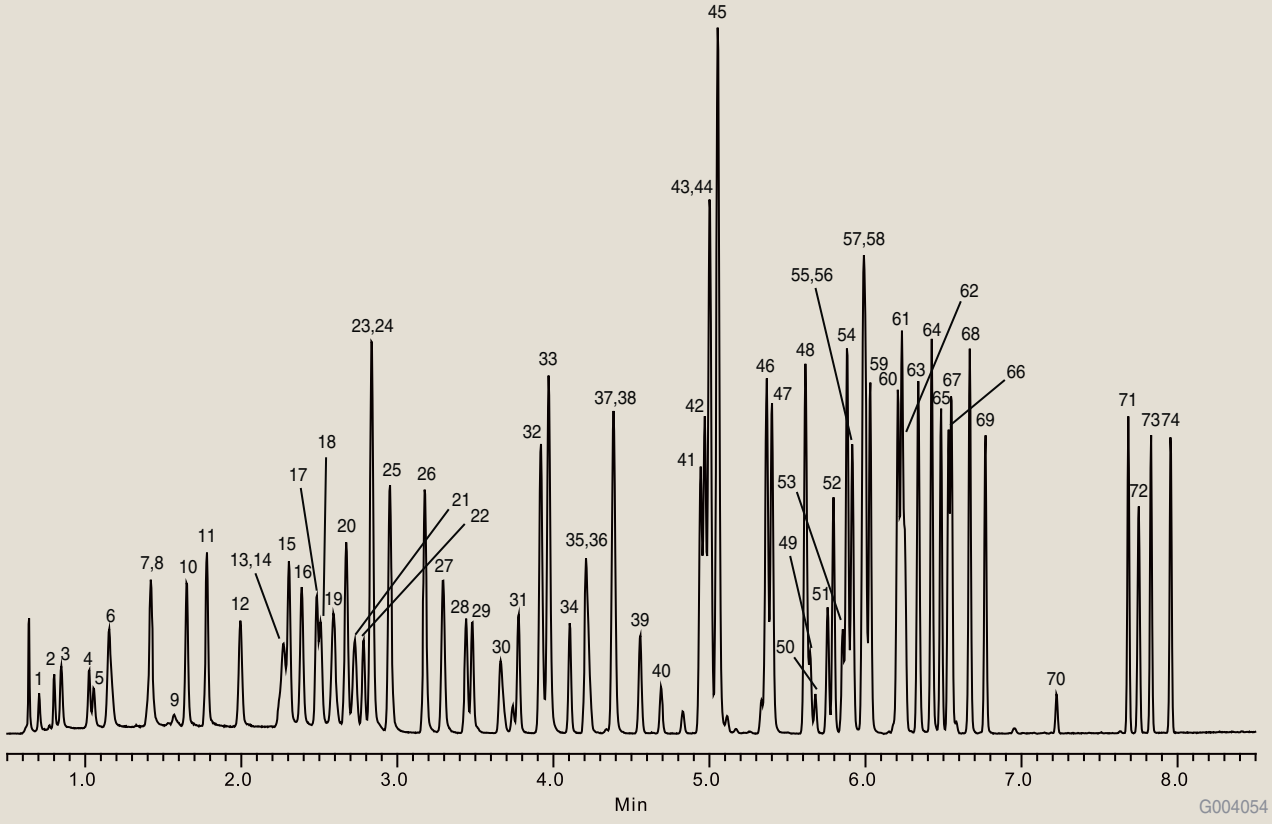


G004053

US EPA Method 8260 Volatiles on the VOCOL

sample/matrix:	each analyte at 50 ppb in 5 mL water
purge trap:	VOCARB 3000 "K" (24940-U)
purge:	40 mL/min. at 25 °C for 11 min.
dry purge:	1 min.
desorption temp.:	210 °C for 1 min.
desorption flow:	150 mL/min.
bake.:	260 °C for 10 min.
transfer line/valve temp.:	110 °C
column:	VOCOL, 20 m x 0.18 mm I.D., 1.0 µm (28463-U)
oven:	40 °C (0.8 min.), 19 °C/min. to 125 °C, 32 °C/min. to 220 °C (1 min.)
inj.:	150 °C
MSD interface:	220 °C
scan range:	m/z = 35-400
carrier gas:	helium, 1.5 mL/min.
injection:	100:1 split
liner:	0.75 mm I.D. SPME

1. Dichlorofluoromethane
2. Chloromethane
3. Vinyl chloride
4. Bromomethane
5. Chloroethane
6. Trichlorofluoromethane
7. Acetone
8. 1,1-Dichloroethene
9. Iodomethane
10. Methylene chloride
11. trans-1,2-Dichloroethene
12. 1,1-Dichloroethane
13. 2-Butanone
14. 2,2-Dichloropropane
15. cis-1,2-Dichloroethene
16. Chloroform
17. Bromochloromethane
18. Dibromofluoromethane (surr.)
19. 1,1,1-Trichloroethane
20. 1,1-Dichloropropene
21. Carbon tetrachloride
22. 1,2-Dichloroethane-d4 (surr.)
23. 1,2-Dichloroethane
24. Benzene
25. Fluorobenzene (I.S.)
26. Trichloroethene
27. 1,2-Dichloropropane
28. Bromodichloromethane
29. Dibromomethane
30. 4-Methyl-2-pentanone
31. cis-1,3-Dichloropropene
32. Toluene-d8 (surr.)
33. Toluene
34. trans-1,3-Dichloropropene
35. 1,1,2-Trichloroethane
36. 2-Hexanone
37. 1,3-Dichloropropane
38. tetrachloroethene
39. Dibromochloromethane
40. 1,2-Dibromomethane
41. Chlorobenzene-d5 (I.S.)
42. Chlorobenzene
43. Ethylbenzene
44. 1,1,1,2-Tetrachloroethane
45. m&p-Xylenes
46. o-Xylene
47. Styrene
48. Isopropylbenzene
49. Bromoform
50. cis-1,4-Dichloro-2-butene
51. 1,1,2,2-Tetrachloroethane
52. 4-Bromofluorobenzene (surr.)
53. 1,2,3-Trichloropropane
54. n-Propylbenzene
55. trans-1,4-Dichloro-2-butene
56. Bromobenzene
57. 1,3,5-Trimethylbenzene
58. o-Chlorotoluene
59. p-Chlorotoluene
60. tert-Butylbenzene
61. 1,2,4-Trimethylbenzene
62. Pentachloroethane
63. sec-Butylbenzene
64. p-Isopropyltoluene
65. 1,3-Tichlorobenzene
66. 1,4-Tichlorobenzene-d4 (I.S.)
67. 1,4-Tichlorobenzene
68. Butylbenzene
69. 1,2-Tichlorobenzene
70. 1,2-Tibromo-3-chloropropane
71. 1,2,4-Trichlorobenzene
72. Hexachlorobutadiene
73. Naphthalene
74. 1,2,3-Trichlorobenzene



Maximize Performance!

GC Accessories and Gas Purification/Management Items

For the practicing gas chromatographer, choosing the correct items when upgrading and replacing parts and accessories for their system can bring on many challenges due to the vast array of commercially available products. At Supelco, we offer our own unique products, as well as products from some of the most trusted names in the industry, to assist in making the selection process easier. Please note that this represents a brief listing of the GC Accessories and Gas Purification/Management products that we offer. For a complete listing, please refer to our catalog and/or web site, sigma-aldrich.com/supelco

Molded Thermogreen™ LB-2 Septa



P001208



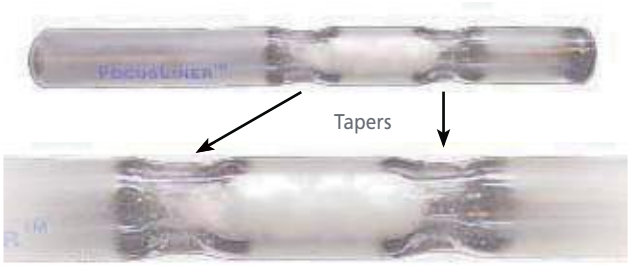
P001227

Molded Thermogreen LB-2 septa are manufactured from high quality, low bleed material using the same exclusive rubber formulation as the popular Thermogreen LB-2 septa. Molded septa offer easier installation and also provide a better seal inside the injection port because every septum conforms to the same mold shape with crisp, clean sides. A version with an injection hole is available, allowing needle penetration through the same location, time after time, reducing septum coring and preventing septum fragments from entering the injection port.

- Ultra low bleed over a wide range of inlet temperatures (100 °C to 350 °C)
- Easier needle penetration and high puncture tolerance
- Already conditioned, ready to use

Description	Pkg	Cat. No.
9.5 mm	50 ea	28670-U
9.5 mm, with injection hole	50 ea	28331-U
10 mm	50 ea	28673-U
10 mm, with injection hole	50 ea	28333-U
11 mm	50 ea	28676-U
11 mm, with injection hole	50 ea	28336-U
Plug (for Shimadzu®)	50 ea	20633

FocusLiner™ Inlet Liners



The use of a wool plug in inlet liners has been used for many years to promote the rapid vaporization of the entire sample, minimize mass discrimination, and prevent non-volatile material from entering the column. FocusLiner inlet liners incorporate a unique design that prevents shifting of the wool plug during repeated injections or sudden inlet pressure changes.

- Typically reduce injection variability by at least 96%
- Provide maximum sensitivity and improved detection levels

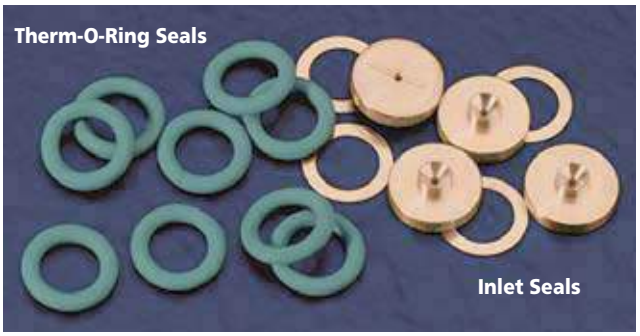
Description	Pkg	Cat. No.
For Agilent® 5890/6890/7890 (78.5 mm x 6.3 mm O.D.)		
Split/splitless, 2.3 mm I.D., wool packed	5 ea	2879605-U
Split/splitless with single taper, 2.3 mm I.D., wool packed	5 ea	2879505-U
For Finnigan		
Same catalog numbers as Agilent		
For PerkinElmer® AutoSystem™ and Clarus® (92 mm x 6.3 mm O.D.)		
Split/splitless, 4 mm I.D., wool packed	5 ea	2879205-U
Split/splitless with single taper, 4 mm I.D., wool packed	5 ea	2879105-U
For Shimadzu® 17A with SPL-17 Injector (95 mm x 5 mm O.D.)		
Split/splitless, 3.4 mm I.D., wool packed	5 ea	2878605-U
Split/splitless with single taper, 3.4 mm I.D., wool packed	5 ea	2878405-U
For Thermo ThermoQuest 8000/TRACE™ (105 mm x 8 mm O.D.)		
Split/splitless with single taper, 5 mm I.D., wool packed	5 ea	2877505-U
For Varian® 1075/1077 Injectors (72 mm x 6.3 mm O.D.)		
Split, 2.3 mm I.D., wool packed	5 ea	2874705-U
For Varian 1078/1079 Injectors (54 mm x 5 mm O.D.)		
Split/splitless with single taper, 3.4 mm I.D., wool packed	5 ea	2875705-U
For Varian CP-1177 Injectors		
Same catalog numbers as Agilent		

Therm-O-Ring™ Seals

Inlet liners used in an Agilent GC require an O-ring placed near the top for proper operation. This O-ring ensures that the only path for carrier gas to get to the outside of the inlet liner is through the grooves in the inlet seal at the bottom of the injection port.

- Fit 6.3 mm, 6.5 mm, or 1/4" O.D. capillary liners that use an O-ring seal
- Can be used with inlet temperatures up to 375 °C without sticking or fragmenting
- Superior replacements for O-rings made from Viton®

Pkg	Cat. No.
10 ea	21003-U
25 ea	21004-U



P000752

Inlet Seals

The inlet seals in an Agilent GC must be regularly changed to prevent sample adsorption due to accumulation of sample residue and/or septum fragments. Supelco manufacturers replacement inlet seals of the highest quality.

- Stainless steel for analyses of non-reactive compounds
- Seals plated with pure gold for applications requiring more inertness
- Cross design intended for high split flows (>200 mL/min.)
- Packs of ten include one washer for each seal

Material	Pkg	Cat. No.
Non-plated	10 ea	23317-U
Gold-plated	10 ea	23319-U
Gold-plated, cross design	10 ea	23415-U

Tubing

Supelco recommends using stainless steel for the most sensitive applications, such as high resolution MS detection. Copper tubing is recommended for all other GC and GC-MS plumbing needs.



P000301

Premium Grade 304 Stainless Steel Tubing

- Virtually impermeable to the diffusion of room air through the tubing walls
- Undergoes a proprietary cleaning procedure to remove all active sites and to ensure inertness

Cleaned Copper Tubing

- Most commonly used tubing for gas chromatography
- Cleaned according to ASTM B-280 plus a proprietary Supelco cleaning procedure

Description	Cat. No.
Premium Grade 304 Stainless Steel Tubing	
50 ft. x 1/4 inch (6.35 mm) O.D. x 0.209 inch (5.3 mm) I.D.	20527
50 ft. x 1/8 inch (3.18 mm) O.D. x 0.085 inch (2.1 mm) I.D.	20526-U
100 ft. x 1/16 inch (1.59 mm) O.D. x 0.030 inch (0.762 mm) I.D.	20553
Cleaned Copper Tubing	
50 ft. x 1/4 inch (6.35 mm) O.D. x 0.190 inch (4.83 mm) I.D.	20489
50 ft. x 1/8 inch (3.18 mm) O.D. x 0.065 inch (1.65 mm) I.D.	20488

Swagelok® Tubing Fittings

Swagelok fittings combine superior design principles with close manufacturing tolerance and rigid quality to provide a leak free connection.



P000252

Description	Cat. No.
Swagelok Fittings Kit	22668-U
Nuts Plus Front and Back Ferrules, brass, 1/8 inch, 10 of each	22014
Tee, brass, 1/8 inch	22020-U
On/off throttling valve, brass, 1/8 inch	22138-U
On/off throttling valve, stainless steel, 1/8 inch	22139-U
Toggle valve, brass, 1/8 inch	22699

Purifiers

Gas purification begins by determining the contaminants that need to be removed from the particular gas stream, levels to which the contaminants must be reduced, flow and pressure needs of the system, and the desired frequency of purifier change-out. Multiple purifiers may be necessary to adequately remove all contaminants to the desired levels to adequately protect the column and detector.

Recommended Purifier Options per Application

Carrier gas: remove hydrocarbons, moisture, and oxygen

- Supelcarb HC, High Capacity Gas Purifier, OMI-2
- Supelcarb HC, Molecular Sieve 5A, Supelpure-O, OMI-2

Compressed air (for FIDs): remove hydrocarbons and moisture

- Supelcarb HC, Molecular Sieve 5A

Hydrogen fuel gas (for FIDs): remove hydrocarbons

- Supelcarb HC

OMI™ (Oxygen Moisture Indicating) Purifier


P000245

- Polishing purifier that removes many contaminants that other upstream purifiers miss
- Simultaneously removes moisture, oxygen, carbon monoxide, carbon dioxide, most sulfur compounds, most halogen compounds, alcohols, and phenols to less than 10 ppb
- Detects moisture and oxygen in hydrogen, helium, nitrogen, argon, and argon/methane

High Capacity Gas Purifier

- Removes moisture, oxygen, carbon monoxide, and carbon dioxide
- No other purifier removes both moisture and oxygen in such large quantities


P000329

Supelcarb™ HC Hydrocarbon Purifier

- Removes hydrocarbons from carrier gas, compressed air, and hydrogen
- Has twice the trapping ability of activated charcoal


P000236

Molecular Sieve 5A Water Vapor Purifier

- Can reduce moisture in the gas stream to final concentrations less than 0.1 ppm
- Also preferred for use on in-house gas lines where moisture content could be high


P000234

Supelpure™-O Oxygen Purifier

- Reduces oxygen to less than 0.5 ppm when the level in the incoming gas does not exceed 10 ppm


P000230

- Oxygen-removing catalyst coated on a molecular sieve, will also trap significant amounts of moisture

Description	Design	Fittings	Cat. No.
Single Bed Purifiers, Indicating			
OMI-2 purifier tube	Inline	n/a	**23906**
OMI-2 holder	Inline	1/8 inch	**23921**
Single Bed Purifiers, Non-Indicating			
High Capacity Gas Purifier, 110 V	Inline	1/8 inch	**23800-U**
High Capacity Gas Purifier, 230 V	Inline	1/8 inch	**23801**
High Capacity replacement purifier tube	Inline	1/8 inch	**22396**
Supelcarb HC hydrocarbon purifier, 120 cc	Inline	1/8 inch	**24448**
Supelcarb HC hydrocarbon purifier, 750 cc	Inline	1/4 inch	**24564**
Molecular Sieve 5A water vapor purifier, 200 cc	Inline	1/8 inch	**20619**
Molecular Sieve 5A water vapor purifier, 750 cc	Inline	1/4 inch	**23991**
Supelpure-O oxygen purifier, 120 cc	Inline	1/8 inch	**22449**
Supelpure-O oxygen purifier, 750 cc	Inline	1/4 inch	**503088**

Gas Generators

Laboratory gas generators are an alternative to gas cylinders. In addition to being a much more sensible source of gas from a cost standpoint, generators are safer, cosmetically better, take up less space, and do not require the labor needed to transport bulky cylinders in the lab. Supelco offers gas generators from Parker domnick hunter. These items can be viewed by referring to our catalog and/or our web site, sigma-aldrich.com/supelco

Norgren Particle and Oil Filters

Norgren filters are designed to remove solid and liquid particles as small as 5 µm in diameter, such as dust particles and/or oils released from an air compressor, preventing damage to any downstream gas generator. These items can be viewed by referring to our catalog and/or our web site, sigma-aldrich.com/supelco

Fast GC Literature From Sigma-Aldrich/Supelco

Reporter Articles (available at sigma-aldrich.com/thereporter)

- The Derivatization and Analysis of Amino Acids by GC-MS (Vol. 25.3, page 17)
- Analysis of Adulterated Lemon Essential Oil on the SLB-5ms (Vol. 24.5, page 16)
- SLB-5ms Fast GC Columns for Semivolatile Analysis (Vol. 24.4, page 12)
- New Regulation Requires Trans Fat Content to be Listed on Food Labels (Vol. 24.1, page 5)
- Fast Analysis of Fish Oils and Animal Lipids on the SUPELCOWAX 10 Column (Vol. 22.4, page 1)
- Fast GC Analysis of Bacterial Acid Methyl Esters (BAMEs) on Equity-1 Columns (Vol. 22.2, page 6)

Tradeshow Poster Transcripts

- Comparison of Capillary Columns for FAME Analysis (T407046)
- Fast GC Using Narrow Bore Capillary Columns (T407020)
- Fast GC in Environmental Analysis (T406106)
- New Capillary Columns for Fast Trans and Omega 3 and 6 FAME Analyses (T406098)
- Trans FAME Analysis Using High Speed GC (T405073)
- Fast GC Using 100 µm I.D. Capillary Columns (T403138)

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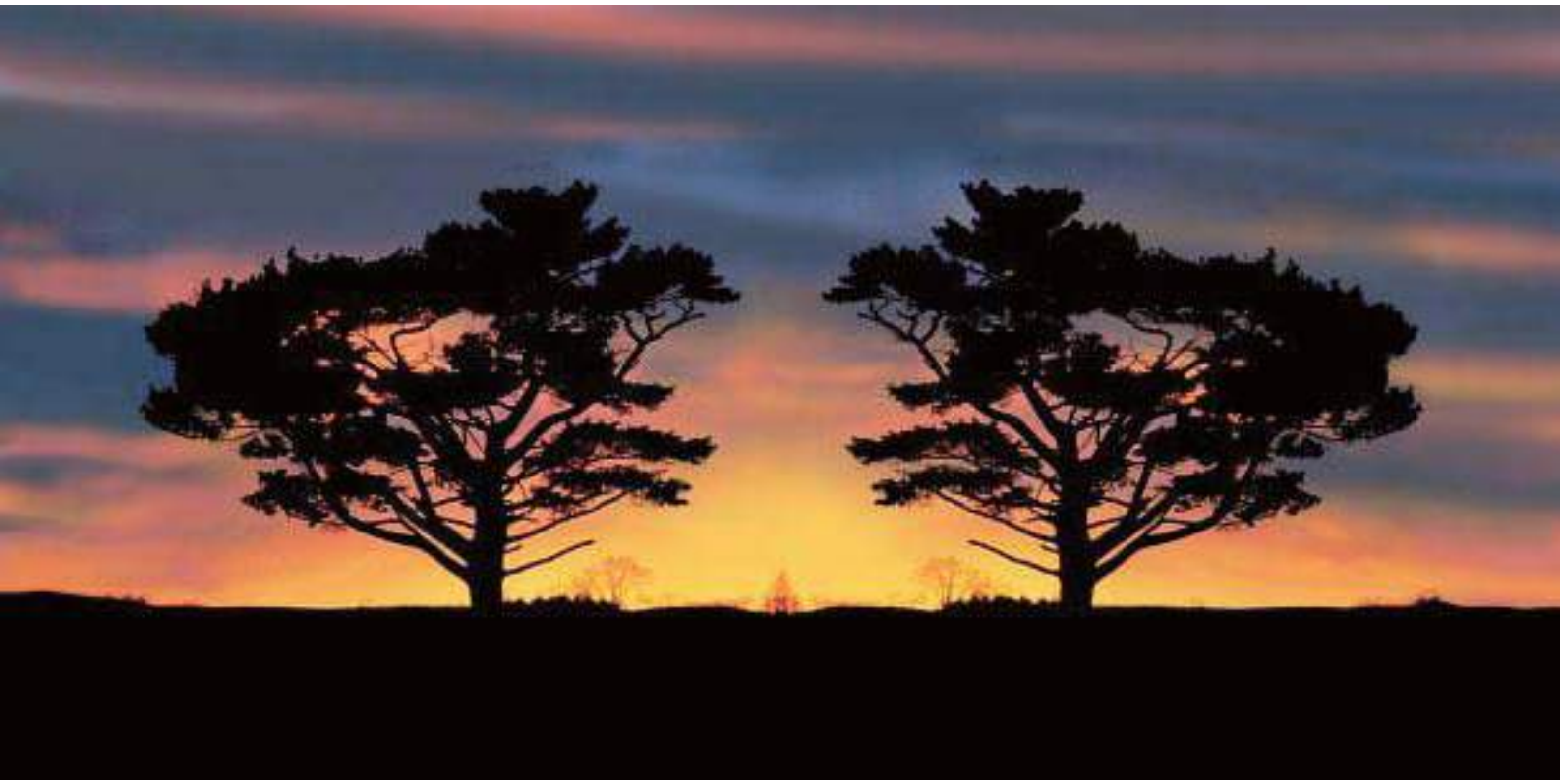
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JTW
T407096A

Chiral Cyclodextrin Capillary GC Columns



895-0008

A Selection Guide to DEX™ Columns

Stable derivatized cyclodextrin stationary phases for high resolution analyses of optical and positional isomers.

- Low bleed, wide temperature range (30°C - 240/250°C)
- Individually tested with phase-specific test mixes to guarantee optimum performance
- Wide range of applications: foods, flavors, essential oils, natural products, pharmaceuticals, chemical syntheses

SUPELCO

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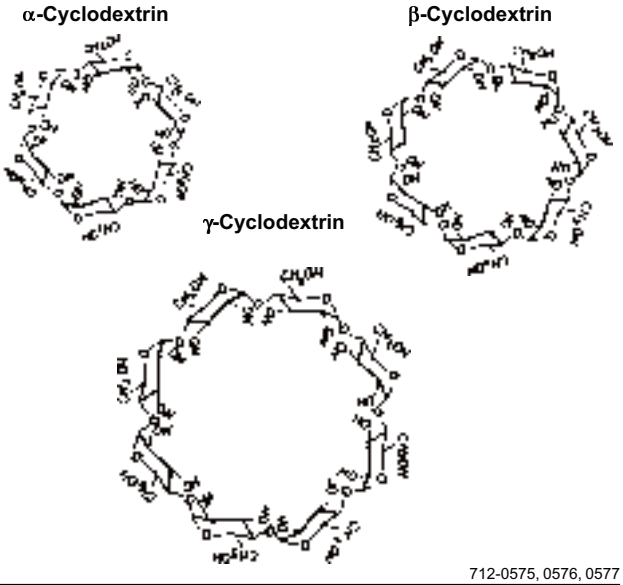
Chiral molecules can elicit very different responses in a biological system, depending on their stereochemistry (1,2). Rapid commercial introduction of optically active drugs requires reliable stereochemical analysis of the products, and of the chiral intermediates used in their synthesis. Capillary gas chromatography is a simple, fast, accurate, sensitive, and reproducible technique for separating stereo and positional isomers of compounds that can be vaporized without decomposition. Chiral separations have been performed by gas chromatography for nearly three decades (3). First generation chiral GC columns were based on nonbonded and bonded amino acid moieties (4); the latest capillary GC columns are based on functionalized cyclodextrins (5,6).

Key Words:
● chiral compounds ● cyclodextrins

Cyclodextrins

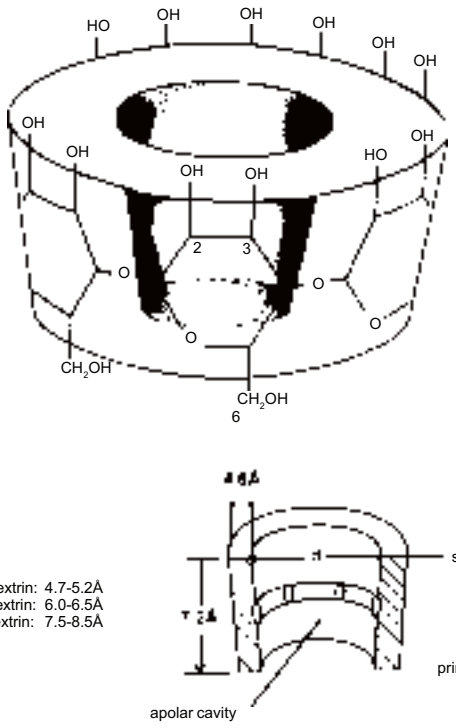
Cyclodextrins (CDs) are cyclic, chiral, torus-shaped macromolecules composed of 6 or more D(+)-glucose residues bonded through α-(1-4) glycosidic linkage. CDs are classified by the number of glucose residues they contain; α-CDs contain 6 residues (cyclohexaamylose), β-CDs contain 7 (cycloheptaamylose), and γ-CDs contain 8 (cyclooctaamylose) (Figure A). The mouth of the torus-shaped CD molecule has a larger circumference than the base and is linked to secondary hydroxyl groups of the C_2 and C_3 atoms of each glucose unit (Figure B). The primary hydroxyl groups are located at the base of the torus, on the C_6 atoms. Free to rotate, they partially block the base. The size of the cavity increases with increasing number of glucose units, from 4.7-5.2Å for α-CD to 6.0-6.5Å for β-CD to 7.5-8.5Å for γ-CD. The hydroxyl groups in the glucose units can be selectively functionalized to provide various physical properties and inclusion selectivities.

Figure A. Cyclodextrins (approx. to scale)



712-0575, 0576, 0577

Figure B. Cyclodextrin: Molecular Model



Cross section through the cone of α-, β-, or γ-cyclodextrin (6, 7, or 8 glucose units) with the hydroxyl groups outside the cavity and the ring of glycosidic oxygens -O- inside.

712-0090,93-9512

In the last few years enantiomers have been chromatographically separated by using peralkylated α-, β-, and γ-CD dissolved in polysiloxanes and coated within glass or fused silica capillary tubing (5,6). Without the cyclodextrin derivative, no enantiomeric selectivity is exhibited. Enantiomers of polar compounds (e.g., alcohols, diols, carboxylic acids) can be separated without previous derivatization on inert fused silica tubing coated with cyclodextrin/polysiloxane phases. Moreover, racemic alkanes and cycloalkanes are separated by such phases. Consequently, cyclodextrin stationary phases have broadened the capabilities of chiral separations into the fields of agriculture, foods, flavors, beverages, environmental samples, petrochemicals, chemicals and natural products.

DEX Columns

α-DEX, β-DEX, and γ-DEX columns are Supelco's new generation of selective, fused silica capillary columns, capable of efficiently separating both optical and positional isomers. We prepare these columns by adding permethylated α-CD (α-DEX), β-CD (β-DEX), or γ-CD (γ-DEX) to a phenyl-containing polysiloxane stationary cophase. From extensive research, SPB™-35 was selected as the cophase, because of its wide operating temperature range, its propensity for dissolving permethylated CDs, and its stability against oxidation. The DEX column name denotes both the type of CD and the amount of CD in the polysiloxane (weight percent). For example, α-DEX 110 denotes 10% α-CD and β-DEX 120 denotes 20% β-CD.

DEX columns make it possible to separate chiral compounds without derivatization – enantiomers and positional isomers are separated by slight differences associated with forming reversible inclusion complexes in the cavities of the functionalized CDs. DEX columns are useful for determining the enantiomeric excess of an enantiomer in a reaction mixture or product, or for identifying impurities in a sample. Not all racemates will separate on a single DEX column. In fact, it is difficult to predict exactly which phase will best separate a particular compound, but some general guidelines are available (Table 1).

Therefore, we offer a variety of α-DEX, β-DEX, and γ-DEX columns, which differ in enantioselectivity, efficiency, and sample capacity, due to differences in:

- the size of the CD inclusion cavity
- the percentage of CD (10% or 20% from stock, 1-30% available)
- column length (30m or 60m from stock, 5-100m available)
- column diameter (0.25mm or 0.53mm ID from stock, 0.10-0.53mm ID available)

Table 1. Enantiomeric Separations Achieved with DEX Columns

DEX Column	Probability of Achieving Separation	Compounds Separated
α-DEX 120	40-50%	alcohols, diols, epoxides, ethers, halohydrocarbons, ketones, positional isomers
β-DEX 110 β-DEX 120	80-90%	acids, amines, alcohols, diols, esters, ethers, halohydrocarbons, hydrocarbons, ketones, positional isomers, silanes, terpenes, terpineols
γ-DEX 120	40-50%	acids, amines, esters, halohydrocarbons, ketones, positional isomers

α-DEX 120 Columns

A small internal cavity in the permethylated α-cyclodextrin generates the molecule's rigid nature and unique chiral selectivities. These columns have a high shape selectivity for positional isomers (e.g., xylenes, menthols, cresols, substituted-phenols, substituted benzenes) and epoxide enantiomers.

β-DEX 110 and β-DEX 120 Columns

The permethylated β-CD in β-DEX columns is unique because it contains an odd number (7) of glucose units. This asymmetrical geometry allows β-DEX columns to distinguish between the enantiomers of a large number of analytes. A β-DEX column is the first column of choice for separating any enantiomeric pair.

γ-DEX 120 Columns

Of the three cyclodextrins, the permethylated γ-CD in γ-DEX 120 columns has the largest cavity. This makes the γ-CD molecule more flexible and less selective in differentiating most enantiomers. Still, some large analytes (e.g., α-BHC, carvone, carboxylic acids, methamphetamine) show the greatest enantiomeric differentiation on a γ-DEX 120 column.

Because the permethylated CDs are not bonded to the polysiloxane cophase, DEX columns should not be rinsed with organic solvents. Solvents in the sample (less than 5µL) will not affect the columns.

For additional protection connect a 1-5m deactivated guard column to the inlet of the DEX column, via a GlasSeal™ connector (Cat. No. 2-0479).

The derivatized cyclodextrin in the phase makes it possible to have chromatographic separations below the melting point of the polysiloxane. To ensure reproducible retention times and enantioselectivity, however, we recommend raising the column temperature to the preliminary conditioning temperature (Table 2) for 5-10 minutes before each analysis. This is especially important with α-DEX columns, because the phase begins to solidify if the column is held below 50°C for 15 minutes. All DEX columns can be programmed to 250°C for short periods. The minimum and maximum operating temperatures are used in the examples in Figures C and D.

Table 2. Temperature Limits for DEX Columns

Column	Minimum	Temperature Preliminary Conditioning	Maximum*
α-DEX 120	30°C	220°C	240°C/250°C
β-DEX 110	30°C	170°C	240°C/250°C
β-DEX 120	30°C	170°C	240°C/250°C
γ-DEX 120	30°C	120°C	240°C/250°C

*Isothermal/programmed.

Figure C. (±)2-Butanol at 30°C (minimum temperature for DEX columns)

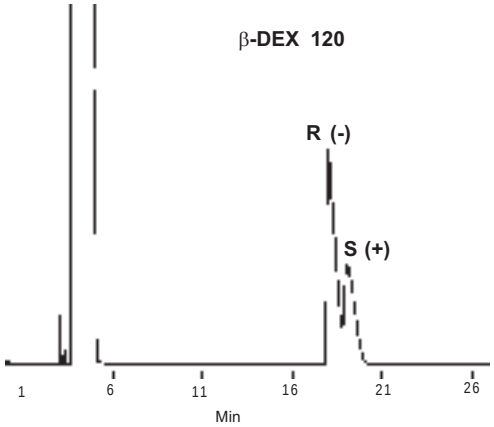
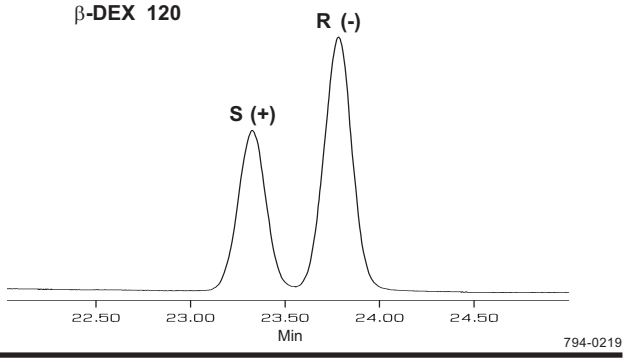


Figure D. (±)2,2,2-Trifluoro-1-(9-anthryl)ethanol at 240°C (maximum temperature for DEX columns)



Chiral Test Mixes

Each DEX column is individually tested with an appropriate isothermal test mix, to guarantee consistent column performance and provide reference values for future monitoring by the analyst. The components of each mix were chosen to monitor specific column performance parameters (Table 3). By using the test mix periodically, an analyst can monitor inertness, film thickness, chiral resolution, and efficiency.

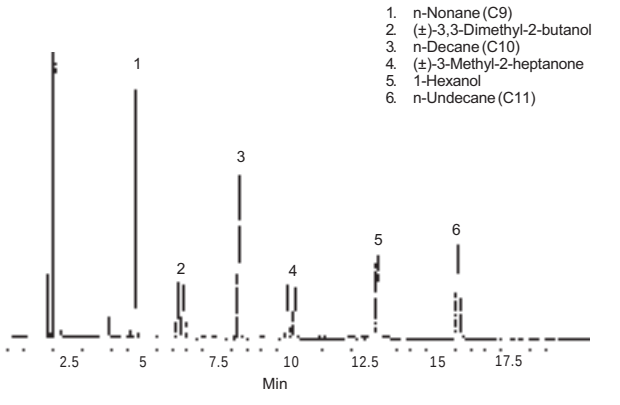
Table 3. Test Mix Components

Component	Column Performance Monitored
normal alkanes	column efficiency (as theoretical plates/m) film thickness (as retention factor, k') retention index standards
optical isomers	enantioselectivity (as α value) retention index markers
positional isomers	shape selectivity (as α value)

The β-DEX Column Isothermal Test Mix (Cat. No. 4-8028) is formulated for monitoring the performance of β-DEX columns. The elution order of the components of this mix are shown in Figure E. The α-DEX Column Isothermal Test Mix (Cat. No. 4-8013) is similar to the β-DEX test mix. Separation factors (α values) are calculated for the racemic compound, (+/-)-1,2-propanediol, to monitor column enantioselectivity and for m- and p-xylene, to monitor column shape selectivity. Analysis of the α-DEX test mix on an α-DEX 120 column is shown in Figure F. The γ-DEX Column Isothermal Test Mix (Cat. No. 4-7898) was designed for evaluating the same performance parameters as the α-DEX test mix (Figure G). Shape selectivity of a γ-DEX column can be monitored by measuring the separation factor (α value) for 1,4- and 1,3-dichlorobenzene. Enantioselectivity (α value) can be monitored by observing the chiral separation of (+/-)-2-ethylhexanoic acid. A programmed test mix will provide a more stringent test of column performance (Figure H).

Figure E. β-DEX Column: Isothermal Test Mix

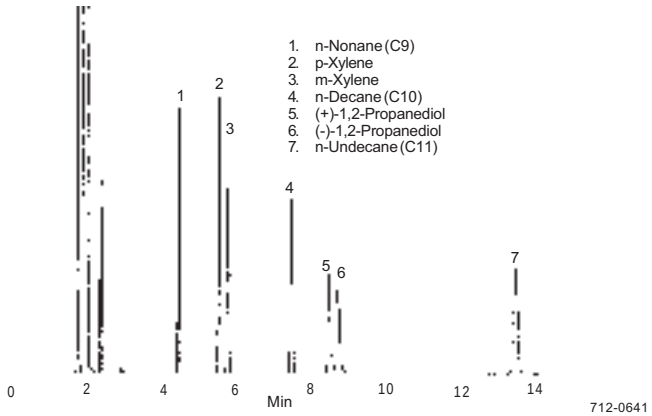
Column: **β-DEX 120 (separation shown) or β-DEX 110,** 30m or 60m x 0.25mm ID, 0.25µm film
Oven: 75°C (β-DEX 110) or 80°C (β-DEX 120)
Carrier: helium, 30cm/sec (30m columns) or 20cm/sec (60m columns)
Det.: FID, 300°C
Inj.: 1µL test mix (Cat. No. 4-8028, 0.5mg/mL each analyte in methylene chloride), split (100:1), 220°C



795-0637

Figure F. α-DEX Column: Isothermal Test Mix

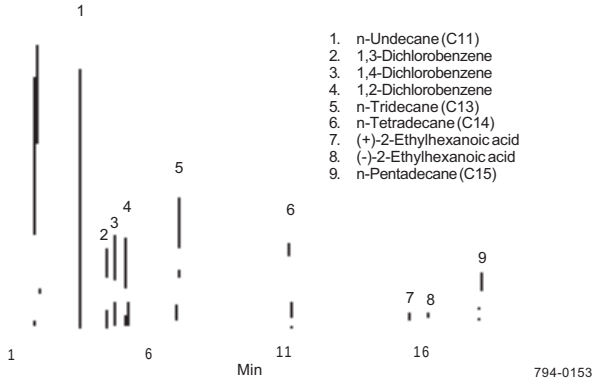
Column: **α-DEX 120,** 30m x 0.25mm ID, 0.25µm film
Oven: 80°C
Carrier: helium, 30cm/sec
Det.: FID, 300°C
Inj.: 1µL test mix (Cat. No. 4-8013, 0.5mg/mL each analyte in methylene chloride), split (100:1), 220°C



712-0641

Figure G. γ-DEX Column: Isothermal Test Mix

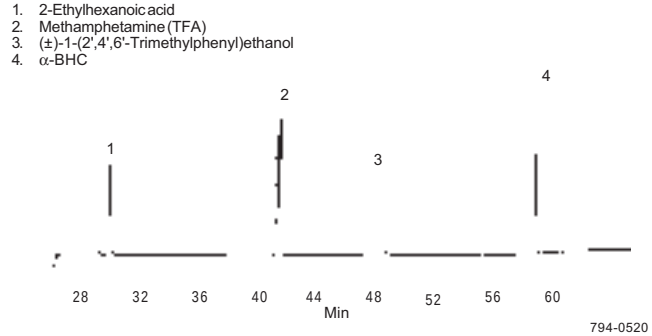
Column: **γ-DEX 120,** 30m x 0.25mm ID, 0.25µm film
Oven: 125°C
Carrier: helium, 30cm/sec
Det.: FID, 300°C
Inj.: 1µL test mix (Cat. No. 4-7898, 0.5mg/mL each analyte in methylene chloride), split (100:1), 220°C



794-0153

Figure H. γ-DEX Column: Temperature Programmed Test Mix

Column: **γ-DEX 120,** 30m x 0.25mm ID, 0.25µm film
Oven: 90°C to 135°C at 1°C/min, then to 240°C at 5°C/min
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride containing 0.5mg/mL each analyte, split (100:1), 300°C



794-0520

Enantioselectivity (α) and Temperature

The GC oven temperature plays an important role in tuning the enantioselectivity (separation factor) of analytes on DEX columns. As depicted in Figure I, decreasing the isothermal temperature increases the separation of enantiomers (higher α values). When conditions yield poor separation of enantiomers, or no separation, reducing the analysis temperature might provide a satisfactory separation.

CD Content

The amount of cyclodextrin in the stationary phase affects the enantioselectivity and polarity of DEX columns. Enantioselectivity increases with higher percentages of CD (Figure J). Increasing the CD content also increases the polarity of the stationary phase. When the CD content is increased from 10% to 20%, 1-hexanol is retained longer, relative to the C10 and C11 hydrocarbons (Figure E).

We offer β-DEX columns with two levels of permethylated CD (10% and 20%) to provide columns that give similar enantiomeric separations, but different polarities. In some cases, the elution order of chiral and achiral components can be changed by connecting a conventional column of lower or higher polarity to the inlet of a DEX column (e.g., connect a SUPELCOWAX™ 10 column to a β-DEX 120 column).

Column Diameter (ID) and Resolution

Decreasing the internal diameter (ID) of DEX columns increases enantiomer resolution, while leaving separation factors (α values) unaffected (Table 4). To balance sample loading capacity and enantiomer resolution, you will find DEX columns of 0.25mm ID ideal for most separations. Custom-prepared 0.10mm ID DEX columns provide the highest resolution, but the lowest sample capacity. Because the opposite is true for 0.53mm ID DEX columns, the latter are best suited for semi-preparative separations (Figure K).

Applications

DEX columns are useful for separating a wide variety of optical isomers: pharmaceuticals, natural products, foods, flavors, agricultural, environmental and biological samples, synthesized asymmetric molecules, etc. (Tables 5, 6, and 7). DEX columns also effectively separate positional isomers.

Chiral Synthesis

In asymmetric synthesis using catalysts, it is important to determine the enantiomeric excess (ee) of products in the reaction mixture before doing any purification which might distort the ee value. Using DEX columns, ee or chiral purity can be determined directly, without sample modification or pretreatment.

Pharmaceuticals

Because enantiomers can have radically different potency and toxicity, single enantiomeric forms of drugs are being targeted by pharmaceutical manufacturers. DEX columns simplify the task of determining enantiomeric purity of pharmaceutical precursors, intermediates, and final products.

Foods, Flavors, and Fragrances

Individual enantiomers usually have significantly different odor and taste. Using DEX columns, analysts can detect adulteration of natural products, flavors in juices, and food additives. Extracts of caraway seed, mushrooms, citrus oils, pine oils and plant oils (obtained by solid phase microextraction) show the versatility of DEX columns for enantiomeric identification (7).

Figure I. Decreasing the (Isothermal) Temperature Increases Enantiomer Separation

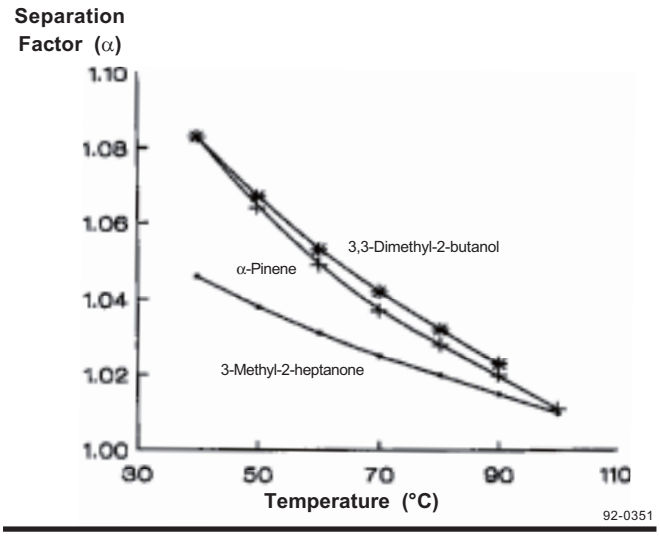


Figure J. Increasing the Cyclodextrin Percentage Increases Enantiomer Separation

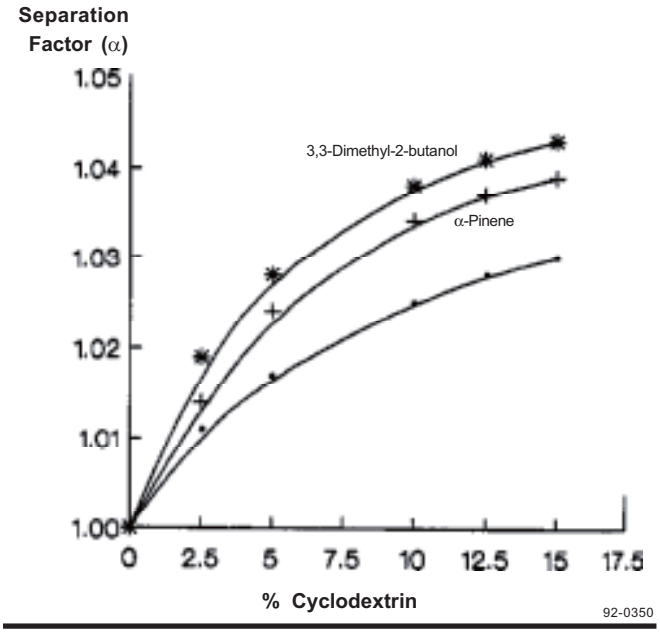


Table 4. Enantioselectivity (α) and Chiral Resolution (Rs) as Functions of Column ID*

	Test Compound					
	(+/-)-3,3-Dimethyl-2-butanol		(+/-)-α-Pinene		(+/-)-3-Methyl-2-heptanone	
Column ID	α	Rs	α	Rs	α	Rs
0.10mm	1.037	1.89	1.031	2.28	1.021	1.84
0.20mm	1.037	1.35	1.031	1.70	1.021	1.47
0.32mm	1.036	0.98	1.030	1.10	1.021	1.01
0.53mm	1.037	0.70	1.033	0.84	1.023	0.80

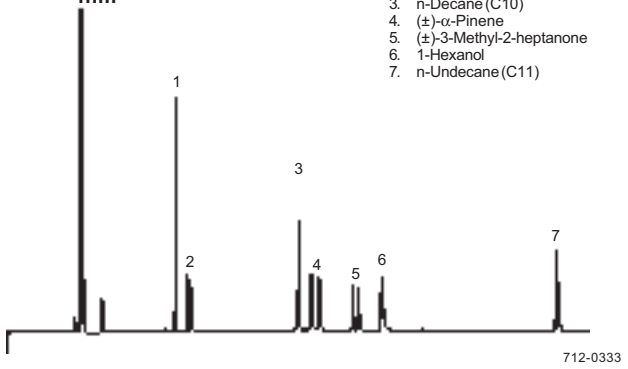
*β-DEX 110 columns (phase ratio = 250); 75°C; helium carrier.

Figure K. Decreasing Column ID Increases Enantiomer Resolution without Affecting Separation Factors*

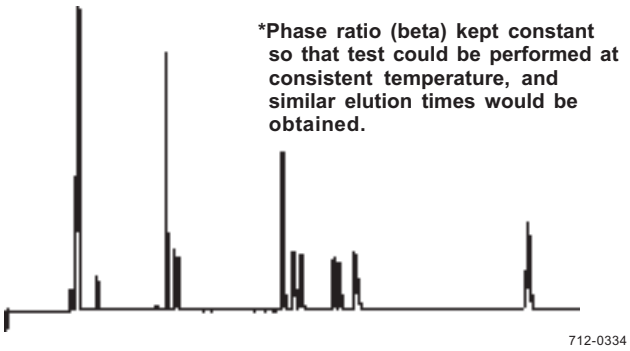
Columns: β-**DEX 110, 30m**
Oven: 75°C
Carrier: helium, 30cm/sec
Det.: FID, 300°C
Inj.: 1µL, 0.5mg/mL each analyte in methylene chloride), split (100:1), 220°C

1. n-Nonane (C9)
2. (±)-3,3-Dimethyl-2-butanol
3. n-Decane (C10)
4. (±)-α-Pinene
5. (±)-3-Methyl-2-heptanone
6. 1-Hexanol
7. n-Undecane (C11)

100µm ID, 0.10µm film

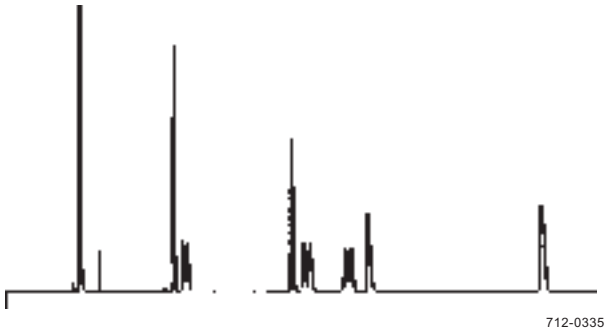


200µm ID, 0.20µm film

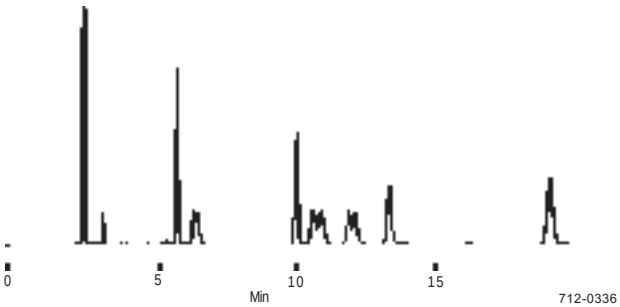


***Phase ratio (beta) kept constant so that test could be performed at consistent temperature, and similar elution times would be obtained.**

320µm ID, 0.32µm film



530µm ID, 0.53µm film



Environmental Applications

Currently, few organic compounds that are classified as environmental pollutants exhibit chirality (8) . However, many exist as positional isomers that are often almost as difficult to separate (see α-BHC in Figure H). Separations of benzene, toluene, ethylbenzene, and the 3 xylenes, to detect leaking underground storage tanks (UST), and of positional isomers of dichlorobenzene, cresol, and dichlorophenol are examples of analyses involving difficult-to-resolve positional isomers.

Silicon Compounds

The importance of silicon chemistry in organic synthesis is increasing. DEX columns have been used successfully to separate several asymmetric silane racemates (Table 6) (9).

Industrial Chemicals

Characterization of large-scale industrial achiral chemicals requires the separation of low level impurities with boiling points close to that of the target product. Positional isomers are typically the most difficult to separate. α-DEX 120 columns have proven useful for separating positional isomers of xylenes, divinylbenzenes, chlorinated phenols, cresols, and chlorinated benzenes. Xylene isomers can be separated on these columns regardless of their relative concentrations.

Natural Products

Using a new sample preparation technique, solid phase microextraction (SPME), chiral and nonchiral volatile flavor and fragrance components can be extracted from natural products and essential oils (10).

Reversal of Enantioselectivity with DEX Columns

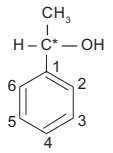
When determining optical purity with one enantiomer in large excess relative to the other, it is generally better to have the less concentrated enantiomer elute first. The enantiomer in excess frequently produces a large tailing peak that could overlap a smaller, later-eluting peak. Reversing the elution order of two enantiomers (enantio-reversal) also is useful in confirming separations and in mechanistics studies.

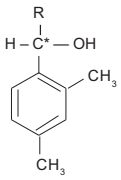
In some cases, enantio-reversal can be achieved by changing columns, such as from α-DEX to β-DEX or γ-DEX (7, 8, 10). For example, carvone enantiomers are separated in reversed order on α-DEX and γ-DEX columns, and coelute on β-DEX columns. Additional examples of enantio-reversal (α-BHC, alcohols, methyl mandelate) are listed in Table 7.

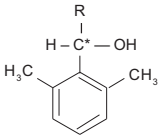
Separation Mechanism

The mechanism by which permethylated cyclodextrin columns separate enantiomers is not fully understood. Separations are, in part, due to the formation of geometrically dissimilar cyclodextrin inclusion complexes. Hydrogen bonding interactions are also involved in the enantioselectivity (Tables 5 and 7). It has been postulated that the number of glucose units (and whether an even or odd number) and the cyclodextrin cavity size play critical roles in differentially interacting with enantiomers. This can be visualized, for example, when one enantiomer predominantly forms an asymmetrical inclusion complex within the β-CD cavity. The other enantiomer, forced by geometrical constraints to form a completely different complex, begins to separate from the first enantiomer as a result of the differences in time spent by each in interacting with the β-CD macromolecule.

Table 5. Enantioselectivity of Substituted Phenyl Alcohols

Compound		Separation Factor (α) at 110°C α-DEX 120	β-DEX 120	γ-DEX 120
1-phenylethanol		NS*	1.065	1.015
1-(2-methylphenyl)ethanol		1.022	1.194	1.032
1-(4-methylphenyl)ethanol		NS	1.088	1.036
1-(2,4-dimethylphenyl)ethanol		1.014	1.273	1.102
1-(2,5-dimethylphenyl)ethanol		1.038	1.230	1.058
1-(2,6-dimethylphenyl)ethanol		1.111	1.191	1.035
1-(3,4-dimethylphenyl)ethanol		NS	1.043	1.026
1-(3,5-bis[trifluoromethyl]phenyl)ethanol		1.017	1.117	1.008

α-alkyl(2,4-dimethylbenzyl) alcohol alkyl (R) =		Separation Factor (α) at 140°C α-DEX 120	β-DEX 120	γ-DEX 120
-methyl**		1.012	1.125	1.043
-butyl		1.011	1.020	1.007
-isobutyl		1.015	1.059	1.032
-t-butyl		1.013	1.105	1.038
-pentyl		NS	NS	1.006
-hexyl		1.008	NS	1.008
-heptyl		1.003	1.013	1.083

α-alkyl(2,6-dimethylbenzyl) alcohol alkyl (R) =		Separation Factor (α) at 140°C α-DEX 120	β-DEX 120	γ-DEX 120
-methyl***		1.072	1.110	1.020
-butyl		NS	1.036	NS
-isobutyl		NS	1.032	1.034
-t-butyl		NS	1.113	1.024
-pentyl		NS	1.038	NS
-hexyl		1.008	1.072	NS
-heptyl		1.002	1.083	1.010
-neopentyl		1.013	1.092	NS

Carrier: helium, 20cm/sec, 70cc/min splitter vent flow
Detector: FID (4 x 10^{-11} AFS), 250°C
Injection: 1µL (0.1-0.5mg/mL each analyte), split (100:1), 250°C

*NS – no observable separation

**1-(2,4-dimethylphenyl)ethanol

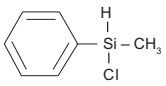
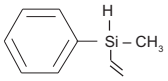
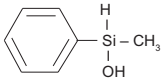
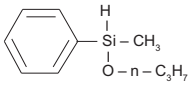
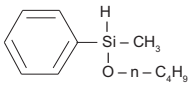
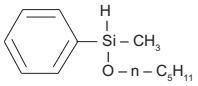
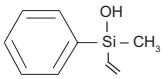
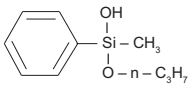
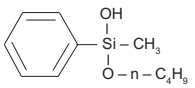
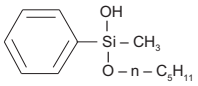
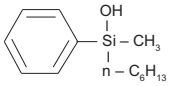
***1-(2,6-dimethylphenyl)ethanol

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Table 6. Chiral Silanes

Compound	Structure	Col. Temp.	α value• and (k'$_1$) α-DEX 110	β-DEX 110	γ-DEX 110
Phenylmethylchlorosilane (Chloromethylphenylsilane)		70°C	NS* (10.3)	NS (11.4)	1.006 (10.9)
Phenylmethylvinylsilane (Methylphenylvinylsilane)		70°C	NS (9.1)	1.012 (9.5)	NS (9.5)
Phenylmethylhydroxysilane (Methylphenylsilanol)		100°C	1.015 (9.0)	1.084 (13.5)	1.015 (10.4)
Phenylmethylpropoxysilane (Methylphenylpropoxysilane)		100°C	NS (6.1)	NS (6.2)	NS (5.6)
Phenylmethylbutoxysilane (Butoxymethylphenylsilane)		100°C	NS (11.1)	NS (11.5)	NS (10.2)
Phenylmethylpentoxysilane (Methylpentoxyphenylsilane)		100°C	NS (20.4)	1.008 (21.3)	NS (18.5)
Methylphenylvinylsilanol		120°C	1.008 (6.6)	1.019 (8.8)	1.015 (8.3)
Methylphenylpropoxysilanol		140°C	1.013 (5.6)	1.017 (6.2)	1.014 (6.5)
Methylphenylbutoxysilanol		140°C	1.018 (8.8)	1.038 (9.7)	1.015 (10.4)
Methylpentoxyphenylsilanol		140°C	1.019 (14.3)	1.065 (15.5)	1.025 (16.6)
Hexylmethylphenylsilanol		140°C	NS (17.9)	1.027 (19.4)	1.023 (20.0)

*NS – no observable separation
•See Key Words and Definitions on page 16.
k'$_1$ = k' for first eluting peak.

Table 7. Chiral Compounds

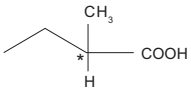
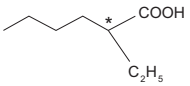
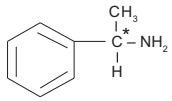
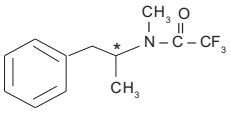
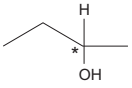
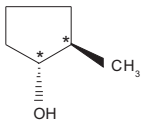
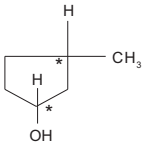
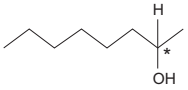
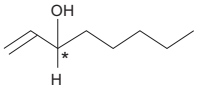
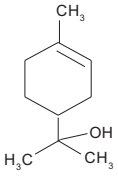
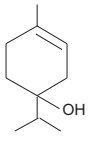
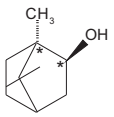
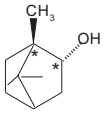
Compound	Structure	Col. Temp.	α value and (k'$_1$) α-DEX 120	β-DEX 110	β-DEX 120	γ-DEX 120
Acids						
2-Methylbutyric acid		110°C	NS[1] (1.9)	1.046 (2.1)	1.051 (3.8)	1.010 (2.6)
2-Ethylhexanoic acid		125°C	1.012 (5.0)	1.035 (5.3)	—	1.048 (7.0)
Amines						
α-Methylbenzylamine		90°C	NS (7.8)	1.029 (8.5)	1.030 (11.9)	NS (9.5)
N-Trifluoroacetyl-methamphetamine		90°C 1°/min	NS (26.6)	NS (27.1)	—	1.066 (23.3)
Alcohols						
2-Butanol		30°C	NS (2.4)	1.043 (4.2)	1.070 (5.0)	NS (2.8)
trans-2-Methylcyclopentanol		70°C	1.040 (4.2)	—	1.060 (13.6)	NS (5.0)
3-Methylcyclopentanol		70°C	1.021 (5.4)	NS (7.5)	NS (13.7)	NS (4.8)
2-Octanol		80°C	1.017 (7.9)	1.011 (8.3)	1.017 (13.4)	NS (7.7)
1-Octen-3-ol		80°C	1.030 (6.9)	1.015 (8.5)	1.021 (13.5)	NS (5.3)
α-Terpineol[2]		100°C	NS (12.4)	1.031 (15.2)	1.042 (23.7)	1.028 (15.4)
Terpinen-4-ol[3]		100°C	NS (6.2)	1.032 (1.8)	1.036 (10.2)	1.010 (12.3)
Borneol		120°C	NS (4.6)	1.046 (6.7)	1.051 (7.9)	NS (6.1)
Isoborneol		120°C	NS (3.8)	1.021 (6.0)	1.025 (9.1)	NS (6.9)

Table 7. Chiral Compounds contd.

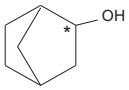
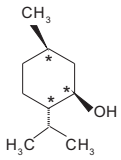
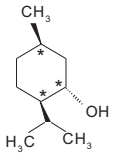
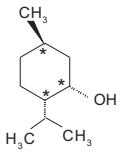
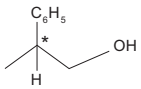
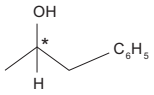
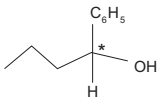
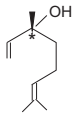
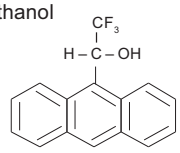
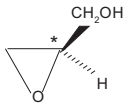
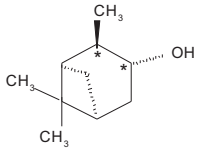
Compound	Structure	Col. Temp.	α value and (k'_1) α-DEX 120	β-DEX 110	β-DEX 120	γ-DEX 120
Exonorborneol		120°C	NS (4.2)	—	1.026 (3.0)	NS (2.1)
Menthol		110°C	1.021 (6.7)	1.025 (7.6)	1.031 (11.5)	1.030 (8.5)
Isomenthol[4]		110°C	1.030 (7.0)	1.031 (8.6)	1.041 (14.6)	1.015 (9.9)
Neomenthol		110°C	1.060 (6.1)	1.037 (6.9)	1.048 (10.2)	1.025 (7.6)
2-Phenyl-1-propanol		110°C	1.012 (10.2)	1.016 (11.2)	1.014 (12.8)	1.006 (13.2)
1-Phenyl-2-propanol		110°C	NS (7.5)	1.018 (7.9)	1.016 (8.9)	NS (8.6)
1-Phenyl-1-butanol		130°C	1.016 (6.5)	NS (6.6)	NS (9.2)	NS (8.3)
Linalool		90°C	NS (8.4)	1.024 (12.3)	1.019 (10.7)	NS (5.6)
2,2,2-Trifluoro-1-(9-anthryl)ethanol		240°C	1.008 (18.0)	1.015 (7.3)	1.018 (8.6)	1.014 (9.7)
Glycidol		40°C	1.043 (11.5)	1.052 (12.3)	1.066 (10.9)	1.016 (10.8)
Isopinocampheol		100°C	1.027 (10.8)	1.014 (16.5)	1.061 (4.5)	1.011 (17.9)

Table 7. Chiral Compounds contd.

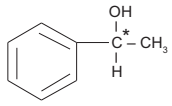
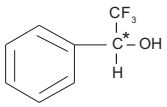
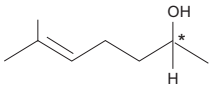
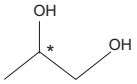
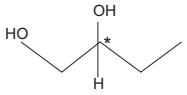
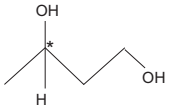
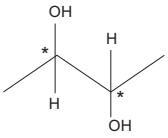
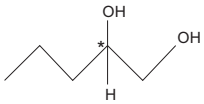
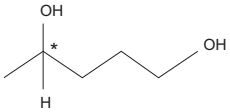
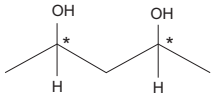
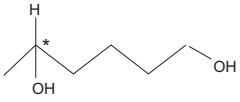
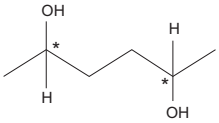
Compound	Structure	Col. Temp.	α value and (k'$_1$) α-DEX 120	β-DEX 110	β-DEX 120	γ-DEX 120
1-Phenylethanol		120°C	NS (3.9)	1.051 (4.1)	1.068 (5.9)	1.021 (4.7)
1-Phenyl-2,2,2-trifluoroethanol		120°C	NS (4.8)	1.071 (5.9)	1.085 (9.7)	1.063 (7.7)
6-Methyl-5-hepten-2-ol		90°C	NS (4.6)	1.041 (5.2)	—	—
Diols						
1,2-Propanediol		80°C	1.034 (4.0)	1.028 (3.4)	1.028 (5.9)	NS (3.3)
1,2-Butanediol		100°C	1.030 (3.2)	1.040 (3.2)	1.044 (5.0)	NS (2.8)
1,3-Butanediol		100°C	1.014 (3.9)	1.017 (3.9)	1.021 (6.2)	NS (3.6)
2,3-Butanediol		100°C	NS (1.6)	1.053 (1.7)	NS (2.7)	NS (1.5)
1,2-Pentanediol		100°C	1.040 (5.9)	1.041 (6.5)	1.046 (10.4)	1.008 (5.6)
1,4-Pentanediol		100°C	NS (8.7)	1.023 (10.6)	1.027 (17.6)	NS (8.3)
2,4-Pentanediol		100°C	1.016 (3.7)	1.013 (4.0)	1.012 (6.8)	1.061 (3.4)
1,5-Hexanediol		100°C	1.015 (16.1)	1.024 (20.0)	1.028 (32.6)	1.011 (17.8)
2,5-Hexanediol		100°C	1.029 (8.2)	1.020 (11.3)	1.035 (17.8)	NS (9.8)

Table 7. Chiral Compounds contd.

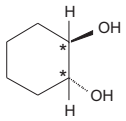
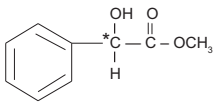
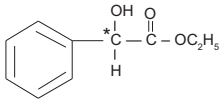
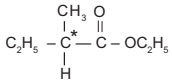
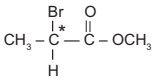
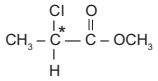
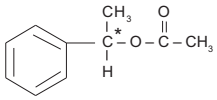
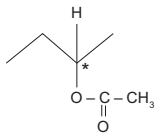
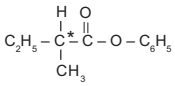
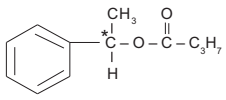
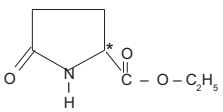
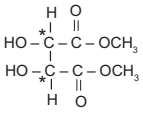
Compound	Structure	Col. Temp.	α value and (k'$_1$) α-DEX 120	β-DEX 110	β-DEX 120	γ-DEX 120
trans-1,2-Cyclohexanediol		110°C	1.018 (8.5)	1.089 (11.5)	1.081 (20.8)	1.030 (11.8)
Esters						
Methyl mandelate[5]		130°C	1.021 (10.5)	NS (9.8)	NS (10.3)	1.017 (12.9)
Ethyl mandelate		130°C	1.019 (13.1)	NS (11.8)	NS (12.3)	NS (14.7)
Ethyl 2-methylbutyrate		40°C	NS (8.5)	1.027 (8.2)	1.037 (12.5)	NS (6.8)
Methyl DL-2-bromopropionate		70°C	NS (3.6)	1.109 (4.4)	1.156 (6.7)	1.022 (4.0)
Methyl DL-2-chloropropionate		70°C	NS (1.8)	1.062 (2.3)	1.089 (3.4)	1.013 (2.0)
α-Methylbenzyl acetate		90°C	NS (19.0)	1.119 (17.8)	1.115 (20.9)	1.028 (19.1)
2-Butyl acetate		60°C	—	—	1.125 (1.9)	—
Phenyl 2-methylbutyrate		130°C	—	—	1.021 (9.0)	—
1-Phenylethyl butyrate		120°C	NS (13.2)	1.013 (11.7)	1.027 (13.4)	1.016 (13.1)
Ethyl 2-pyrrolidone-5-carboxylate		100°C	—	—	1.070 (11.7)	—
Dimethyl tartrate		120°C	—	—	1.154 (20.5)	—

Table 7. Chiral Compounds contd.

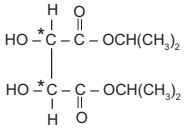
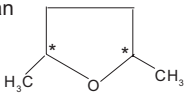
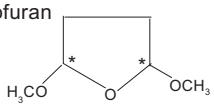
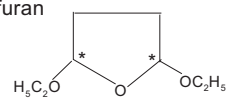
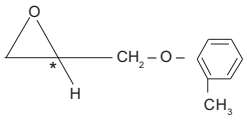
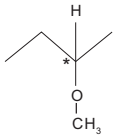
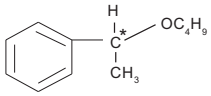
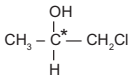
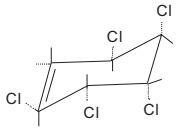
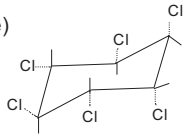
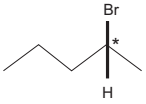
Compound	Structure	Col. Temp.	α value and (k'$_1$) α-DEX 120	β-DEX 110	β-DEX 120	γ-DEX 120
Diisopropyltartarate		150°C	—	—	1.069 (7.5)	—
Ethers						
2,5-Dimethyltetrahydrofuran		60°C	1.022 (1.1)	1.046 (1.1)	1.062 (1.9)	NS (0.8)
2,5-Dimethoxytetrahydrofuran		60°C	1.027 (5.2)	1.150 (6.0)	1.208 (9.1)	1.023 (5.5)
2,5-Diethoxytetrahydrofuran		100°C	1.038 (2.2)	1.064 (1.9)	1.084 (1.8)	1.039 (2.3)
Glycidyl-2-methylphenyl-ether		120°C	1.005 (17.8)	NS (16.2)	NS (19.6)	NS (19.1)
sec-Butylmethylether		35°C	NS (1.7)	1.043 (2.9)	1.041 (2.1)	NS (1.7)
(1-Phenyl)ethylbutylether		120°C	1.027 (17.9)	1.007 (15.2)	1.018 (16.5)	NS (17.6)
Halogenated Compounds						
1-Chloro-2-propanol		40°C	1.033 (7.9)	1.018 (8.9)	NS (8.5)	1.754 (4.6)
Pentachlorocyclohexene[3]		160°C	NS (13.7)	1.026 (13.2)	1.036 (16.6)	1.017 (18.3)
α-BHC[3,6] (Hexachlorocyclohexane)		160°C	1.011 (17.6)	1.014 (16.4)	1.020 (19.0)	1.042 (22.2)
2-Bromopentane		50°C	1.015 (2.1)	1.032 (3.6)	1.044 (4.0)	NS (2.6)

Table 7. Chiral Compounds contd.

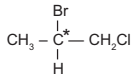
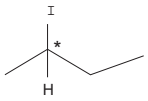
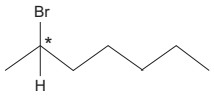
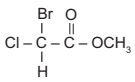
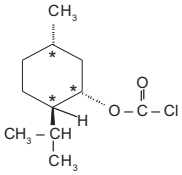
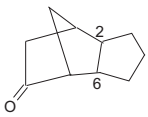
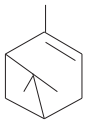
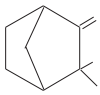
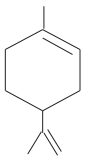
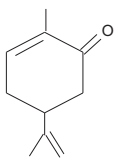
Compound	Structure	Col. Temp.	α value and (k'$_1$) α-DEX 120	β-DEX 110	β-DEX 120	γ-DEX 120
2-Bromo-1-chloropropane		55°C	NS (4.9)	1.019 (3.8)	1.025 (5.8)	NS (2.3)
2-Iodobutane		60°C	NS (10.3)	1.013 (12.0)	1.015 (17.7)	1.017 (8.9)
2-Bromoheptane		60°C	NS (9.3)	1.013 (12.8)	1.012 (12.2)	1.014 (9.2)
Chlorobromoacetonitrile		70°C	NS (10.3)	1.013 (9.3)	1.013 (6.4)	NS (7.5)
Chlorobromoacetic acid methyl ester		70°C	NS (7.5)	1.024 (16.1)	1.030 (12.0)	—
Menthol chloroformate		100°C	NS (20.9)	—	1.021 (33.2)	1.033 (17.4)
Hydrocarbons 8-Ketotricyclo-[5•2•1•0^{2,6}]decane		130°C	NS (7.9)	1.030 (9.2)	1.041 (13.8)	1.018 (8.9)
α-Pinene		80°C	NS (1.9)	1.032 (2.9)	1.048 (4.5)	NS (2.4)
Camphene		80°C	NS (2.4)	1.037 (3.9)	1.051 (6.1)	NS (3.2)
Limonene		80°C	1.024 (4.9)	1.023 (5.7)	1.030 (8.2)	NS (5.3)
Ketones Carvone[7]		90°C	1.012 (23.7)	NS (24.7)	NS (43.7)	1.020 (30.6)

Table 7. Chiral Compounds contd.

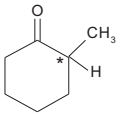
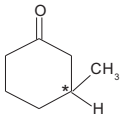
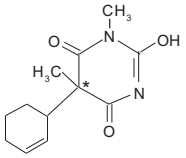
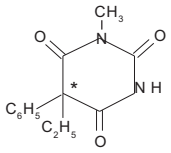
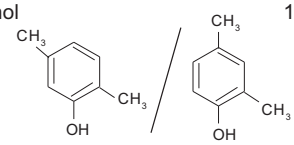
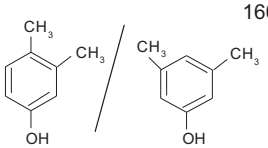
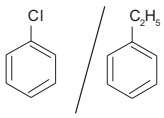
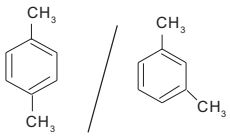
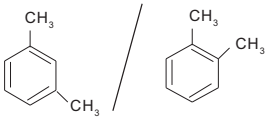
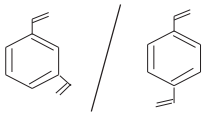
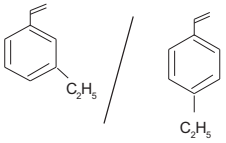
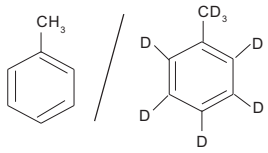
Compound	Structure	Col. Temp.	α value and (k'$_1$) α-DEX 120	β-DEX 110	β-DEX 120	γ-DEX 120
2-Methylcyclohexanone		70°C	1.014 (7.8)	1.014 (9.7)	1.020 (14.7)	NS (7.8)
3-Methylcyclohexanone		70°C	1.017 (8.3)	NS (6.8)	NS (11.5)	NS (5.8)
Hexobarbital		210°C	NS (9.1)	1.025 (7.0)	1.036 (8.6)	1.010 (9.5)
Mephobarbital		210°C	NS (11.6)	1.034 (8.7)	1.050 (10.9)	1.016 (12.2)
Aromatic Positional Isomers						
2,5- and 2,4-Dimethylphenol		160°C	1.097 (1.5)	1.128 (2.7)	1.120 (1.9)	1.073 (2.3)
3,4- and 3,5-Dimethylphenol		160°C	1.039 (2.1)	1.170 (3.6)	1.157 (2.5)	1.175 (3.2)
Chlorobenzene / Ethylbenzene		110°C	1.140 (0.7)	1.081 (0.7)	1.109 (0.9)	1.088 (0.7)
p-Xylene / m-Xylene		70°C	1.090 (2.9)	NS (2.6)	NS (3.3)	1.024 (2.7)
m-Xylene / o-Xylene		70°C	1.214 (3.2)	1.355 (2.6)	1.345 (3.3)	1.276 (2.8)
m-Divinylbenzene / p-Divinylbenzene		140°C	1.088 (1.5)	1.125 (1.3)	1.153 (1.6)	1.111 (1.5)
m-Ethylvinylbenzene / p-Ethylvinylbenzene		140°C	1.066 (1.1)	1.084 (1.0)	1.108 (1.3)	1.069 (1.1)

Table 7. Chiral Compounds contd.

Compound	Structure	Col. Temp.	α value and (k'$_1$) α-DEX 120	β-DEX 110	β-DEX 120	γ-DEX 120
Toluene / Toluene-d_8		30°C	1.039 (5.9)	—	1.027 (7.7)	—

[1]NS = no observable separation
[2]Enantio-reversal from β-DEX column to γ-DEX column.
[3](+) Enantiomer elutes first from β-DEX column. (-) Enantiomer elutes first from γ-DEX column.
[4](-) Enantiomer elutes first from α-DEX or β-DEX column. (+) Enantiomer elutes first from γ-DEX column.
[5](+) Enantiomer elutes first from α-DEX column. (-) Enantiomer elutes first from γ-DEX column.
[6]Elution order not determined for α-DEX column.
[7](-) Enantiomer elutes first from α-DEX column. (+) Enantiomer elutes first from γ-DEX column.

Gas Chromatographic Enantiomer Separation with Modified Cyclodextrins

W.A. König, Hüthig, 1992, 168 pp.

Lipophilic cyclodextrin derivatives have proven superior to all other previously used chiral stationary phases for capillary GC, due to their almost unlimited range of applications. Numerous examples are given of stereochemical separations. In addition to covering the data of all the resolved chiral compounds, the preparation and characterization of lipophilic cyclodextrin derivatives and the production and testing of glass and fused silica capillary columns are described in detail.

Description	Cat. No.
Book	**2-6554**

Chromatographic Enantioseparation: Methods and Applications (2nd Edition)

S.G. Allenmark, Prentice Hall, 1991, 244 pp.

Comprehensive treatment of chiral chromatography, including basic theory and methodology.

Description	Cat. No.
Book	**Z23,412-5**

Chiral Liquid Chromatography

W.J. Lough, Ed., Blackie/Chapman and Hall, 1989, 288 pp.

This comprehensive reference provides a thorough review of chiral liquid chromatography systems and their practical applications. It includes background material on the nature of chirality, the historical development and use of chiral LC, and an appendix with relevant suppliers and products.

Description	Cat. No.
Book	**Z23,560-1**

Key Words and Definitions

α-DEX
α-cyclodextrin-containing capillary GC column, proprietary to Supelco

asymmetric molecule
molecule with different substituents to a central carbon, silicon, phosphorus, etc. atom (e.g., $C^*R_1R_2R_3R_4$), existing in two mirror image configurations with no elements of symmetry

β-DEX
β-cyclodextrin-containing capillary GC column, proprietary to Supelco

CD
cyclodextrin

chiral molecule
molecule that can exist in two non-superimposable (mirror image) configurations (e.g., d- and l-glucose)

enantiomeric resolution (Rs)
a measure of chromatographic separation of isomers in which column efficiency is considered:

$$Rs = 1.177 \times \frac{t_{r2} - t_{r1}}{w_1 + w_2}$$

w_1 & w_2 are peak widths for isomers 1 & 2 at half-height

enantiomers (optical isomers)
non-superimposable mirror image molecules which rotate polarized light in equal and opposite directions (e.g., d- and l-amino acids)

enantiomeric excess (ee)
the percent by which one enantiomer of an optically active compound is in excess of the other in a mixture of the two (typically determined from area or area %):

$$ee = \frac{\%\ \text{enantiomer}_1 - \%\ \text{enantiomer}_2}{\%\ \text{enantiomer}_1 + \%\ \text{enantiomer}_2} \times 100$$

enantio-reversal
reversal in the elution order of two enantiomers as a result of changing the (CD) stationary phase

enantioselectivity
same as separation factor

γ-DEX
γ-cyclodextrin-containing capillary GC column, proprietary to Supelco

meso compound
a molecule which contains two or more chiral centers, but has a plane of symmetry and thus is optically inactive

optical purity
the percent of one enantiomer in excess of the other, as determined from optical rotation measurements

positional isomers
molecules having identical molecular formula, but with one substituent (Cl, OH, etc.) located at different positions

racemate (racemic mixture)
a 50:50 mixture of two enantiomers, denoted as (dl) or (+/-)

retention factor (k')
a relative measure of chromatographic retention of a compound:

$$k' = \frac{\text{retention time of compound} - \text{dead time}}{\text{dead time}}$$

$$= \frac{t_r - t_0}{t_0}$$

separation factor (α value)
a measure of chromatographic separation of isomers in which column efficiency **is not** considered:

$$\alpha = \frac{\text{retention time}_{\text{isomer 2}} - \text{dead time}}{\text{retention time}_{\text{isomer 1}} - \text{dead time}}$$

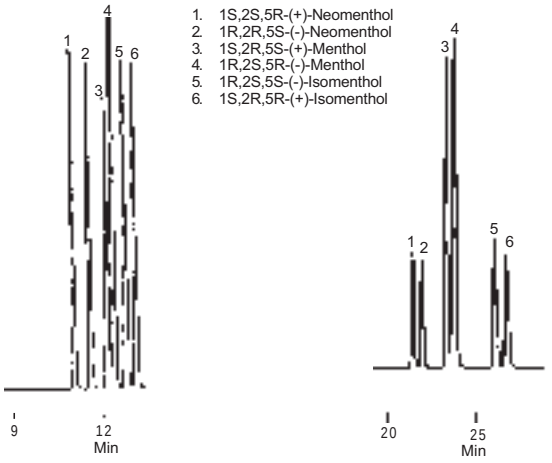
$$= \frac{t_{r2} - t_0}{t_{r1} - t_0} = \frac{k'_2}{k'_1}$$

stereochemistry
the study of molecules having the same molecular formula, but different spatial orientations

Menthols

Column: α-DEX 120, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 2-4310
Column: β-DEX 110, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 2-4301
Oven: 110°C
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride (0.5mg/mL each analyte), split (100:1), 300°C (α-DEX 120) or 220°C (β-DEX 110)

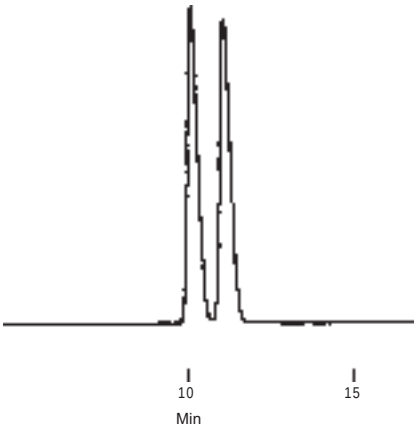
α-DEX 120 β-DEX 110



713-0089,712-0265

(±)-1-Octen-3-ol

Column: α-DEX 120, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 2-4310
Oven: 100°C
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: 1µL methanol (0.5mg/mL each analyte), split (100:1), 250°C



713-0090

1-Phenylethanol; 1-Phenylpropanol

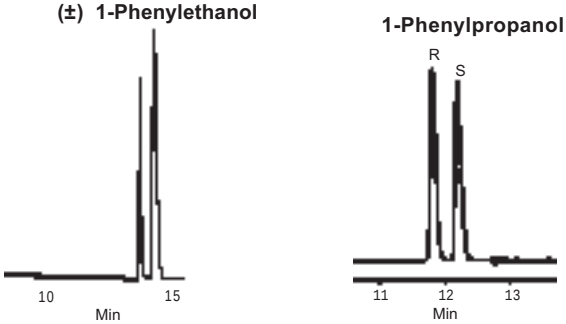
1-Phenylethanol*

Column: β-DEX 110, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 2-4301
Oven: 110°C
Carrier: helium, 20cm/sec
Det.: FID, 200°C
Inj.: 1µL methylene chloride (0.5mg/mL each analyte), split (100:1), 150°C

1-Phenylpropanol

Column: β-DEX 120, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 2-4304
Oven: 130°C
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride containing 1mg/mL racemate, split 100:1, 220°C

(±) 1-Phenylethanol 1-Phenylpropanol

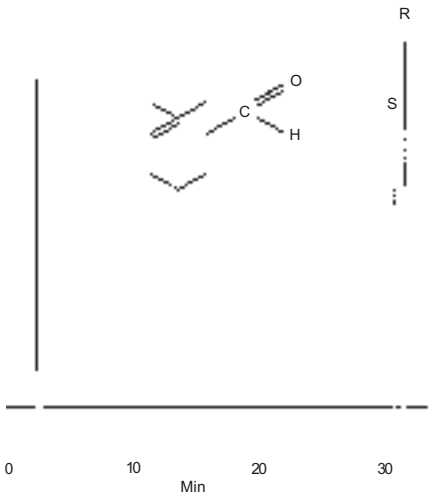


*Application developed by Dr. L. Sundaram, The Pennsylvania State University, University Park, PA USA.

712-0253,797-0151

Citronellal

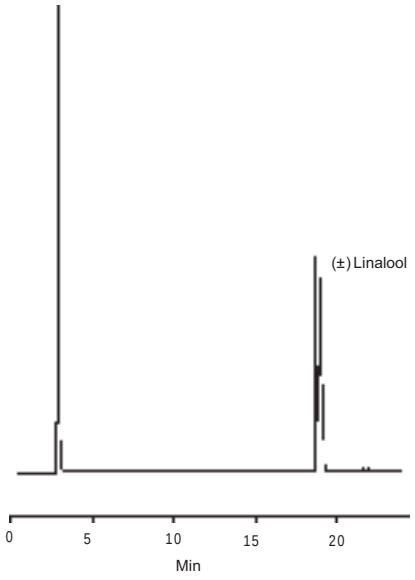
Column: β-DEX 225, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 2-4348
Oven: 95°C
Carrier: helium, 20cm/sec
Det: FID, 300°C
Inj.: 1µL methylene chloride containing 1mg/mL mixed enantiomers, split 100:1, 220°C



796-0642

Linalool

Column: β-DEX 110, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 2-4301
Oven: 100°C
Carrier: helium, 20cm/sec
Det.: FID, 200°C
Inj.: 1µL methylene chloride (0.5mg/mL each analyte), split (100:1), 150°C

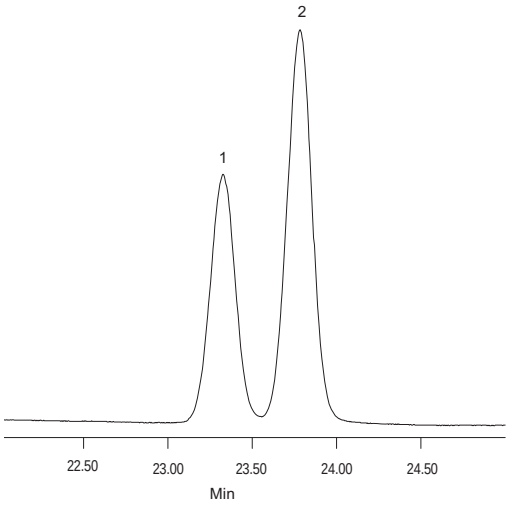


712-0267

2,2,2-Trifluoro-1-(9-anthryl)ethanol

Column: γ-DEX 120, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 2-4307
Oven: 240°C
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride (0.5mg/mL each analyte), split (100:1), 300°C

1. S-(+)-2,2,2-Trifluoro-1-(9-anthryl)ethanol
2. R-(-)-2,2,2-Trifluoro-1-(9-anthryl)ethanol

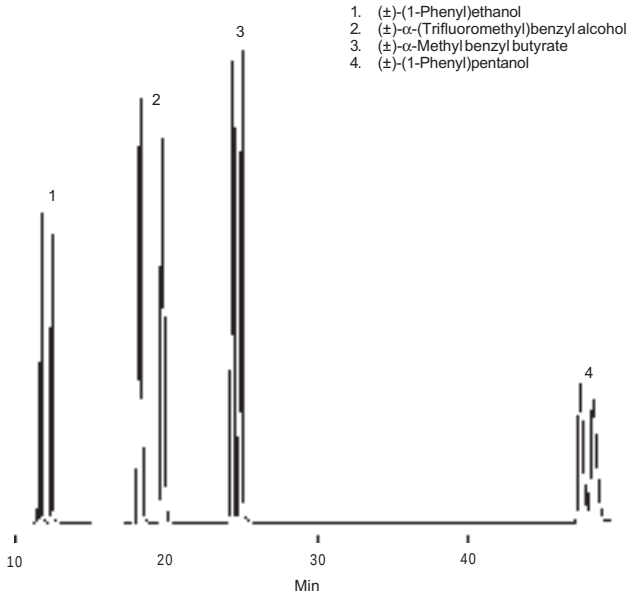


794-0219

Alcohols

Column: β-DEX 120, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 2-4304
Oven: 120°C
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride (0.5mg/mL each analyte), split (100:1), 200°C

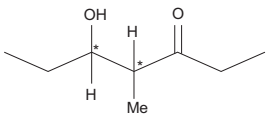
1. (±)-(1-Phenyl)ethanol
2. (±)-α-(Trifluoromethyl)benzyl alcohol
3. (±)-α-Methyl benzyl butyrate
4. (±)-(1-Phenyl)pentanol

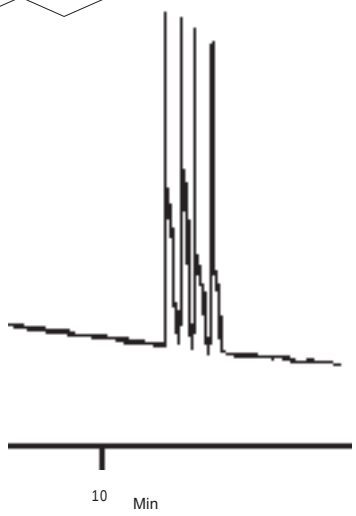


94-0340

5-Hydroxy-4-methyl-3-heptanone

Column: γ-DEX 120, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 2-4307
Oven: 110°C
Carrier: helium, 35cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride (0.5mg/mL each analyte), split (100:1), 300°C

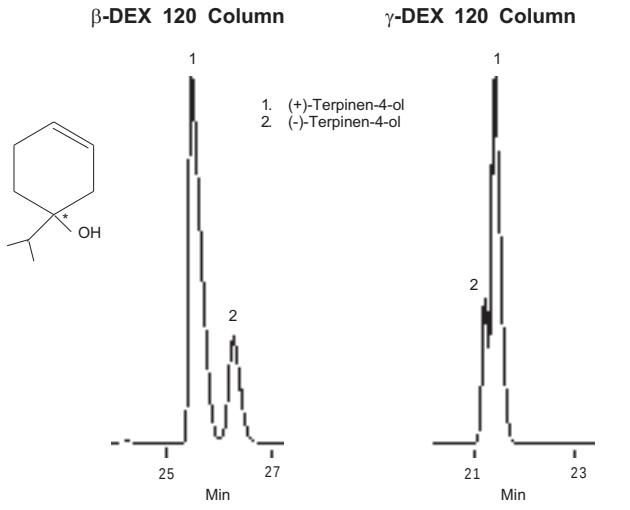




92-0344

Terpinen-4-ol (Enantio-reversal)

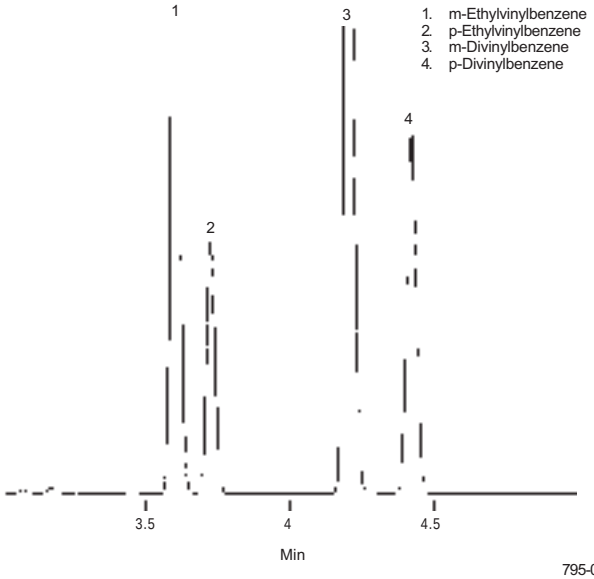
Column: β-DEX 120 and γ-DEX 120, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 2-4304 (β-DEX 120), 2-4307 (γ-DEX 120)
Oven: 100°C
Carrier: helium, 35cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride (1mg/mL each analyte), split (100:1), 250°C



794-0284,0285

Divinylbenzenes

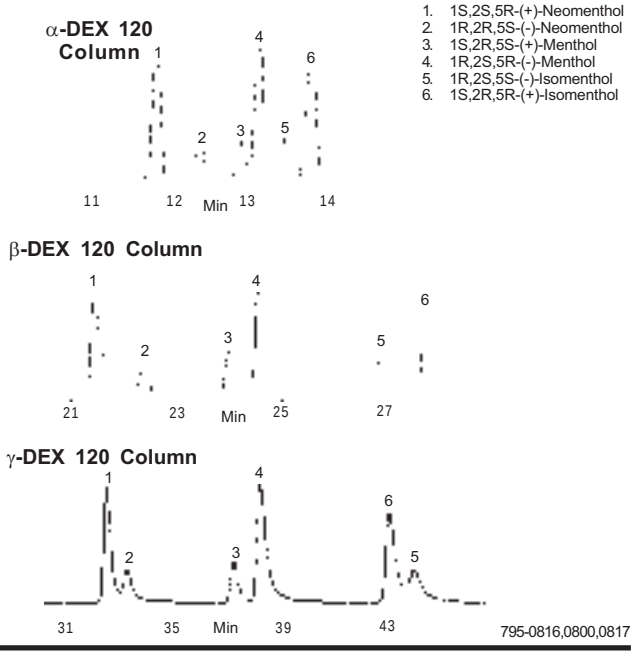
Column: α-DEX 120, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 2-4310
Oven: 140°C
Carrier: helium, 35cm/sec
Det.: FID, 300°C
Inj.: 4µL methylene chloride (0.5mg/mL each analyte), split (100:1), 300°C



795-0801

Menthols (Enantio-reversal)

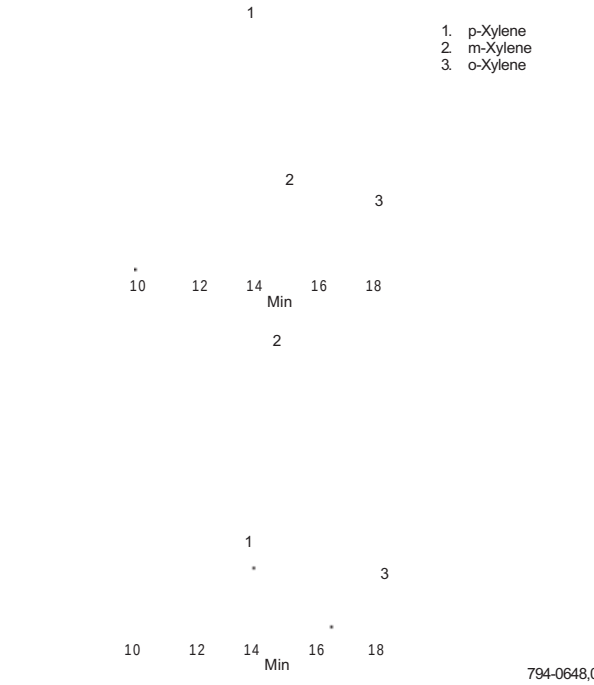
Column: α-DEX 120, β-DEX 120, and γ-DEX 120, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 2-4310 (α-DEX 120), 2-4304 (β-DEX 120), 2-4307 (γ-DEX 120)
Oven: 110°C
Carrier: helium, 30cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride (0.5mg/mL each analyte), split (100:1), 250°C



795-0816,0800,0817

Xylene Isomers

Column: α-DEX 120, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 2-4310
Oven: 50°C
Carrier: helium, 30cm/sec
Det.: FID, 300°C
Inj.: 0.6µL each analyte (neat), split (100:1), 80°C

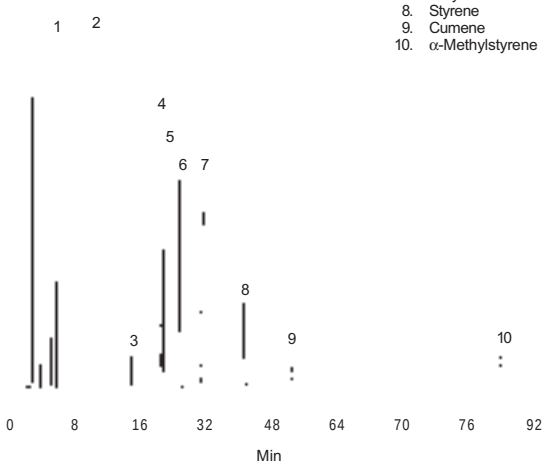


794-0648,0649

Aromatics

Column: β-DEX 110, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 2-4301
Oven: 50°C
Carrier: helium, 20cm/sec
Det.: FID, 260°C
Inj.: 0.1µL methylene chloride (0.5mg/mL each analyte), split (100:1), 100°C

1. Benzene
2. Toluene
3. n-Nonane
4. p-Xylene
5. m-Xylene
6. Ethylbenzene
7. o-Xylene
8. Styrene
9. Cumene
10. α-Methylstyrene

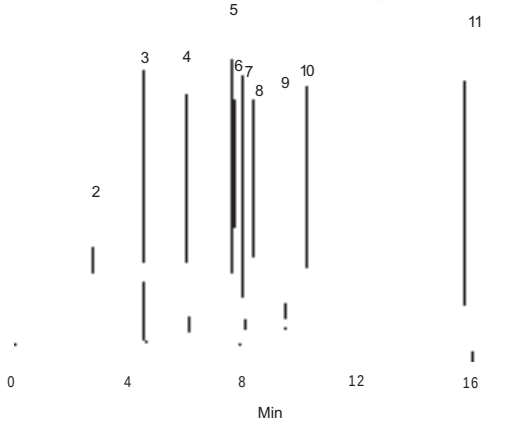


794-0652

BTEX Compounds, Gasoline Range Organics (GRO)

Column: β-DEX 120, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 2-4304
Oven: 40°C to 180°C at 8°C/min
Carrier: helium, 30cm/sec
Det.: FID, 300°C
Inj.: 1µL methanol (0.5mg/mL each analyte), direct injection, 250°C

1. Methanol
2. Methyl tert-butyl ether (MTBE)
3. Benzene
4. Toluene
5. p-Xylene
6. m-Xylene
7. Ethylbenzene
8. o-Xylene
9. 1,3,5-Trimethylbenzene
10. 1,2,4-Trimethylbenzene
11. Naphthalene

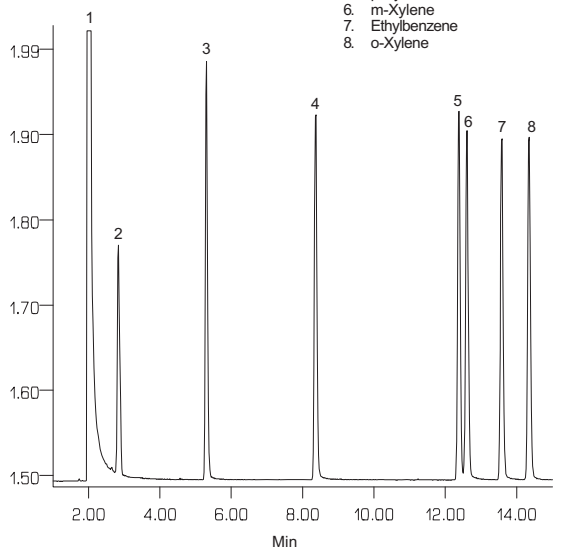


794-0580

BTEX Compounds

Column: β-DEX 120, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 2-4304
Oven: 55°C (5 min) to 75°C at 2°C/min
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride (0.5mg/mL each analyte), split (100:1), 250°C

1. Methanol
2. Methyl tert-butyl ether (MTBE)
3. Benzene
4. Toluene
5. p-Xylene
6. m-Xylene
7. Ethylbenzene
8. o-Xylene



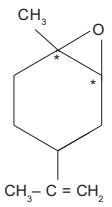
94-0338

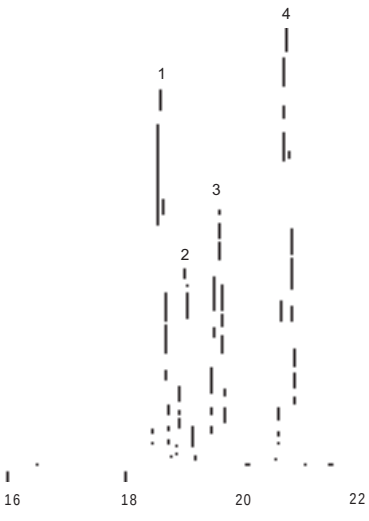
Epoxides

Limonene Oxide

Column: α-DEX 120, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 2-4310
Oven: 90°C
Carrier: helium, 30cm/sec
Det.: FID, 250°C
Inj.: 1µL, split (100:1), 250°C

1.,4. cis/trans-(+)-Limonene oxide
2.,3. cis/trans-(-)-Limonene oxide



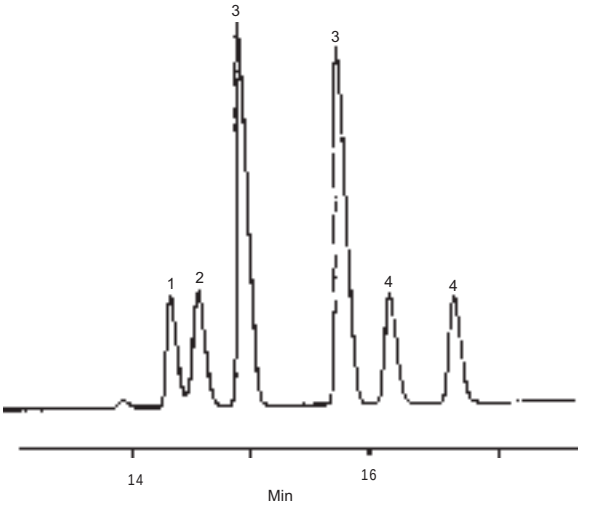


795-0802

Epoxides

Column: α-**DEX 120, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **2-4310**
Oven: 110°C
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride (0.5mg/mL each analyte), split (100:1), 300°C

1. R-(+)-Styrene oxide
2. S-(-)-Styrene oxide
3. (±)-2,2-Dimethyl-3-phenyloxirane
4. (±)-trans-2-Methyl-3-phenyloxirane



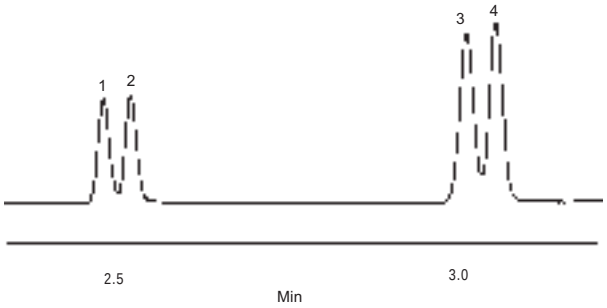
93-0404

Esters

Methyl and Ethyl Mandelate

Column: α-**DEX 120, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **2-4310**
Oven: 130°C
Carrier: helium, 30cm/sec
Det.: FID, 300°C
Inj.: 1µL methanol (0.5mg/mL each analyte), split (100:1), 300°C

1. S-(+)-Methyl mandelate
2. R-(-)-Methyl mandelate
3. S-(+)-Ethyl mandelate
4. R-(-)-Ethyl mandelate

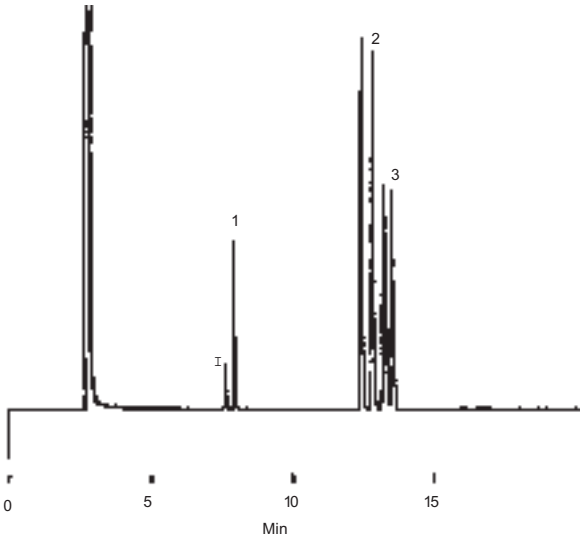


93-0405

Epoxides

Column: β-**DEX 110, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **2-4301**
Oven: 110°C
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride (0.5mg/mL each analyte), split (100:1), 300°C

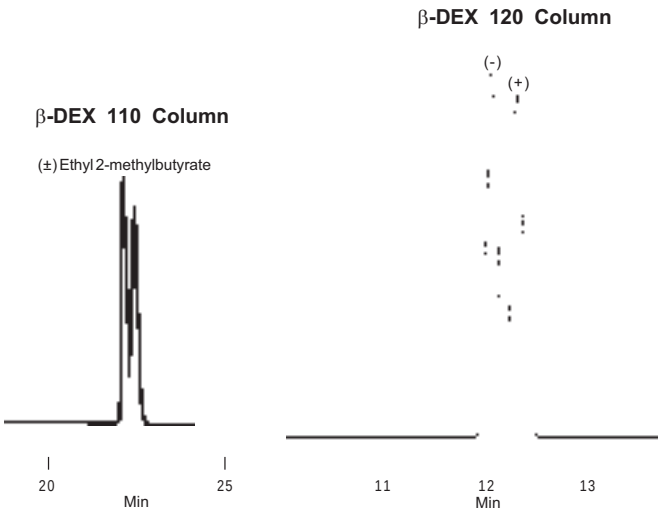
I Impurity
1. cis-Methylstyrene oxide
2. (±)-2,2-Dimethyl-3-phenyloxirane
3. (±)-trans-2-Methyl-3-phenyloxirane



92-0343

Ethyl 2-Methylbutyrate

Column: β-**DEX 110, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **2-4301**
Column: β-**DEX 120, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **2-4304**
Oven: 40°C
Carrier: helium, 20cm/sec
Det.: FID, 200°C (β-DEX 110) or 300°C (β-DEX 120)
Inj.: 1µL methylene chloride (0.5mg/mL each analyte), split (100:1), 100°C (β-DEX 110) or 250°C (β-DEX 120)

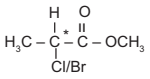


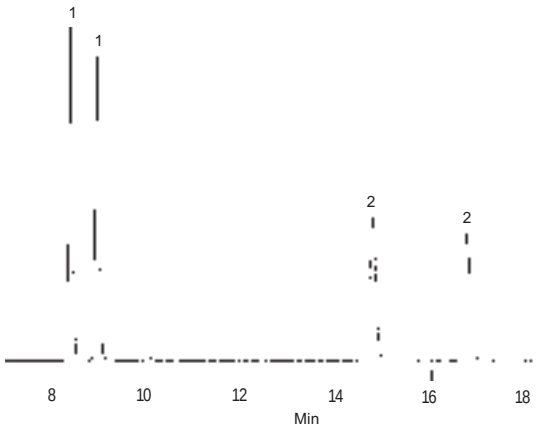
712-0268, 795-0804

Methyl 2-Chloropropionate and Methyl 2-Bromopropionate

Column: β-DEX 120, 30m x 0.25mm ID, 0.25µm film
Cat. No.: **2-4304**
Oven: 70°C
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride (0.5mg/mL each analyte), split (100:1), 250°C

1. (±)-Methyl 2-chloropropionate
2. (±)-Methyl 2-bromopropionate



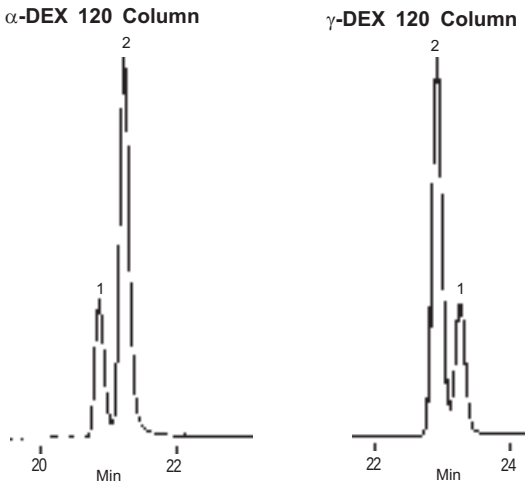


795-0803

Methyl Mandelate (Enantio-reversal)

Column: α-DEX 120 and γ-DEX 120, 30m x 0.25mm ID, 0.25µm film
Cat. No.: **2-4310** (α-DEX 120), **2-4307** (γ-DEX 120)
Oven: 130°C
Carrier: helium, 35cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride (1mg/mL each analyte), split (100:1), 250°C

1. S-(+)-Methyl mandelate
2. R-(-)-Methyl mandelate

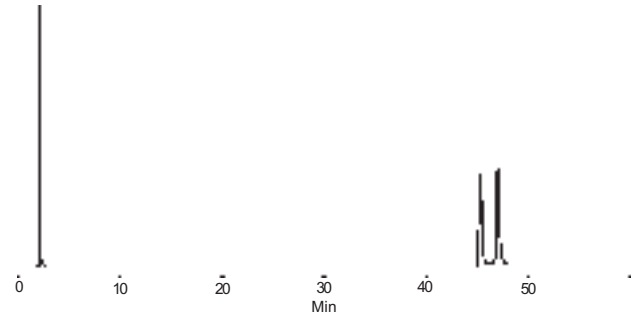


794-0282,0283

Free Acids

4-Methyloctanoic Acid

Column: γ-DEX 120, 30m x 0.25mm ID x 0.25µm film
Cat. No.: **2-4307**
Oven: 115°C
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride containing ~1mg/mL racemate, split 100:1, 220°C



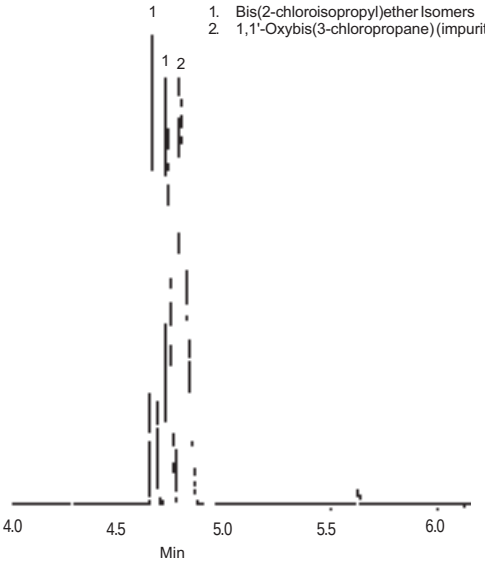
797-0225

Ethers

Bis(2-chloroisopropyl)ether

Column: α-DEX 120, 30m x 0.25mm ID, 0.25µm film
Cat. No.: **2-4310**
Oven: 70°C to 200°C at 2°C/min
Carrier: helium, 20cm/sec
Det.: MSD (scan: 18-500 amu)
Inj.: 1µL methylene chloride (0.5mg/mL each analyte), 80°C

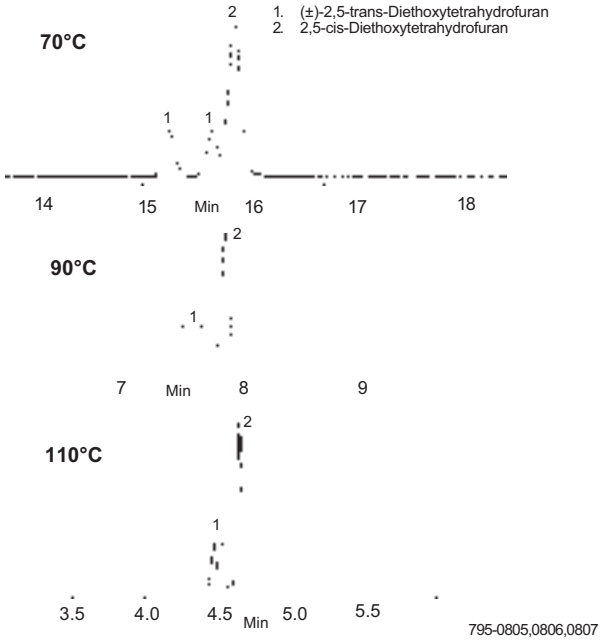
1. Bis(2-chloroisopropyl)ether Isomers
2. 1,1'-Oxybis(3-chloropropane) (impurity)



794-0188

Diethoxytetrahydrofuran

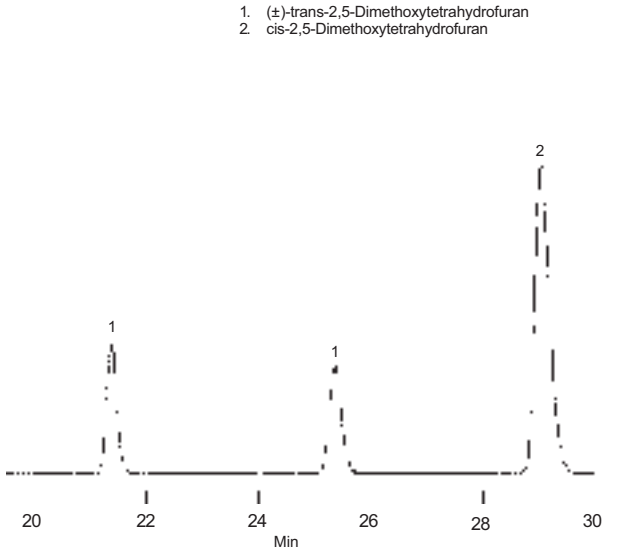
Column: α-DEX 120, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 2-4310
Oven: 70°C/90°C/110°C
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride (0.5mg/mL each analyte), split (100:1), 250°C



795-0805,0806,0807

Dimethoxytetrahydrofuran

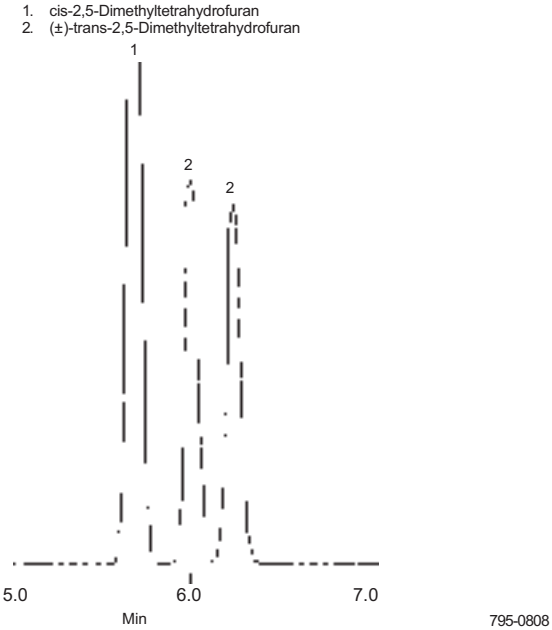
Column: β-DEX 120, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 2-4304
Oven: 60°C
Carrier: helium, 30cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride (0.5mg/mL each analyte), split (100:1), 250°C



795-0809

Dimethyltetrahydrofuran

Column: β-DEX 120, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 2-4304
Oven: 60°C
Carrier: helium, 30cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride (0.5mg/mL each analyte), split (100:1), 250°C

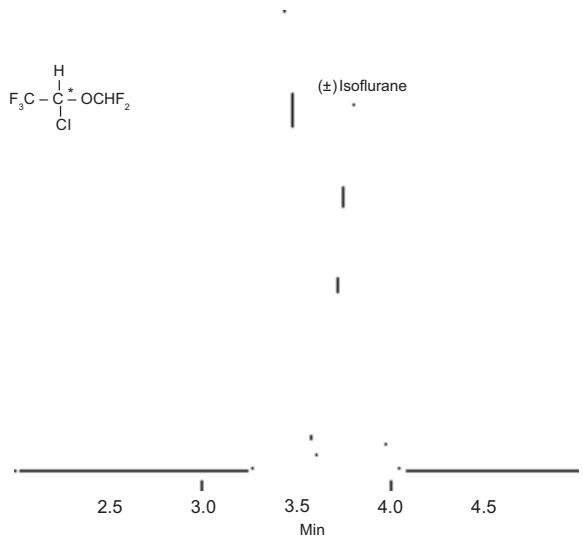


795-0808

Halogenated Compounds

Isoflurane (Florane)

Column: β-DEX 110, 60m x 0.53mm ID, 0.5µm film
Cat. No.: 2-5411
Oven: 35°C
Carrier: helium, 20cm/sec
Det.: FID, 250°C
Inj.: 1µL methylene chloride (0.5mg/mL each analyte), split (100:1), 250°C

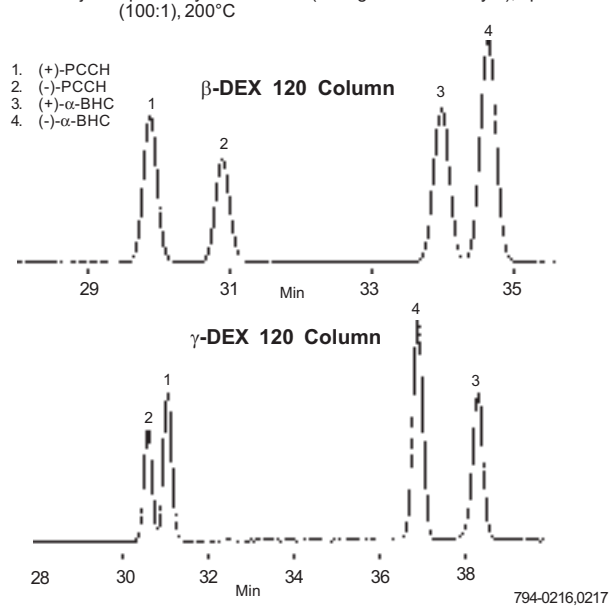


795-0810

Hydrocarbons

α-BHC and PCCH (Enantio-reversal)

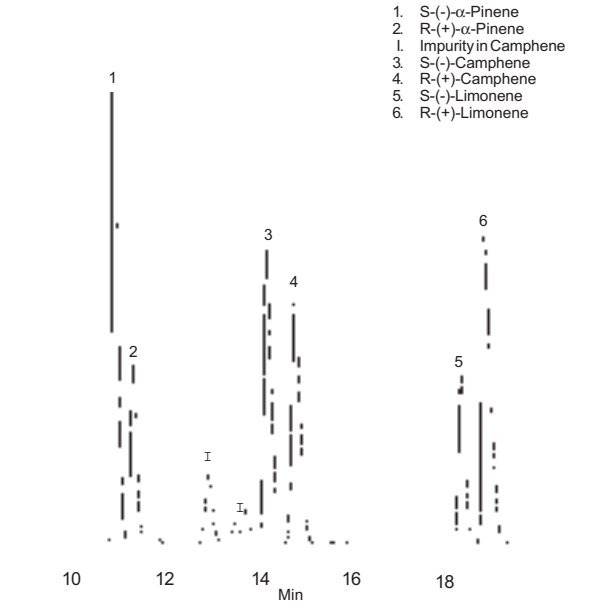
Column: **β-DEX 120 and γ-DEX 120, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **2-4304** (β-DEX 120), **2-4307** (γ-DEX 120)
Oven: 160°C
Carrier: helium, 30cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride (0.5mg/mL each analyte), split (100:1), 200°C



794-0216,0217

α-Pinene, Camphene, and Limonene

Column: **β-DEX 120, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **2-4304**
Oven: 80°C
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride (0.5mg/mL each analyte), split (100:1), 150°C

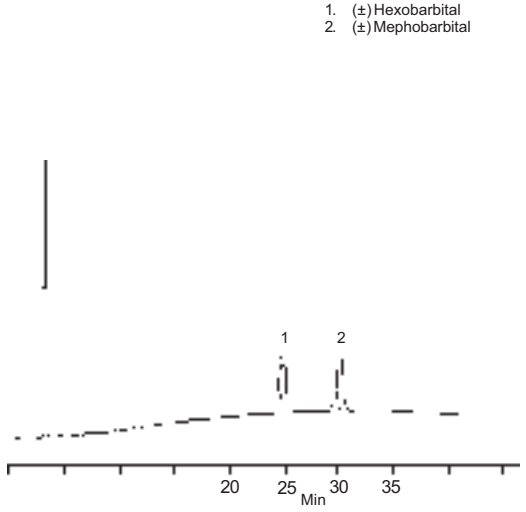


795-0811

Ketones

Barbitals

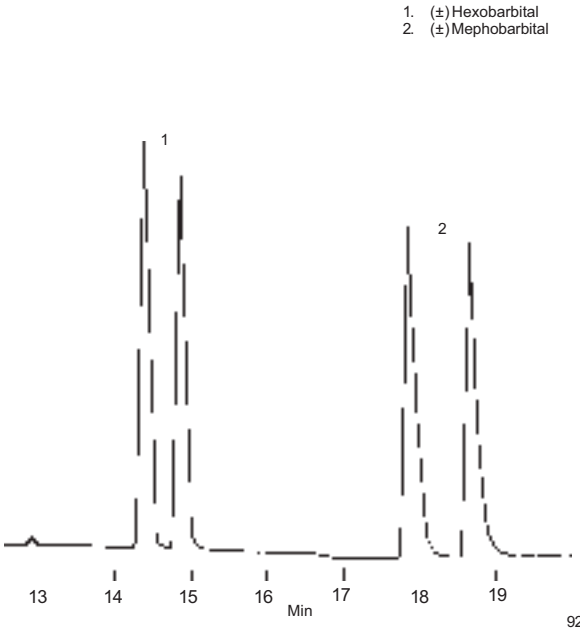
Column: **β-DEX 110, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **2-4301**
Oven: 210°C
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride (0.5mg/mL each analyte), split (100:1), 250°C



712-0264

Barbitals

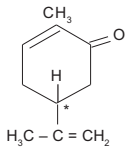
Column: **β-DEX 120, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **2-4304**
Oven: 210°C
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride (5.0mg/mL each analyte), split (100:1), 300°C



92-0342

Carvone (Enantioreversal)

Sample: 0.3mg/mL S-(+)/0.2mg/mL R-(-) solution extracted by solid phase microextraction (100µm polydimethylsiloxane-coated SPME fiber, 30°C, 10 min)
Column: **α-DEX 120, β-DEX 120, and γ-DEX 120, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **2-4310** (α-DEX 120), **2-4304** (β-DEX 120), **2-4307** (γ-DEX 120)
Oven: 90°C
Carrier: helium, 35cm/sec
Det.: FID, 300°C
Inj.: split (100:1), 250°C



1. S-(+)-Carvone
2. R-(-)-Carvone

α-DEX 120 Column



β-DEX 120 Column



γ-DEX 120 Column



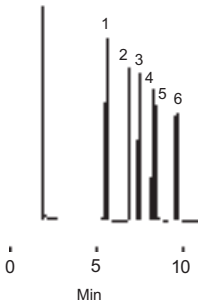
93-0540

Phenols

Dimethylphenol Positional Isomers

Column: **β-DEX 110, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **2-4301**
Oven: 140°C
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride (0.5mg/mL each analyte), split (100:1), 220°C

1. 2,6-Dimethylphenol
2. 2,4-Dimethylphenol
3. 2,5-Dimethylphenol
4. 2,3-Dimethylphenol
5. 3,5-Dimethylphenol
6. 3,4-Dimethylphenol



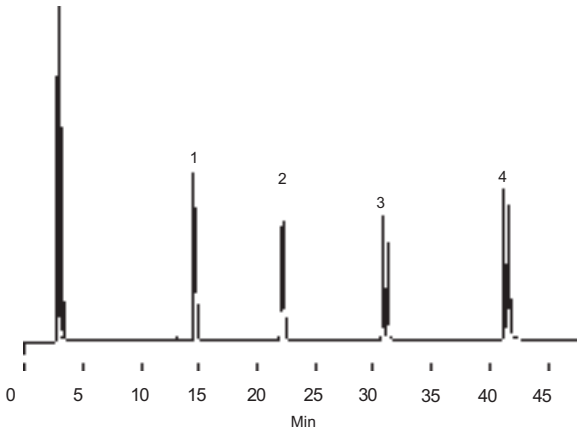
712-0276

Lactones

Alkylated γ-Lactones

Column: **β-DEX 110, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **2-4301**
Oven: 90°C to 200°C at 1°C/min
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride (0.5mg/mL each analyte), split (100:1), 300°C

1. (±)-Methyl-γ-lactone
2. (±)-Ethyl-γ-lactone
3. (±)-Propyl-γ-lactone
4. (±)-Butyl-γ-lactone



712-0266

Phenols

Column: **α-DEX 120, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **2-4310**
Oven: 130°C (12 min) to 220°C at 10°C/min, hold 5 min
Carrier: hydrogen, 40cm/sec
Det.: FID, 300°C
Inj.: 1µL, split (100:1), 250°C

1. Phenol
2. 2-Methylphenol (o-Cresol)
3. 2,6-Dimethylphenol
4. 4-Methylphenol (p-Cresol)
5. 3-Methylphenol (m-Cresol)
6. 2-Ethylphenol
7. 2,4-Dimethylphenol
8. 2,5-Dimethylphenol
9. 2,4,6-Trimethylphenol
10. 4-Ethylphenol
11. 2,3-Dimethylphenol
12. 2,3,5-Trimethylphenol
13. 3-Ethylphenol
14. 3,4-Dimethylphenol
15. 3,5-Dimethylphenol

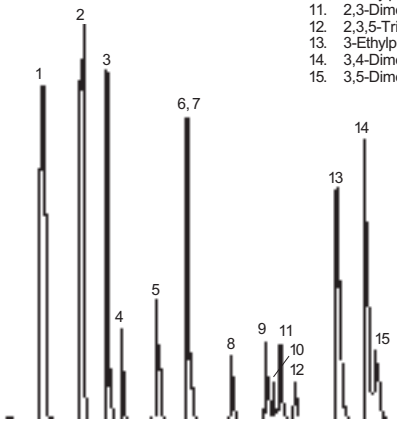


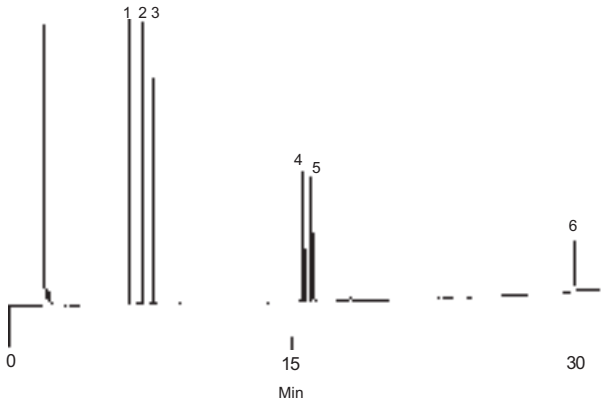
Figure provided by J. Novrocik, DEZA Corporation, Czech Republic.

795-0853

Toxicity Characteristics Leaching Procedure (TCLP) Acids

Column: α-DEX 120, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 2-4310
Oven: 130°C to 220°C at 3°C/min
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride (0.5mg/mL each analyte), split (100:1), 300°C

1. 2-Methylphenol (o-Cresol)
2. 4-Methylphenol (p-Cresol)
3. 3-Methylphenol (m-Cresol)
4. 2,4,6-Trichlorophenol
5. 2,4,5-Trichlorophenol
6. Pentachlorophenol

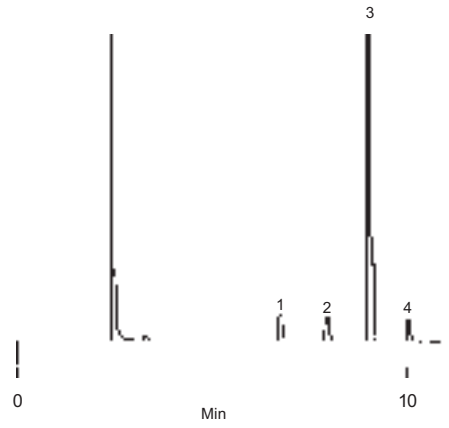


92-0328

Methylphenols (Cresols)

Column: α-DEX 120, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 2-4310
Oven: 160°C
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride (0.5mg/mL each analyte), split (100:1), 250°C

1. Phenol
2. 2-Methylphenol (o-Cresol)
3. 4-Methylphenol (p-Cresol)
4. 3-Methylphenol (m-Cresol)

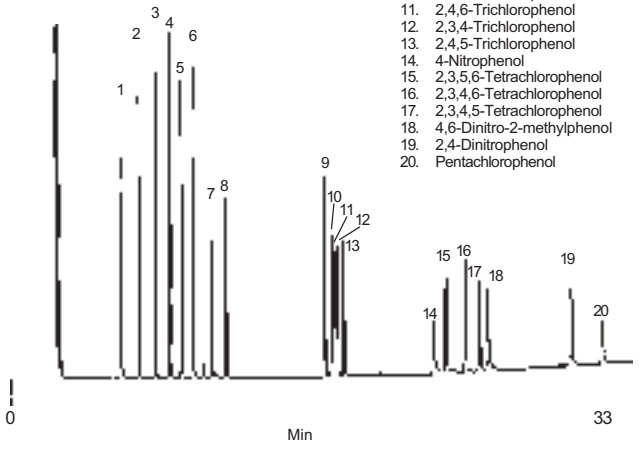


713-0082

Phenols

Column: α-DEX 120, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 2-4310
Oven: 130°C to 220°C at 3°C/min
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: 1µL methanol (0.5mg/mL each analyte), split (100:1), 300°C

1. 2-Chlorophenol
2. Phenol
3. 2-Methylphenol (o-Cresol)
4. 4-Methylphenol (p-Cresol)
5. 3-Methylphenol (m-Cresol)
6. 2,4-Dimethylphenol
7. 2,4-Dichlorophenol
8. 2,6-Dichlorophenol
9. 4-Chloro-3-methylphenol
10. 2,3,5-Trichlorophenol
11. 2,4,6-Trichlorophenol
12. 2,3,4-Trichlorophenol
13. 2,4,5-Trichlorophenol
14. 4-Nitrophenol
15. 2,3,5,6-Tetrachlorophenol
16. 2,3,4,6-Tetrachlorophenol
17. 2,3,4,5-Tetrachlorophenol
18. 4,6-Dinitro-2-methylphenol
19. 2,4-Dinitrophenol
20. Pentachlorophenol

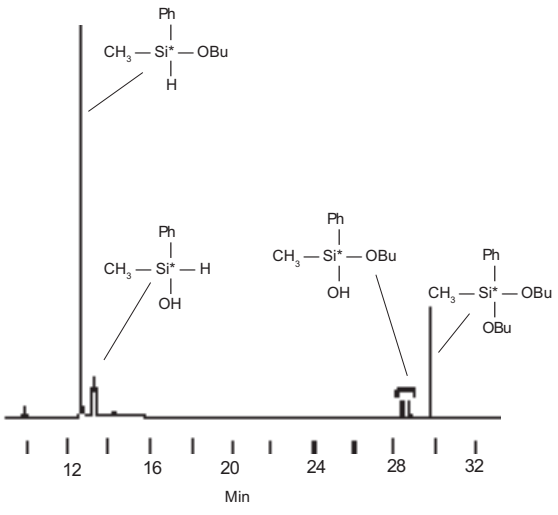


713-0083

Silicon Compounds

Silicon Compounds

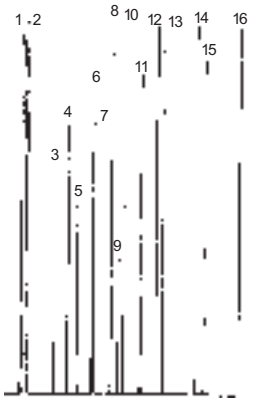
Column: β-DEX 110, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 2-4301
Oven: 100°C to 220°C at 2°C/min
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride (0.5mg/mL each analyte), split (100:1), 250°C



712-0277

Solvents

Column: α-DEX 120, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 2-4310
Oven: 40°C (2 min) to 180°C at 5°C/min, hold 10 min
Carrier: hydrogen, 30cm/sec
Det.: FID, 200°C
Inj.: 1µL methylene chloride:methanol, 95:5 (1µL/mL each analyte, 0.25µL/mL int. std.), 200°C



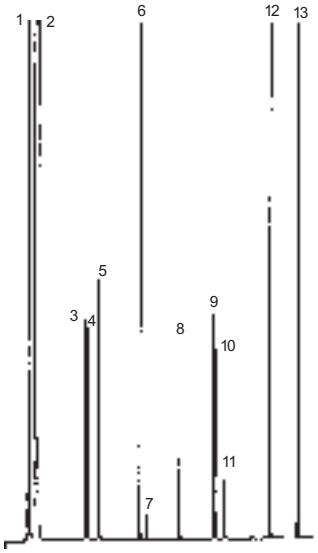
1. Methanol
2. Methylene chloride (Dichloromethane)
3. 2-Methoxyethanol (Methyl Cellosolve®)
4. 2-Ethoxyethanol (Cellosolve)
5. 2-Isopropoxyethanol (Isopropyl Cellosolve)
6. 2-Methoxyethyl acetate (Methyl Cellosolve acetate)
7. 2-Propoxyethanol (Propyl Cellosolve)
8. 2-Ethoxyethyl acetate (Cellosolve acetate)
9. n-Hexanol (int. std.)
10. 2-Butoxyethanol (Butyl Cellosolve)
11. 2-(2-Methoxyethoxy)ethanol (Methyl carbitol)
12. 2-(2-Ethoxyethoxy)ethanol (Carbitol)
13. 2-Butoxyethyl acetate (Butyl Cellosolve acetate)
14. 2-(2-Ethoxyethoxy)ethyl acetate (Carbitol acetate)
15. 2-(2-Butoxyethoxy)ethanol (Butyl carbitol)
16. 2-(2-Butoxyethoxy)ethyl acetate (Butyl carbitol acetate)

Figure provided by Mr. M.L. Shulsky, Occupational Safety and Health Administration.

713-0224

Solvents

Column: α-DEX 120, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 2-4310
Oven: 40°C (2 min) to 180°C at 5°C/min, hold 10 min
Carrier: hydrogen, 30cm/sec
Det.: FID, 200°C
Inj.: 1µL methylene chloride:methanol, 95:5 (1µL/mL each analyte, 0.25µL/mL int. std.), 200°C



1. Methanol
2. Methylene chloride (Dichloromethane)
3. 1-Methoxy-2-propanol (Propylene glycol methyl ether)
4. 1-Methoxy-2-propanol (2nd isomer)
5. 2-Methoxy-1-propanol
6. 1-Methoxy-2-propyl acetate (Propylene glycol methyl ester acetate)
7. 2-Methoxy-1-propyl acetate (0.05µL/mL)
8. n-Hexanol (*int. std.)
9. Dipropylene glycol methyl ester
10. Dipropylene glycol methyl ester (2nd isomer)
11. Dipropylene glycol methyl ester (3rd isomer)
12. N-Methyl-2-pyrrolidinone
13. Vinyl pyrrolidinone

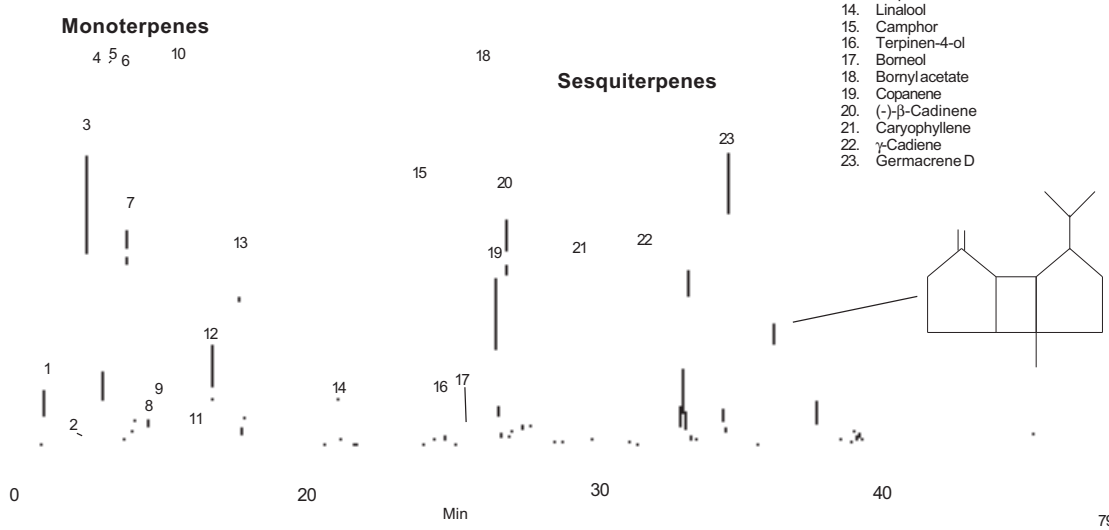
Figure provided by Mr. M.L. Shulsky, Occupational Safety and Health Administration.

713-0225

SPME/Chiral Capillary GC

Juniper Leaves

Sample: 0.5g sliced juniper leaves in 7mL vial
SPME Fiber: **100µm polydimethylsiloxane**
Cat. No.: **57300-U** (manual sampling)
Extraction: headspace, 40°C, 20 min
Desorption: 1 min, 250°C
Column: β-DEX 120, 30m x 0.25mm ID, 0.25µm film
Cat. No.: **2-4304**
Oven: 40°C (2 min) to 220°C at 4°C/min
Carrier: helium, 35cm/sec
Det.: FID, 300°C
Inj.: split (100:1), 250°C



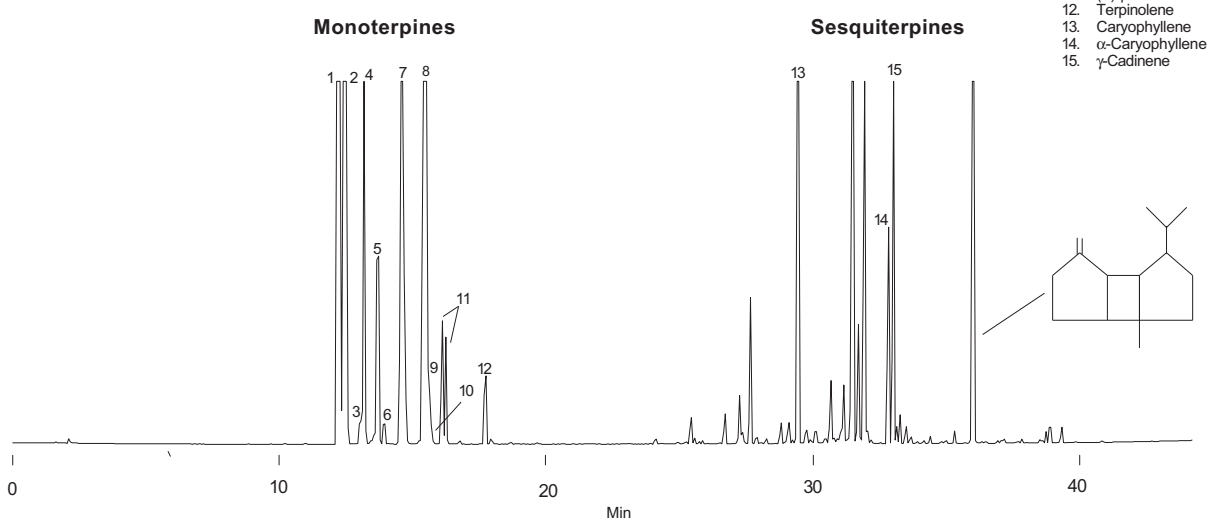
1. α-Thujene
2. (-)-α-Pinene
3. (+)-α-Pinene
4. Tricyclene
5. β-Myrcene
6. Sabinene
7. (+)-Camphene
8. (-)-Camphene
9. α-Terpinene
10. (+)-Limonene
11. β-Phellandrene
12. γ-Terpinene
13. Terpinolene
14. Linalool
15. Camphor
16. Terpinen-4-ol
17. Borneol
18. Bornyl acetate
19. Copanene
20. (-)-β-Cadinene
21. Caryophyllene
22. γ-Cadiene
23. Germacrene D

795-0812

White Pine Leaves

Sample: 0.5g pine leaves in 7mL vial
SPME Fiber: **100µm polydimethylsiloxane**
Cat. No.: **57300-U** (manual sampling)
Extraction: headspace, 40°C, 20 min
Desorption: 1 min, 250°C
Column: **β-DEX 120, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **2-4304**
Oven: 40°C (2 min) to 220°C at 4°C/min
Carrier: helium, 35cm/sec
Det.: FID, 300°C
Inj.: split (100:1), 250°C

1. (-)-α-Pinene
2. (+)-α-Pinene
3. β-Myrcene
4. (+)-Sabinene
5. (+)-Camphene
6. (-)-Camphene
7. (+)-β-Pinene
8. 3-Carene
9. (-)-Limonene
10. (+)-Limonene
11. (±)-β-Phellandrene
12. Terpinolene
13. Caryophyllene
14. α-Caryophyllene
15. γ-Cadinene

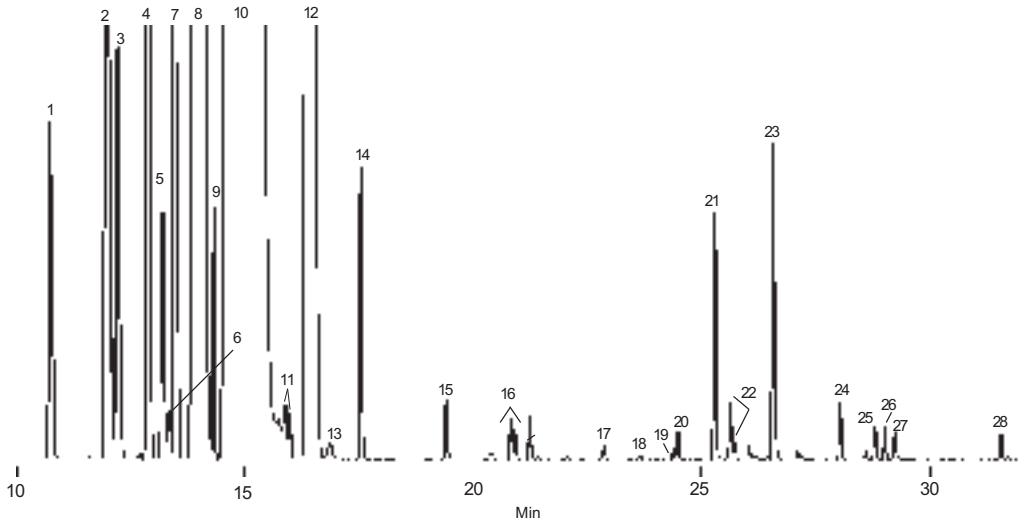


94-0298

Lemon Oil

Sample: 0.5g lemon oil in 7mL vial
SPME Fiber: **100µm polydimethylsiloxane**
Cat. No.: **57300-U** (manual sampling)
Extraction: headspace, 30°C, 30 sec
Desorption: 1 min, 250°C
Column: **β-DEX 120, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **2-4304**
Oven: 40°C (2 min) to 220°C at 4°C/min, hold 5 min
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: split (100:1), 250°C

1. α-Thujene
2. (-)-α-Pinene
3. (+)-α-Pinene
4. β-Myrcene
5. Sabinene
6. (+)-Camphene
7. (-)-Camphene
8. β-Pinene
9. α-Terpinene
10. (-)-Limonene
11. β-Phellandrene
12. γ-Terpinene
13. 3-Octanol
14. Terpinolene
15. Citronellal
16. Linalool
17. Linalyl acetate
18. Menthone
19. (+)-Terpinen-4-ol
20. (-)-Terpinen-4-ol
21. Geranial
22. (±)-α-Terpineol
23. Neral
24. Geranyl acetate
25. Bergamptene
26. Neryl acetate
27. Caryophyllene
28. β-Bisabolene

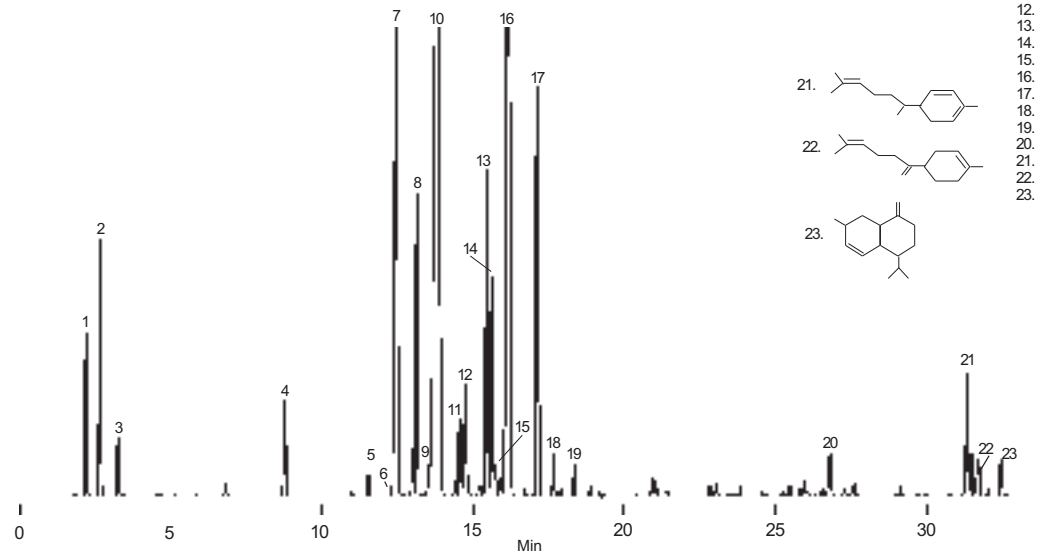


795-0814

Ginger Oil

Sample: 0.5g ginger oil in 7mL vial
SPME Fiber: **100µm polydimethylsiloxane**
Cat. No.: **57300-U** (manual sampling)
Extraction: headspace, 30°C, 30 sec
Desorption: 1 min, 250°C
Column: **β-DEX 120, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **2-4304**
Oven: 40°C (2 min) to 220°C at 4°C/min, hold 5 min
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: split (100:1), 250°C

1. Acetone
2. Isopropyl alcohol
3. Ethyl acetate
4. Hexanal
5. (-)-α-Pinene
6. (+)-α-Pinene
7. Tricyclene
8. β-Myrcene
9. (+)-Camphene
10. (-)-Camphene
11. (+)-β-Pinene
12. (-)-β-Pinene
13. (-)-Limonene
14. (+)-Limonene
15. 6-Methyl-5-hepten-2-one
16. β-Phellandrene
17. Cineole
18. Terpinene
19. Terpinolene
20. Borneol
21. structures shown at left
22. structures shown at left
23. structures shown at left

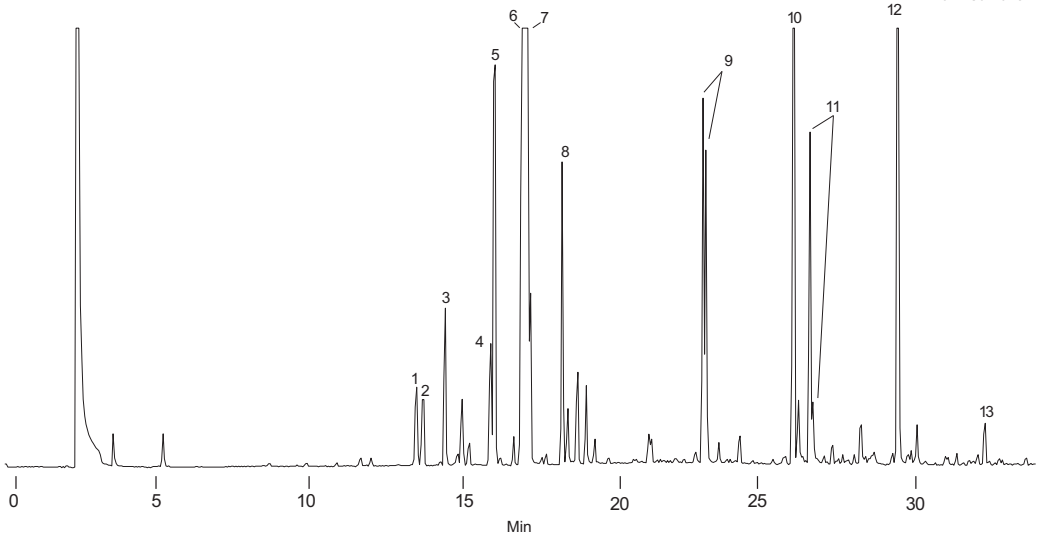


795-0815

Perfume

Sample: 1g perfume in 7mL vial
SPME Fiber: **100µm polydimethylsiloxane**
Cat. No.: **57300-U** (manual sampling)
Extraction: headspace, 30°C, 1 min
Desorption: 1 min, 250°C
Column: **β-DEX 120, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **2-4304**
Oven: 40°C (2 min) to 220°C at 4°C/min, hold 5 min
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: split (100:1), 250°C

1. (-)-α-Pinene
2. (+)-α-Pinene
3. β-Myrcene
4. (+)-β-Pinene
5. (-)-β-Pinene
6. (-)-Limonene
7. (+)-Limonene
8. γ-Terpinene
9. (±)-Linalool
10. (±)-Linalyl acetate
11. unknown chiral component
12. unknown
13. Carvone

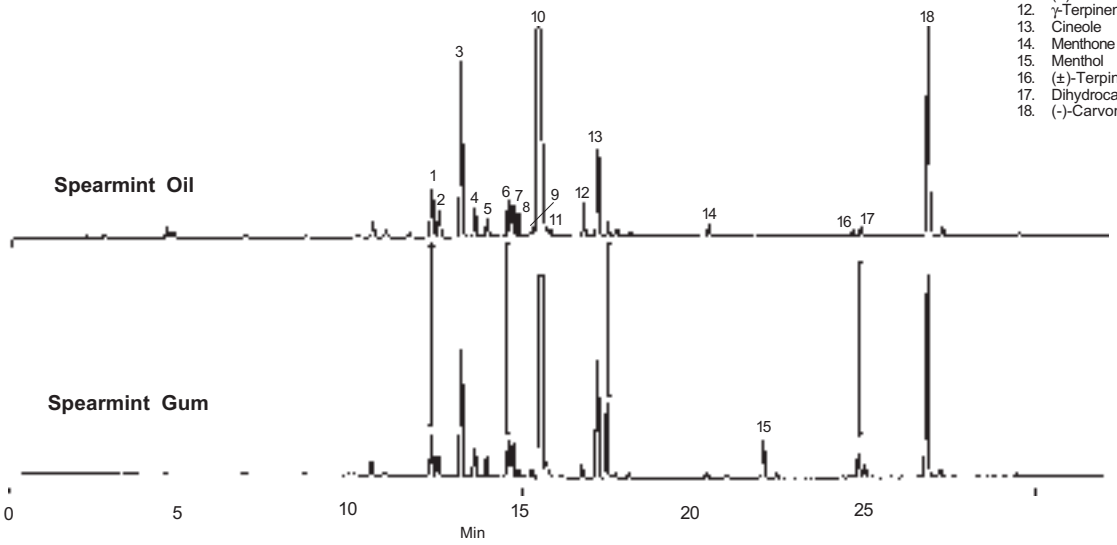


94-0297

Spearmint Oil and Spearmint Gum

Sample: 0.5g spearmint oil or gum in 7mL vial
SPME Fiber: **100µm polydimethylsiloxane**
Cat. No.: **57300-U** (manual sampling)
Extraction: headspace, 30°C, 3 min
Desorption: 1 min, 250°C
Column: **β-DEX 120, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **2-4304**
Oven: 40°C (2 min) to 220°C at 4°C/min
Carrier: helium, 35cm/sec
Det.: FID, 300°C
Inj.: split (100:1), 250°C

1. (-)-α-Pinene
2. (+)-α-Pinene
3. β-Myrcene
4. Sabinene
5. (-)-Camphene
6. (+)-β-Pinene
7. (-)-β-Pinene
8. α-Terpinene
9. 3-Carene
10. (-)-Limonene
11. (+)-Limonene
12. γ-Terpinene
13. Cineole
14. Menthone
15. Menthol
16. (±)-Terpinen-4-ol
17. Dihydrocarvone
18. (-)-Carvone

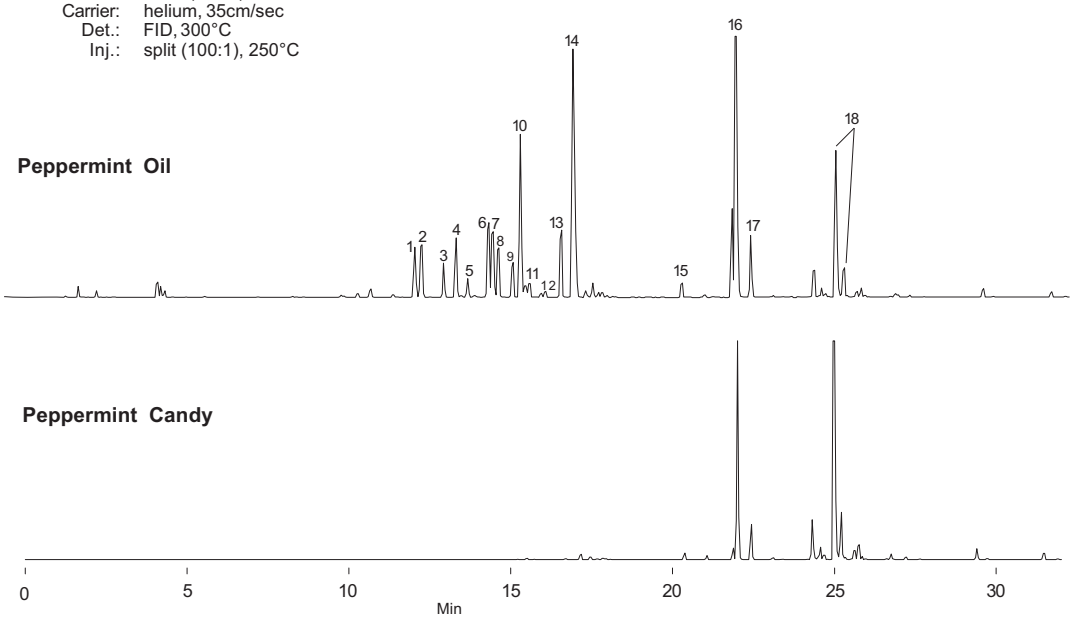


94-0281

Peppermint Oil and Peppermint Candy

Sample: 0.5g peppermint oil or crushed candy in 7mL vial
SPME Fiber: **100µm polydimethylsiloxane**
Cat. No.: **57300-U** (manual sampling)
Extraction: headspace, 30°C, 3 min
Desorption: 1 min, 250°C
Column: **β-DEX 120, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **2-4304**
Oven: 40°C (2 min) to 220°C at 4°C/min
Carrier: helium, 35cm/sec
Det.: FID, 300°C
Inj.: split (100:1), 250°C

1. (-)-α-Pinene
2. (+)-α-Pinene
3. β-Myrcene
4. Sabinene
5. (-)-Camphene
6. (+)-β-Pinene
7. (-)-β-Pinene
8. α-Terpinene
9. 3-Carene
10. (-)-Limonene
11. (+)-Limonene
12. (±)-β-Phellandrene
13. γ-Terpinene
14. Cineole
15. Menthone
16. (+)-Menthol
17. (-)-Menthol
18. (±)-Menthyl acetate

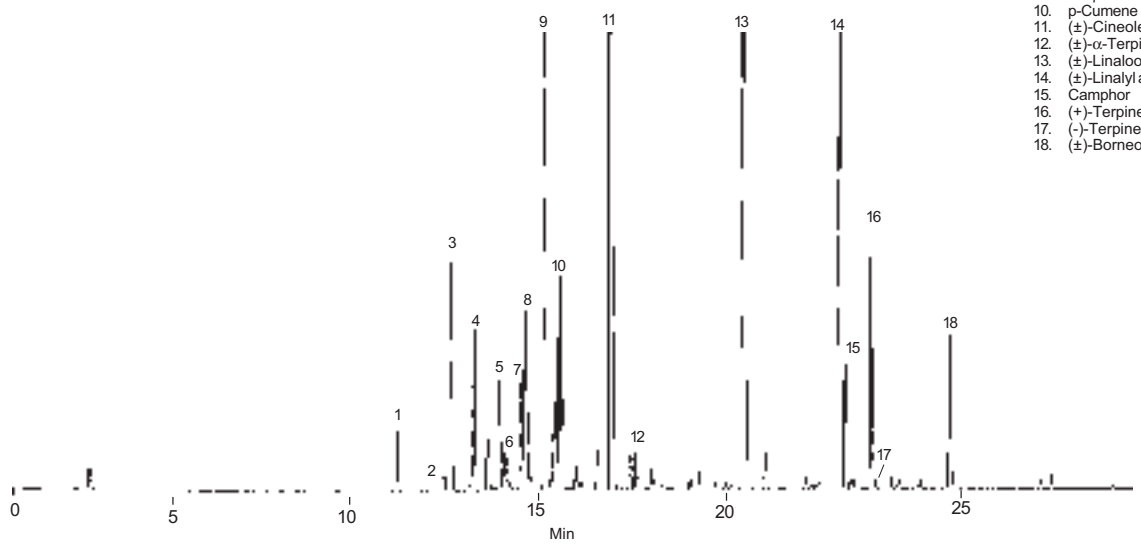


94-0278,0279

Lavender Oil

Sample: 0.5g lavender oil in 7mL vial
SPME Fiber: **100µm polydimethylsiloxane**
Cat. No.: **57300-U** (manual sampling)
Extraction: headspace, 30°C, 30 sec
Desorption: 1 min, 250°C
Column: **β-DEX 120, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **2-4304**
Oven: 40°C (2 min) to 220°C at 4°C/min, hold 5 min
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: split (100:1), 250°C

1. α-Thujene
2. (-)-α-Pinene
3. (+)-α-Pinene
4. β-Myrcene
5. (+)-Camphene
6. (-)-Camphene
7. (+)-β-Pinene
8. (-)-β-Pinene
9. cis-β-Ocimene
10. p-Cumene
11. (±)-Cineole
12. (±)-α-Terpinolene
13. (±)-Linalool
14. (±)-Linalyl acetate
15. Camphor
16. (+)-Terpinen-4-ol
17. (-)-Terpinen-4-ol
18. (±)-Borneol

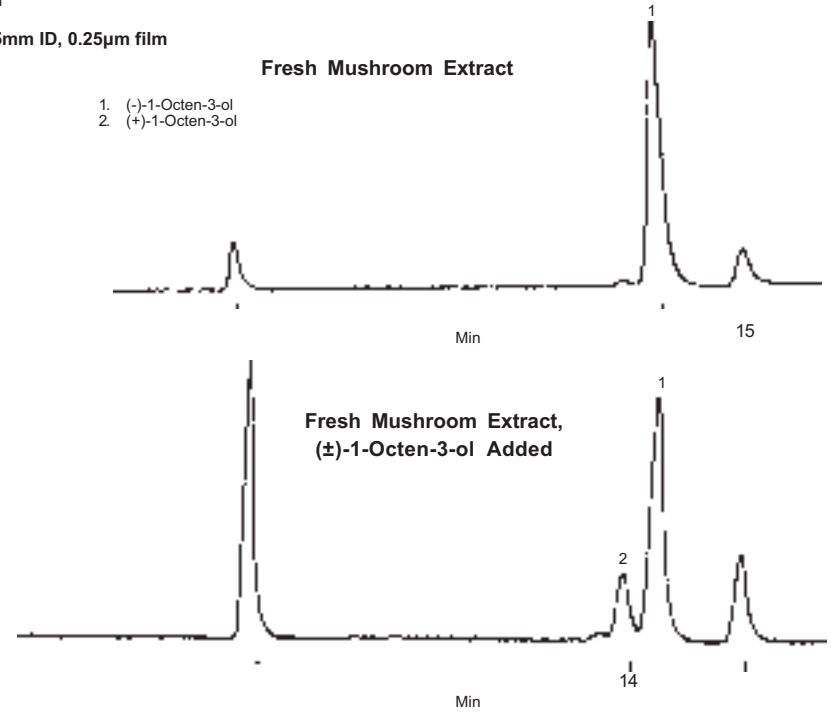


795-0813

Mushroom Extract

Sample: 5g fresh mushroom extract or 5g fresh mushroom extract plus 2µL of 2ppm solution of (±)-1-octen-3-ol in 7mL vial
SPME Fiber: **100µm polydimethylsiloxane**
Cat. No.: **57300-U** (manual sampling)
Extraction: headspace, 40°C, 5 min
Desorption: 1 min, 250°C
Column: **α-DEX 120, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **2-4310**
Oven: 80°C
Carrier: helium, 30cm/sec
Det.: FID, 300°C
Inj.: split (100:1), 250°C

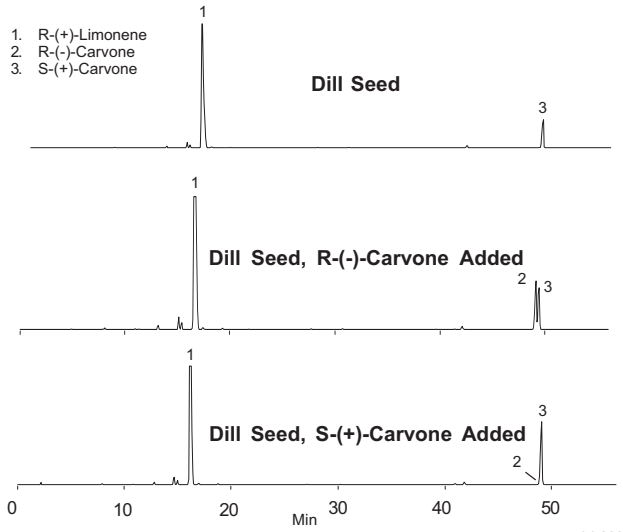
1. (-)-1-Octen-3-ol
2. (+)-1-Octen-3-ol



93-0397,0400

Dill Seed

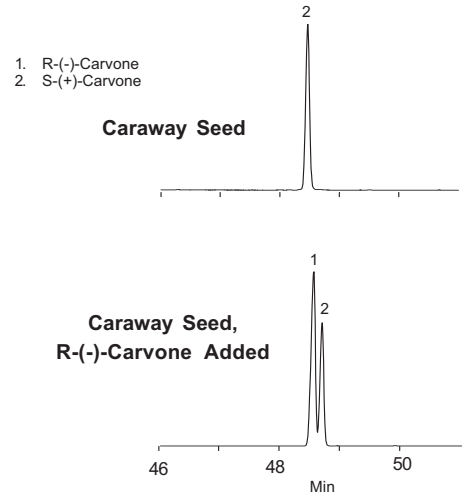
Sample: 1g dill seed or 1g dill seed plus 1µL carvone isomer in 7mL vial
SPME Fiber: **100µm polydimethylsiloxane**
Cat. No.: **57300-U** (manual sampling)
Extraction: headspace, 30°C, 5 min
Desorption: 1 min, 250°C
Column: **α-DEX 120, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **2-4310**
Oven: 80°C
Carrier: helium, 30cm/sec
Det.: FID, 300°C
Inj.: split (100:1), 250°C



94-0293

Caraway Seed

Sample: 0.5g caraway seed, 0.5g caraway seed plus 1µL R-(-)-carvone in 7mL vial
SPME Fiber: **100µm polydimethylsiloxane**
Cat. No.: **57300-U** (manual sampling)
Extraction: headspace, 40°C, 5 min
Desorption: 1 min, 250°C
Column: **α-DEX 120, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **2-4310**
Oven: 80°C
Carrier: helium, 35cm/sec
Det.: FID, 300°C
Inj.: split (100:1), 250°C

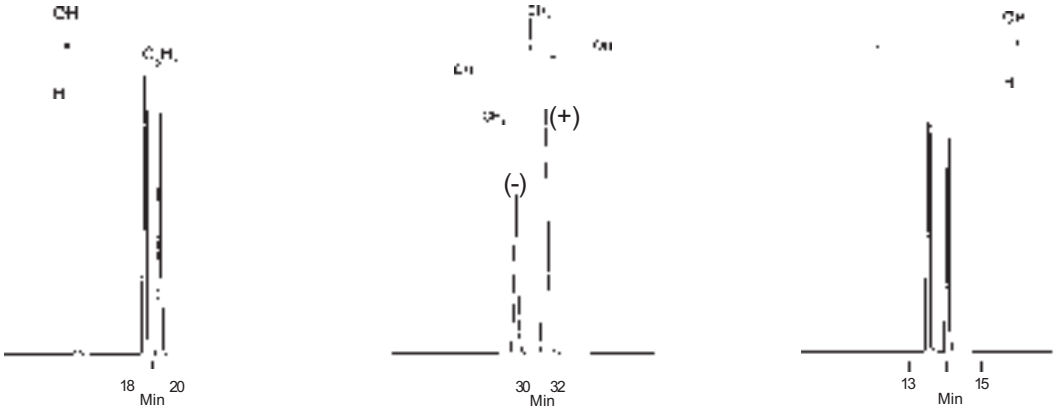


794-0294,0293

DEX 225 and DEX 325 Columns are the latest additions to the DEX column line. See inside back cover.

Column: **β-DEX 325, 30m x 0.25mm ID, 0.25µm film**
Cat. No.: **2-4308**
Oven: 110°C, 1-phenyl-2-propanol; 100°C, isopinocampheol; 90°C, 6-methyl-5-hepten-2-ol
Carrier: helium, 20cm/sec
Det.: FID, 300°C
Inj.: 1µL methylene chloride (1mg/mL each analyte), split (100:1) 220°C

1-Phenyl-2-propanol **Isopinocampheol** **6-Methyl-5-hepten-2-ol**



797-0021, 797-0022, 797-0023, 797-0020, 797-0025, 797-0024

Ordering Information:

α-DEX 120

The chiral stationary phase in α-DEX columns contains permethylated α-cyclodextrin embedded in an intermediate polarity stationary phase. The columns provide unique selectivity for the enantiomeric separation of small molecules; also recommended for separating positional isomers (phenols, xylenes, etc.).

Phase: nonbonded; 20% permethylated α-cyclodextrin in SPB-35 poly(35% phenyl/65% dimethylsiloxane)

Temp. Limits: 30°C to 250°C

McReynolds Nos.: x' y' z' u' s' = 102 243 142 221 170

Length (m)	d_f (µm)	Beta	Cat. No.
0.25mm ID Fused Silica			
30	0.25	250	**24310**

γ-DEX 120

The chiral stationary phase in γ-DEX columns contains 20% permethylated γ-cyclodextrin embedded in an intermediate polarity stationary phase. Because the elution order of the members of a chiral pair frequently reverses (enantioreversal) on a γ-DEX column, compared to the elution order on an α-DEX or β-DEX column, we recommend γ-DEX columns as complements to α-DEX and β-DEX columns.

Phase: nonbonded; 20% permethylated γ-cyclodextrin in SPB-35 poly(35% diphenyl/65% dimethylsiloxane)

Temp. Limits: 30°C to 250°C

Length (m)	d_f (µm)	Beta	Cat. No.
0.25mm ID Fused Silica			
30	0.25	250	**24307**

Custom Columns

We can prepare fused silica capillary columns with:

- 1-30% permethylated cyclodextrin, 0.1-0.5µm film
- 5-100 meter length
- 0.10-0.53mm ID
- alternative cyclodextrin derivatives
- alternative stationary cophases

Prices for these columns are comparable to prices for stock DEX columns. Please contact our Technical Service chemists or your local sales representative for more information.

β-DEX 110, β-DEX 120

The chiral stationary phase in β-DEX columns contains permethylated β-cyclodextrin embedded in an intermediate polarity stationary phase. Recommended for the enantiomeric separation of a wide range of chiral compounds (ketones, esters, alkanes, alkenes, alcohols, acids, ethers, etc.). The 10% (β-DEX 110) and 20% (β-DEX 120) β-cyclodextrin content alters the elution order while maintaining similar enantioselectivity.

Phase: nonbonded; 10% and 20% permethylated β-cyclodextrin in SPB-35 poly(35% diphenyl/65% dimethylsiloxane)

Temp. Limits: 30°C to 250°C

McReynolds Nos.: x' y' z' u' s' = 112 236 153 130 184 (β-DEX 110)

x' y' z' u' s' = 119 264 154 134 187 (β-DEX 120)

Length (m)	d_f (µm)	Beta	Cat. No.
β-DEX 110, 0.25mm ID Fused Silica			
30	0.25	250	**24301**
60	0.25	250	**24302**
β-DEX 110, 0.53mm ID Fused Silica			
30	0.5	265	**25410-U**
60	0.5	265	**25411**
β-DEX 120, 0.25mm ID Fused Silica			
30	0.25	250	**24304**
60	0.25	250	**24305-U**
β-DEX 120, 0.53mm ID Fused Silica			
30	0.5	265	**25413-U**
60	0.5	265	**25414**

Cyclodextrin Column Selection Kit I

This kit provides you with the tools you need to perform most chiral separations. Identities of enantiomers can be confirmed by monitoring changes in their elution order (enantioreversal) from an α-DEX column to a β-DEX column, a β-DEX column to a γ-DEX column, or an α-DEX column to a γ-DEX column.

Kit includes one 30m x 0.25mm ID, 0.25µm film column of each type: α-DEX 120, β-DEX 120, γ-DEX 120.

Description	Cat. No.
Cyclodextrin Column Selection Kit I	**24340**

Cyclodextrin Column Selection Kit II

In combination with Kit I, this kit provides you with a library of columns that spans the full range of DEX column enantioselectivity at substantial savings, relative to purchasing individual columns.

Kit includes one 30m x 0.25mm ID, 0.25µm film column of each type: β-DEX 120, β-DEX 225, γ-DEX 225, β-DEX 325.

Description	Cat. No.
Cyclodextrin Column Selection Kit II	**24328-U**

α-DEX 225

The chiral stationary phase in α-DEX 225 columns contains 2,3-di-O-acetyl-6-O-TBDMS-α-cyclodextrin embedded in an intermediate polarity phase.

Phase: nonbonded; 25% 2,3-di-O-acetyl-6-O-TBDMS-α-cyclodextrin embedded in SPB-20 poly(20% phenyl/80% dimethylsiloxane)

Temp. Limits: 30°C to 250°C

Length (m)	d_f (µm)	Beta	Cat. No.
0.25mm ID Fused Silica			
30	0.25	250	**24311**

β-DEX 225

The chiral stationary phase in β-DEX 225 columns contains 2,3-di-O-acetyl-6-O-TBDMS-β-cyclodextrin embedded in an intermediate polarity phase. These columns provide unique selectivity for enantiomeric separations of small molecules: alcohols, aldehydes (e.g., 2-phenylpropionaldehyde), esters (e.g., methyl malate, methyl lactate), flavor compounds, and ketones.

Phase: nonbonded; 25% 2,3-di-O-acetyl-6-O-TBDMS-β-cyclodextrin embedded in SPB-20 poly(20% phenyl/80% dimethylsiloxane)

Temp. Limits: 30°C to 250°C

Length (m)	d_f (µm)	Beta	Cat. No.
0.25mm ID Fused Silica			
30	0.25	250	**24348**
0.32mm ID Fused Silica			
30	0.25	320	**24349**
0.53mm ID Fused Silica			
30	0.25	265	**25442**

γ-DEX 225

The chiral stationary phase in γ-DEX 225 columns contains 2,3-di-O-acetyl-6-O-TBDMS-γ-cyclodextrin embedded in an intermediate polarity phase.

Phase: nonbonded; 25% 2,3-di-O-acetyl-6-O-TBDMS-γ-cyclodextrin embedded in SPB-20 poly(20% phenyl/80% dimethylsiloxane)

Temp. Limits: 30°C to 250°C

Length (m)	d_f (µm)	Beta	Cat. No.
0.25mm ID Fused Silica			
30	0.25	250	**24312**

α-DEX 325

The chiral stationary phase in α-DEX 325 columns contains 2,3-di-O-methyl-6-O-TBDMS-α-cyclodextrin embedded in an intermediate polarity phase.

Phase: nonbonded; 25% 2,3-di-O-methyl-6-O-TBDMS-α-cyclodextrin embedded in SPB-20 poly(20% phenyl/80% dimethylsiloxane)

Temp. Limits: 30°C to 250°C

Length (m)	d_f (µm)	Beta	Cat. No.
0.25mm ID Fused Silica			
30	0.25	250	**24303**

β-DEX 325

The chiral stationary phase in β-DEX 325 columns contains 2,3-di-O-methyl-6-O-TBDMS-β-cyclodextrin embedded in an intermediate polarity phase.

Phase: nonbonded; 25% 2,3-di-O-methyl-6-O-TBDMS-β-cyclodextrin embedded in SPB-20 poly(20% phenyl/80% dimethylsiloxane)

Temp. Limits: 30°C to 250°C

Length (m)	d_f (µm)	Beta	Cat. No.
0.25mm ID Fused Silica			
30	0.25	250	**24308**
0.32mm ID Fused Silica			
30	0.25	320	**24309**
0.53mm ID Fused Silica			
30	0.50	265	**25443**

γ-DEX 325

The chiral stationary phase in γ-DEX 325 columns contains 2,3-di-O-methyl-6-O-TBDMS-γ-cyclodextrin embedded in an intermediate polarity phase.

Phase: nonbonded; 25% 2,3-di-O-methyl-6-O-TBDMS-γ-cyclodextrin embedded in SPB-20 poly(20% phenyl/80% dimethylsiloxane)

Temp. Limits: 30°C to 250°C

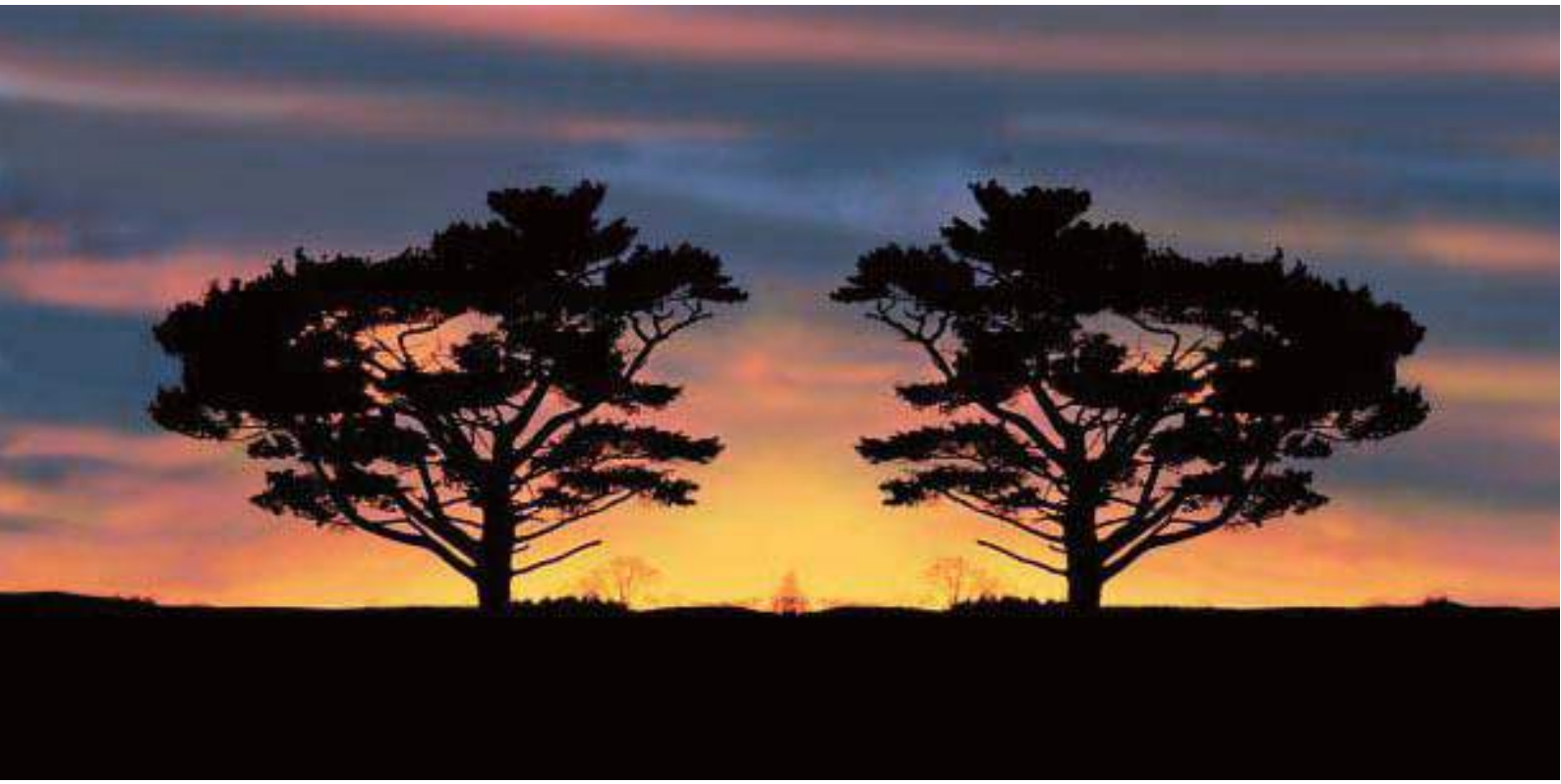
Length (m)	d_f (µm)	Beta	Cat. No.
0.25mm ID Fused Silica			
30	0.25	250	**24306**

For more information, or current prices, contact your nearest Supelco subsidiary listed below. If your country is not listed, see the Supelco catalog for a complete list of all Supelco representatives, or contact Supelco, Bellefonte, PA 16823-0048 USA.

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BELGIUM · Sigma-Aldrich N.V./S.A. · B-2880 Bornem **BRAZIL** · Sigma-Aldrich Quimica Brasil Ltda. · 01239-010 São Paulo, SP **CANADA** · Sigma-Aldrich Canada, Ltd. · 2149 Winston Park Drive, Ontario L6H 6J8
CZECH REPUBLIC · Sigma-Aldrich s.r.o.· 186 00 Praha 8 **FINLAND**· Sigma-Aldrich Finland/YA-Kemia Oy · FIN-00700 Helsinki **FRANCE** · Sigma-Aldrich Chimie · 38297 Saint-Quentin-Fallavier Cedex
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α-DEX – β-DEX – γ-DEX Chiral Cyclodextrin Capillary GC Columns



Derivatized α-, β-, and γ-cyclodextrin on a stable phenylmethylpolysiloxane cophase, for efficiently separating optical and positional isomers without derivatization: foods – flavors – essential oils – pharmaceuticals – polymers – natural products – synthesized chemicals.

Selective, new-generation columns: high resolution, high temperature limits, low bleed, individually tested. Temperature range: 30°C – 240°C/250°C (isothermal/programmed)

Cyclodextrin Column Selection Kit

Determine which DEX column most effectively separates your samples, or use different columns to produce enantioreversals. Kit includes three 30m x 0.25mm ID x 0.25µm film columns, one of each 20% cyclodextrin type: α-DEX 120, β-DEX 120, γ-DEX 120.

Catalog No. 2-4340

Custom-Prepared Cyclodextrin Columns

Customize enantioselectivity / efficiency / sample capacity to your exact needs, by choosing:

- *CD inclusion cavity size*
- *CD content* 1-30% CD / 0.1-0.5µm film
- *Column internal diameter* 0.10-0.53mm
- *Column length* 5-100m

Prices for these columns are comparable to prices for stock DEX columns. Please contact our Technical Service chemists for more information (Phone 800-359-3041 or 814-359-3041, FAX 800-359-3044 or 814-359-5468).

For prices, or to order:

Phone: **800-247-6628 or 814-359-3441**

FAX: **800-447-3044 or 814-359-3044**

SUPELCO

Supelco Park • Bellefonte, PA 16823-0048 USA

Maximize Performance!

Gas Chromatography Accessories and Gas Purification/Management Products

SUPELCO® Analytical



- Septa
- Liners
- Ferrules
- Solvents
- Syringes
- Vials
- Purifiers and more

SIGMA-ALDRICH®



Choosing the Correct Products

Choosing the proper items for routine system maintenance and new column installation can save costly downtime and rework, plus help prevent inaccurate chromatographic results. For the gas chromatographer, choosing the correct items when upgrading and replacing parts and accessories for their system can bring on many challenges due to the vast array of commercially available products. At Supelco, we offer our own unique products, as well as products from some of the most trusted names in the industry, to assist in making the selection process easier.

Preventative Maintenance

Often overlooked is the importance of preventative maintenance of the gas chromatographic system. Many times, maintenance is only performed after a serious problem occurs, and serves solely to remedy the situation. A better choice is to take a proactive, instead of a reactive, approach to maintenance in an effort to prevent problems from manifesting. This can best be performed by strictly adhering to a schedule of routine preventative maintenance.

Non-volatile material accumulates on injection port items, creating active spots, leading to poor chromatography and loss of sensitivity. Periodical replacement of injection port items will minimize this adsorption of analytes. Over time, purifiers become saturated and must be replaced to maintain the continuous supply of chromatographic quality carrier gas. To maximize the performance of the chromatographic system, Supelco offers preventative maintenance items only of the highest quality; items such as septa, inlet liners, O-rings, inlet seals, ferrules, and purifiers.

Installation and Troubleshooting

In addition to being required for a scheduled preventative maintenance routine, quality products are also needed for installation and troubleshooting tasks. Some of the same items and tools are used whether performing an initial set-up of a new instrument, the replacement of system components (such as a column), or troubleshooting activities. To aid in accomplishing these tasks, Supelco offers the highest quality products; products such as column nuts, flow meters, tubing, fittings, valves, particle and oil filters, gas generators, leak detectors and pressure regulators. Additionally, Supelco offers numerous hand tools that have been specifically designed to assist the chromatographer in the installation and maintenance associated with gas chromatography.

Supelco Products

Throughout this brochure you will find GC Accessories and Gas Purification/Management products that are designed to maximize instrument performance while helping to reduce the risk of chromatographic problems. Please note that this represents a brief listing of the GC Accessories and Gas Purification/ Management products that we offer. For a complete listing, please refer to our catalog and/or web site, ***sigma-aldrich.com/gc***

Quick Look-Up Tables

These quick look-up tables can be used as a reference to find frequently replaced accessories for commonly used GC instruments. In-depth details (photos, descriptions and specifications) can be found elsewhere in this brochure.

Agilent® 5890, 6890, 7890 GCs

Description	Pkg	Cat. No.
Molded Thermogreen™ LB-2 Septa, 9.5 mm, with injection hole	50 ea	**28331-U**
Molded Thermogreen LB-2 Septa, 11 mm, with injection hole	50 ea	**28336-U**
Inlet Liner, Cup Design, Wool Packed, 4 mm I.D.	5 ea	**2048205**
Inlet Liner, Straight Through, Wool Packed, 4 mm I.D.	5 ea	**2048605**
Inlet Liner, Single Taper. 4 mm I.D.	5 ea	**2046605**
Inlet Liner, FocusLiner™, Single Taper, Wool Packed, 4 mm I.D.	5 ea	**2879905-U**
Therm-O-Ring™, 1/4 in.	10 ea	**21003-U**
Gold Plated Inlet Seal	10 ea	**23319-U**
Supeltex M-2A Short Capillary Ferrules, 0.25 mm Column	10 ea	**24803-U**
Supeltex M-4 Short Capillary Ferrules, 0.25 mm Column	10 ea	**24811-U**
Supeltex M-2A Long Capillary Ferrules, 0.25 mm Column	10 ea	**24826-U**
Column Nut for Agilent	2 ea	**24833-U**
Source Column Nut for Agilent MSD	5 ea	**28034-U**

PerkinElmer® AutoSystem™ and Clarus GCs

Description	Pkg	Cat. No.
Molded Thermogreen LB-2 Septa, 11 mm, with injection hole	50 ea	**28336-U**
Inlet Liner, FocusLiner, Single Taper, Wool Packed, 4 mm I.D.	5 ea	**2879105-U**
Inlet Liner, Straight Through, 2 mm I. D.	5 ea	**2631105**
Therm-O-Ring, 1/4 in.	10 ea	**21003-U**
M-2A Long Capillary Ferrules, 0.25 mm Column	10 ea	**24826-U**
Column Nut for PerkinElmer	5 ea	**28034-U**

Varian® GCs

Description	Pkg	Cat. No.
Thermogreen LB-2 Septa, 9.0 mm	50 ea	**28021-U**
Molded Thermogreen LB-2 Septa, 11 mm, with injection hole	50 ea	**28336-U**
Inlet Liner, FocusLiner, Single Taper, Wool Packed, 3.4 mm I.D. for 1078/1079 injectors	5 ea	**2875705-U**
Inlet Liner, SPME, 0.75 mm I.D., for CP-1177 Injector	5 ea	**2637505**
M-2A Long Capillary Ferrules, 0.25 mm Column	10 ea	**24826-U**
Column Nut for Varian	1 ea	**28033-U**

Septa

Molded Thermogreen LB-2 Septa



Molded Thermogreen LB-2 septa are manufactured from high quality, low bleed material using the same exclusive LB-2 rubber formulation that chromatographers are accustomed to using. The difference is that molded septa, unlike traditional die-cut septa, offer easier installation and better sealing. This is because our liquid injection molding process yields septa that all conform to the same shape with crisp, clean sides.

The useable inlet temperature range of 100-350 °C is adequate for the majority of GC applications. **Don't be fooled by other septa that advertise a maximum temperature of 400 °C (to make a septa with high thermal limits, one must also make it stiffer, resulting in septa that are harder to pierce and easier to core)!** Our molded Thermogreen LB-2 septa offer the perfect combination of temperature range, low bleed, and easy puncturability.

The version with injection hole is for autosampler injections, manual injections, and/or SPME applications. The solid disc version is for manual injections.

- Rubber formulation exclusive to Supelco
- Strict tolerances (diameter, thickness, and injection hole) due to the constant dimensions of the mold itself.
- Ultra low bleed over a wide range of inlet temperatures (100 °C to 350 °C)
- No foreign substances or powders (which could contaminate the inlet) are used during manufacturing
- Fully tested for bleed and contamination
- Already conditioned, ready-to-use
- Ideal for use with low bleed GC-MS columns

Description	Pkg	Cat. No.
9.5 mm, with injection hole	50 ea	**28331-U**
9.5 mm, with injection hole	250 ea	**28332-U**
9.5 mm, solid discs	50 ea	**28670-U**
9.5 mm, solid discs	250 ea	**28671-U**
10 mm, with injection hole	50 ea	**28333-U**
10 mm, with injection hole	250 ea	**28334-U**
10 mm, solid discs	50 ea	**28673-U**
10 mm, solid discs	250 ea	**28675-U**
11 mm, with injection hole	50 ea	**28336-U**
11 mm, with injection hole	250 ea	**28338-U**
11 mm, solid discs	50 ea	**28676-U**
11 mm, solid discs	250 ea	**28678-U**
11.5 mm, with injection hole	50 ea	**29446-U**
11.5 mm, with injection hole	250 ea	**29448-U**
11.5 mm, solid discs	50 ea	**29449-U**
11.5 mm, solid discs	250 ea	**29451-U**
17 mm, with injection hole	50 ea	**29452-U**
17 mm, with injection hole	250 ea	**29453-U**
17 mm, solid discs	50 ea	**29456-U**
17 mm, solid discs	250 ea	**29457-U**

Thermogreen LB-2 Septa



We test every lot of Thermogreen LB-2 septa, to ensure low bleed and high puncture tolerance. We also condition these septa – they are ready-to-use, right from the container. Popular dimensions are listed below. Other dimensions can be found in our catalog and on our web site.

- Formulation exclusive to Supelco
- Extremely low bleed over a wide range of inlet temperatures (100 °C to 350 °C)
- Already conditioned, ready-to-use

Description	Pkg	Cat. No.
9.0 mm	50 ea	**28021-U**
9.5 mm	50 ea	**20652**
9.5 mm	250 ea	**20666**
10 mm	50 ea	**20653-U**
10 mm	250 ea	**23156**
11 mm	50 ea	**20654**
11 mm	250 ea	**23163**
11 mm	1000 ea	**23164**
11.5 mm	50 ea	**23154**
17 mm	50 ea	**23159**
Plug (for Shimadzu)	10 ea	**20608**
Plug (for Shimadzu)	50 ea	**20633**

Merlin Microseal™ System Kits

The Merlin Microseal system incorporates a unique design with two sequential seals that provide long septum life. The patented design is a replacement for the standard septum and septum nut in a capillary inlet system. Popular kits are listed below. Kit components can be found in our catalog and on our web site.



- Sustain many injections without leaks or septum fragments
- For use with 23 gauge blunt tipped needles
- Ideal for use with an SPME device with a 23 gauge needle
- These kits include all necessary items for initial installation

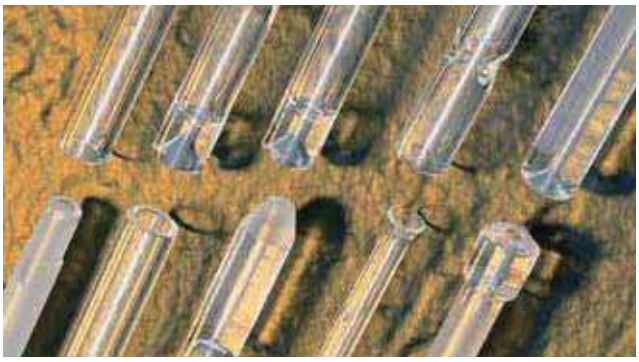
Description	Max Pressure	Cat. No.
For Agilent 5890/6890/7890 GCs	30 psi	**22584**
For Agilent 5890/6890/7890 GCs	100 psi	**24815-U**
For Varian 3400/3800 GCs with 1077/1078/1079 Injectors	100 psi	**24817-U**
For Varian 3800 GCs with CP-1177 Injector	100 psi	**22609-U**



Liners and Seals

Inlet Liners

A regular schedule of inlet liner replacement as part of a preventative maintenance routine will help prevent adsorption problems that can drastically affect chromatography if left unchecked. Inlet liners should be highly inert and manufactured to the strictest of tolerances. Supelco is recognized as a leader in the manufacturing of high quality inlet liners. Popular inlet liner dimensions are listed below. Other inlet liners can be found in our catalog and on our web site.



P000179

- Proprietary high temperature silanization (exclusively from Supelco) ensures inertness
- Our in-house glass shop ensures consistent dimensions that meet, or exceed, GC manufacturers' strict tolerances
- Inlet liners that are packed use a high-quality glass wool, deactivated using a proprietary silanization process (exclusively from Supelco)

Description	Pkg	Cat. No.
For Agilent 5890/6890/7890 (78.5 mm length x 6.3 mm O.D.)		
Split with cup, 4 mm I.D., unpacked	5 ea	**2051005**
Split with cup, 4 mm I.D., wool packed	5 ea	**2048205**
Split straight through, 4 mm I.D., unpacked	5 ea	**2879405-U**
Split straight through, 4 mm I.D., wool packed	5 ea	**2048605**
Splitless with single taper, 4 mm I.D., unpacked	5 ea	**2046605**
Splitless with single taper, 4 mm I.D., wool packed	5 ea	**2047805**
Splitless with dual taper, 4 mm I.D., unpacked	5 ea	**2048505**
Splitless straight through, 2 mm I.D., unpacked	5 ea	**2051305**
Splitless straight through, 1.5 mm I.D., unpacked	5 ea	**2051705**
SPME, 0.75 mm I.D., unpacked	5 ea	**2637505**
For Finnigan		
Same catalog numbers as Agilent		
For PerkinElmer AutoSystem and Clarus (92 mm length x 6.3 mm O.D.)		
Split, 4 mm I.D., unpacked	5 ea	**2630905**
Split, 4 mm I.D., wool packed	5 ea	**2631005**
Splitless straight through, 2 mm I.D., unpacked	5 ea	**2631105**
SPME, 0.75 mm I.D., unpacked	5 ea	**2631205**
For Shimadzu® 17A with SPL-17 Injector (95 mm length x 5 mm O.D.)		
Split, 3.4 mm I.D., unpacked	5 ea	**2633605**
Split, 3.4 mm I.D., wool packed	5 ea	**2632705**
Splitless with middle gooseneck, 3.4 mm I.D., unpacked	5 ea	**2878305-U**
Splitless with recessed gooseneck, 3.4 mm I.D., wool packed	5 ea	**2877905-U**
Splitless straight through, 2.6 mm I.D., unpacked	5 ea	**2633705**
SPME, 0.75 mm I.D., unpacked	5 ea	**2633905**
For Thermo® ThermoQuest 8000/TRACE® (105 mm length x 8 mm O.D.)		
Split, 5 mm I.D., unpacked	5 ea	**2877105-U**
Split, 3 mm I.D., unpacked	5 ea	**2876705-U**
Splitless with single taper, 5 mm I.D., unpacked	5 ea	**2877305-U**
Splitless with single taper, 3 mm I.D., unpacked	5 ea	**2877405-U**
SPME, 0.8 mm I.D., unpacked	5 ea	**2876605-U**
For Varian 1075/1077 Injectors (72 mm length x 6.3 mm O.D.)		
Split with baffle, 4 mm I.D., unpacked	5 ea	**2050105**
Split, 4 mm I.D., unpacked	5 ea	**2636105**
Split, 4 mm I.D., wool packed	5 ea	**2636005**
Splitless, 2 mm I.D., unpacked	5 ea	**2050205**
SPME. 0.75 mm I.D., unpacked	5 ea	**2635805**
For Varian 1078/1079 Injectors (54 mm length x 5 mm O.D.)		
Split, 3.4 mm I.D., unpacked	5 ea	**2637105**
Split, 3.4 mm I.D., wool packed	5 ea	**2637305**
Splitless, 2 mm I.D., unpacked	5 ea	**2637405**
Splitless, 2 mm I.D., wool packed	5 ea	**2637705**
SPME, 0.8 mm I.D., unpacked	5 ea	**2637805**
For Varian CP-1177 Injectors		
Same catalog numbers as Agilent		

Glass Wool

Glass wool is a fine pliable untreated glass fiber. Silanized glass wool and Pesticide Grade glass wool undergo a proprietary deactivation process to remove active sites that may interfere with an analysis.



P000316

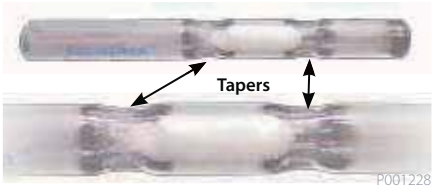
- Maximum temperature 400 °C
- Silanized – use where minimal activity is required
- Pesticide Grade – use in the analysis of pesticides
- Phosphoric Acid Treated – use in the analysis of free acids, phenols, and glycols
- Puller/Inserter – easily inserts or removes glass wool plugs



E000812

Description	Pkg	Cat. No.
Silanized	50 g	**20411**
Pesticide Grade	10 g	**20409**
Phosphoric Acid Treated	50 g	**20383**
Puller/Inserter Tool	2 g	**22406**

FocusLiner Inlet Liners



The use of a wool plug in inlet liners has been used for many years to promote the rapid vaporization of the entire sample, minimize mass discrimination, and prevent non-volatile material from entering the column. FocusLiner inlet liners incorporate a unique design that prevents shifting of the wool plug during repeated injections or sudden inlet pressure changes. Popular FocusLiner inlet liners are listed below. Other inlet liners can be found in our catalog and on our web site.

- Tapers inside the liner stabilize the position of the wool plug, the wool plug is always correctly located
- Unique design prevents shifting of the wool plug during repeated injections or sudden inlet pressure changes
- Large surface area for maximum sample vaporization
- Wiping action removes residual liquid sample from the needle tip, thus preventing droplet formation
- Reduced solvent tailing
- Lower mass discrimination during split injections
- Typically reduces injection variability by at least 96%
- Provide maximum sensitivity and improved detection levels
- High temperature deactivated glass
- Guaranteed to fit

Description	Pkg	Cat. No.
For Agilent 5890/6890/7890 (78.5 mm length x 6.3 mm O.D.)		
Split/splitless, 4 mm I.D., wool packed	5 ea	**2879805-U**
Split/splitless, 2.3 mm I.D., wool packed	5 ea	**2879605-U**
Split/splitless with single taper, 4 mm I.D., wool packed	5 ea	**2879905-U**
Split/splitless with single taper, 2.3 mm I.D., wool packed	5 ea	**2879505-U**
For Finnigan		
Same catalog numbers as Agilent		
For PerkinElmer AutoSystem and Clarus (92 mm length x 6.3 mm O.D.)		
Split/splitless, 4 mm I.D., wool packed	5 ea	**2879205-U**
Split/splitless with single taper, 4 mm I.D., wool packed	5 ea	**2879105-U**
For Shimadzu 17A with SPL-17 Injector (95 mm length x 5 mm O.D.)		
Split/splitless, 3.4 mm I.D., wool packed	5 ea	**2878605-U**
Split/splitless with single taper, 3.4 mm I.D., wool packed	5 ea	**2878405-U**
For Thermo ThermoQuest 8000/TRACE (105 mm length x 8 mm O.D.)		
Split, 5 mm I.D., wool packed (for use with 50 mm needles)	5 ea	**2877005-U**
Splitless, 5 mm I.D., wool packed (for use with 70 mm needles)	5 ea	**2877205-U**
Splitless with single taper, 5 mm I.D., wool packed	5 ea	**2877505-U**
Split, 4 mm I.D., wool packed	5 ea	**2875405-U**
Split with single taper, 4 mm I.D., wool packed	5 ea	**2874805-U**
Split, 2.3 mm I.D., wool packed	5 ea	**2874705-U**
For Varian 1078/1079 Injectors (54 mm length x 5 mm O.D.)		
Split/splitless with single taper, 3.4 mm I.D., wool packed	5 ea	**2875705-U**
Split/splitless with dual taper, 3.4 mm I.D., wool packed	5 ea	**2875505-U**
For Varian CP-1177 Injectors		
Same catalog numbers as Agilent		

Therm-O-Ring Seals

Inlet liners used in an Agilent GC require an O-ring placed near the top for proper operation. This O-ring ensures that the only path for carrier gas to get to the outside of the inlet liner is through the grooves in the inlet seal at the bottom of the injection port.

- Available exclusively from Supelco
- Fit 6.3 mm, 6.5 mm, or 1/4" O.D. capillary liners that use an O-ring seal
- Can be used with inlet temperatures up to 375 °C without sticking or fragmenting
- Superior replacements for O-rings made from Viton™

Description	Pkg	Cat. No.
Therm-O-Ring Seal	10 ea	**21003-U**
Therm-O-Ring Seal	25 ea	**21004-U**

Inlet Seals

The inlet seals in an Agilent GC must be regularly changed to prevent sample adsorption due to accumulation of sample residue and/or septum fragments. Supelco offers replacement inlet seals of the highest quality.

- Stainless steel for analyses of non-reactive compounds
- Pure gold plating for applications requiring more inertness
- No brighteners used in the plating process
- Cross design intended for high split flows (>200 mL/min.)
- Packs of two or ten include one washer for each seal
- Packs of 100 include 50 washers

Description	Pkg	Cat. No.
Non-plated	2 ea	**23316-U**
	10 ea	**23317-U**
	100 ea	**23363-U**
Gold-plated	2 ea	**23318-U**
	10ea	**23319-U**
Gold-plated, cross design	2 ea	**23413-U**
	10 ea	**23415-U**



Ferrules and Nuts

GC ferrules should provide a leak-tight seal, accommodate column O.D. variations, seal with minimum torque, and not stick to the column or fittings. Additionally, they should be resilient enough to maintain their seal when column temperature and corresponding back pressure increases. Three popular ferrule compositions that meet these requirements are listed below. Ferrules of other compositions and/or with other internal diameters can be found in our catalog and on our web site.

Supeltex™ M-2A Ferrules

- Max. Temp.: 400 °C
- Composition: VESPEL® SP-21 (85% polyimide/15% graphite)
- Characteristics: Seal at 1/4-turn past fingertight.
- Benefits: High reusability. Won't stick to metal or glass. Form leaktight seals without sticking to the column. Do not require back ferrules.

Supeltex M-4 Ferrules

- Max. Temp.: 450 °C
- Composition: Flexible graphite
- Characteristics: Seal at 1/4-turn past fingertight.
- Benefits: An improved design that offers a clean, sharp profile with minimal flash. Maximum sealing surface contact. Reduced risk of column contamination at installation.

CapSeal Bullet™ Ferrules

- Available exclusively from Supelco
- Max. Temp.: 450 °C
- Composition: Graphite material captured in aluminum base
- Characteristics: Seal at 1/8-turn past fingertight.
- Benefits: Reusable. A special end taper reduces graphite extrusion into fitting. Aluminum base keeps the ferrule from adhering to the fitting, making it easy to remove.

Column Nuts

Improper nut/ferrule combinations create dead volume (empty space between the ferrule and the injection port that is not swept by carrier gas). This may result in poor chromatography, as evidenced by fronting peaks and band broadening. Ensure that your chromatography is the best by always using the proper nut/ferrule combination. For assistance in determining the correct nut/ferrule combination, contact Supelco Technical Service at 800-359-3041 (US and Canada only), 814-359-3041, or e-mail techservice@sial.com.



22470-U

24833-U



28034-U



22021

P000777, P000920, P000282, P000915

Ferrule Designs

Short design ferrules fit:

- The original nuts that ship with Agilent GCs

Long design ferrules fit:

- MSD source nuts for Agilent GCs
- The original nuts that ship with PerkinElmer GCs
- The original nuts that ship with Varian GCs

General purpose ferrules fit:

- Supelco Ferrule Nut Adapters for Agilent GCs
- 1/16 inch compression nuts for PerkinElmer GCs



P000770

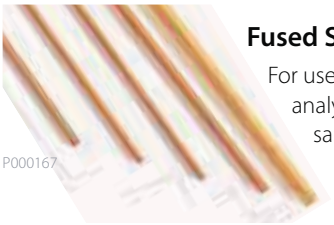
Ferrules

Column I.D.	Ferrule I.D.	Pkg	Cat. No.
Supeltex M-2A, Short Design			
0.10-0.25 mm	0.4 mm	10 ea	**24803-U**
0.10-0.25 mm	0.4 mm	50 ea	**24807-U**
Supeltex M-4, Short Design			
0.10-0.25 mm	0.4 mm	10 ea	**24811-U**
CapSeal Bullet, Short Design			
0.10-0.25 mm	0.4 mm	10 ea	**23864**
0.10-0.25 mm	0.4 mm	50 ea	**23867**
Supeltex M-2A, Long Design			
0.10-0.25 mm	0.4 mm	10 ea	**24826-U**
0.10-0.25 mm	0.4 mm	50 ea	**28022-U**
Supeltex M-4, Long Design			
0.10-0.25 mm	0.4 mm	10 ea	**28025-U**
0.10-0.25 mm	0.4 mm	50 ea	**28028-U**
CapSeal Bullet, Long Design			
0.10-0.25 mm	0.4 mm	12 ea	**23488**
0.10-0.25 mm	0.4 mm	48 ea	**23493**
Supeltex M-2A, General Purpose			
0.10-0.25 mm	0.4 mm	10 ea	**503258**
0.10-0.25 mm	0.4 mm	50 ea	**22474**
Supeltex M-4, General Purpose			
0.10-0.25 mm	0.4 mm	10 ea	**22498**
0.10-0.25 mm	0.4 mm	50 ea	**22480-U**
CapSeal Bullet, General Purpose			
0.10-0.25 mm	0.4 mm	12 ea	**23480-U**
0.10-0.25 mm	0.4 mm	48 ea	**23485**

Column Nuts

Description	Ferrules Used	Pkg	Cat. No.
Agilent nut	Short design	2 ea	**24833-U**
Supelco ferrule nut adapter	General purpose	2 ea	**22470-U**
Agilent MSD source nut	Long design	5 ea	**28034-U**
PerkinElmer nut	Long design	5 ea	**28034-U**
1/16 inch compression nut	General purpose	10 ea	**22021**
Varian nut	Long design	1 ea	**28033-U**

Guard Columns and Connectors


P000167

Fused Silica Guard Columns

For use as guard columns to protect analytical columns from damaging sample components. Match the deactivation of the tubing with the polarity of the injection solvent.

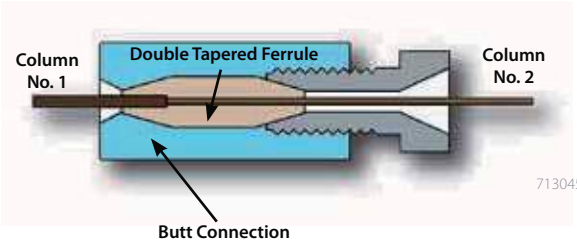
Deactivation	Injection Solvents	Max. Temp.
Non-Polar	Alkanes Carbon disulfide Ethers	360 °C
Intermediate Polarity	Acetone Methylene chloride Toluene	360 °C
Polar	Acetonitrile Methanol Water	260 °C

	Length (m)	I.D. (mm)	Cat. No.
Non-Polar Deactivation			
	3	0.25	**25722**
	5	0.25	**25742**
	3	0.32	**25723**
	5	0.32	**25743**
Intermediate Polarity Deactivation			
	3	0.25	**25727**
	5	0.25	**25747**
	3	0.32	**25728**
	5	0.32	**25748-U**
Polar Deactivation			
	5	0.32	**25752-U**

Fused Silica Tubing Inner/Outer Diameters

Tubing I.D.	Tubing I.D. Range	Tubing O.D. Range
0.10 mm (1)	0.094 – 0.106 mm	0.348 – 0.370 mm
0.10 mm (2)	0.094 – 0.106 mm	0.285 – 0.315 mm
0.20 mm	0.194 – 0.206 mm	0.345 – 0.375 mm
0.25 mm	0.244 – 0.256 mm	0.345 – 0.375 mm
0.32 mm	0.312 – 0.328 mm	0.425 – 0.455 mm
0.53 mm	0.523 – 0.551 mm	0.650 – 0.690 mm
0.75 mm	0.742 – 0.758 mm	0.875 – 0.925 mm

(1) Columns with non-polar or intermediate polarity stationary phases.
(2) Columns with polar stationary phases.



Capillary Column Butt Connector

This device consists of a double-tapered ferrule and a stainless steel compression housing with a threaded cap. Small and light (2.3 cm x 0.6 cm, 4.4 g with ferrule), it provides a gas tight seal with zero dead volume. This unit maintains inertness with no change in column efficiency.

Description	Cat. No.
Capillary Column Butt Connector, body only	**23804**
Supeltex M-2B Ferrules, pack of 2, Max. Temp. 350 °C	
To connect 0.20/0.25 mm I.D. to 0.20/0.25 mm I.D.	**22453**
To connect 0.32 mm I.D. to 0.32 mm I.D.	**22454**
To connect 0.53 mm I.D. to 0.53 mm I.D.	**22591**
To connect 0.20/0.25 mm I.D. to 0.53 mm I.D.	**22455-U**
To connect 0.32 mm I.D. to 0.53 mm I.D.	**22586**

GlasSeal™ Capillary Column Connectors


P000324

Use a GlasSeal connector to attach a guard column to an analytical column or to repair a column which has broken.

Use a GlasSeal "Y" connector to split a sample to two columns for confirmatory analysis or to split the output of one column to two detectors. Silanized for an inert inside surface, these can be used with our 0.10-0.53 mm I.D. tubing. To make this an extremely durable connection, use a small drop of polyimide sealing resin (cure at 200 °C, maximum temperature 350 °C).

Description	Pkg	Cat. No.
Borosilicate Glass Connector	12 ea	**20479**
Fused Silica Connector	5 ea	**23627**
Fused Silica Connector	25 ea	**23628**
Borosilicate Glass "Y" Connector	1 ea	**20480**
Fused Silica "Y" Connector	1 ea	**23631**
Fused Silica "Y" Connector	3 ea	**23632**
Polyimide Sealing Resin	5 ea	**23817**



Flowmeters

Gas chromatographers must routinely measure gas flows (when setting up an instrument, developing a method, or trouble-shooting). Even though many GCs have electronic pressure control (EPC) for setting flow rates, a flowmeter is still an essential tool to have to verify EPC readings when troubleshooting. Additionally, older GCs do not have EPC, requiring that flows be set manually. There are a variety of flow measuring devices available for this, falling into one of two categories, volumetric (bubble) flowmeters and mass flowmeters.

Optiflow Bubble Flowmeters

These volumetric (bubble) flowmeters are reliable, accurate, and easy to use.



E001024

- Automates the 'positive displacement' technique, which works independent of the type, mass, or mixture of gas being measured
- Combines the simplicity and versatility of a bubble meter with the speed and accuracy of a microprocessor
- Optical sensors respond accurately to the passage of a bubble
- Features an easy to read, accurate digital display, eliminating the need for tedious bubble watching, timing, and flow rate/time conversions
- Requires a 9 volt battery for operation

Description	Flow Range	Cat. No.
Optiflow Bubble Flowmeters		
Model 520	0.5-500 mL/min.	**28679-U**

Hand Tools

We offer a variety of hand tools that are specifically designed to assist the chromatographer in the installation and maintenance associated with gas chromatography.





Description	Cat. No.
Capillary Starter Kit	**23639**
Hook Septum Puller	**20352**
Screw Septum Puller	**20353**
Stainless Steel Forceps	**22435-U**
Pin Vise Drill Kit	**23820-U**
Capillary Cleaving Tool, retractable blade	**23814**
Coddington Magnifier, 20X	**23139**
Lenscope Illuminated Magnifier, 10X	**23135**
Mirror with Rotating Head	**22434**
Solvent Rinse Kit	**23626**
Split Vent Trap Kit	**22536**

High-Purity GC Solvents

Our high-purity GC solvents are suitable for a wide variety of applications, including pesticide residue analysis (PRA), metabolites, volatiles, other environmentally relevant substances, and preservatives. All solvents are manufactured and bottled under oxygen-free conditions and sealed with a PTFE-lined cap to prevent product contamination and degradation.

Description	Qty.	Cat. No.
Acetone, PESTANAL®	2.5 L	**34480-2.5L**
	4 x 2.5 L	**34480-4X2.5L**
Acetonitrile, PESTANAL	1 L	**34481-1L**
	6 x 1 L	**34481-6X1L**
	2.5 L	**34481-2.5L**
	4 x 2.5 L	**34481-4X2.5L**
Carbon disulfide, low benzene, *ReagentPlus*®, ≥99.9%	1 L	**342270-1L**
	6 x 1 L	**342270-6X1L**
Diethyl ether, for residue analysis, ≥99.8%	1 L	**31671-1L**
	2.5 L	**31671-2.5L**
Ethyl acetate, PESTANAL	1 L	**31063-1L**
	2.5 L	**31063-2.5L**
	4 x 2.5 L	**31063-4X2.5L**
	7 L	**31063-7L**
n-Hexane, PESTANAL	2.5 L	**34484-2.5L**
	4 x 2.5 L	**34484-4X2.5L**
n-Hexane, ENVISOLV™, ≥95%	2.5 L	**34412-2.5L**
Isooctane, PESTANAL	1 L	**34499-1L**
	6 x 1 L	**34499-6X1L**
	2.5 L	**34499-2.5L**
Methanol, PESTANAL	2.5 L	**34485-2.5L**
	4 x 2.5 L	**34485-4X2.5L**
Methanol, purge and trap grade, ≥99.9%	1 L	**414816-1L**
Methyl tert-butyl ether (MTBE), PESTANAL	1 L	**34498-1L**
	2.5 L	**34498-2.5L**
	4 x 2.5 L	**34498-4X2.5L**
Methylene chloride, PESTANAL	1 L	**34488-1L**
	2.5 L	**34488-2.5L**
	4 x 2.5 L	**34488-4X2.5L**
Methylene chloride, ENVISOLV, ≥99.8%	2.5 L	**34411-2.5L**
Pentane, PESTANAL	1 L	**34497-1L**
	2.5 L	**34497-2.5L**
Toluene, PESTANAL	2.5 L	**34494-2.5L**
	4 x 2.5 L	**34494-4X2.5L**
Toluene, ENVISOLV, ≥99.7%	2.5 L	**34413-2.5L**

GC Headspace Solvents

Analysis of residual solvents using headspace GC techniques is an important quality control procedure in pharmaceutical and food-related laboratories. Our GC headspace solvents are specifically designed and tested for such applications. These solvents provide both high purity to maximize detector sensitivity and extremely low background due to volatile impurities.

Description	Qty.	Cat. No.
N,N-Dimethylacetamide, puriss. p.a., ≥99.9%	1 L	**44901-1L**
N,N-Dimethylformamide, puriss. p.a., ≥99.9%	1 L	**51781-1L**
1,3-Dimethyl-2-imidazolidinone, puriss. p.a., ≥99.5%	1 L	**67484-1L**
Dimethyl sulfoxide, puriss. p.a., ≥99.9%	1 L	**51779-1L**
Water, puriss. p.a.	1 L	**53463-1L**

Sigma-Aldrich Solvent Grades

Grade	Description
ENVISOLV	Suitable for the analysis of dioxins, furans, and PCBs
PESTANAL	Suitable for pesticide residue analysis (PRA)
Purge and Trap	Suitable for analysis of volatiles using purge and trap
puriss. p.a.	≥98.5% pure
ReagentPlus	≥98.5% pure

Trademarks

Agilent – **Agilent Technologies;** AutoSystem, Clarus, PerkinElmer – **PerkinElmer Inc.;** CapSeal Bullet, ENVISOLV, GlasSeal, OMI, PESTANAL, *ReagentPlus*, Supelco, Supelpure, Supeltex, Thermogreen, Therm-O-Ring – **Sigma-Aldrich Biotechnology LP;** ChromGas, domnick hunter, NITROX – **Parker domnick hunter;** FocusLiner – **SGE International Pty Ltd.;** GOW-MAC – **GOW-MAC Instruments Co.;** Hamilton – **Hamilton Co.;** Microseal – **Merlin Instrument Company;** Norgren – **C.A. Norgren Co;** Shimadzu – **Shimadzu Corporation;** SIR – **Airgas;** Super Clean – **Scientific Glass Technology B.V.;** Swagelok – **Swagelok Co.;** Teflon, VESPEL, Viton – **E.I. duPont de Nemours & Co., Inc.;** Thermo, TRACE – **Thermo Electron Corp.;** Varian – **Varian Associates Corp.**



GC Autosampler Syringes



The syringe is the interface between the sample and the chromatograph. Rapid and precise injection requires a tight fit of the syringe in the autosampler. Supelco carries two brands of top-quality autosampler syringes, Hamilton® and SGE.

- 23s gauge needles – for standard injections
- 26s gauge needles – for on-column and split/splitless injection
- 23s-26s dual gauge needles perform all applications without the need to change syringes
- Available with fixed needle or removable needle

Agilent (7673, 7683 and 6850)

Manufacturer Model Number	Volume	Needle Length in./mm	Gauge	O.D. mm	Point Style	Manufacturer Part No.	Pkg. Size	Cat. No.
Hamilton								
Modified Microliter Syringes - Removable Needle								
7000.5ASRN	0.5 µL	1.71/43	23s	0.64	Cone	86276	1	**26214**
7000.5ASRN	0.5 µL	1.71/43	26s	0.47	Cone	86274	1	**26215**
7001ASRN	1 µL	1.71/43	23s	0.64	Cone	80176	1	**26216**
7001ASRN	1 µL	1.71/43	26s	0.47	Cone	80175	1	**26217**
Microliter Syringes - Fixed Needle								
75ASN	5 µL	1.71/43	23s	0.64	Cone	87987	1	**21311**
75ASN	5 µL	1.71/43	23s-26s	0.64-0.47	Cone	87993	1	**24570-U**
75ASN	5 µL 6/pk	1.71/43	23s	0.64	Cone	87990	6	**21315**
75ASN	5 µL 6/pk	1.71/43	26s	0.47	Cone	87989	6	**21314**
75ASN	5 µL 6/pk	1.71/43	23s-26s	0.64-0.47	Cone	87994	6	**24571**
75ASN	5 µL	1.71/43	23s	0.64	Bevel	87991	1	**26714**
75ASN	5 µL	1.71/43	26s	0.47	Bevel	87992	1	**26721**
701ASN	10 µL	1.71/43	23s	0.64	Cone	80387	1	**21313**
701ASN	10 µL	1.71/43	26s	0.47	Cone	80388	1	**21312**
701ASN	10 µL	1.71/43	23s-26s	0.64-0.47	Cone	80393	1	**24573**
701ASN	10 µL 6/pk	1.71/43	23s	0.64	Cone	80390	6	**21317**
701ASN	10 µL 6/pk	1.71/43	26s	0.47	Cone	80389	6	**21316**
701ASN	10 µL 6/pk	1.71/43	23s-26s	0.64-0.47	Cone	80391	6	**24574**
701ASN	10 µL	1.71/43	23s	0.64	Bevel	80398	1	**26715**
701ASN	10 µL	1.71/43	26s	0.47	Bevel	80399	1	**26722**
Microliter Syringes - Removable Needle								
75ASRN	5 µL	1.71/43	23s	0.64	Cone	87957	1	**21321**
701ASRN	10 µL	1.71/43	23s	0.64	Cone	80357	1	**21323-U**
701ASRN	10 µL	1.71/43	26s	0.47	Cone	80358	1	**21322-U**
701ASRN	10 µL	1.71/43	23s-26s	0.64-0.47	Cone	80359	1	**24575**
Gastight Syringes - Fixed Needle								
175	5 µL	1.71/43	23s	0.64	Cone	80074	1	**26716**
175	5 µL 6/pk	1.71/43	23s	0.64	Cone	80090	6	**26700-U**
175	5 µL 6/pk	1.71/43	23s-26s	0.64-0.47	Cone	80092	6	**24577**
1701	10 µL	1.71/43	23s	0.64	Cone	80080	1	**26719**
1701	10 µL	1.71/43	23s-26s	0.64-0.47	Cone	80079	1	**24579**



Agilent (7673, 7683 and 6850)

Manufacturer Model Number	Volume	Needle Length in./mm	Gauge	O.D. mm	Point Style	Manufacturer Part No.	Pkg. Size	Cat. No.
Hamilton (contd.)								
Gastight Syringes - Fixed Needle								
1701	10 µL 6/pk	1.71/43	23s	0.64	Cone	80094	6	**26701**
1701	10 µL 6/pk	1.71/43	23s-26s	0.64-0.47	Cone	80096	6	**24580**
Gastight Syringes - Removable Needle								
1701	10 µL	1.71/43	23s	0.64	Cone	80087	1	**21325-U**
1701	10 µL	1.71/43	26s	0.47	Cone	80088	1	**21324**
1701	10 µL	1.71/43	23s-26s	0.64-0.47	Cone	80089	1	**24581**
SGE								
Fixed Needle								
SK-5F-HP-0.47	5 µL	1.65/42	26	0.47	Cone	001804	6	**21910**
5F-HP-0.63	5 µL	1.65/42	23	0.63	Cone	001810	1	**21542**
SK-5F-HP-0.63	5 µL	1.65/42	23	0.63	Cone	001814	6	**21911**
10F-HP-0.47	10 µL	1.65/42	26	0.47	Cone	002800	1	**21541**
SK-10F-HP-0.47	10 µL	1.65/42	26	0.47	Cone	002804	6	**21912**
10F-HP-0.63	10 µL	1.65/42	23	0.63	Cone	002810	1	**21543**
SK-10F-HP-0.63	10 µL	1.65/42	23	0.63	Cone	002814	6	**21544**
Fixed Needle - Dual Gauge								
5F-HP-0.63/0.47	5 µL	1.65/42	23-26	0.63/0.47	Cone	001822	6	**26887-U**
10F-HP-0.63/0.47	10 µL	1.65/42	23-26	0.63/0.47	Cone	002821	1	**29616-U**
10F-HP-0.63/0.47	10 µL	1.65/42	23-26	0.63/0.47	Cone	002822	6	**26889-U**
Removable Needle								
0.5BR-HP-0.63	0.5 µL	1.65/42	23	0.63	Cone	000410	1	**24403**
5R-HP-0.47	5 µL	1.65/42	26	0.47	Cone	001805	1	**23963**
5R-HP-0.63	5 µL	1.65/42	23	0.63	Cone	001815	1	**23962**
10R-HP-0.47	10 µL	1.65/42	26	0.47	Cone	002805	1	**24417**
10R-HP-0.63	10 µL	1.65/42	23	0.63	Cone	002815	1	**24416**
25R-HP-0.63	25 µL	1.65/42	23	0.63	Cone	003865	1	**509701**
Gas Tight - Fixed Needle, Dual Gauge								
10F-HP-GT-0.63/0.47	10 µL	1.65/42	23-26	0.63/0.47	Cone	002826	1	**26890-U**
SK-10F-HP-GT-0.63/0.47	10 µL	1.65/42	23-26	0.63/0.47	Cone	002827	6	**26891-U**
25F-HP-GT-0.63/0.47	25 µL	1.65/42	23-26	0.63/0.47	Cone	003668	1	**26892-U**
50F-HP-GT-0.63/0.47	50 µL	1.65/42	23-26	0.63/0.47	Cone	004668	1	**26893-U**
100F-HP-GT-0.63/0.47	100 µL	1.65/42	23-26	0.63/0.47	Cone	005668	1	**26894-U**

CTC (A200S)

Hamilton

Gastight Syringes – Fixed Needle								
1701N	10 µL	2/51	22s	0.72	Blunt	203560	1	**29612-U**
1702N	25 µL	2/51	22s	0.72	Blunt	203563	1	**29613-U**
1710N	100 µL	2/51	22s	0.72	Blunt	203566	1	**29614-U**



CTC (GC PAL Autosamplers)

Manufacturer Model Number	Volume	Needle Length in./mm	Gauge	O.D. mm	Point Style	Manufacturer Part No.	Pkg. Size	Cat. No.
Hamilton (contd.)								
Microliter Syringes - Fixed Needle								
7701.2N	1.2 µL	2/51	26P	---	Cone	203185	1	**28617-U**
75N	5 µL	2/51	26s	0.47	Cone	203189	1	**28613-U**
701N	10 µL	2/51	26s	0.47	Bevel	203072	1	**28614-U**
701N	10 µL	2/51	26s	0.47	Bevel	203269	6	**29607-U**
701N	10 µL	2/51	26s	0.47	Cone	203205	1	**28615-U**
701N	10 µL	2/51	23s	0.64	Bevel	203363	1	**29606-U**
701N	10 µL	2/51	23s	0.64	Cone	203361	1	**29603-U**
Gastight Syringes - Fixed Needle								
1702N	25 µL	2/51	26s	0.47	Cone	203043	1	**28649-U**
1702N Slim	25 µL	2/51	26s	0.47	Cone	203074	1	**29608-U**
1710N	100 µL	2/51	26s	0.47	Cone	203076	1	**28651-U**
1725N	250 µL	2/51	26s	0.47	Cone	203078	1	**28652-U**
1750N	500 µL	2/51	26s	0.47	Cone	203080	1	**28653-U**

PerkinElmer (GC Autosystem and Clarus® 500)

Hamilton

Microliter Syringes - Fixed Needle								
75ASN/PE	5 µL	2.75/70	26s	0.47	Blunt	88040	1	**24522**
75ASN/PE	5 µL	2.75/70	23s	0.64	Blunt	88035	1	**24523**

SGE

Fixed Needle								
5F-PE-0.47	5 µL	2.75/70	26	0.47	Cone	001953	1	**509736**
5F-PE-0.63	5 µL	2.75/70	23	0.63	Cone	001954	1	**509744**
Removable Needle (Plunger-in-needle)								
0.5BR-PE-0.47	0.5 µL	2.75/70	26	0.47	Cone	000475	1	**24406**
0.5BR-PE-0.63	0.5 µL	2.75/70	23	0.63	Cone	000478	1	**24407**
Gas Tight Syringes - Fixed Needle								
5F-PE-GT-0.47	5 µL	2.75/70	26	0.47	Cone	001955	1	**21930-U**
5F-PE-GT-0.63	5 µL	2.75/70	23	0.63	Cone	001957	1	**21929-U**

Shimadzu (AOC9 Autosampler)

Hamilton

Microliter Syringe - Removable Needle								
701	10 µL	2/51	26s	0.47	Bevel	80330	1	**20697**

SGE

Fixed Needle - Flexible Plunger								
10FX	10 µL	1.97/50	26	0.47	Bevel	002130	6	**23966**



Shimadzu (AOC9 Autosampler and AOC 14, AOC 17, and AOC 20 GC Autosamplers)

Manufacturer Model Number	Volume	Needle Length in./mm	Gauge	O.D. mm	Point Style	Manufacturer Part No.	Pkg. Size	Cat. No.
SGE								
Removable Needle - Flexible Plunger								
10RX	10 µL	1.97/50	26	0.47	Bevel	002180	6	**23967**
Removable Needle								
0.5BR-S(9)-0.63	10 µL	1.97/50	26	0.47	Cone	002885	1	**509760**
Fixed Needle								
10F-S-0.47	5 µL	1.65/42	26	0.47	Cone	001987	1	**29619-U**
10F-S-0.63	5 µL	1.65/42	23	0.63	Cone	001988	1	**29618-U**
Removable Needle								
10R-S-0.47	10 µL	1.65/42	26	0.47	Cone	002897	1	**24418**
10R-S-0.63	10 µL	1.65/42	23	0.63	Cone	002898	1	**24419**
Gas Tight - Removable Needle								
10R-S-GT-0.63	10 µL	1.65/42	23	0.63	Cone	002902	1	**29621-U**

Thermo Finnigan Autosamplers

Hamilton

Microliter Syringes - Fixed Needle								
701	10 µL	2/51	26s	0.47	Bevel	80300	1	**20734**
701	10 µL	2/51	26s	0.47	Bevel	80366	6	**20779**
701	10 µL	2/51	26s	0.47	Cone tip, Side-port	80339	1	**24532**
Microliter Syringes - Removable Needle								
701	10 µL	2/51	26s	0.47	Bevel	80338	1	**21357**

Varian Autosamplers

SGE

Varian 8035, 8100, and 8200 GC Autosamplers – Fixed Needle								
10F-VA8X-11	10 µL	1.97/50	26	0.47	Bevel	002950	1	**29617-U**
Varian 8035, 8100, and 8200 GC Autosamplers - Removable Needle								
10R-VA8X-11	10 µL	2.09/53	25	0.5	Cone tip, Side-port	002924	1	**24421**
SGE Replacement Needles and Plungers for Varian Syringes								
for Varian 8035	---	.09/53	25	0.5	Bevel	037776	2	**24444**
for Varian 8100	---	2.09/53	25	0.5	Cone tip, Side-port	037777	1	**24445**
Replacement plunger for Varian 10 µL syringes	---	---	---	---	---	031218	1	**21924**



GC Autosampler Vials

A critical component to a successful chromatography analysis is the autosampler vial. Supelco offers autosampler vials in several configurations to assist in maintaining sample integrity.

- Available with crimp seals or screw caps
- Available in clear or amber glass (amber glass protects sensitive samples from exposure to UV light)
- Silanized glass available in some configurations (silanization prevents adsorption on glass surfaces)



Crimp Top Vials

Description	Pack Size	Cat. No.	Pack Size	Cat. No.
12 x 32 mm, 6.0 mm Opening				
Vials				
2.0 mL, Clear glass, 6.0 mm opening, crimp top	100	**SU860055**	1000	**854964**
2.0 mL, Amber glass, 6.0 mm opening, crimp top	100	**SU860063**	1000	**854981**
2.0 mL, Clear glass, 6.0 mm opening, crimp top, with marking spot	100	–	1000	**854500**
2.0 mL, Clear glass, 6.0 mm opening, crimp top, silanized	100	**27060-U**	1000	**27061**
2.0 mL, Amber glass, 6.0 mm opening, crimp top, silanized	100	**27225-U**	1000	**27216**
2.0 mL, Amber glass, 6.0 mm opening, crimp top, with marking spot	100	**854998**	–	–
1.5 mL, Maximum recovery vials, clear glass	100	**29298-U**	–	–
1.1 mL, Clear glass, conical bottom (requires support 27335)	100	**27310**	1000	**27311**
0.1 mL, Limited volume vials, clear glass	100	**24714**	–	–
Inserts for 6.0mm vials				
0.1 mL Glass insert with bottom spring, 6 x 28 mm	100	**SU860066**	1000	**854110**
0.1 mL Glass insert, conical, 6 x 31 mm	100	**SU860067**	1000	**854988**
0.25 mL Glass insert, conical, 6 x 31 mm	100	**24717**	1000	**24718**
0.35 mL Glass insert, shell style, 6 x 31 mm	100	**24715**	1000	**24716**
11mm Crimp caps				
Aluminum, clear, 5.5 mm opening, TEF/natural rubber, 1.0 mm thick	100	**854140**	1000	**854980-U**
Aluminum, green, 5.5 mm opening, TEF/natural rubber, 1.0 mm thick	–	–	1000	**854142**
Aluminum, red, 5.5 mm opening, TEF/natural rubber, 1.0 mm thick	–	–	1000	**854144**
Aluminum, blue, 5.5 mm opening, TEF/natural rubber, 1.0 mm thick	100	**854187**	–	–
Aluminum, gold, 5.5 mm opening, TEF/natural rubber. 1.0 mm thick	100	**854188**	–	–
Aluminum, clear, 5.5 mm opening, PTFE/white silicone, 1.3 mm thick	100	**SU860094**	1000	**SU860016**
Aluminum, clear, 5.5 mm opening, red PTFE/white silicone/red PTFE, 1.0 mm thick	100	**SU860080**	–	–
Convenience kits				
2.0 mL Clear vials, with PTFE/red rubber cap, unassembled	100	**27239**	1000	**27240-U**
2.0 mL Amber vials, with PTFE/red rubber cap, unassembled	100	**27241**	1000	**27242-U**

Snap Top Vials

12 x 32 mm, 6.0 mm Opening

Vials				
2.0 mL Clear glass, 6.0 mm opening	100	**SU860068**	1000	**854974**
2.0 mL Amber glass, 6.0 mm opening	100	**SU860089**	1000	**854993**
2.0 mL Clear glass, 6.0 mm opening, with marking spot	100	**SU860081**	–	–
2.0 mL Amber glass, 6.0 mm opening, with marking spot	100	**SU860082**	–	–



Snap Top Vials

Description	Pack Size	Cat. No.	Pack Size	Cat. No.
12 x 32 mm, 6.0 mm Opening (contd.)				
Inserts for 6.0mm vials				
0.1 mL Glass insert with bottom spring, 6 x 28 mm	100	**SU860066**	1000	**854110**
0.1 mL Glass insert, conical, 6 x 31 mm	100	**SU860067**	1000	**854988**
0.25 mL Glass insert, conical, 6 x 31 mm	100	**24717**	1000	**24718**
0.35 mL Glass insert, shell style, 6 x 31 mm	100	**24715**	1000	**24716**
Snap ring caps				
Polyethylene snap caps, 6 mm opening, TEF/natural rubber liner, 1.0 mm thick	100	**SU860090**	1000	**854975**
Polyethylene snap caps, 6 mm opening, PTFE/silicone liner, 1.3 mm thick	100	**SU860093**	–	–
Polypropylene snap caps with PTFE liner, 0.3 mm thick	100	**24754**	–	–
Polypropylene snap caps with PTFE/silicone with slit, 1.0 mm thick	100	**27426**	–	–
Polypropylene snap caps with PTFE/silicone with starburst, 1.0 mm thick	100	**27427**	–	–
Polypropylene snap caps with PTFE/silicone/PTFE with starburst, 1.0 mm thick	100	**27428**	–	–
Polypropylene snap caps with PTFE/silicone/PTFE, 1.0 mm thick	100	**24760-U**	–	–

Screw Cap Vials

12 x 32 mm, 4.6 mm Opening, 8/425 Thread

Vials				
2.0 mL, Amber glass, 4.6 mm opening	100	**SU860083**	1000	**854983**
2.0 mL, Clear glass, 4.6 mm opening, with marking spot	100	**854171**	–	–
2.0 mL, Amber glass, 4.6 mm opening, with marking spot	100	**854172**	–	–
1.1 mL, Clear glass, tapered bottom, Chromacol (requires sleeve 27335)	100	**27317**	1000	**27318**
Inserts for 4.6mm vials				
0.1 mL Glass insert with bottom spring, 5 x 29 mm	100	**24707**	–	–
0.35 mL Glass insert, shell style, 5 x 31 mm	100	**24701**	1000	**24702**
Caps with septa				
Polypropylene cap, black, 5.5 mm centre hole, TEF/natural rubber, 1.3 mm thick	100	**SU860091**	1000	**854984**
Polypropylene cap, black, 5.5 mm centre hole, red PTFE/white silicone, 1.3 mm thick	100	**SU860076**	–	–
Polypropylene cap, black, 5.5 mm centre hole, red PTFE/cream silicone, 1.3 mm thick	–	–	1000	**854985**
Caps without septa				
Phenolic cap, black, open top	100	**27094-U**	–	–
Polypropylene cap, black, open top	100	**27052**	1000	**24764**
Phenolic cap, solid caps with PTFE liner	100	**27091-U**	–	–
Phenolic cap, solid cap with aluminum liner	100	**27092-U**	–	–
Septa				
Septa, red PTFE/silicone/red PTFE, 1.0 mm thick	100	**27096-U**	1000	**23182-U**
Septa, beige PTFE/silicone, 1.5 mm thick	100	**27095-U**	1000	**33213**
Septa, red PTFE/white silicone, 1.5 mm thick	100	**27097-U**	1000	**23243**
Septa, PTFE/silicone with slit, 1.0 mm thick	100	**27098-U**	1000	**24881**
Septa, black viton, 0.75 mm thick	100	**27350-U**	–	–
Septa, PTFE/red rubber, 1.3 mm thick	100	**27132**	–	–
Liner, white PTFE, 0.25 mm thick (for use with solid top cap)	100	**27133**	–	–



Screw Cap Vials

Description	Pack Size	Cat. No.	Pack Size	Cat. No.
12 x 32 mm, 6.0 mm Opening, 9 mm Thread				
Vials				
2.0 mL, Clear glass, 6.0 mm opening, with marking spot	100	**854165**	–	–
2.0 mL, Amber glass, 6.0 mm opening, with marking spot	100	**SU860033**	–	–
Inserts for 6.0mm vials				
0.1 mL, Glass insert with bottom spring, 6 x 28 mm	100	**SU860066**	1000	**854110**
0.1 mL, Glass insert, conical, 6 x 31 mm	100	**SU860067**	1000	**854988**
0.25 mL, Glass insert, conical, 6 x 31 mm	100	**24717**	1000	**24718**
0.35 mL, Glass insert, shell style, 6 x 31 mm	100	**24715**	1000	**24716**
Caps				
Blue polypropylene cap, 6.0 mm centre hole with TEF/natural rubber septa, 1.0 mm thick	100	**854161**	1000	–
Blue polypropylene cap, 6.0 mm centre hole with red PTFE/white silicone septa, 1.0 mm thick	100	**SU860092**	1000	**SU860019**
Blue polypropylene cap, 6.0 mm centre hole with red PTFE/white silicone/red PTFE septa, 1.0 mm thick	100	**SU860079**	1000	**SU860020**
12 x 32 mm, 6.0 mm Opening, 10/425 Thread				
Vials				
2.0 mL, Clear glass, 6.0 mm opening	100	**27265**	2000	**27266**
2.0 mL, Clear glass, 6.0 mm opening, with 0.25 mL glass insert	100	**27418**	–	–
2.0 mL, Amber glass, 6.0 mm opening	100	**27267-U**	1000	–
2.0 mL, Amber glass with step, 6.0 mm opening	100	**27406**	–	–
2.0 mL, Amber glass, 6.0 mm opening, with 0.25 mL glass insert	100	**27419**	–	–
1.0 mL, Polypropylene, 6.0 mm opening	100	**27269**	1000	**27270-U**
0.75 mL, Polypropylene, 6.0 mm opening	100	**27411**	–	–
0.5 mL, Polypropylene, 6.0 mm opening	100	**27410**	–	–
Inserts for 6.0mm vials				
0.1 mL, Glass insert with bottom spring, 6 x 29 mm	100	**24721**	–	–
0.25 mL, Glass insert, conical, 6 x 31 mm	100	**24717**	1000	**24718**
0.35 mL, Glass insert, shell style, 6 x 31 mm	100	**24715**	1000	**24716**
Caps for 6.0 mm opening vials				
Polypropylene, black, open top	100	**27271**	1000	**27272-U**
Polypropylene, yellow, open top	100	**27413**	–	–
Polypropylene, white, open top	100	**27414**	–	–
Polypropylene, black, open top with PTFE/silicone septa, 1.5 mm thick	100	**27273**	–	–
Septa for 6.0 mm opening vials				
Septa, PTFE/silicone/PTFE, 1.0 mm thick	100	**27275**	1000	**27276**
Septa, red PTFE/silicone, 1.5 mm thick	100	**27277**	1000	**27278**
Septa, PTFE/silicone with slit, 1.0 mm thick	100	**27279**	1000	**27280-U**

Vial Accessories

- Hand Crimper – secures vial closure with a consistent and dependable seal
- Decapper – for quick and easy removal of an aluminum seal
- Vial Rack – convenient storage of screw and crimp cap vials
- Glass Magnet – keeps individual vials in place to prevent them from being accidentally knocked over









Description	Pkg	Cat. No.
Hand Crimper, for use with 11 mm crimp seals	1 ea	**33195**
Pliers-Type Decapper, for use with 11 mm crimp seals	1 ea	**33281**
Vial Rack, for 12 x 32 mm vials (holds 50 vials)	5 ea	**23207**
Glass Magnet, 4 inch diameter	2 ea	**57270**

PID Lamps


P001229

The photoionization detector (PID) lamp is a valuable tool for chromatographers and others investigating the presence of volatile organic compounds (VOCs). In fact, the PID continues to be the preferred choice for detecting VOCs due to its fast response time and sensitivity.

- Can detect volatiles as low as 1 ppb
- Emits very stable, precise photon energy
- More selective alternative than the flame ionization detector (FID)

Description	Chamber Gas	Cat. No.
Model 108, 10.0/10.6 eV	Krypton	**22626**
Model 108-BTEX, 10.0/10.6 eV	Krypton	**23129-U**
Model 103C, 10.0/10.6 eV	Krypton	**22631**
PID Window Cleaning Kit	---	**22627**

Wire Brush Detector Cleaning Kit


P000304

A collection of wire brushes specially tailored to clean FIDs and injection ports that accept 1/4 inch columns. The brass brushes prevent scratching and marring of expensive FID components.

Kit includes:

- Two detector brushes
- One injector port tube brush
- Brass toothbrush (for cleaning jets)
- A piece of emery (for electrical contacts)

Description	Pkg	Cat. No.
For use with HP 5700, 5830	1 ea	**22403**
For use with Varian 3700, 1400, and 2700	1 ea	**22404**



Purifiers

Gas purification begins by determining the contaminants that need to be removed from the particular gas stream, levels to which the contaminants must be reduced, flow and pressure needs of the system, and the desired frequency of purifier change-out. Multiple purifiers may be necessary to remove the desired levels of contaminants to adequately protect the column and detector. Purifiers for most applications are listed below. Other purifiers are available, and can be found in our catalog and on our web site.

OMI™ (Oxygen Moisture Indicating) Polishing Purifier

- Polishing purifier that removes many contaminants that other upstream purifiers miss
- Simultaneously removes moisture, oxygen, carbon monoxide, carbon dioxide, most sulfur compounds, most halogen compounds, alcohols, and phenols to less than 10 ppb
- Detects moisture and oxygen in hydrogen, helium, nitrogen, argon, and argon/methane
- As little as 1 ppm of moisture or oxygen will change the indicating resin from black to brown
- The indicating resin is licensed exclusively to Supelco for use in chromatographic applications
- Inert glass body prevents diffusion of ambient room contaminants into the carrier gas stream
- See-through polycarbonate holder provides safety



P000245

Supelpure™ HC Hydrocarbon Trap

- Activated charcoal purifier that adsorbs hydrocarbons and other contaminants from carrier gas, compressed air, and hydrogen
- When the total hydrocarbons in the incoming gas average 100 ppm, operates efficiently for approximately six months



P000203

High Capacity Gas Purifier

- Removes moisture, oxygen, carbon monoxide, and carbon dioxide
- No other purifier removes both moisture and oxygen in such large quantities
- Removes up to 35 liters of moisture or 14 liters of oxygen
- Clamshell heating unit has been specifically designed to ensure maximum gas purity
- Purifier tube is heated inside an oven where moisture and oxygen react with the reactant material in the tube
- Irreversible chemical reaction prevents contaminants from returning to the gas stream even when the purifier tube reaches saturation



P000329

Molecular Sieve 5A Water Vapor Trap

- Can reduce moisture in the gas stream to final concentrations less than 0.1 ppm
- Also preferred for use on in-house gas lines where moisture content could be high
- Offers greater working capacity than similar molecular sieves



P000234

Supelpure-O Oxygen Trap


P000230

- Reduces oxygen to less than 0.5 ppm when the level in the incoming gas does not exceed 10 ppm
- Oxygen-removing catalyst coated on a molecular sieve, will also trap signifcant amounts of moisture
- 120 cc purifier removes up to 1.5 g of moisture
- 750 cc purifier removes up to 10.2 g of moisture

Supelco Helium Purifier


P000332

- Incorporates a highly effective, high capacity adsorbent material to remove hydrocarbons, moisture, oxygen, carbon monoxide, and carbon dioxide from helium streams
- Ideal for any GC or GC-MS application where high purity helium is essential
- Output gas is 99.99999% pure
- Output purity: <100 ppb total of all contaminants, <30 ppb hydrocarbons (as methane), <20 ppb moisture, <2 ppb oxygen, <20 ppb carbon monoxide, <20 ppb carbon dioxide

Super Clean™ Base-Plate Design Purifiers


E000938

- Specially designed base plate has needle valves that instantly close to provide a diffusion-proof seal when the purifier is removed
- Purifier replacement can be performed in seconds without exposing the gas lines to room air
- Purifiers remove contaminants to produce better than 6.0 gas quality (99.9999% pure), independent of the purity of the incoming gas

Carbon Dioxin Trap


P000333

- Selectively removes carbon dioxide from gas streams
- Contains sodium hydroxide nonfibrous silicate media
- Media changes color from greenish-brown to white as carbon dioxide is absorbed
- Media can absorb 20-30% of its weight in carbon dioxide before reaching saturation
- Media evolves water as carbon dioxide is absorbed (recommend to install a water vapor trap downstream)

Economy Water Vapor Trap


P000235

- Economical choice for moisture removal for compressed air service to pneumatically-controlled devices
- Contains a mixture of Molecular Sieves 4A and 13X
- Purifier body is clear polycarbonate
- Not for use with carrier gases due to permeability of purifier body

Recommended Purifier Options per Application

Carrier gas: need to remove hydrocarbons, moisture, and oxygen

Option 1: Supelpure HC, High Capacity Gas Purifier, OMI-2
2: Supelpure HC, Molecular Sieve 5A, Supelpure-O, OMI-2
3: Supelco Helium Purifier, OMI-2
4: Super Clean hydrocarbon, Super Clean moisture, Super Clean oxygen, OMI-2
5: Super Clean dual, Super Clean oxygen, OMI-2
6: Super Clean triple, OMI-2

Compressed air (for FIDs): need to remove hydrocarbons and moisture

Option 1: Supelpure HC, Molecular Sieve 5A
2: Super Clean hydrocarbon, Super Clean moisture
3: Super Clean dual

Hydrogen fuel gas (for FIDs): need to remove hydrocarbons

Option 1: Supelpure HC
2: Super Clean hydrocarbon

Compress air (for pneumatic control): need to remove moisture

Option 1: Economy water vapor trap



Purifiers

Description	Design	Indicating?	Fittings	Cat. No.
Polishing Purifiers (remove many contaminants that upstream purifiers miss)				
OMI-2 purifier tube	In-line (1)	Yes (2)	n/a	**23906**
OMI-4 purifier tube	In-line (1)	Yes (2)	n/a	**23909**
Hydrocarbon-only Removing Purifiers				
Supelpure HC hydrocarbon trap, 120 cc	In-line	No	1/8 inch	**22445-U**
Supelpure HC hydrocarbon trap, 120 cc	In-line	No	1/4 inch	**22446**
Supelpure HC hydrocarbon trap, 750 cc	In-line	No	1/4 inch	**24518**
Supelpure HC hydrocarbon trap, 750 cc	In-line	No	1/2 inch	**24519**
Super Clean hydrocarbon trap	Base-plate (3)	No	n/a	**SU861023**
High Capacity Moisture and Oxygen Removing Purifiers				
High Capacity Gas Purifier, 110 V	In-line	No	1/8 inch	**23800-U**
High Capacity Gas Purifier, 230 V	In-line	No	1/8 inch	**23801**
High Capacity replacement purifier tube	In-line	No	1/8 inch	**22396**
High Capacity Gas Purifier, 110 V	In-line	No	1/4 inch	**23802**
High Capacity Gas Purifier, 230 V	In-line	No	1/4 inch	**23803**
High Capacity replacement purifier tube	In-line	No	1/4 inch	**22398**
Moisture-only Removing Purifiers				
Molecular Sieve 5A water vapor trap, 200 cc	In-line	No	1/8 inch	**20619**
Molecular Sieve 5A water vapor trap, 200 cc	In-line	No	1/4 inch	**20618**
Molecular Sieve 5A water vapor trap, 750 cc	In-line	No	1/4 inch	**23991**
Molecular Sieve 5A water vapor trap, 750 cc	In-line	No	1/2 inch	**23992**
Super Clean moisture trap	Base-plate (3)	Yes	n/a	**SU861021**
Economy water vapor trap, 400 cc	In-line	Yes	1/8 inch	**23987**
Economy water vapor trap, 400 cc	In-line	Yes	1/4 inch	**23988**
Oxygen-only Removing Purifiers				
Supelpure-O oxygen trap, 120 cc	In-line	No	1/8 inch	**22449**
Supelpure-O oxygen trap, 120 cc	In-line	No	1/4 inch	**22450-U**
Supelpure-O oxygen trap, 750 cc	In-line	No	1/4 inch	**503088**
Supelpure-O oxygen trap, 750 cc	In-line	No	1/2 inch	**503096**
Super Clean oxygen trap	Base-plate	Yes	n/a	**SU861022**
Triple Purifiers (remove hydrocarbons, moisture, and oxygen)				
Supelco Helium purifier	In-line	No	1/8 inch	**27600-U**
Supelco Helium purifier	In-line	No	1/4 inch	**27601-U**
Super Clean triple purifier	Base-plate (3)	Yes (4)	n/a	**SU861026**
Super Clean triple purifier, helium specific	Base-plate (3)	Yes (4)	n/a	**SU861027**
Dual Purifiers (remove hydrocarbons and moisture)				
Super Clean dual purifier	Base-plate (3)	Yes (4)	n/a	**SU861025**
Carbon Dioxide-only Removing Purifiers				
Carbon dioxide trap, 100 cc	In-line	Yes	1/8 inch	**503185**
Carbon dioxide trap, 100 cc	In-line	Yes	1/4 inch	**503193**
Carbon dioxide trap, 250 cc	In-line	Yes	1/8 inch	**503207**
Carbon dioxide trap, 250 cc	In-line	Yes	1/4 inch	**503215**

1. Must be installed into a reusable holder prior to use.
2. Indicating for moisture and oxygen.
3. Must be installed into a reusable base-plate prior to use.
4. Not indicating for hydrocarbons.

Purifiers



Purifier Accessories

Description	Cat. No.
OMI Holders	
OMI-2 holder, 1/8 inch stainless steel fittings	**23921**
OMI-4 holder, 1/8 inch stainless steel fittings	**23926**
Super Clean Base-Plates	
One position, 1/8 inch brass fittings	**SU861011**
Two position, 1/8 inch brass fittings	**SU861012**
Three position, 1/8 inch brass fittings	**SU861013**
Mounting Clips	
For 100 cc traps, 1 ea	**502936**
For 120 cc traps, 1 ea	**23993**
For 200 cc traps, 1 ea	**503231**
For 400 cc traps, 1 ea	**23990**
For 750 cc traps, 1 ea	**24983**
Purifier Refills	
Supelpure HC hydrocarbon trap refill, non-indicating, 400 cc	**22451**
Molecular Sieve 5A water vapor trap refill, non-indicating, 220 g	**20298**
Carbon dioxide trap refill, indicating, 500 cc	**503223**
Economy water vapor trap refill, indicating, 475 cc	**23989**

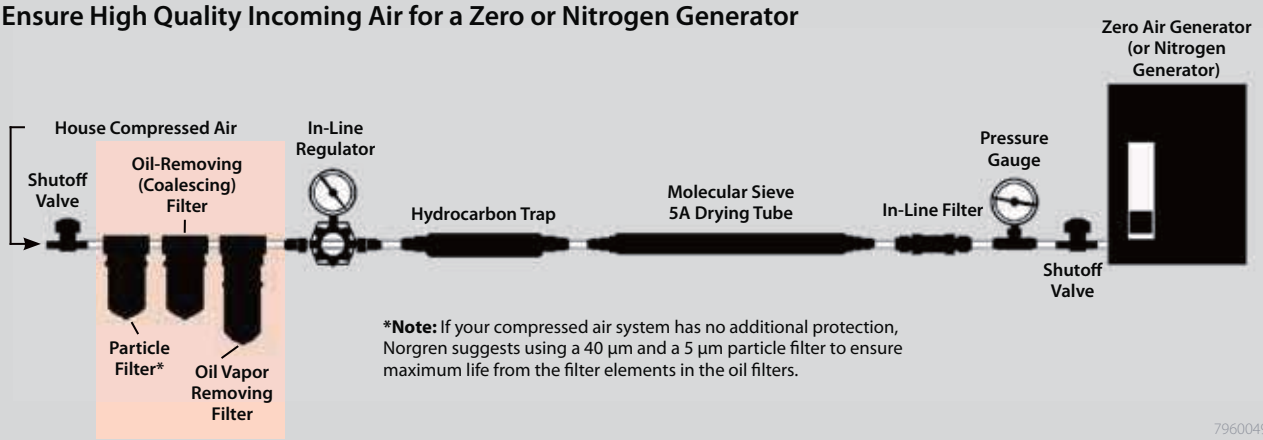
Norgren® Particle and Oil Filters

Airborne dust can be drawn into the intake of an air compressor. These dust particles as well as any oils released from an air compressor can damage any downstream gas generator. Norgren filters are designed to remove solid and liquid particles in addition to oil aerosols. The oil-removing and oil vapor-removing filters must be protected with a particle filter upstream.

- Install between air compressors and gas generators
- Designed to be used together as a three- or four-filter system
- Elements are easily replaced

Description	Fittings	Cat. No.
Particle filter, 40 µm	1/4 inch female NPT	**24990-U**
Particle filter, 5 µm	1/4 inch female NPT	**24992**
Oil-removing filter	1/4 inch female NPT	**24994**
Oil vapor-removing filter	3/8 inch female NPT	**24996**

Ensure High Quality Incoming Air for a Zero or Nitrogen Generator



***Note:** If your compressed air system has no additional protection, Norgren suggests using a 40 µm and a 5 µm particle filter to ensure maximum life from the filter elements in the oil filters.

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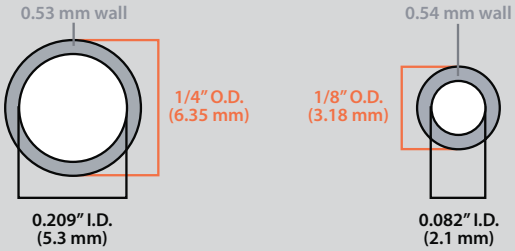
Tubing, Cutters, and Fittings



Many types of tubing are available to supply a variety of gases for gas chromatography systems. Supelco recommends using stainless steel for the most sensitive applications, such as high resolution MS detection (MS-MS, ion trap, or TOF). More economical copper tubing is recommended for all other GC and GC-MS plumbing needs. All of our tubing is specially cleaned to remove any residue. Other tubing choices are available and can be found in our catalog and on our web site.

Premium Grade 304 Stainless Steel Tubing

Stainless Steel Tubing Dimensions



- Virtually impermeable to the diffusion of room air through the tubing walls
- Undergoes a proprietary cleaning procedure to remove all active sites and to ensure inertness
- Best choice for the most sensitive applications, such as high resolution MS detection (MS-MS, ion trap, or TOF)

Cleaned Copper Tubing

- Most commonly used tubing for gas chromatography
- Cleaned according to ASTM B-280 plus a proprietary Supelco cleaning procedure, resulting in tubing that exceeds instrument manufacturers' requirements
- Best choice for most GC and GC-MS plumbing needs

Description	Cat. No.
Premium Grade 304 Stainless Steel Tubing	
50 ft. x 1/4 inch (6.35 mm) O.D. x 0.209 inch (5.3 mm) I.D	**20527**
50 ft. x 1/8 inch (3.18 mm) O.D. x 0.085 inch (2.1 mm) I.D.	**20526-U**
100 ft. x 1/16 inch (1.59 mm) O.D. x 0.030 inch (0.762 mm) I.D.	**20553**
Cleaned Copper Tubing	
50 ft. x 1/4 inch (6.35 mm) O.D. x 0.190 inch (4.83 mm) I.D.	**20489**
50 ft. x 1/8 inch (3.18 mm) O.D. x 0.065 inch (1.65 mm) I.D.	**20488**

Tubing Cutters



Proper gas line connections are important for maximum chromatographic performance. Leaks, caused by a poor fit between tubing and the mating seat, can cause serious damage to GC columns. Therefore, it is critical for tubing to have crisp, clean ends.

- TC-20 is voltage selectable (110/220 V) and CE compliant
- TC-20 cuts 1/16, 1/8, or 1/4 inch copper or stainless steel
- Heavy duty cuts 1/8 or 1/4 inch copper or stainless steel
- Tubing bender – easily bends copper and stainless tubing up to 180° without kinking
- Tubing reamer – opens and rounds tubing after cutting



Description	Cat. No.
TC-20 Tubing Cutter (110/220 V)	**58539-U**
Heavy Duty Tubing Cutter	**20425-U**
1/8 inch O.D. Tubing Bender	**20422-U**
1/4 inch O.D. Tubing Bender	**20424-U**
Tubing Reamer	**20389**

Swagelok® Tubing Fittings



A leak free system is the first requirement in a systematic approach to supplying quality gas to a chromatography system. Swagelok fittings combine superior design principles with close manufacturing tolerance and rigid quality to provide such a leak free connection. Some of the most popular items are listed. For a complete listing, please refer to our catalog and/or our web site.

Description	Cat. No.
Swagelok Fittings Kit	**22668-U**
Nuts Plus Front and Back Ferrules, brass, 1/8 inch, 10 of each	**22014**
Nuts Plus Front and Back Ferrules, stainless steel, 1/8 inch, 5 of each	**22040-U**
Tee, brass, 1/8 inch	**22020-U**
Tee, stainless steel, 1/8 inch	**22046**
On/off throttling valve, brass, 1/8 inch	**22138-U**
On/off throttling valve, stainless steel, 1/8 inch	**22139-U**
Toggle valve, brass, 1/8 inch	**22699**
Toggle valve, stainless steel, 1/8 inch	**22698**

Valves and Gauges

Diaphragm Shutoff Valve

- Multiple metal diaphragms provides a permanent seal
- Diaphragm prevents diffusion of air and moisture into gas flow
- Brass body
- Kel-F seat


P000208

Description	Pkg	Cat. No.
1/4 in. male NPT, 1/4 in. female NPT	1 ea	**23896**
1/4 in. male NPT	1 ea	**23897**

Pressure Gauge

- Steel and copper alloy construction
- 2 inch diameter gauge
- Brass tee


P000209

Description	Pkg	Cat. No.
0-30 psi, in-line tee: 1/8 in.	1 ea	**20469**
0-60 psi, in-line tee: 1/8 in.	1 ea	**20470**
0-100 psi, in-line tee: 1/8 in.	1 ea	**22423**
0-30 psi, in-line tee: 1/8 in. male NPT	1 ea	**20393**
0-60 psi, in-line tee: 1/8 in. male NPT	1 ea	**20394**

Pressure Gauge Kit

- 0-100 psi
- 1/8 inch tee
- Includes 1/2 meter of copper tubing


P000210

Description	Pkg	Cat. No.
Pressure gauge kit	1 ea	**20392**

Related Information

For more information on plumbing gas lines to a GC, whether a single system or a complete facility, request T196898 AYW (Gas Management Systems for GC), or contact Supelco Technical Service at 800-359-3041 (US and Canada only), 814-359-3041, or techservice@sial.com

Leak Detectors


P001377

Using liquids to detect gas leaks in a gas chromatography system can lead to unforeseen problems. Small amounts of liquid can seep into fittings, or through the septum, and damage the column. Electronic leak detectors are a much better alternative than liquid detectors, and can easily and quickly pinpoint gas leaks that are too small to detect with a soap solution. Liquid leak detectors are still available, and can be found in our catalog and on our web site.

GOW-MAC® Gas Leak Detectors

- Easy to operate
- Allow leaks to be found quickly without risk of contaminating the system
- Provides maximum usable sensitivity with high signal to noise ratio amplification
- Operates on the same principle as a thermal conductivity detector
- Will respond to any gas mixture that has a thermal conductivity value different from that of air
- Include internal, rechargeable batteries and charger

Description	Cat. No.
Model 21-070, miniature, 115 V	**22807**
Model 21-072, miniature, 230 V	**22808**
Carrying case for 22807 or 22808	**22809**



Pressure Regulators

For all chromatographic applications, it is recommended to use a regulator that does not allow contaminants to enter the gas stream. Our HP, HP+, and UHP regulators meet this stringent demand. We only offer regulators with bar stock bodies. Compared to forged body regulators, ours have:

- Smoother internal surfaces resulting in more efficient gas flows (no eddy swirling), and that contaminants will not cling to
- Much smaller internal volumes (about 20X less) that take less time to purge

Each of our cylinder regulators also has two additional features, which help keep contaminants from entering the regulator body.

- A check valve in the inlet fitting, activated during cylinder change-out
- A shut-off valve on the outlet side that can be closed when replacing downstream components

Two-Stage Cylinder Regulators

- Reduces cylinder pressure to a factory-set intermediate pressure, then to a user-set final pressure
- Use when the gas cylinder is located within 25 feet of the instrumentation



E001123

Single-Stage Cylinder Regulators

- Reduces cylinder pressure to a user-set intermediate pressure
- Use when the gas cylinder is located more than 25 feet from the instrumentation
- Requires an in-line regulator to be installed within 25 feet of the instrumentation



E001124

In-line Regulators

- Reduces an intermediate pressure to a user-set final pressure
- Install within 25 feet of the instrumentation



P000211

Cylinder Pressure Regulator Features

Feature	HP	HP+	UHP
Check valve in inlet	●	●	●
Bar stock nickel-plated brass body	●	●	●
Stainless steel diaphragm with captive Teflon seal	●	●	
Stainless steel diaphragm with metal-to-metal seal			●
Nickel-plated zinc bonnets	●	●	
Machined brass bonnets (panel-mount capable)			●
2 ½ inch diameter gauges	●	●	●
Needle shut-off valve	●		
Diaphragm shut-off valve		●	●
1/8 inch male stainless steel Swagelok outlet fitting	●	●	●

Pressure Regulators

Description	Grade	Maximum Inlet Pressure (psi / bar)	Maximum Delivery Pressure (psi / bar)	Cat. No.
CGA 580 Cylinders (for helium, nitrogen, and argon)				
Two-stage	HP	3000 / 204	0-100 / 0-6.9	**29557-U**
Single-stage	HP	3000 / 204	0-100 / 0-6.9	**29556-U**
Two-stage	HP+	3000 / 204	0-100 / 0-6.9	**29574-U**
Two-stage	HP+	3000 / 204	0-150 / 0-10.3	**29575-U**
Single-stage	HP+	3000 / 204	0-100 / 0-6.9	**29573-U**
Two-stage	UHP	3000 / 204	0-100 / 0-6.9	**29585-U**
Single-stage	UHP	3000 / 204	0-100 / 0-6.9	**29584-U**
DIN 6 Cylinders (for helium, nitrogen, and argon)				
Two-stage	HP	3000 / 204	0-100 / 0-6.9	**29559-U**
Single-stage	HP	3000 / 204	0-100 / 0-6.9	**29558-U**
Two-stage	HP+	3000 / 204	0-100 / 0-6.9	**29577-U**
Two-stage	HP+	3000 / 204	0-150 / 0-10.3	**29578-U**
Single-stage	HP+	3000 / 204	0-100 / 0-6.9	**29576-U**
Two-stage	UHP	3000 / 204	0-100 / 0-6.9	**29588-U**
Single-stage	UHP	3000 / 204	0-100 / 0-6.9	**29587-U**

Pressure Regulators (contd.)



Description	Grade	Maximum Inlet Pressure (psi / bar)	Maximum Delivery Pressure (psi / bar)	Cat. No.
CGA 350 Cylinders (for hydrogen, methane, and argon/methane)				
Two-stage	HP	3000 / 204	0-100 / 0-6.9	**29561-U**
Single-stage	HP	3000 / 204	0-100 / 0-6.9	**29560-U**
Two-stage	HP+	3000 / 204	0-100 / 0-6.9	**29581-U**
Single-stage	HP+	3000 / 204	0-100 / 0-6.9	**29579-U**
Two-stage	UHP	3000 / 204	0-100 / 0-6.9	**29591-U**
Single-stage	UHP	3000 / 204	0-100 / 0-6.9	**29589-U**
DIN 1 Cylinders (for hydrogen, methane, and argon/methane)				
Two-stage	HP	3000 / 204	0-100 / 0-6.9	**29563-U**
Single-stage	HP	3000 / 204	0-100 / 0-6.9	**29562-U**
Two-stage	HP+	3000 / 204	0-100 / 0-6.9	**29583-U**
Single-stage	HP+	3000 / 204	0-100 / 0-6.9	**29582-U**
Two-stage	UHP	3000 / 204	0-100 / 0-6.9	**29593-U**
Single-stage	UHP	3000 / 204	0-100 / 0-6.9	**29592-U**
CGA 320 Cylinders (for carbon dioxide)				
Two-stage	HP	3000 / 204	0-100 / 0-6.9	**29567-U**
Single-stage	HP	3000 / 204	0-100 / 0-6.9	**29564-U**
CGA 590 Cylinders (for compressed air)				
Two-stage	HP	3000 / 204	0-100 / 0-6.9	**29569-U**
Single-stage	HP	3000 / 204	0-100 / 0-6.9	**29568-U**
DIN 13 Cylinders (for compressed air)				
Two-stage	HP	3000 / 204	0-100 / 0-6.9	**29572-U**
Single-stage	HP	3000 / 204	0-100 / 0-6.9	**29571-U**
In-line				
Single-stage	HP	400 / 27	0-100 / 0-6.9	**23882**
Single-stage	UHP	400 / 27	0-100 / 0-6.9	**23884**

Related Information

Interested in learning more? Here is a short list of technical and application pieces designed to assist you in meeting your analyses needs, available for download at no charge. Simply visit sigma-aldrich.com/gc, or contact Supelco Technical Service at 800-359-3041 (US and Canada only), 814-359-3041, or techservice@sial.com

Lit. Code	Type	Description
T401027 DWM	Product Information Sheet	Capillary Injector Products for Agilent Technologies GCs
T407082 JQV	Product Information Sheet	Molded Thermogreen LB-2 Septa
T196899 BBB	Bulletin	Capillary GC Inlet Liner Selection Guide
T408101 KOX	Product Information Sheet	FocusLiner Inlet Liners
T404081 HCH	Poster	Selecting The Appropriate Inlet Liner
T100741 AXR	Bulletin	Ferrules and Fittings for Packed and Capillary GC
T308184 KPP	Application Note	Hydrogen: Superior Carrier Gas to Helium
T197918 BIT	Bulletin	Selecting Purifiers for Gas Chromatography
T196898 AYW	Bulletin	Gas Management Systems for GC
T407110 JXP	Brochure	Gas Generators
T112853 AIP	Bulletin	Capillary GC Troubleshooting Guide



Gas Generators

Laboratory gas generators are a great alternative to gas cylinders. In addition to being a much more sensible source of gas from a cost standpoint, generators are safer, cosmetically better, take up less space, and do not require the labor needed to transport bulky cylinders into the lab. Supelco offers gas generators from Parker domnick hunter. Models for hydrogen, zero air, and nitrogen are listed below. Other gas generators can be found in our catalog and on our web site.

Parker PEM and ChromGas® Hydrogen Generators



- Easy to use, an electrical outlet and deionized water are all that are required to generate hydrogen for weeks of continuous operation
- Minimal maintenance required
- Uses a solid polymer electrolyte, rather than a liquid electrolyte, eliminating the need for toxic liquids
- Built-in sensing circuit shuts the generator down if a leak is detected
- Can be used with any instrumentation requiring fuel grade hydrogen
- Connections: 1/8" compression fitting
- Delivery purity: 99.9995% (99.99997% for Model 9800)

Parker ChromGas Zero Air Generators



- Easy to use, an electrical outlet and a compressed air source are all that are required to produce ultra-high purity zero air
- Minimal maintenance required
- Recommended for use with flame ionization detectors to stabilize baselines and improve detection
- Inlet air pressure: 2-125 psi
- Connections: 1/8" compression fitting
- Delivery purity: <0.1 ppm total hydrocarbons (as methane)

domnick hunter® NITROX™ Hydrocarbon-free Nitrogen Generators



- Employs pressure swing adsorption technology to produce a continuous supply of hydrocarbon-free nitrogen.
- Integral oil-free air compressor eliminates need for a separate air compressor
- Filtered compressed air goes across a bed of carbon molecular sieve, which selectively removes hydrocarbons, moisture, oxygen, and carbon dioxide
- Heated catalyst reduces any residual hydrocarbons
- Connections: 1/4" NPT fitting
- Delivery purity: <10 ppm oxygen
- Delivery purity: <0.1 ppm total hydrocarbons (as methane)

domnick hunter NITROX High-Purity Nitrogen Generators

- Employs pressure swing adsorption technology to produce a continuous supply of high purity nitrogen
- Integral oil-free air compressor eliminates need for a separate air compressor
- Filtered compressed air goes across a bed of carbon molecular sieve, which selectively removes hydrocarbons, moisture, oxygen, and carbon dioxide
- Connections: 1/4" NPT fitting
- Delivery purity: <10 ppm oxygen

Description	Max. Output	Cat. No.
Parker PEM and ChromGas Hydrogen Generators		
H2PEM-100, 110-230 V	100 mL/min.; 90 psi	**27773-U**
H2PEM-165, 110-230 V	165 mL/min.; 90 psi	**27620-U**
H2PEM-260, 110-230 V	260 mL/min.; 90 psi	**22751**
H2PEM-510, 110-230 V	510 mL/min.; 90 psi	**22801**
Model 9800, 110 V	1200 mL/min.; 100 psi	**22835**
Parker ChromGas Zero Air Generators		
Model 1000, 110 V	1000 mL/min.; 125 psi	**22824**
Model 3500, 110 V	3500 mL/min.; 125 psi	**27625-U**
Model 1001, 230 V	1000 mL/min.; 125 psi	**22830-U**
Model 3501, 230 V	3500 mL/min.; 125 psi	**27626-U**
domnick hunter Hydrocarbon-free Nitrogen Generators		
Model 1001, 110 V	1000 mL/min.; 73 psi / 5 bar	**27765-U**
Model 1001, 230 V	1000 mL/min.; 73 psi / 5 bar	**28366-U**
domnick hunter High-Purity Nitrogen Generators		
Model 0751, 110 V	750 mL/min.; 73 psi / 5 bar	**27760-U**
Model 1501, 110 V	1500 mL/min.; 73 psi / 5 bar	**27761-U**
Model 3001, 110 V	3000 mL/min.; 73 psi / 5 bar	**27762-U**
Model 0751, 230 V	750 mL/min.; 73 psi / 5 bar	**28360-U**

Supelco GC Columns

Made for Chromatographers by Chromatographers

SUPELCO Analytical



Supelco is dedicated to the development of leading-edge technology to meet the needs of our loyal customer base.

- Special purpose columns for many specific applications
- Columns for general purpose uses
- Each capillary column individually tested to ensure quality
- Guaranteed satisfactory performance
- Superior technical service before and after your purchase

To learn more, download our GC Column Selection Guide (T407133 KCX) at *sigma-aldrich.com/gc* or contact Supelco Technical Service at 800-359-3041 (USA and Canada only), 814-359-3041, or email techservice@sial.com

To learn more, visit *sigma-aldrich.com/gc*

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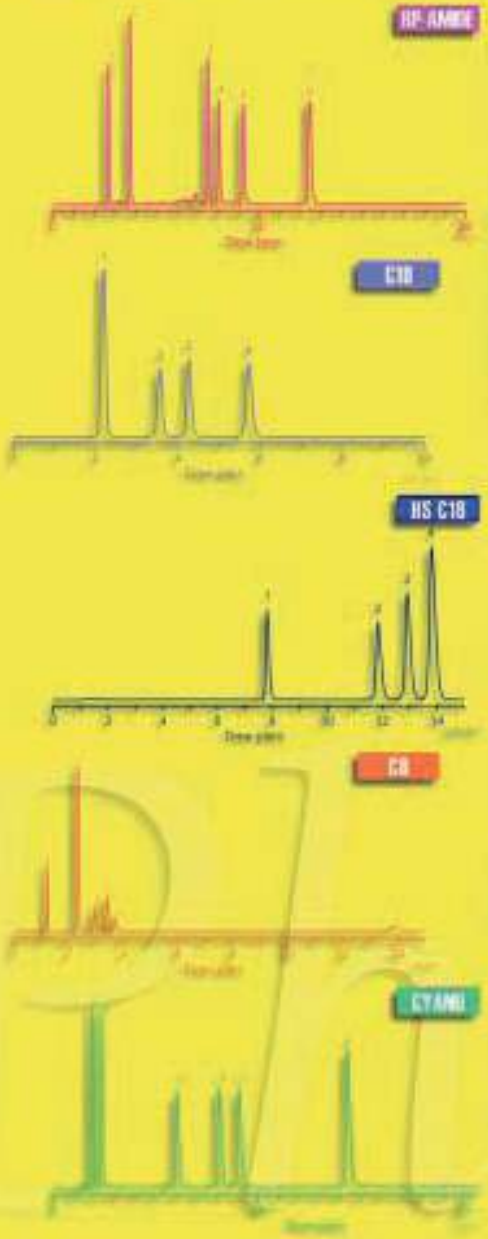
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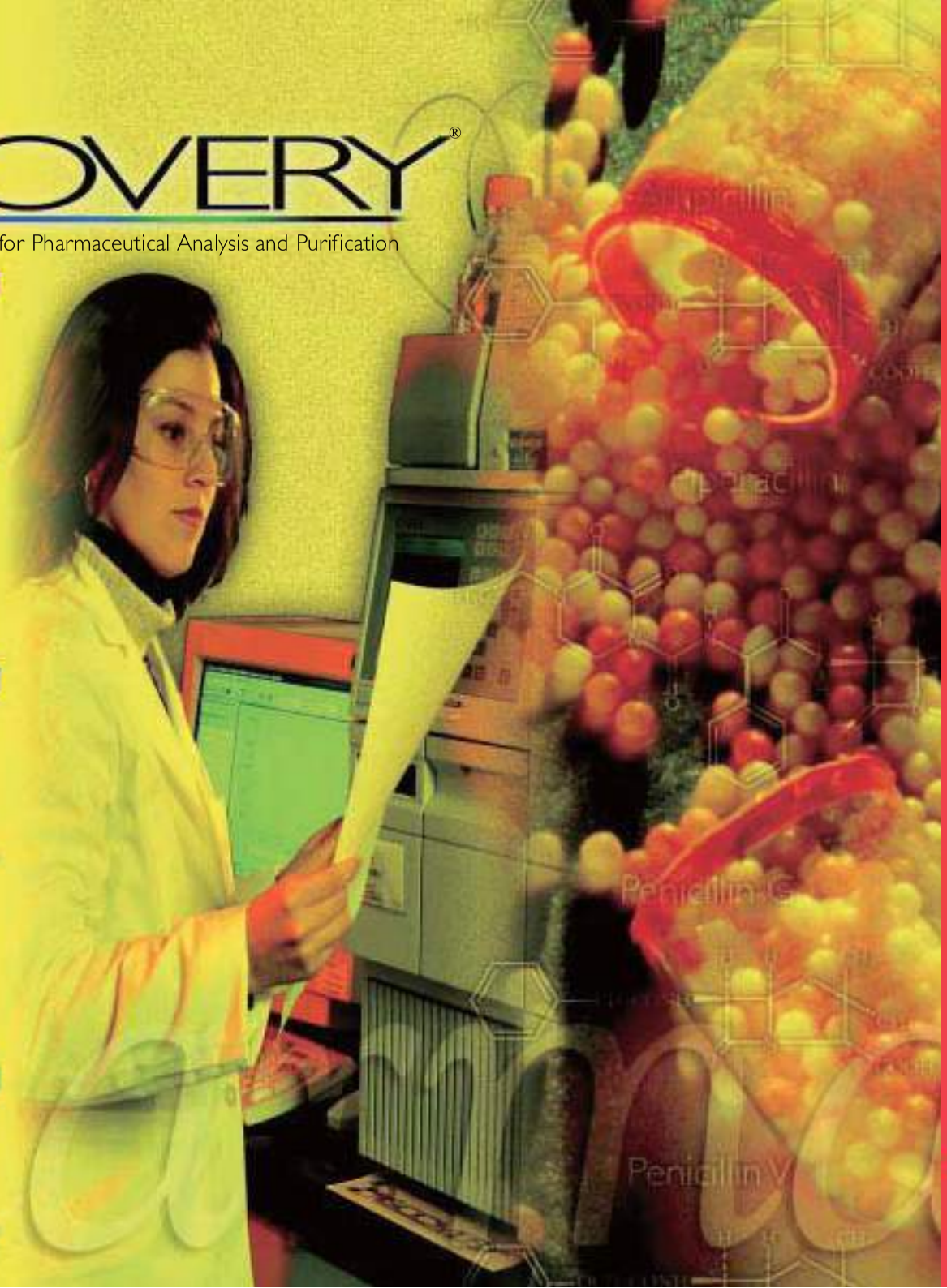
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HPLC COLUMNS

HPLC column	Icon	Features
RP-AmideC16	RP-AMIDE	• excellent reproducibility • unique selectivity • excellent retention and resolution of polar compounds • less hydrophobicity than C18 phases • different elution profiles compared to C18 phases • compatible with low organic/highly aqueous mobile phases
C8	C8	• excellent reproducibility • faster separation of strongly hydrophobic analytes • exceptional peak shapes for basic and acidic compounds • excellent stability from pH 2 to pH 8 • suitable for LC/MS applications

HPLC column	Icon	Features
C18	C18 HS C18	• excellent reproducibility • exceptional peak shape for basic and acidic analytes • greater (Discovery HS C18) and lesser (Discovery C18) hydrophobic phases available • resolution of geometrical isomers and other structurally closely related compounds • separation of peptides and small proteins (especially Discovery C18) • suitable for LC/MS applications (especially Discovery HS C18)
Cyano	CYANO	• excellent reproducibility • low hydrophobicity, for rapid elution of hydrophobic molecules • retention and separation of strongly basic analytes, including quaternary ammonium salts, with excellent peak shapes • compatible with highly aqueous mobile phases • exceptional stability and column lifetime

SOLID PHASE EXTRACTION TUBES

SPE

SPE tube	features
DSC-18	• Polymerically bonded octadecyl (C18)-bonded silica isolates, purifies and concentrates pharmaceuticals and related compounds from aqueous media, like biological fluids • 18% typical %carbon loading for high hydrophobic capacity • Careful quality-control testing ensures consistent lot-to-lot and tube-to-tube chemical and physical properties
DSC-18Lt	• A moderate carbon loading bonded silica (11% carbon) with carbon loading lower than that of its sister product, DSC-18 (18% carbon) • Lower carbon loading is useful when high hydrophobic capacity is not desired, or for extracting polar compounds that need secondary interactions with the silica backbone for efficient extraction. • Ideal for eluting hydrophobic compounds with small volumes of solvent, relative to volumes that are needed when using high-carbon loading silicas

SPE tube	features
DPA-6S	• Polyamide, used to adsorb polar compounds such as those with hydroxyl groups, especially phenolic substances • Polyamide has been used for extracting tannis, chlorophyll, humic acid, pharmacologically active terpenoids, flavonoids, gallic acid, catechol A protocatechuic acid, and phloroglucinol A from aqueous or methanolic solutions • Carboxylic acids, especially aromatic carboxylic acids and compounds with multiple carboxylic acid groups, also can bind with the polyamide sorbent, forming hydrogen bonds

Acetaminophen and Caffeine from Serum

HPLC Conditions:
Discovery C18, 15cm x 4.6mm, 5µm particles,
MeOH: 25mM K_2HPO_4, pH7.0 (3:97)
1.0mL/min
30°C
UV, 220nm
30µL

Discovery SPE Tube:
DSC-18Lt
500mg/3mL

SPE

SPE Procedure, Using Zymark® RapidTrace® SPE Workstation

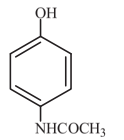
Step	Solvent/ Solution	Volume (mL)	Flow Rate (mL/min)	Comments
1. Condition	MeOH	2.0	5.0	conditions sorbent
2. Condition	H_2O	2.0	5.0	conditions sorbent
3. Load	spiked porcine serum	2.0[A]	0.75	applies serum sample
4. Rinse	5% MeOH	2.0	5.0	washes sample
5. Purge-Cannula	H_2O	4.0	30.0	cleans sample cannula
6. Rinse	vent	0.1	2.0	positions SPE tube over waste port
7. Dry	Time = 10 min			dries sorbent
8. Purge-Cannula	MeOH	4.0	30.0	cleans sample cannula
9. Collect	MeOH	2.0	1.0	elutes analytes into collection vessel
10. Collect	vent	6.0	3.0	pushes residual eluent into vessel[B]
11. Purge-Cannula	H_2O	4.0	30.0	cleans sample cannula

[A] 1mL porcine serum spiked with 0.5µg/mL acetaminophen and 1.0µg/mL caffeine, then diluted with 1mL water.
[B] Eluent evaporated to dryness with nitrogen stream at 30°C, using a Zymark TurboVap® LV Workstation, then reconstituted with 200µL of water.

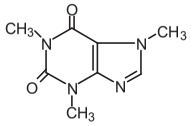
Acetaminophen and Caffeine from Serum

Neutral antipyretic/analgesic compounds like acetaminophen can be extracted from serum, using Discovery DSC-18Lt SPE tubes and a generic methanol and water-based SPE method. This method is applicable to many other neutral compounds. Recoveries for acetaminophen and caffeine are about 95% with this method.

Acetaminophen



Caffeine



Efficiency of Recovery

Compound	Concentration	%Recovery	%RSD (n=6)
1. Acetaminophen	0.50µg/mL	95.4	±0.9
2. Caffeine	1.0µg/mL	94.3	±1.5

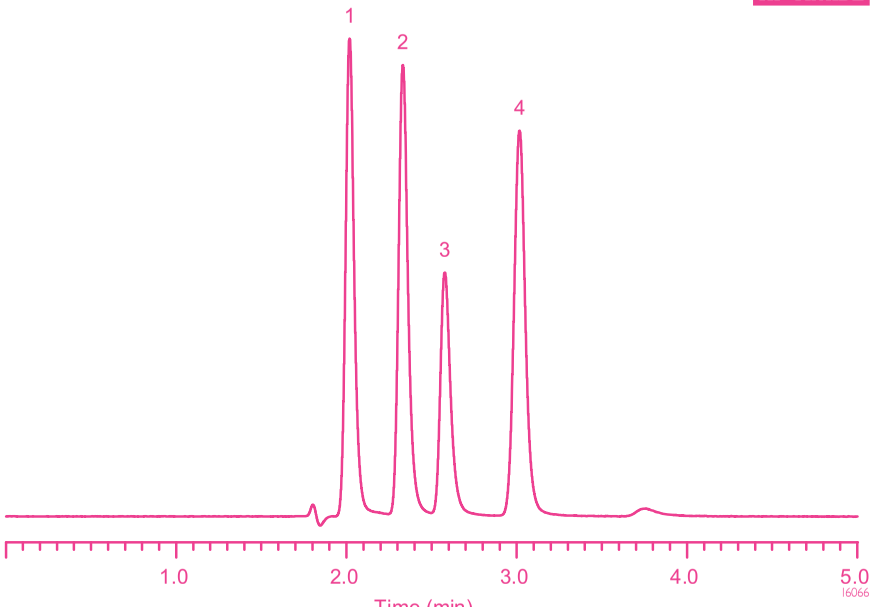
G000243, G000096

α-Hydroxy Aliphatic Acids

Discovery RP-AmideC16
15cm x 4.6mm, 5µm particles,
25mM KH_2PO_4,
pH 3.0
2mL/min
35°C
UV, 220nm
10µL, 1 µg/mL each analyte

1. Tartaric acid
2. Malic acid
3. Lactic acid
4. Citric acid

RP-AMIDE



α-Hydroxy Aliphatic Acids

α-Hydroxy aliphatic carboxylic acids are strongly acidic compounds, with pK_a values around 3.0 and can significantly interact with residual silanols. This chromatogram shows the separation of four such hydroxy acids on a Discovery RP-AmideC16 column under buffered acidic mobile phase conditions. This example demonstrates the applicability of the amide-functionalized bonded phase for separations requiring 100% aqueous mobile phases without chain collapse as observed for C18 columns.

Tartaric acid



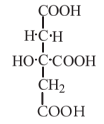
Malic acid



Lactic acid



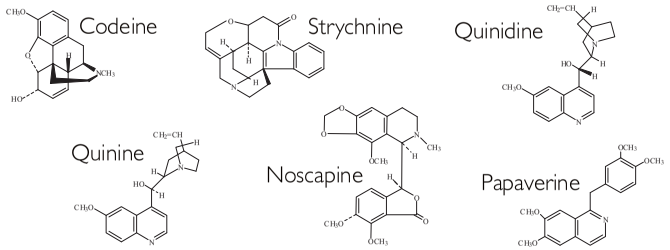
Citric acid



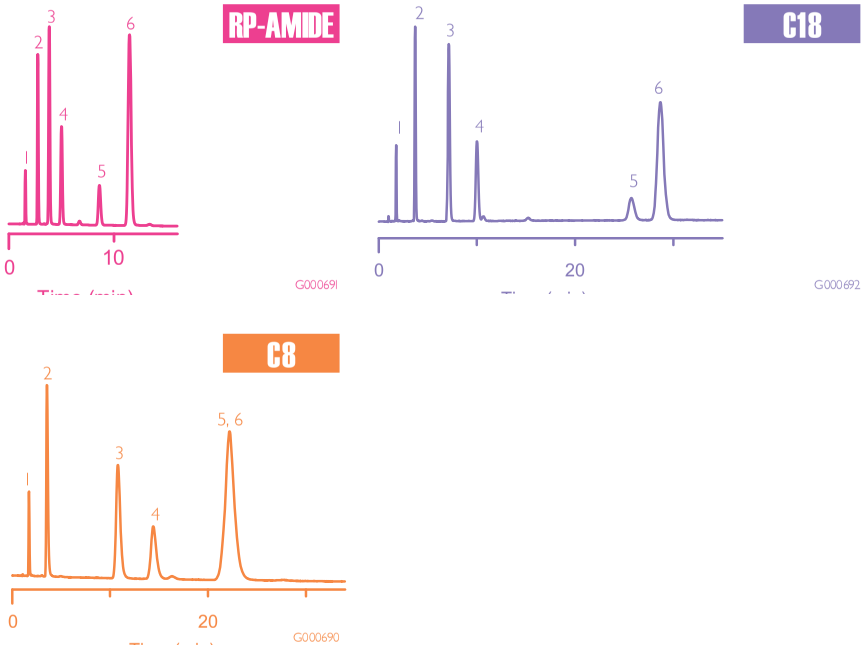
G001241, G001242
G001243, G001244

Alkaloids

Alkaloids are naturally occurring bases with complex multicyclic ring structures. They are difficult candidates for separation based on RP-HPLC as they are amenable to hydrophobic as well as polar and ionic interactions with a silica-based reversed phase packing material. They can tail significantly due to ion exchange with residual silanols, and mobile phase additives are commonly employed to alleviate this problem. They can be analyzed on a Discovery column under isocratic conditions, without any additive, and show excellent peak symmetry. The RP-AmideC16 column shows the best separation characteristics for the test mixture, with all components eluting within 12 minutes. Under the methanol/ buffer conditions used, papaverine and noscapine coelute on the C8 column. All columns provide excellent separation for quinine and quinidine, which differ only in stereochemistry at the exocyclic carbon to the C4 carbon of the quinoline ring. Papaverine and noscapine, which differ in the number of methoxyls and the absence/presence of a lactone group, also are best resolved on the RP-AmideC16 column.



G000222, G000223, G000220, G000221, G000238, G000239



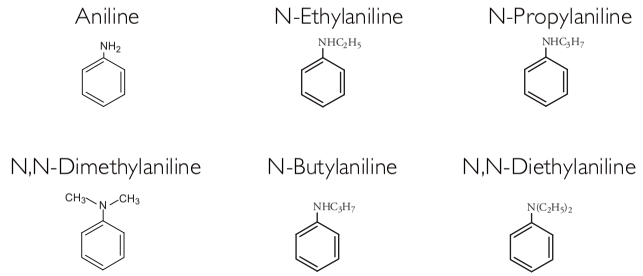
Alkaloids

15cm x 4.6mm columns,
5µm particles,
MeOH/25mM KH_2PO_4,
pH 3.0 (20:80)
2mL/min
35°C
UV, 254nm
10µL

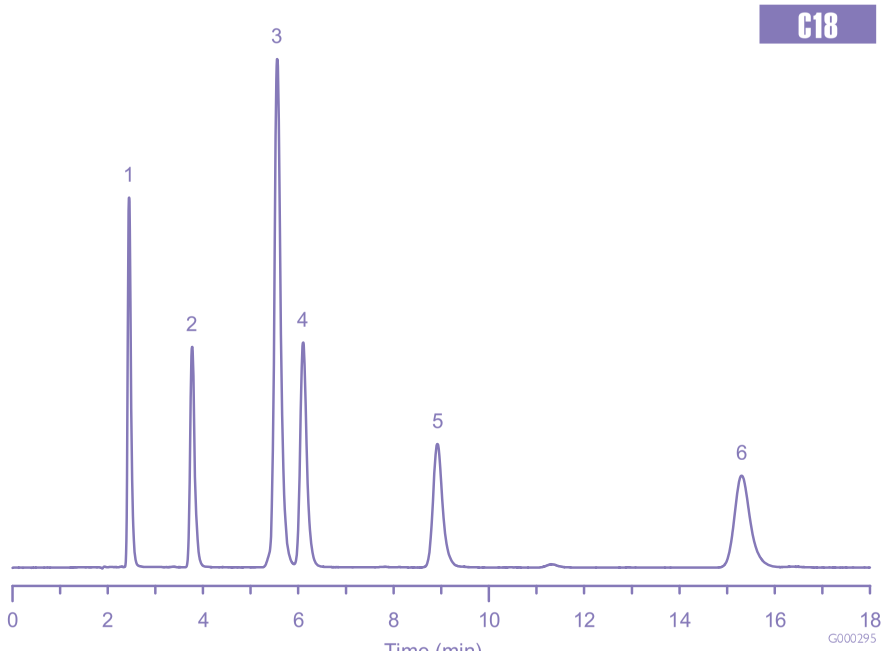
1. Codeine
2. Strychnine
3. Quinidine
4. Quinine
5. Noscapine
6. Papaverine

Aniline Homologs

Aniline derivatives are weak bases if the amine moiety is primary, but progressively become more basic with alkyl substitution on the nitrogen atom. Thus, aniline has a pK_a of 4.63, while N-ethylaniline and N,N-diethylaniline have values of 5.12 and 6.61, respectively. These bases can interact with acidic silanols through ionic interaction. The excellent peak symmetries obtained for six aniline derivatives on a Discovery C18 column indicate the absence of any such reactions under unbuffered mobile phase conditions.



G000739, G001245, G001246,
G000094, G001247, G001248



Aniline Homologs

Discovery C18, 15cm x 4.6mm,
5µm particles,
MeOH:H_2O (60:40)
1mL/min
30°C
UV, 254nm
10µL, 1µg/mL each analyte

1. Aniline
2. N-Ethylaniline
3. N-Propylaniline
4. N,N-Dimethylaniline
5. N-Butylaniline
6. N,N-Diethylaniline

Antibiotics (ß-Lactam):

15cm x 4.6mm columns,
5µm particles,

A: 0.01% TFA in H_2O
B: 0.01% TFA in MeCN
1.5mL/min

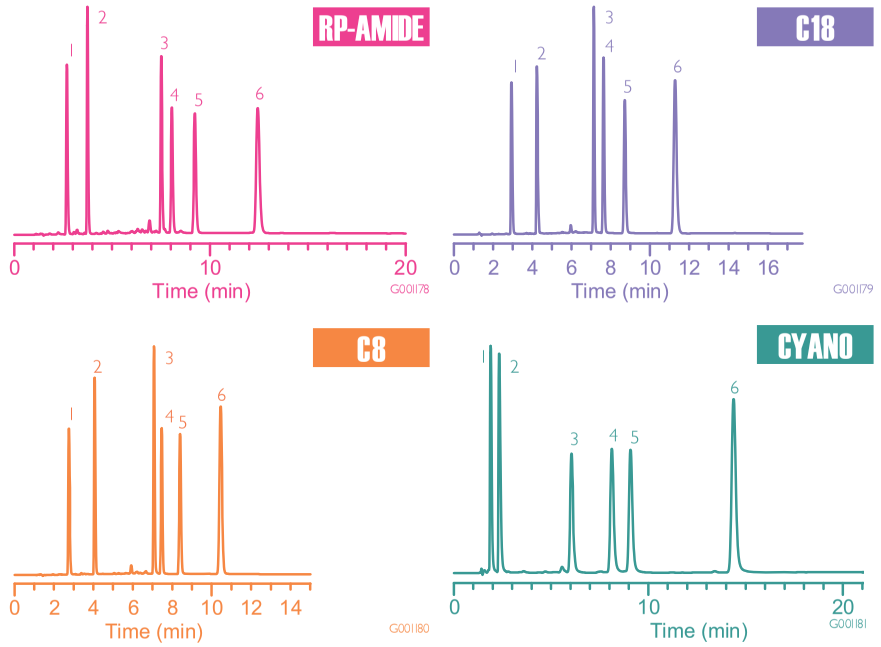
Gradient (RP-AmideC16, C18, C8)

min	%B
0	5
5	35
20	35

Gradient (Cyano)

min	%B
0	5
20	25

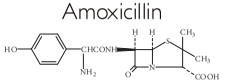
1. Amoxicillin
2. Ampicillin
3. Piperacillin
4. Penicillin G
5. Penicillin V
6. Cloxacillin



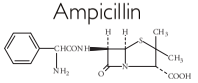
Antibiotics (ß-Lactam):

β-Lactam antibiotics contain 6-aminopenicillanic acid as the basic skeleton and structurally vary from each other with respect to the 6-acyl substituent. These antibiotics are weakly acidic and are rapidly inactivated by strong acids or bases. Amoxicillin is the most polar of the series investigated, due to the phenolic hydroxyl and amino moieties on the acyl chain. Ampicillin, which carries an amino group on its acyl chain, is less polar than amoxicillin. Penicillin G and V are much less polar than amoxicillin or ampicillin, as they do not contain any polar functionality on the acyl chain. Cloxacillin consists of a chlorophenyl-isoxazole moiety on the acyl chain, and is the most hydrophobic due to this feature. The interaction of the stationary phase with the acyl chain appears to be the governing factor in the RP-HPLC of these antibiotics. The carboxylic group is sterically hindered by the dimethyl group on the adjoining carbon of the thiazolidine ring. Since TFA is a strong protonating agent, the functional groups on ampicillin and amoxicillin are protonated, hence these two are less retained. No significant selectivity differences among the Discovery bonded phases are observed under the gradient conditions utilized. The Discovery Cyano column requires a more gradual gradient for optimal resolution.

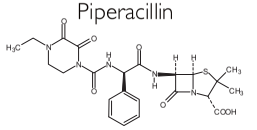
Amoxicillin



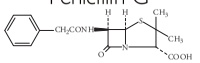
Ampicillin



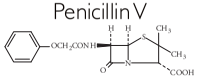
Piperacillin



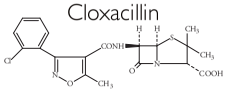
Penicillin G



Penicillin V



Cloxacillin



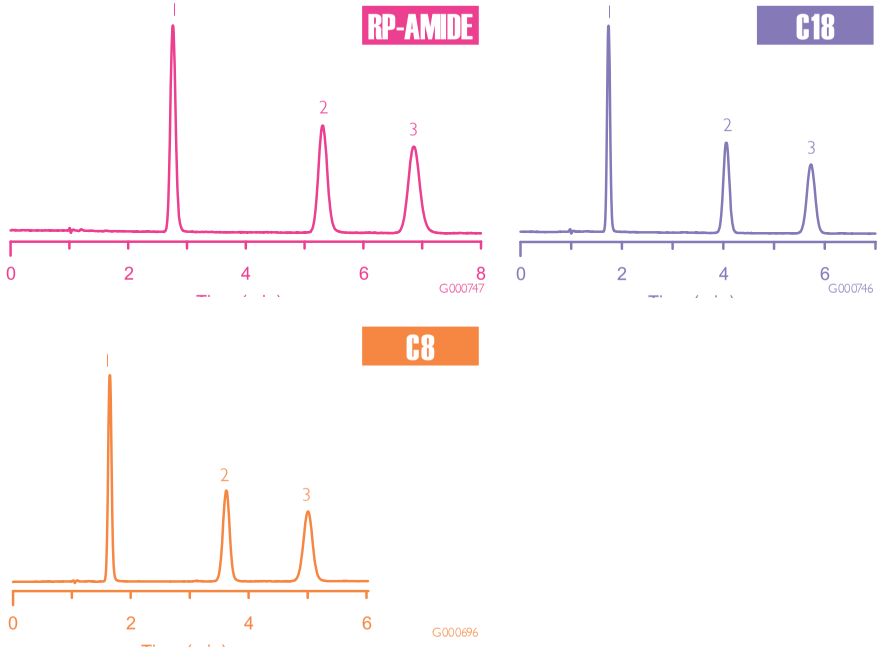
G001176, G001177, G000929, G001173, G001174, GG001175

Antibiotics (Cephalosporins)

conditions for RP-AmideC16:
15cm x 4.6mm column,
5µm particles,
MeOH:25mM KH_2PO_4, pH 3.0 (10:90)
2mL/min, 20°C,
254nm, 1µL

conditions for C8, C18:
15cm x 4.6mm column,
5µm particles,
MeOH:25mM KH_2PO_4, pH 3.0 (20:80)
2mL/min, 20°C,
254nm, 1µL

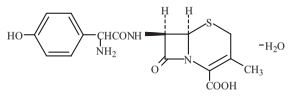
1. Cefadroxil
2. Cefaclor
3. Cephalexin



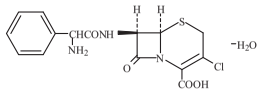
Antibiotics (Cephalosporins)

Cephalosporins are weakly acidic antibiotics based on the 5-thia-1-aza bicyclo [4,2,0] oct-2-ene-2-carboxylic acid skeleton, with pK_a values of 5.2 and 7.3. Cefadroxil and cephalexin differ only by a phenolic hydroxyl on the acyl chain of the former. Cefaclor and cephalexin differ in the 3-substituent on the thiazine nucleus, with chlorine the functionality in the former and methyl in the latter. The C18 and C8 columns show similar elution patterns, with the most hydrophobic component, cephalexin, eluting last. A more aqueous mobile phase is needed for the RP-AmideC16 column to separate cefaclor from cephalexin.

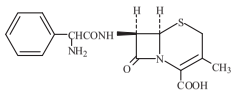
Cefadroxil



Cefaclor



Cephalexin

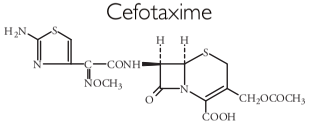


G000683, G000682, G000681

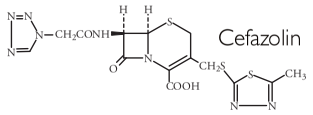
Antibiotics (Cephalosporins) from Serum

These closely related sulfur- and nitrogen-containing compounds can be extracted from serum using Discovery DSC-18Lt SPE tubes and a simple SPE method. The recoveries for all compounds are about 90%.

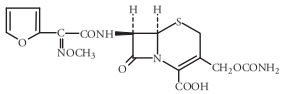
Cefotaxime



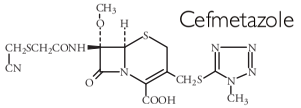
Cefazolin



Cefuroxime



Cefmetazole



G001206, G001207, G001208, G001209

Efficiency of Recovery

Compound	Concentration	%Recovery	%RSD (n=6)
1. Cefotaxime	1.4µg/mL	89.0	±1.2
2. Cefazolin	2.1µg/mL	91.9	±1.1
3. Cefuroxime	2.0µg/mL	89.6	±2.7
4. Cefmetazole	3.3µg/mL	91.1	±2.3

SPE

SPE Procedure, Using Zymark RapidTrace SPE Workstation

Step	Solvent/ Solution	Volume (mL)	Flow Rate (mL/min)	Comments
1. Condition	MeOH	2.0	12.0	conditions sorbent
2. Condition	H_2O	2.0	12.0	conditions sorbent
3. Load	sample	2.1[A]	0.75	applies serum sample
4. Rinse	H_2O	2.0	5.0	washes sample
5. Purge-Cannula	H_2O	4.0	30.0	clean sample cannula
6. Rinse	vent	0.1	2.0	positions SPE tube over waste port
7. Dry	N_2	Time = 3 min		dries sorbent
8. Purge-Cannula	MeOH	4.0	30.0	cleans sample cannula
9. Collect	MeOH	1.0	1.02	elutes analytes into collection vessel
10. Purge-Cannula	MeOH	4.0	30.0	cleans sample cannula
11. Purge-Cannula	H_2O	4.0	30.0	cleans sample cannula

[A] 1mL porcine serum spiked with each analyte, then diluted with 1mL of 0.1m K_2HPO_4 (pH 7.0).

[B] Eluent was evaporated to dryness with a nitrogen stream at 45°C, using a Zymark TurboVap LV Workstation. The residue was reconstituted with 100µL water prior to HPLC analysis.

Antibiotics (Cephalosporins) from Serum

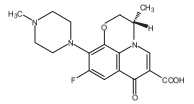
HPLC Conditions:
Discovery C18, 15cm x 4.6mm, 5µm particles, preceded by C18 guard column and 0.5µm frit filter
MeCN:20mM KH_2PO_4 pH 3.0 (adjusted with 10% phosphoric acid) (14:86)
1.2mL/min, 30°C, UV, 254nm
10µL reconstituted porcine serum

SPE Tube:
DSC-18Lt
500mg/3mL

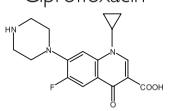
Antibiotics (Fluoroquinolones from Tablets)

Fluoroquinolone antibiotics consist of the 1,4-dihydro-4-oxo-3-quinoline carboxylic acid skeleton (nalidixic acid), along with a 6-fluoro substituent. They differ from each other in the substitution pattern on the quinolone ring nitrogen and on the piperazinyl moiety at the 7- position of the quinoline. The lone exception is trovafloxacin, which has a pyridino-pyridone skeleton. Fluoroquinolone antibiotics are amphoteric, due to the acidic carboxyl group and the basic quinoline and piperazine nitrogens. Their separation under RP-HPLC conditions is governed by the differences in substitution patterns. Thus, the elution order ciprofloxacin<lomefloxacin<sparfloxacin stems from the gradual increase in methyl substitution on the piperazine moiety. Grepafloxacin, with a 5-methyl substituent on the quinoline ring, is retained longer than lomefloxacin. Trovafloxacin, due to the difluorophenyl group on the quinoline nitrogen, is the most hydrophobic of the analytes studied and is eluted last. Under the gradient conditions employed, the only significant difference among the RP-AmideC16 and C18 columns is the longer retention of ciprofloxacin on the former, possibly due to H-bonding interactions. The HS (high surface area) C18 provides somewhat better resolution than the other C18 phase due to more retention (higher k').

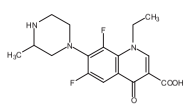
Levofloxacin



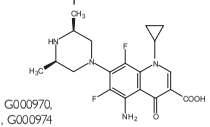
Ciprofloxacin



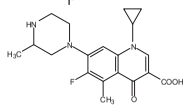
Lomefloxacin



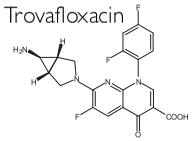
Sparfloxacin



Grepafloxacin

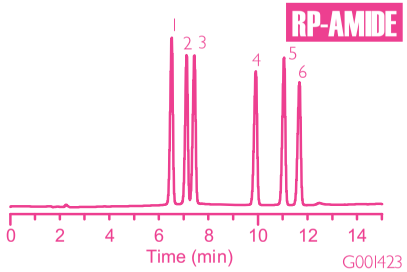


Trovafloxacin



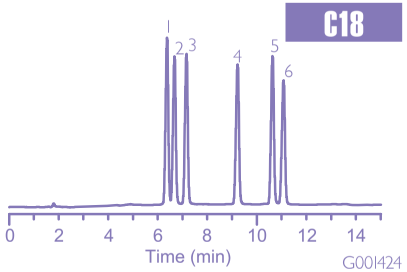
G000971, G000972, G000970, G000973, G000968, G000974

RP-AMIDE



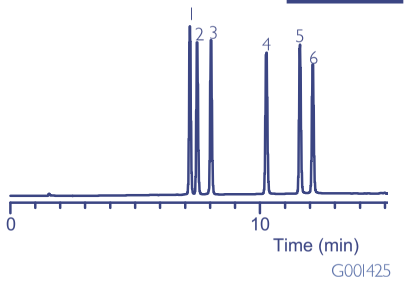
G001423

C18



G001424

HS C18



G001425

Antibiotics (Fluoroquinolones from Tablets)

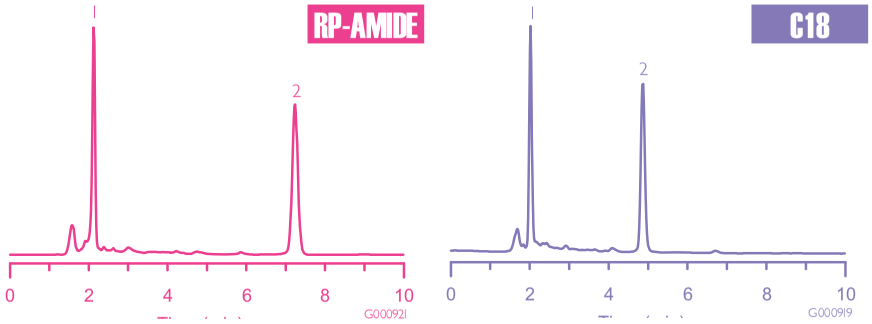
15cm x 4.6mm columns,
(A) 25mM phosphate buffer, pH 3.0
(B) MeCN
10% B to 35% B in 15 min
1mL/min
35°C
UV, 220nm
10µL

1. Levofloxacin
2. Ciprofloxacin
3. Lomefloxacin
4. Sparfloxacin
5. Grepafloxacin
6. Trovafloxacin

Antibiotics (Peptides)

15cm x 4.6mm columns,
5µm particles,
MeCN:25mM KH_2PO_4,
pH 3.0 (40:60)
1mL/min
35°C
UV, 220nm
10µL, 50µg/mL each analyte.

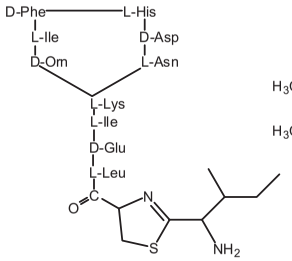
1. Bacitracin A
2. Virginiamycin M1



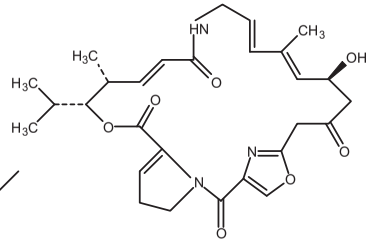
Antibiotics (Peptides)

Bacitracin A is a cyclic decapeptide, carrying an aminoalkylthiazoline substituent on the terminal leucine moiety. Virginiamycin M1 is a macrocyclic molecule containing an oxazole and a pyrroline ring as part of the cyclic skeleton, and does not contain any amino acid in its structure. Owing to the presence of multiple amide linkages, bacitracin A is much more polar than Virginiamycin M1 and is eluted first. Virginiamycin M1 is retained longer on the RP-AmideC16 column, since it potentially undergoes dipolar interactions through the keto and ester functionalities with the amide moiety of the stationary phase.

Bacitracin A



Virginiamycin M1

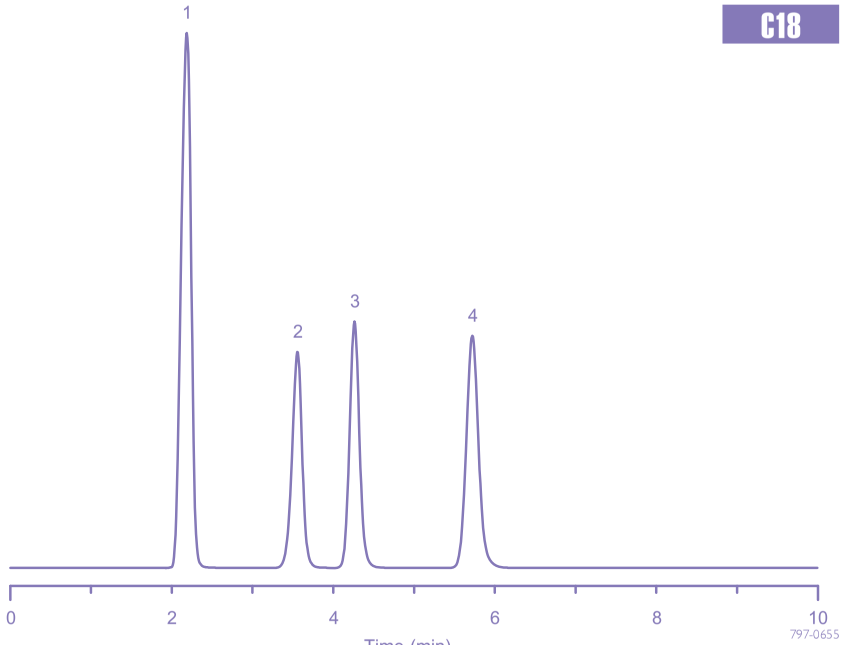


G000935, G000936

Antibiotics (Sulfa Drugs)

Discovery C18
15cm x 4.6mm column,
5µm particles,
MeOH:H_2O with 1% acetic acid
(20:80)
1mL/min
20°C
UV, 254nm
10µL, 1µg/mL each analyte

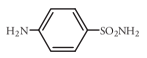
1. Sulfanilamide
2. Sulfathiazole
3. Sulfamerazine
4. Sulfamethazine



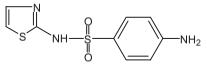
Antibiotics (Sulfa Drugs)

These drugs are based on a 4-aminobenzenesulfonamide skeleton and carry a thiazole or pyrimidine system on the sulfonamide nitrogen. The parent sulfanilamide exhibits pK_a values of 10.43 and 2.37, and the heterocyclic derivatives show values of 7.4 and 2.65. The sulfonamide moiety is acidic and forms salts readily, while the aromatic amino group imparts basic properties to these drugs. These polar functionalities make the HPLC separation of sulfa drugs difficult. The longer retention of sulfamerazine and sulfamethazine may be attributable to the hydrophobic effect of the methyl substituents.

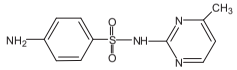
Sulfanilamide



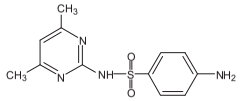
Sulfathiazole



Sulfamerazine



Sulfamethazine

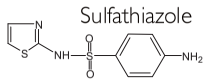


G001249, G000597,
G000598, G000599

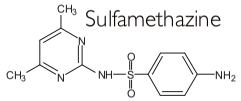
Antibiotics (Sulfa Drugs) from Serum

These four antibacterial agents in the sulfa drug family can be extracted from serum. After acidifying a diluted serum sample, recoveries for the compounds are greater than 90%, using a simple methanol and water-based SPE method.

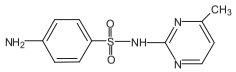
Sulfathiazole



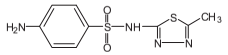
Sulfamethazine



Sulfamerazine



Sulfamethizole



G000597, G000598, G000599, G000600

Efficiency of Recovery

Compound	Concentration	%Recovery	%RSD (n=6)
1. Sulfathiazole	1.0µg/mL	90.1	±2.7
	5.0µg/mL	97.7	±2.1
2. Sulfamerazine	1.0µg/mL	91.8	±2.8
	5.0µg/mL	97.2	±2.4
3. Sulfamethazine	1.0µg/mL	91.9	±2.8
	5.0µg/mL	96.5	±2.2
4. Sulfamethizole	1.0µg/mL	88.7	±3.2
	5.0µg/mL	98.3	±2.5

SPE

SPE Procedure, Using Zymark RapidTrace SPE Workstation

Step	Solvent/ Solution	Volume (mL)	Flow Rate (mL/min)	Comments
1. Condition	MeOH	2.0	5.0	conditions sorbent
2. Condition	H_2O	2.0	5.0	conditions sorbent
3. Load	spiked porcine serum	2.0[A]	0.75	applies serum sample
4. Rinse	5% MeOH in H_2O	2.0	5.0	washes sorbent
5. Purge-Cannula	H_2O	4.0	30.0	clean sample cannula
6. Rinse	vent	0.1	2.0	positions SPE tube over waste port
7. Dry	N_2	Time = 10 min		dries sorbent
8. Purge-Cannula	MeOH	4.0	30.0	cleans sample cannula
9. Collect	MeOH	1.0	1.0	elutes analytes into collection vessel
10. Collect	vent	6.0	3.0	pushes residual eluent into vessel[B]
11. Purge-Cannula	H_2O	4.0	30.0	cleans sample cannula

[A] 1mL porcine serum spiked 1.0µg/mL or 5.0µg/mL, diluted with 1mL water, then acidified with 40µL H_3PO_4.

[B] Eluent evaporated to dryness with a nitrogen stream at 40°C, using a Zymark TurboVap LV Workstation, then reconstituted with 1mL mobile phase.

Antibiotics (Sulfa Drugs) from Serum

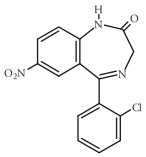
HPLC Conditions:
Discovery C18,
15cm x 4.6mm, 5µm particles,
preceded by 2cm C18 guard column and 0.5µm frit filter.
MeOH: 1% acetic acid (8:92)
1.0mL/min (8 min) then 0.6mL/min
30°C
UV, 254nm
10µL reconstituted porcine serum extract

SPE Tube:
Discovery DSC-18
500mg/3mL

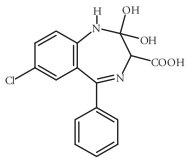
Anticonvulsants

These drugs contain a benzodiazepine nucleus. Clonazepam is the most polar, due to the presence of the nitro substituent, and shows pK_a values of 1.5 and 10.5. Clorazepate remains as the potassium salt under the neutral mobile phase conditions and is moderately acidic. Diazepam is the most hydrophobic of the three and is a weaker acid with a pK_a of 3.4. Clonazepam and clorazepate contain an NH moiety capable of H-bonding with the amide group of the RP-AmideC16 stationary phase and hence is retained longer on this phase. Diazepam is retained longer on the C18 phase, as expected from its hydrophobic interactions.

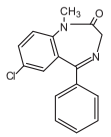
Clonazepam (IS)



Clorazepate

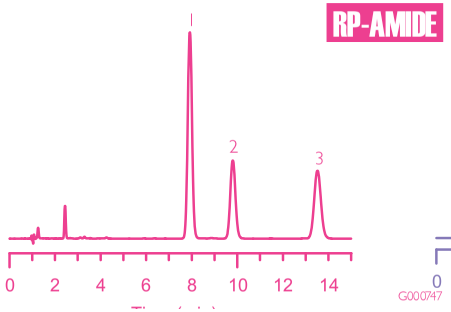


Diazepam

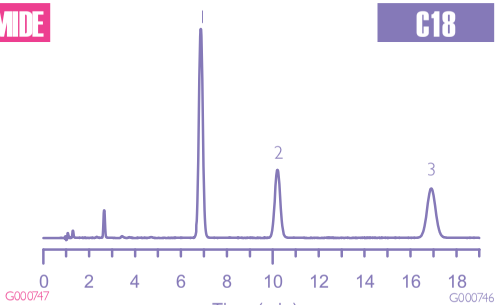


G001211, G000199, G000200

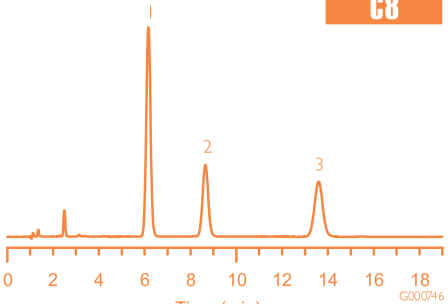
RP-AMIDE



C18



C8



Anticonvulsants

15cm x 4.6mm columns,
5µm particles,
MeCN:H_2O (30:70)
2mL/min
20°C
UV, 254nm
10µL

1. Clonazepam (IS)
2. Clorazepate
3. Diazepam

Anticonvulsant Compounds from Serum

HPLC Conditions:
Discovery C18
15cm x 4.6mm, 5µm particles, preceded by a 2cm C18 guard column and 0.5µm frit filter.
MeOH: H_2O (55:45)
1.0mL/min
30°C
UV, 254nm
10µL

SPE Tube:
DSC-18Lt
500 mg/3mL

SPE

SPE Procedure, Using Zymark RapidTrace SPE Workstation

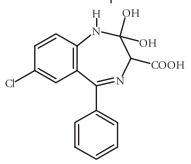
Step	Solvent/ Solution	Volume (mL)	Flow Rate (mL/min)	Comments
1. Condition	MeOH	2.0	5.0	conditions sorbent
2. Condition	H_2O	2.0	5.0	conditions sorbent
3. Load	spiked porcine serum	2.0[A]	0.75	applies serum sample
4. Rinse	20% MeOH in H_2O	2.0	5.0	washes sample
5. Purge-Cannula	H_2O	4.0	30.0	cleans sample cannula
6. Rinse	vent	0.1	2.0	positions SPE tube over waste port
7. Dry	N_2	Time = 10 min		dries sorbent
8. Purge-Cannula	MeOH	4.0	30.0	cleans sample cannula
9. Collect	MeOH	1.0	1.0	elutes analytes into collection vessel
10. Collect	vent	6.0	3.0	pushes residual eluent into vessel[B]
11. Purge-Cannula	H_2O	4.0	30.0	cleans sample cannula

[A] 1mL porcine serum spiked with 0.2µg/mL or 0.5µg/mL each analyte and clonazepam (IS), then diluted with 1.0mL water.
[B] Eluent evaporated to dryness with a nitrogen stream at 30°C, using a Zymark TurboVap LV Workstation, then reconstituted with 200µL methanol

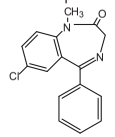
Anticonvulsant Compounds from Serum

These anticonvulsant compounds, similar in structure, can be extracted from serum using Discovery DSC-18Lt SPE tubes, then analyzed on a Discovery C18 HPLC column. Recoveries range from 93 to 99%.

Clorazepate



Diazepam



G00121I, G000199

Efficiency of Recovery

Compound	Concentration	%Recovery	%RSD (n=6)
1. Clorazepate	0.20µg/mL	93.2	±1.0
	0.50µg/mL	99.7	±1.1
2. Diazepam	0.20µg/mL	93.8	±1.7
	0.50µg/mL	98.5	±1.0

Anticonvulsants/ Anxiolytics from Serum

HPLC Conditions:
Discovery C18,
15cm x 4.6mm, 5µm particles, preceded by 2cm C18 guard column and 0.5µm frit filter.
MeCN:MeOH: 25mM KH_2PO_4 (pH 7.0 with triethylamine) (32:23:45)
1.0mL/min, ambient temp.
UV, 254nm
20µL reconstituted porcine serum extract

SPE Tube:
Discovery DSC-18
100mg/1mL

SPE

SPE Procedure, Using Zymark RapidTrace SPE Workstation

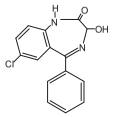
Step	Solvent/ Solution	Volume (mL)	Flow Rate (mL/min)	Comments
1. Condition	MeOH	2.0	5.0	conditions sorbent
2. Condition	H_2O	2.0	5.0	conditions sorbent
3. Load	spiked porcine serum	2.0[A]	0.75	applies serum sample
4. Rinse	MeCN/MeOH/H_2O 15:15:70	2.0	5.0	washes sorbent
5. Purge-Cannula	H_2O	4.0	30.0	cleans sample cannula
6. Rinse	vent	0.1	2.0	positions SPE tube over waste port
7. Dry	N_2	Time = 10 min		dries sorbent
8. Purge-Cannula	MeOH	4.0	30.0	cleans sample cannula
9. Collect	MeOH	1.0	1.0	elutes analytes into collection vessel
10. Collect	vent	6.0	3.0	pushes residual eluent into vessel[B]
11. Purge-Cannula	H_2O	4.0	30.0	cleans sample cannula

[A] 1mL porcine serum spiked with 0.05µg/mL or 0.5µg/mL each analyte and, then diluted with 1mL water.
[B] Eluent evaporated to dryness with a nitrogen stream at room temp., using a Zymark TurboVap LV Workstation, then reconstituted with 200µL mobile phase.

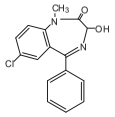
Anticonvulsants/Anxiolytics from Serum

Five closely related benzodiazepine derivatives were extracted from serum using Discovery DSC-18 SPE tubes and an automated SPE method. High recoveries and low RSD's for these compounds are observed when using these SPE tubes and the Zymark RapidTrace SPE Workstation.

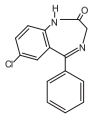
Oxazepam



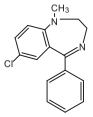
Temazepam



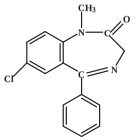
Desmethyl-diazepam



Diazepam



Medazepam



G000584, G000585, G000586, G000200, G000587

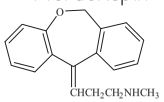
Efficiency of Recovery

Compound	Concentration	%Recovery	%RSD (n=6)
1. Oxazepam	0.05µg/mL	98.3	±1.8
	0.50µg/mL	99.1	±0.9
2. Temazepam	0.05µg/mL	98.6	±3.3
	0.50µg/mL	97.7	±1.2
3. Desmethyldiazepam	0.05µg/mL	98.6	±1.1
	0.50µg/mL	103.7	±0.8
4. Diazepam	0.05µg/mL	101.1	±2.5
	0.50µg/mL	101.7	±0.8
5. Medazepam	0.05µg/mL	92.9	±2.0
	0.50µg/mL	97.0	±5.8

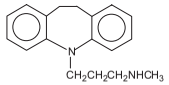
Antidepressants (Tricyclic)

These drugs are comprised of a dibenzo-cycloheptene or oxepin or azepin skeleton and are strongly basic in nature. They tail significantly under RP-HPLC conditions and mobile phase additives are frequently used to overcome this problem. A Discovery C8 column can separate multi-component mixtures of these drugs without any mobile additive. This chromatogram illustrates typical therapeutic levels of these compounds, including two internal standards, Chlorimipramine and Nor-chlorimipramine.

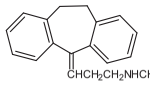
Nordoxepin



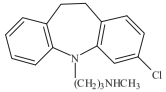
Desipramine



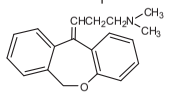
Nortriptyline



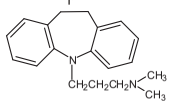
Nor-chlorimipramine (IS)



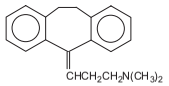
Doxepin



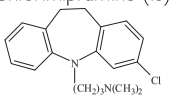
Imipramine



Amitriptyline

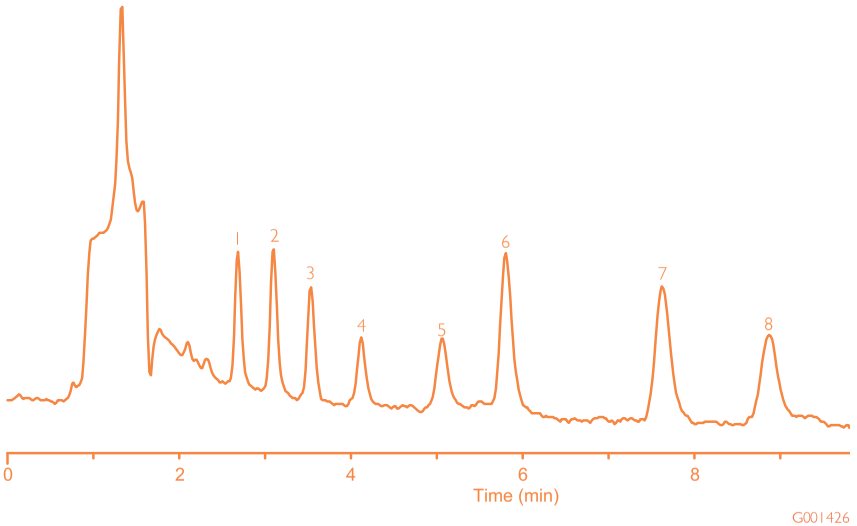


Chlorimipramine (IS)



G001422, G000160, G000618, G001421, G000619, G000620, G000159, G000420

C8



G001426

Antidepressants (Tricyclic)

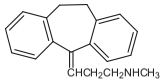
15cm x 4.6mm column, with C8 guard column,
5µm particles,
MeCN:25mM K_2HPO_4,
pH 7.0 (45:55)
1.4mL/min
25°C
UV, 248nm
10µL, 40ng/mL of each analyte

1. Nordoxepin
2. Desimipramine
3. Nortriptyline
4. Nor-chlorimipramine (IS)
5. Doxepin
6. Imipramine
7. Amitriptyline
8. Chlorimipramine (IS)

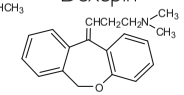
Antidepressants (Tricyclic) from Serum

This application shows the recoveries for four common tricyclic antidepressant compounds. These basic compounds can be extracted and analyzed with a simple SPE method, using Discovery DSC-18 SPE tubes. Recoveries for all are 92 to 100%.

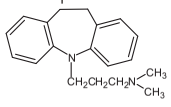
Nortriptyline



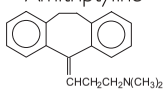
Doxepin



Imipramine



Amitriptyline



G000618, G000619, G000620, G000159

Efficiency of Recovery

Compound	Concentration	%Recovery	%RSD (n=6)
1. Nortriptyline	0.10µg/mL	103.6	±4.5
	0.50µg/mL	97.5	±4.5
2. Doxepin	0.10µg/mL	102.2	±3.0
	0.50µg/mL	100.8	±1.8
3. Imipramine	0.10µg/mL	92.0	±1.5
	0.50µg/mL	97.5	±1.7
4. Amitriptyline	0.10µg/mL	93.6	±1.2
	0.50µg/mL	95.7	±1.4

SPE

SPE Procedure, Using Zymark RapidTrace SPE Workstation

Step	Solvent/ Solution	Volume (mL)	Flow Rate (mL/min)	Comments
1. Condition	MeOH	2.0	5.0	conditions sorbent
2. Condition	H_2O	2.0	5.0	conditions sorbent
3. Load	spiked porcine serum	2.0[A]	0.75	applies serum sample
4. Rinse	20% MeOH in H_2O	2.0	5.0	washes sorbent
5. Purge-Cannula	H_2O	4.0	30.0	cleans sample cannula
6. Rinse	vent	0.1	2.0	positions SPE tube over waste port
7. Dry	N_2	Time = 10 min		dries sorbent
8. Purge-Cannula	MeOH	4.0	30.0	cleans sample cannula
9. Collect	MeOH	1.0	1.0	elutes analytes into collection vessel
10. Collect	vent	6.0	3.0	pushes residual eluent into vessel[B]
11. Purge-Cannula	H_2O	4.0	30.0	cleans sample cannula

[A] 1mL porcine serum spiked with 0.1 µg/mL or 0.5µg/mL each analyte basified with 3µL 10N KOH, then diluted with 1mL water

[B] 350µL water added per mL methanolic eluent before analysis.

Antidepressants (Tricyclic) from Serum

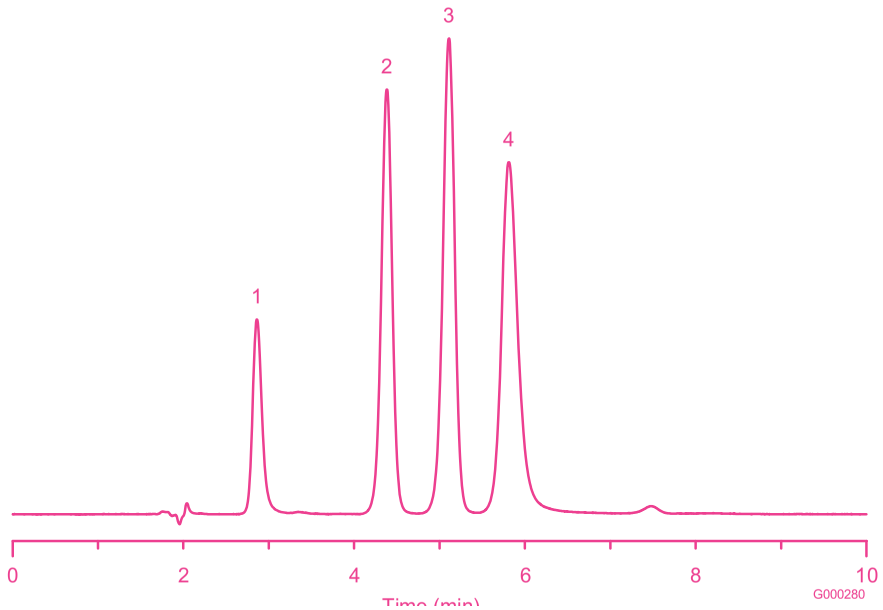
HPLC Conditions:
Discovery C18 column,
15cm x 4.6mm, 5µm particles,
preceded by 2cm C18 guard column and 0.5µm frit filter
MeCN:MeOH: 25mM KH_2PO_4 (pH 7.0 with triethylamine) (45:25:30)
1.0mL/min, ambient temp.
UV, 254nm
50µL diluted porcine serum extract

SPE Tube:
Discovery DSC-18
100mg/1mL

Antihypertensive-Diuretic Combination

Discovery RP-AmideC16
15cm x 4.6mm column,
5µm particles,
MeOH: 25mM K_2HPO_4,
pH 7.0 (22:78)
1mL/min
30°C
UV, 254nm
10µL, 1µg/mL of each analyte

1. Atenolol
2. Amiloride
3. Hydrochlorothiazide
4. Caffeine

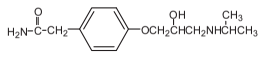


RP-AMIDE

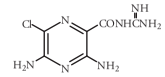
Antihypertensive-Diuretic Combination

This mix consists of three diuretics, amiloride (a pyrazine derivative), hydrochlorothiazide (a benzothiadiazine derivative) and caffeine (a xanthine analog), along with a β-blocker, atenolol. They are basic compounds capable of interactions with the silica surface through ionic interaction or hydrogen bonding in the presence of exposed siloxide ions. A Discovery RP-AmideC16 column completely separates these compounds in approximately 6 minutes under neutral mobile phase conditions.

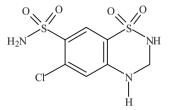
Atenolol



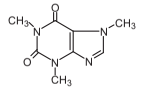
Amiloride



Hydrochlorothiazide



Caffeine

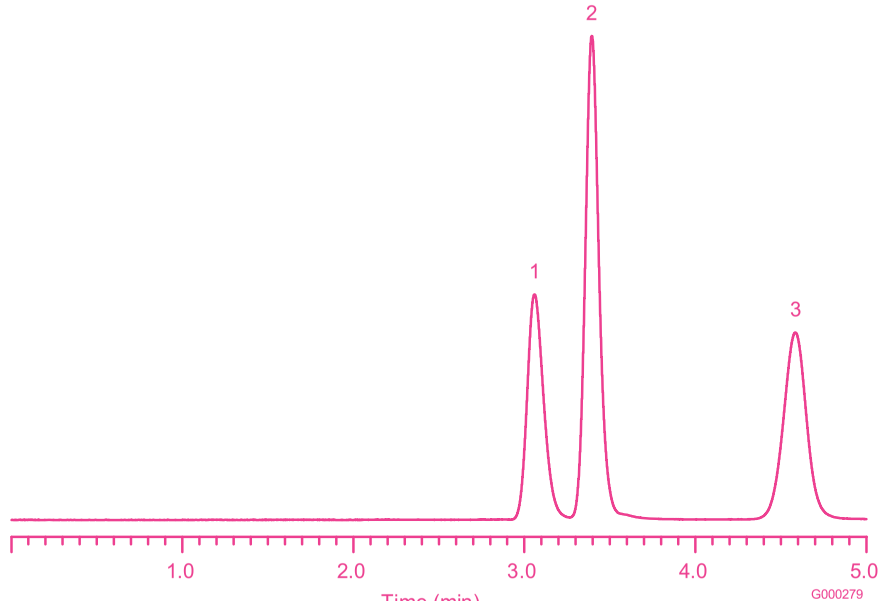


G000613, G001251, G001252, G000096

Antihypertensive ACE Inhibitors

Discovery RP-AmideC16
15cm x 4.6mm column,
5µm particles,
MeCN:25mM KH_2PO_4,
pH 2.3 (33:67)
0.6mL/min
35°C
UV, 214nm
3µL, 1µg/mL of each analyte

1. Enalapril
2. Lisinopril
3. Captopril

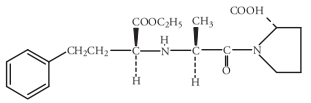


RP-AMIDE

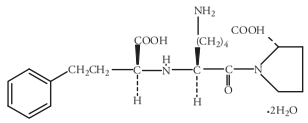
Antihypertensive ACE Inhibitors

ACE inhibitors are amino acid derivatives containing an L-proline skeleton and incorporating highly polar functionalities such as thiol (captopril), secondary amine (enalapril and lisinopril), primary amine (lisinopril) and carboxyl (all three). They exhibit a wide range of pK_a values (e.g. 2.5, 4.0, 6.7 and 10.1 for lisinopril). Their HPLC on reversed phase columns can be difficult, yet a complete separation of all 3 compounds can be achieved in less than 5 minutes on a Discovery RP-AmideC16 column.

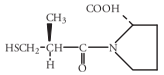
Enalapril



Lisinopril



Captopril

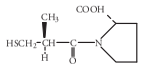


G001253, G001254,G001255

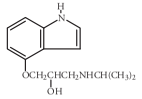
Antihypertensive Drugs (calcium channel blockers, β-blocker and ACE inhibitor)

Five antihypertensive drugs of different classes are resolved in a single separation on a Discovery RP-AmideC16 column. They include the calcium channel blockers diltiazem, verapamil and nifedipine, with a benzothiazepinone, valeronitrile, and dihydropyridine skeleton, respectively, pindolol, a β-blocker with an indole skeleton, and captopril, an ACE inhibitor with an L-proline skeleton. Desmethyldiltiazem is a metabolite of diltiazem and is commonly encountered in fluids of patients taking diltiazem. These strongly basic molecules are difficult candidates for HPLC. A Discovery RP-AmideC16 column demonstrates excellent separation of these compounds at neutral pH, and provides good peak characteristics.

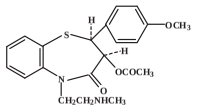
Captopril



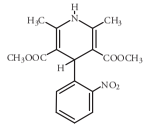
Pindolol



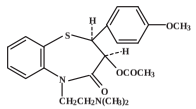
Desmethyldiltiazem



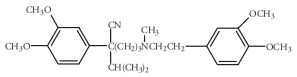
Nifedipine



Diltiazem

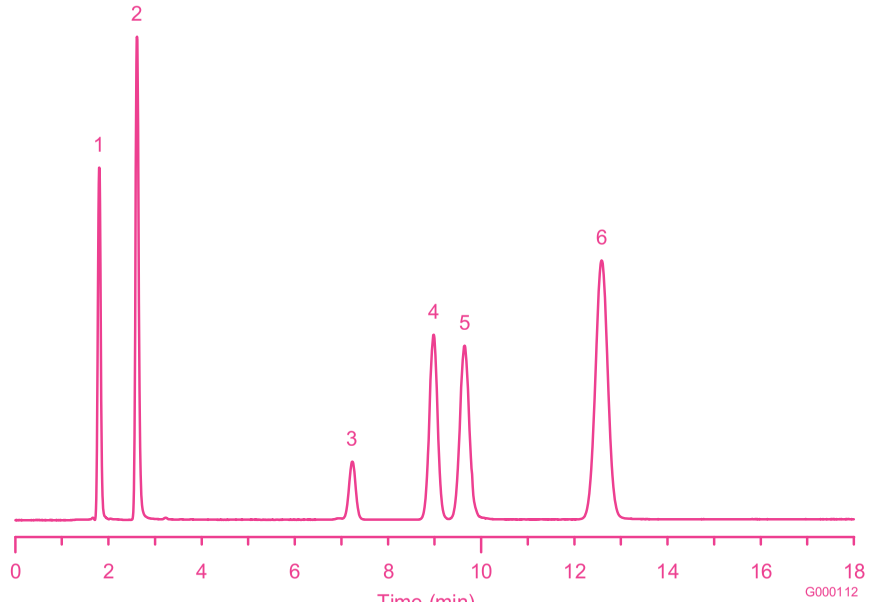


Verapamil



G001255, G001256, G000245, G001257, G000244, G001258

RP-AMIDE



G000112

Antihypertensive Drugs (calcium channel blockers, β-blocker and ACE inhibitor)

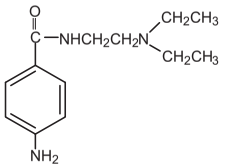
Discovery RP-AmideC16
15cm x 4.6mm column,
5µm particles,
MeOH:25mM KH_2PO_4,
pH 7.0 (40:60)
1mL/min
35°C
UV, 214nm
5µL, 0.5µg/mL of each analyte

1. Captopril
2. Pindolol
3. Desmethyldiltiazem
4. Nifedipine
5. Diltiazem
6. Verapamil

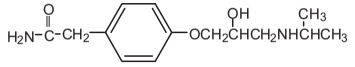
Antihypertensive/Antiarrhythmic Compounds from Serum

Basic drugs like procainamide and atenolol can be extracted from serum, using Discovery DSC-18 SPE tubes. The results shown here are approximately 100%, recovery.

Procainamide



Atenolol



G000095, G000613

SPE

SPE Procedure, Using Visiprep™ SPE Vacuum Manifold

Condition: 2mL MeOH, then 2mL 25mM K_2HPO_4 (pH 9.0)

Apply Sample: 1 mL porcine serum spiked with 0.25µg/mL or 0.50µg/mL each analyte, basified with 2.5µL 10M KOH

Wash and Dry: 2mL 15% MeOH in 25mM K_2HPO_4 (pH 9.0): dry tube 10 min with nitrogen stream

Elute: 1mL MeOH; evaporate to dryness with nitrogen stream at room temperature; reconstitute in 200µL H_2O

Efficiency of Recovery

Compound	Concentration	%Recovery	%RSD (n=6)
1. Procainamide	0.25µg/mL	98.6	±3.5
	0.50µg/mL	99.7	±2.3
2. Atenolol	0.25µg/mL	101.7	±3.7
	0.50µg/mL	100.3	±2.3

Antihypertensive/ Antiarrhythmic Compounds from Serum

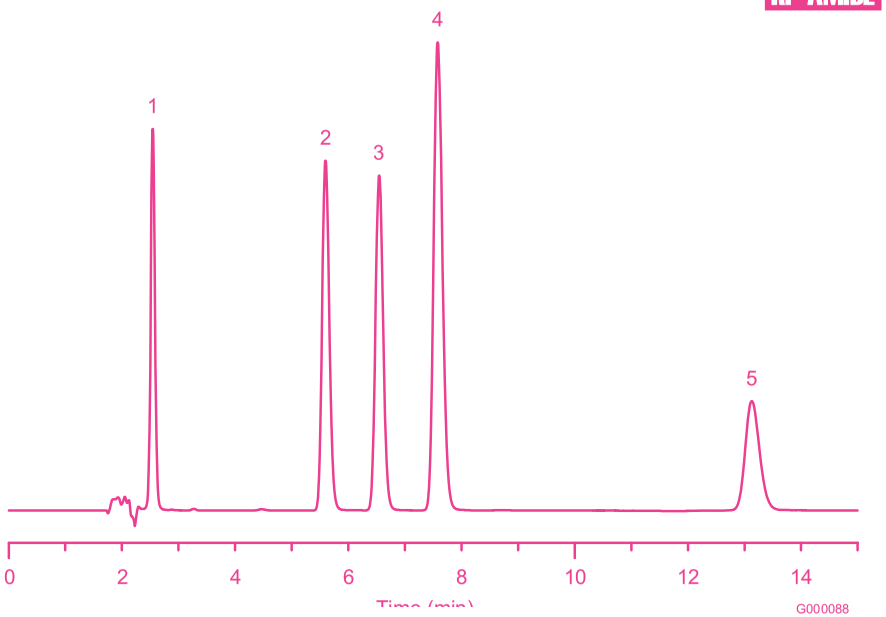
HPLC Conditions:
Discovery C18,
15cm x 4.6mm column, 5µm particles, preceded by a 2cm C18 guard column and 0.5µm frit filter.
MeOH:25mM K_2HPO_4
pH 7.0 (10:90)
1mL/min
30°C
UV, 220nm
50µL reconstituted porcine serum extract

SPE Tube:
Discovery DSC-18
500mg/3mL

Antipyretics/Analgesics/ Antifungals

Discovery RP-AmideC16
15cm x 4.6mm column,
5µm particles,
MeCN:H_2O, 0.1% TFA (25:75)
1mL/min
30°C
UV, 254nm
10µL, 1µg/mL of each analyte

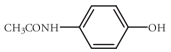
1. Acetaminophen
2. Aspirin
3. Sorbic acid
4. Benzoic acid
5. Salicylic acid



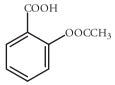
Antipyretics/Analgesics/Antifungals

These test probes consist of weakly acidic (acetaminophen) and strongly acidic (salicylic and benzoic acids and aspirin) benzene derivatives and an aliphatic dienoic acid (sorbic acid). These compounds may undergo hydrogen bonding under acidic mobile phase conditions if silanol groups are present on the bonded phase surface. A Discovery RP-AmideC16 column provides excellent separation with good peak shapes for this application.

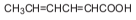
Acetaminophen



Aspirin



Sorbic acid



Benzoic acid



Salicylic acid

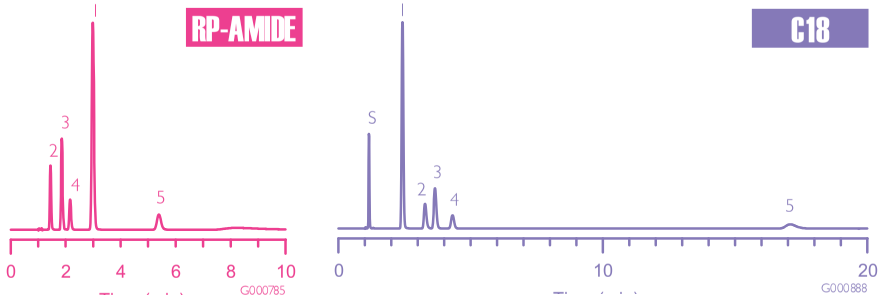


G001259, G001260, G000093
G001261, G000098

Antitussives/ Antihistamines/ Antipyretics

15cm x 4.6mm columns,
5µm particles,
A) 25mM KH_2PO_4, pH 2.3
B) MeCN
10% (2min) to 30% B in 4 min, hold 4 min, to 50% B in 10 min
2mL/min, ambient temp.
UV, 214nm
10µL, 1µg/mL of each analyte

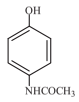
S Solvent
1. Acetaminophen
2. Doxylamine
3. Pseudoephedrine
4. Codeine
5. Chlorpheniramine



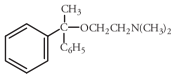
Antitussives/Antihistamines/Antipyretics

Many cold remedies contain various combinations of acetaminophen, pseudoephedrine, and an antihistamine as ingredients. The separation of a five component mix on Discovery columns is shown in this figure. It is striking that the RP-AmideC16 column elutes doxylamine, pseudoephedrine and codeine before acetaminophen, while the C18 and C8 columns display the opposite behavior. This selectivity difference may be exploited for method development of those cold remedies which contain large amounts of acetaminophen with minor quantities of other ingredients.

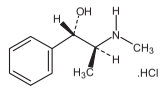
Acetaminophen



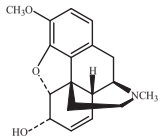
Doxylamine



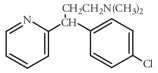
Pseudoephedrine



Codeine



Chlorpheniramine

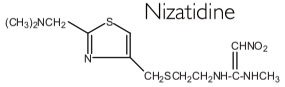


G000243, G001212, G000873, G000222, G001213

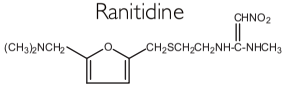
Antiulcer Compounds

These molecules are complex in structure, with a core heterocyclic ring (furan, imidazole or thiazole) and a side chain carrying a sulfide and secondary amine functionalities. Other polar groups such as nitro, cyano or iminosulfonamide also are present on the side chain. The hetero ring carries a tertiary amine or guanidine moiety. These compounds are strongly basic and are not only difficult to separate, but also produce severe tailing from silanol interactions. They require highly aqueous mobile phases for sufficient retention needed for achieving good separation. A notable selectivity difference between the RP-AmideC16 and C18 columns can be seen in the reversal of the elution order of cimetidine and famotidine. This reversal may be attributable to the H-bonding interactions of the guanidine and/or sulfonamide groups on famotidine with the stationary phase amide moiety of RP-AmideC16, leading to its longer retention. Note the better resolution of the HS (high surface area) C18 compared to the other C18 column, attributable to the former column's greater retention of the analytes.

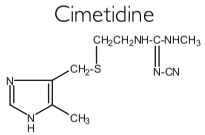
Nizatidine



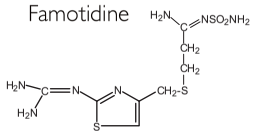
Ranitidine



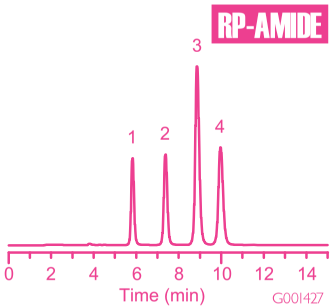
Cimetidine

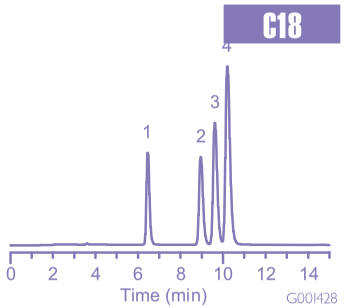


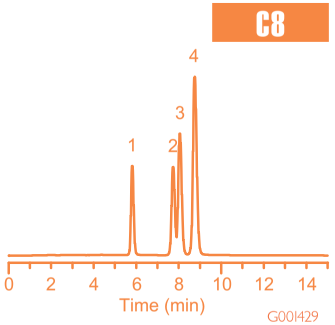
Famotidine

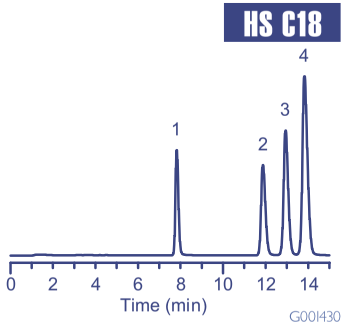


G000247, G000248, G000249, G000250









Antiulcer Compounds

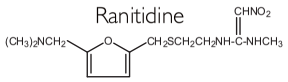
15cm x 4.6mm columns,
MeOH:25mM H_3PO_4/KOH,
pH 3.0 (15:85)
0.5mL/min
ambient temp.
215nm
3µL, 1.6µg/mL of each analyte

1. Nizatidine
2. Ranitidine
3. Famotidine
4. Cimetidine

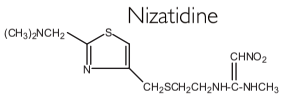
Antiulcer Compounds from Serum

These basic, sulfur-containing compounds can be extracted from serum using Discovery DSC-18 SPE tubes under basic conditions. The compounds can be analyzed subsequently on a Discovery C18 HPLC column. This method provides recoveries in the range of 93-98% for these compounds.

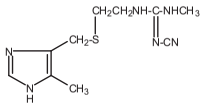
Ranitidine



Nizatidine



Cimetidine



G000248, G000247, G000249

Efficiency of Recovery

Compound	Concentration	%Recovery	%RSD (n=6)
1. Ranitidine	0.25µg/mL	92.5	±5.4
	0.50µg/mL	95.5	±5.1
2. Cimetidine	0.25µg/mL	94.5	±5.2
	0.50µg/mL	98.2	±3.2
3. Nizatidine	0.25µg/mL	97.0	±7.0
	0.50µg/mL	94.8	±3.4

SPE

SPE Procedure, Using Visiprep SPE Vacuum Manifold

Condition: 2mL MeOH, then 2mL 25mM K_2HPO_4 (pH 9.0)

Apply Sample: 1mL porcine serum spiked with 0.25µg/mL or 0.50µg/mL each analyte, basified with 2.5µL 10M KOH

Wash and Dry: 2mL 5% MeOH in 25mM K_2HPO_4 (pH 9.0): dry tube 10 min with nitrogen stream

Elute: 1mL MeOH; evaporate to dryness with nitrogen stream at room temperature; reconstitute in 200µL mobile phase

Antiulcer Compounds from Serum

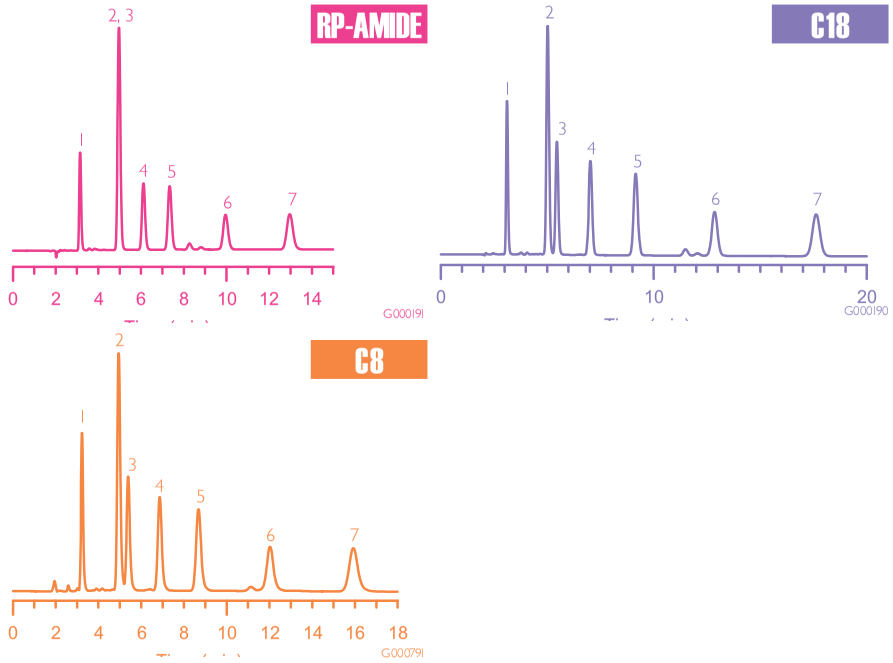
HPLC Conditions:
Discovery C18,
15cm x 4.6mm, 5µm particles,
preceded by 2cm C18 guard column and 0.5µm frit filter.
MeOH: 25mM K_2HPO_4,
pH 7.0 (20:80)
1.0mL/min, ambient temp.
UV, 235nm
60µL reconstituted porcine serum extract

SPE Tube:
Discovery DSC-18
500mg/3mL

Barbiturates

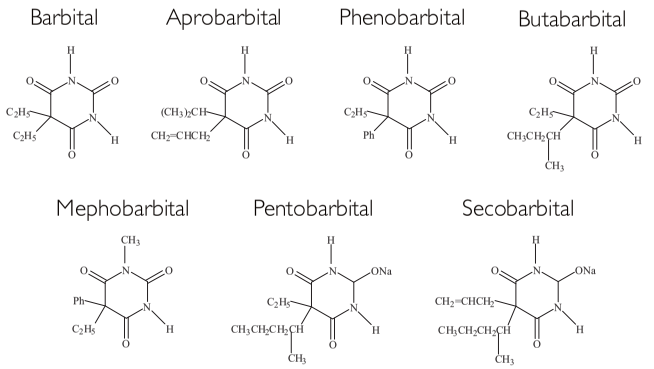
15cm x 4.6mm columns,
5µm particles,
MeOH:H_2O, (45:55)
1mL/min
ambient temp.
UV, 214nm
5µL (Discovery C8) or 10µL (Discovery RP-AmideC16, Discovery C18)
1µg/mL each of analyte

1. Barbital
2. Aprobarbital
3. Phenobarbital
4. Butabarbital
5. Mephobarbital
6. Pentobarbital
7. Secobarbital



Barbiturates

These sedative drugs are good candidates for comparing the hydrophobic selectivity of reversed phase columns. A mixture of seven barbiturates differing from each other in the extent of alkyl substitution were screened. The RP-AmideC16 column coelutes phenobarbital and aprobarbital under these conditions, while the C8 and C18 show good baseline separation of these two.



G000201, G000202, G000203, G000204
G000205, G000206, G000207

Barbiturates from Serum

HPLC Conditions:
Discovery C18
15cm x 4.6mm, 5µm particles, preceded by 2cm C18 guard column and 0.5µm frit filter.
MeOH:H_2O (40:60)
1.0mL/min
30°C
UV, 214nm
30µL

SPE Tube:
DSC-18Lt
500mg/3mL

SPE

SPE Procedure, Using Zymark RapidTrace SPE Workstation

Step	Solvent/ Solution	Volume (mL)	Flow Rate (mL/min)	Comments
1. Condition	MeOH	2.0	5.0	conditions sorbent
2. Condition	H_2O	2.0	5.0	conditions sorbent
3. Load	sample	1.0[A]	0.75	applies serum sample
4. Rinse	5% MeOH in H_2O	2.0	5.0	washes sample
5. Purge-Cannula	H_2O	4.0	30.0	cleans sample cannula
6. Rinse	vent	0.1	2.0	positions SPE tube over waste port
7. Dry	N_2	Time = 10 min		dries sorbent
8. Purge-Cannula	MeOH	4.0	30.0	cleans sample cannula
9. Collect	MeOH	1.0	1.0	elutes analytes into collection vessel
10. Collect	vent	6.0	3.0	pushes residual eluent into vessel[B]
11. Purge-Cannula	H_2O	4.0	30.0	cleans sample cannula

[A] 0.5mL porcine serum spiked with 0.5µg/mL or 1.0µg/mL each analyte, then diluted with 0.5mL water.
[B] Eluent evaporated to dryness with a nitrogen stream at 30°C, using a Zymark TurboVap LV Workstation, then reconstituted with 200µL water.

Barbiturates from Serum

Six drugs from this class of compounds were extracted from serum, using DSC-18Lt SPE tubes, and were analyzed subsequently on a Discovery C18 HPLC column. Recoveries for these compounds are greater than 95% using this simple methanol and water-based SPE method.

For chemical structures, see above.

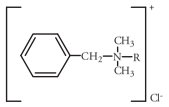
Efficiency of Recovery

Compound	Concentration	%Recovery	%RSD (n=6)
1. Aprobarbital	0.5µg/mL	98.5	±2.1
	1.0µg/mL	100.8	±0.8
2. Phenobarbital	0.5µg/mL	96.2	±1.6
	1.0µg/mL	94.9	±1.7
3. Butabarbital	0.5µg/mL	97.2	±1.9
	1.0µg/mL	98.7	±1.8
4. Mephobarbital	0.5µg/mL	99.7	±2.4
	1.0µg/mL	101.0	±2.0
5. Pentobarbital	0.5µg/mL	96.4	±1.7
	1.0µg/mL	96.4	±1.9
6. Secobarbital	0.5µg/mL	98.2	±1.7
	1.0µg/mL	97.7	±1.8

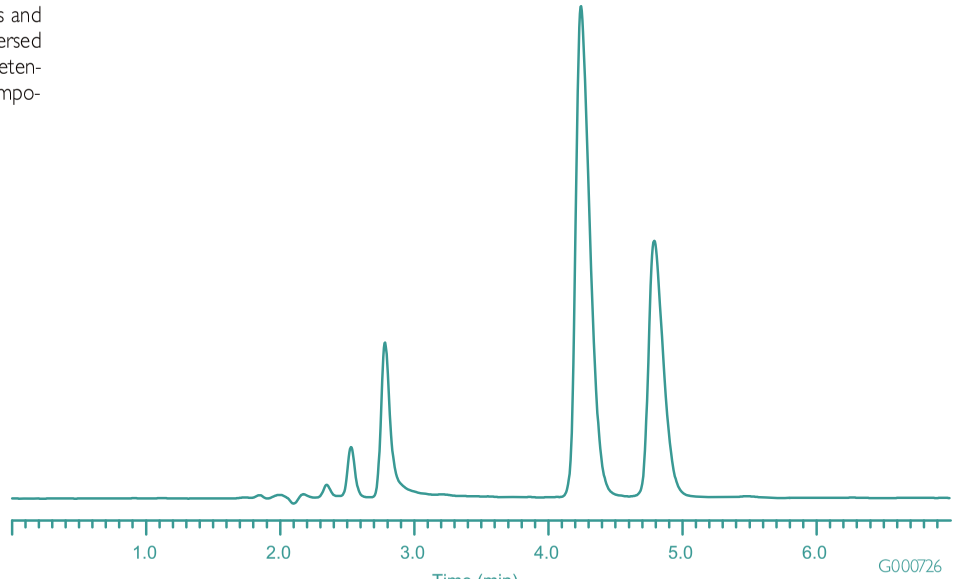
Benzalkonium Chlorides

These compounds are mixtures of alkyl benzyldimethylammonium salts with the alkyl moiety ranging from C_8 to C_{18}. They are used as topical antiseptives and preservatives. These are retained for long periods on conventional reversed phase columns, and are not well resolved. Because of its low hydrophobic retention, the Cyano column is best suited for this separation and elutes all components within 6 minutes.
The sample contained components of undefined alkyl chain length.

Benzalkonium Chlorides



CYANO



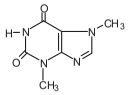
Benzalkonium Chlorides

Discovery Cyano
15cm x 4.6mm column,
5µm particles,
MeCN:acetate buffer,
pH 4.5, (60:40)
1mL/min
ambient temp.
UV, 254nm

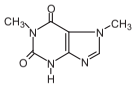
Bronchodilator (Caffeine Metabolites) from Serum

Theophylline and other caffeine metabolites can be extracted from serum with Discovery DSC-18 SPE tubes, using the method shown here. Recoveries are greater than 95% using a Visiprep SPE vacuum manifold.

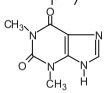
Theobromine



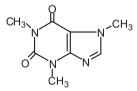
Paraxanthine



Theophylline



Caffeine



G000588, G000589, G000590, G000096

Efficiency of Recovery

Compound	Concentration	%Recovery	%RSD (n=6)
1. Theobromine	0.1µg/mL	97.4	±6.8
	0.5µg/mL	96.4	±8.5
	1.0µg/mL	96.1	±5.0
2. Paraxanthine	0.1µg/mL	96.2	±8.4
	0.5µg/mL	95.2	±8.7
	1.0µg/mL	95.0	±8.7
3. Theophylline	0.1µg/mL	97.8	±8.5
	0.5µg/mL	97.8	±8.8
	1.0µg/mL	98.5	±5.7
4. Caffeine	0.1µg/mL	98.8	±3.9
	0.5µg/mL	95.6	±6.7
	1.0µg/mL	97.6	±5.8

SPE

SPE Procedure, Using Visiprep SPE Vacuum Manifold

Condition: 2mL MeOH, then 2mL H_2O

Apply Sample: 1 mL porcine serum spiked with 0.1µg/mL, 0.5µg/mL, or 1.0µg/mL each analyte

Wash and Dry: 2mL 5% MeOH in H_2O: dry tube 10 min with nitrogen stream

Elute: 1mL MeOH; evaporate to dryness with nitrogen stream at room temperature; reconstitute in 200µL mobile phase

Bronchodilator (Caffeine Metabolites) from Serum

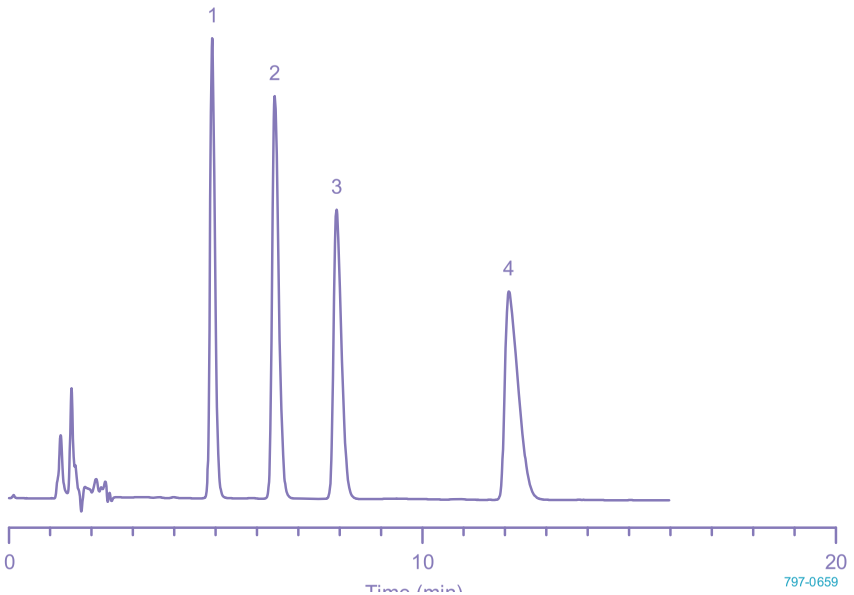
HPLC Conditions:
Discovery RP-AmideC16 column,
15cm x 4.6mm, 5µm particles,
preceded by 2cm RP-AmideC16 guard column and 0.5µm frit filter.
MeOH:1% acetic acid (17:83)
1.0mL/min
30°C
UV, 272nm
20µL reconstituted porcine serum extract

SPE Tube:
DSC-18
500mg/3mL

Catecholamines

Discovery C18
15cm x 4.6mm column,
5µm particles,
MeCN:50mM KH_2PO_4/H_3PO_4,
pH 3.0
100mg/L EDTA, 200mg/L
1-octane-sulfonic acid (5:95)
1mL/min
20°C
UV, 254nm
10µL, 1µg/mL of each analyte

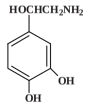
1. Norepinephrine
2. Epinephrine
3. 3,4-Dihydroxybenzylamine
4. Dopamine



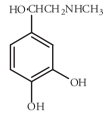
Catecholamines

These dihydroxyphenylethylamine derivatives are very difficult candidates for HPLC separations since they carry both acidic and basic functionalities in their structures. A Discovery C18 column demonstrates excellent selectivity for the separation of catecholamines, using an acidic mobile phase with ion-pairing additives.

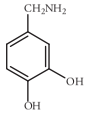
Norepinephrine



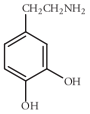
Epinephrine



3,4-Dihydroxybenzylamine



Dopamine



G000559, G001262, G001263, G001264

Chlorophyll from Methanolic Plant Extracts

SPE Tube:
DPA-6S
300mg/3mL

Breakthrough Analysis
The eluents that were collected during sample application were tested by UV absorption at 660nm using a 1cm cell. Breakthrough was defined as the point at which the absorbance of the fraction was greater than that of a standard 2% solution of chlorophyll in methanol.

SPE

SPE Procedure, Using Visiprep SPE Vacuum Manifold

Sample Prep.: 10g of freshly cut green leaves of *Philodendron* were blended for 5 min with 80mL MeOH. After centrifugation for 5min at 2000rpm, the green supernatant was decanted and used as the sample.

Condition: 2mL MeOH

Apply Sample: 1mL aliquots of the methanolic plant extract were applied using a flow rate of 0.75mL/min; fractions were collected after each 1mL of sample was applied.

Breakthrough Results

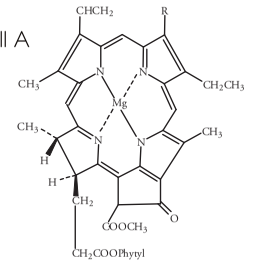
Fraction	Absorbance at 660nm (AU)	Appearance
1	0.081	Clear
2	0.178	Clear
3	0.255	Clear
4	0.286	Clear
5	0.330	Clear
6	0.402	Slightly green
7	0.503	Slightly green
2% chlorophyll standard	0.399	Slightly green

Breakthrough of chlorophyll occurred while fraction 6 was applied to the DPA-6S SPE tube. This result indicates that Discovery DPA-6S products may be used to remove chlorophyll from plant extracts, while allowing unretained species to pass through, free of chlorophyll.

Chlorophyll from Methanolic Plant Extracts

Chlorophyll is a green pigment that is present in all photosynthetic plants, as well as in some bacteria. It occurs in three forms, all of which are magnesium-centered porphyrins containing a hydrophilic carbocyclic ring with a lipophilic phytyl tail. Chlorophyll is a photoreceptor up to a wavelength of 700nm; it is sparingly soluble in alcohols; and its solutions are blue-green in color. Chlorophyll often interferes with the analysis of bioactives in natural product research or in pesticide analysis. Discovery DPA-6S polyamide SPE products can be used to remove chlorophyll from aqueous or methanolic extracts in these applications. In this experiment, 300mg of bulk DPA-6S sorbent was packed into 3mL SPE tubes and plant extracts were processed through the tubes.

Chlorophyll A

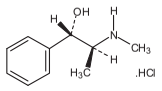


G001273

Cold Remedy Ingredients

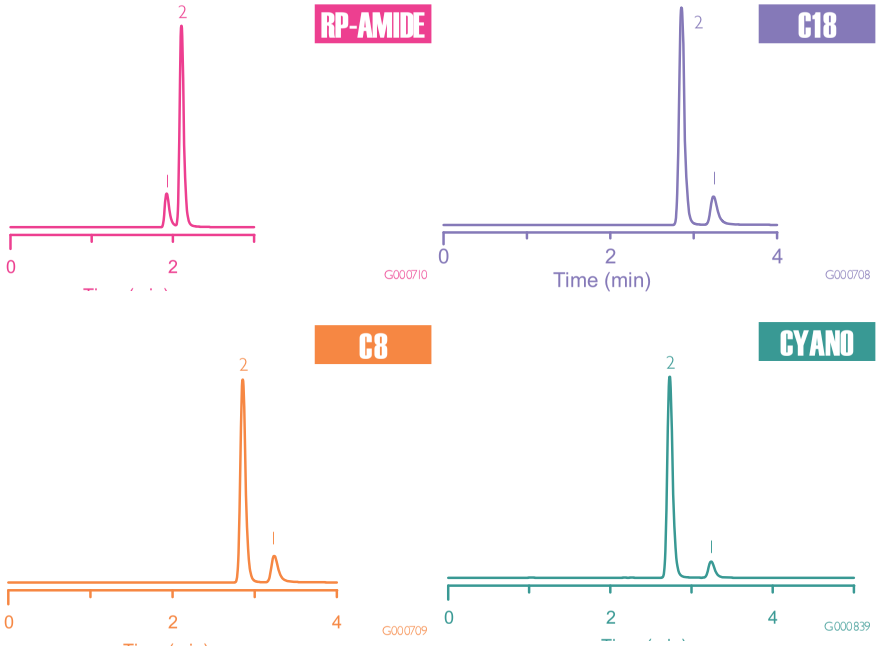
The separation of acetaminophen and pseudoephedrine on Discovery columns at biological pH is shown in this figure. The RP-AmideC16 column displays unique selectivity for this pair of drugs, and elutes acetaminophen after pseudoephedrine. This may be due to the fact that the phenolic hydroxyl on acetaminophen can undergo hydrogen bonding with the amide moiety on the stationary phase and this interaction contributes to longer retention. This order of elution can be exploited in analyzing over-the-counter cold remedies that contain large amounts of acetaminophen and much smaller amounts of pseudoephedrine. If pseudoephedrine elutes after acetaminophen in such cases, quantitation of pseudoephedrine becomes a problem as the large acetaminophen peak can overlap or swamp the smaller pseudoephedrine peak.

Pseudoephedrine



Acetaminophen





G000873, G000243

Cold Remedy Ingredients

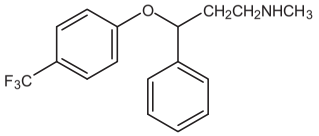
15cm x 4.6mm columns
5µm particles,
MeCN:25mM KH_2PO_4
pH 7.0 (15:85)
1mL/min
20°C
UV, 214nm
1µL

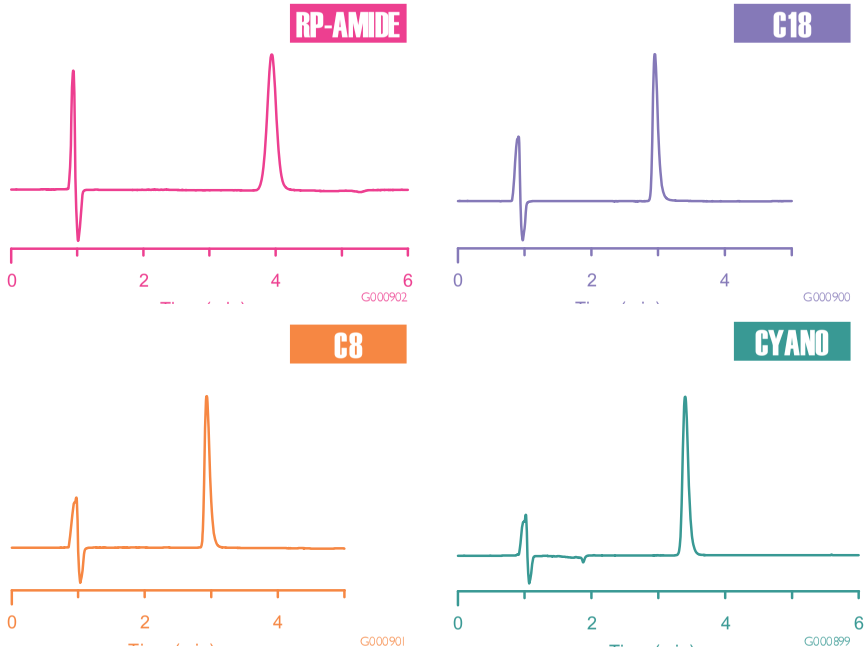
1. Pseudoephedrine
2. Acetaminophen

Fluoxetine (Prozac)

This drug is a phenyl benzyl ether with a methylaminoethyl chain attached to the benzylic carbon. It shows longer retention on the RP-AmideC16 column than on C8 or C18, possibly due to the H-bonding interactions of the secondary amine functionality on the drug with the amide of the stationary phase. In fact, the RP-AmideC16 forms a stronger interaction than the Cyano phase, as evidenced by the longer retention of fluoxetine on the former.

Fluoxetine (Prozac®)





G000874

Fluoxetine (Prozac)

15cm x 4.6mm columns,
5µm particles
MeCN:25mM KH_2PO_4
pH 7.0 (40:60)
2mL/min
30°C
UV, 214nm
1µL

Humic Acids from Water

SPE Tube:
DPA-6S
300mg/3mL and 600mg/3mL

Breakthrough Analysis
The eluents that were collected during sample application were tested by UV absorption over the range of 220nm to 700nm, in 2nm intervals, using a 1cm cell. Breakthrough was defined as the point at which the total absorbance of the fraction was greater than that of a standard 2% solution of humic acids in water.

SPE

SPE Procedure, Using Visiprep SPE Vacuum Manifold

Condition: 2mL MeOH, then 2mL H_2O

Apply Sample: 1mL aliquots of 0.2mg/mL and 1.0mg/mL humic acid in H_2O were applied using a flow rate of 0.75mL/min; fractions were collected after each 1mL of sample was applied.

Breakthrough Results

Humic Acids Conc. (mg/mL)	DPA-6S Sorbent Mass (mg)	Fraction	Absorbance of Fraction Versus 2% Standard
0.2	300	1-3 4	Lower Higher (breakthrough)
0.2	600	1-6 7	Lower Higher (breakthrough)
1.0	300	1 2	Lower Higher (breakthrough)
1.0	600	1-3 4	Lower Higher (breakthrough)

These results indicate that Discovery DPA-6S products can be used to remove humic acids from aqueous solutions, while allowing unretained species to pass through, free of humic acids. The capacity of the sorbent for humic acids depends on the concentration of the sample, and these studies indicate that the relationship may be linear. Perform breakthrough studies for your sample, to select the best SPE tube size.

Humic Acids from Water

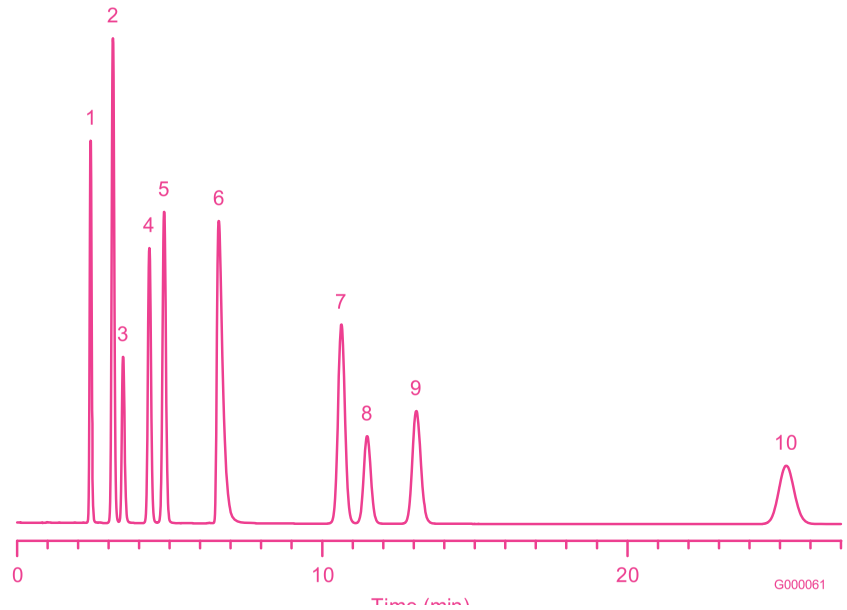
Humic acids are found in soils, coals, and peat. They are brown-colored, mixtures of not-well-defined macromolecules with polymeric phenolic and heterocyclic structures containing carboxyl groups and nitrogen functionalities. They are soluble in water and bases, but insoluble in mineral acids and alcohols. Humic acids may interfere with the analysis of bioactives in natural product research or in pesticide analysis. Discovery DPA-6S polyamide SPE products can be used to remove humic acids from aqueous solutions in these applications. In this experiment, 300mg and 600mg of bulk DPA-6S sorbent was packed into 3mL SPE tubes and aqueous humic acid solutions were processed through the tubes.

Nonsteroidal Antiinflammatory Drugs

15cm x 4.6mm column,
5µm particles
MeCN:25mM KH_2PO_4,
pH 3.0 (40:60)
1mL/min
30°C
UV, 230nm
10µL, 1µg/mL of each analyte

1. Piroxicam
2. Sulindac
3. Tolmetin
4. Ketoprofen
5. Naproxen
6. Diflunisal
7. Indomethacin
8. Ibuprofen
9. Diclofenac
10. Mefanamic acid

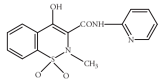
RP-AMIDE



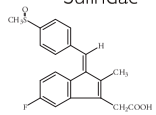
Nonsteroidal Antiinflamatory Drugs

NSAIDs are strongly acidic molecules possessing diverse structural features. They typically present problems during RP-HPLC separations/analyses. A Discovery RP-AmideC16 column provides an isocratic separation of these drugs within a short time, including the baseline separation of nine compounds within 14 minutes.

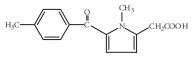
Piroxicam



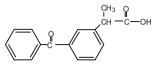
Sulindac



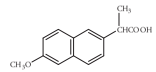
Tolmetin



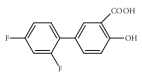
Ketoprofen



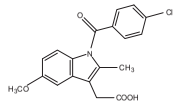
Naproxen



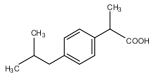
Diflunisal



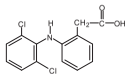
Indomethacin



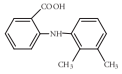
Ibuprofen



Diclofenac



Mefanamic acid

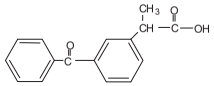


G001265, G001266, G001267, G000240, G001268, G001269, G001137, G000603, G000604, G001270

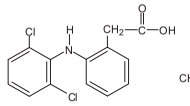
Nonsteroidal Antiinflammatory Drugs from Serum

Ketoprofen, ibuprofen, and diclofenac are commonly used antiinflammatory drugs. Serum levels for these acidic compounds can be monitored using this SPE method, after acidification of the serum sample. Recoveries of the compounds are greater than 90% using this method.

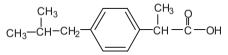
Ketoprofen



Diclofenac



Ibuprofen



G000240, G000603, G000604

Efficiency of Recovery

Compound	Concentration	%Recovery	%RSD (n=6)
1. Ketoprofen	0.5µg/mL	95.0	±7.7
	3.0µg/mL	90.8	±4.7
2. Ibuprofen	0.5µg/mL	94.3	±8.3
	3.0µg/mL	100.7	±5.9
3. Diclofenac	0.5µg/mL	101.2	±7.1
	3.0µg/mL	97.2	±3.0

SPE

SPE Procedure, Using Visiprep SPE Vacuum Manifold

Condition: 2mL MeOH, then 2mL H_2O

Apply Sample: 1 mL porcine serum spiked with 0.5µg/mL or 3.0µg/mL each NSAID, acidified with 20µL H_3PO_4

Wash and Dry: 2mL 5% MeOH in H_2O: dry tube 10 min with nitrogen stream

Elute: 1mL MeOH; evaporate to dryness with nitrogen stream at room temperature; reconstitute in 200µL mobile phase

Nonsteroidal Antiinflammatory Drugs from Serum

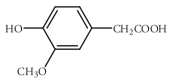
HPLC Conditions:
Discovery RP-AmideC16 column, 15cm x 4.6mm, 5µm particles, preceded by 2cm RP-AmideC16 guard column and 0.5µm frit filter.
MeCN: 25mM KH_2PO_4 pH 3.0 (50:50)
1.0mL/min
30°C
UV, 230nm
20µL reconstituted porcine serum extract

SPE Tube:
DSC-18
500mg/3mL

Organic Acids

Aromatic carboxylic acids have pK_a values ranging from 2.5 to 4.5. They can interact with residual silanols on a reversed phase packing material through hydrogen bonding under acidic mobile phase conditions. In addition, chelating molecules like salicylic acid can bind to metallic impurities, if present, on the silica surface. This chromatogram of four organic acids on the C18 columns indicates the absence of silanol and metal chelating interactions. The longer retention of Discovery HS (high surface area) C18 may be desirable for serum or urine samples, where matrix peaks appear just after the void volume (not shown).

Homovanillic acid

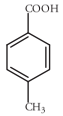


Sorbic acid

Salicylic acid

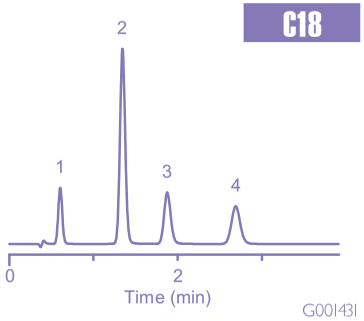


p-Toluic acid



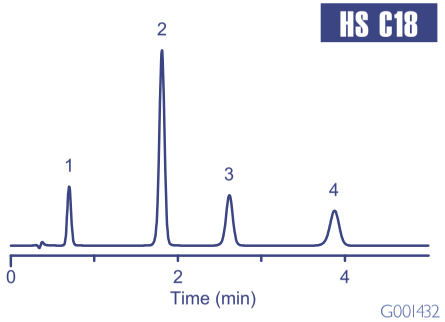
G001271, G000093, G000098, G001272

C18



G001431

HS C18



G001432

Organic Acids

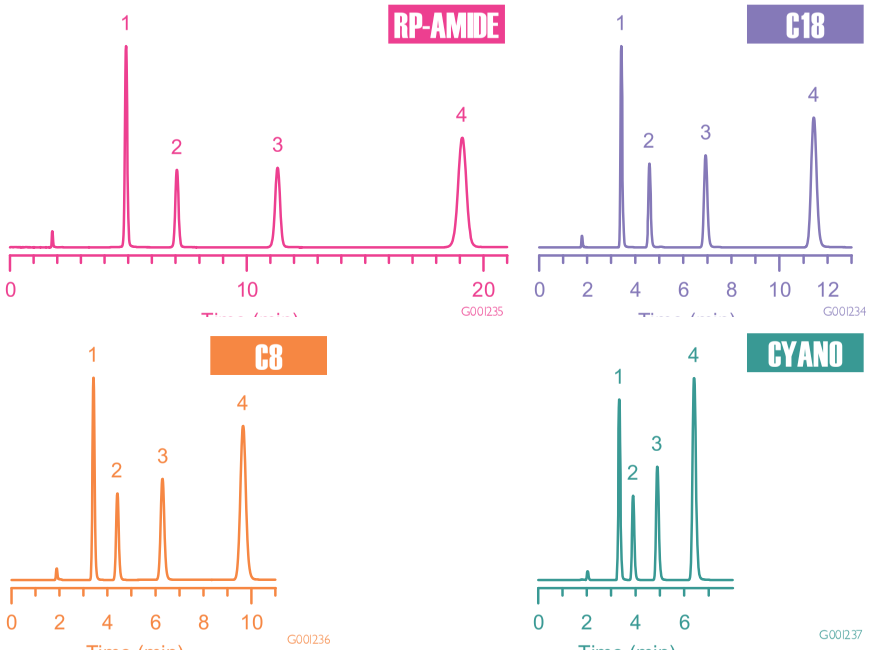
5cm x 4.6mm column,
MeOH:H_2O, 0.1% TFA (40:60)
2.0mL/min
20°C
UV, 254nm
10µL

1. Homovanillic acid 0.0625µg/mL
2. Sorbic acid 0.00625µg/mL
3. Salicylic acid 0.0625µg/mL
4. p-Toluic acid 0.00625µg/mL

Parabens

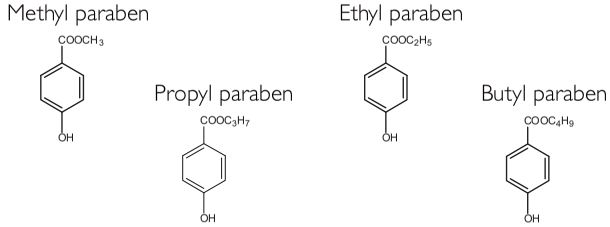
conditions for RP-AmideC16, C18, and C8
MeCN:H_2O, (40:60),
1mL/min, 20°C, UV, 254nm,
10µL
conditions for Cyano
MeCN:H_2O, (30:70),
1mL/min, 20°C, UV, 254nm,
10µL

1. Methyl paraben
2. Ethyl paraben
3. Propyl paraben
4. Butyl paraben



Parabens

Parabens are alkyl esters of 4-hydroxybenzoic acid and are commonly used in formulations of a variety of drugs. The lower members of the sequence are very polar, and hydrophobicity increases in the order methyl<ethyl<propyl<butyl. A significant feature in the RP-HPLC of these molecules under unbuffered mobile phase conditions is that all four parabens are retained longer on the RP-AmideC16 column with either acetonitrile or methanol as organic component, in comparison with C8 or C18 columns. This behavior may be attributable to the strong H-bonding capability of the phenolic hydroxyl with the amide moiety of the RP-AmideC16 stationary phase. The Cyano column requires more aqueous mobile phase conditions for resolution of the four parabens and its low hydrophobic retention is reflected in the elution of butyl paraben in about 6min even at this 30:70 acetonitrile/water ratio.

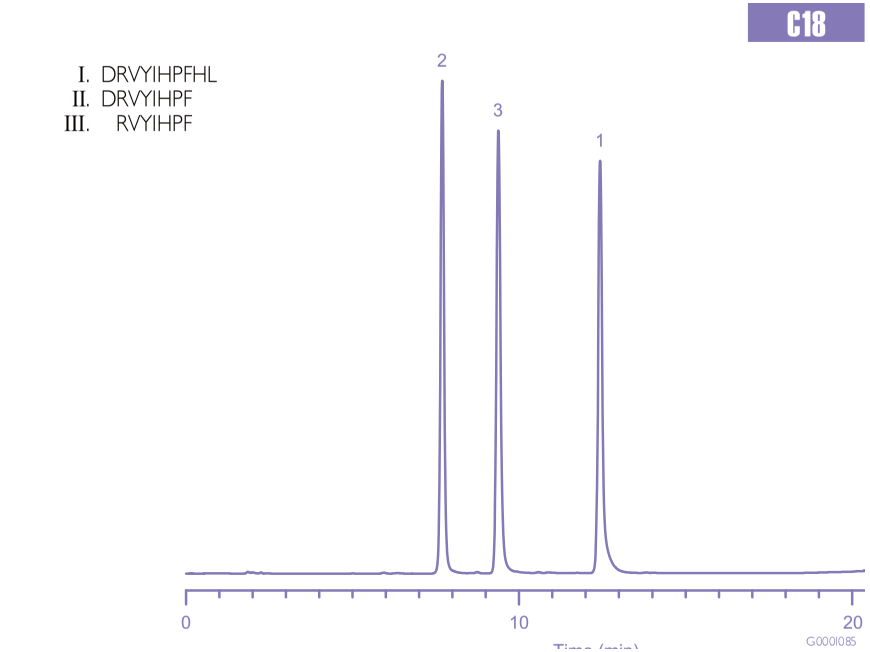


G000194, G000195, G000196, G000197

Peptides (Angiotensins)

Discovery C18
15cm x 4.6mm column,
5µm particles,
(A) 5mM $(NH_4)H_2PO_4$/NH_4OH, pH 7.0
(B) 5mM $(NH_4)H_2PO_4$/NH_4OH, pH 7.0: MeCN (50:50)
30-60% B in 15 min
1mL/min
35°C

1. Angiotensin I
2. Angiotensin II
3. Angiotensin III

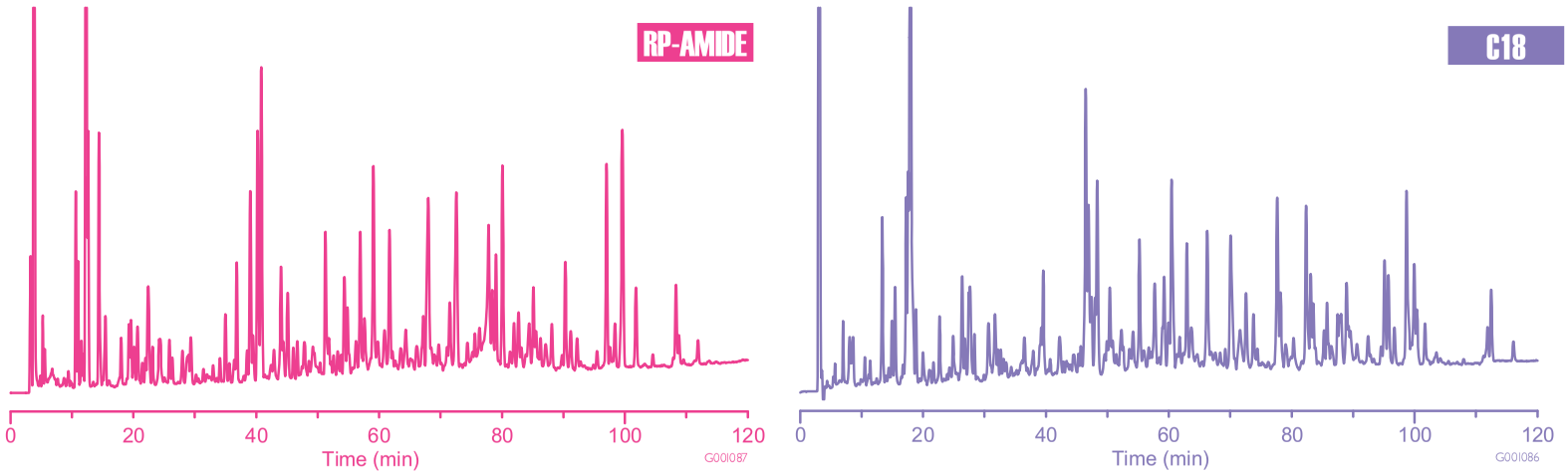


Peptides (Angiotensins)

Angiotensins are peptide hormones that effect blood pressure and aldosterone release from adrenal glands. Human angiotensins **I**, **II**, & **III** contain a conserved seven amino acid sequence exemplified by angiotensin **III**. Two additional *C*-terminal amino acids, histidine and leucine, of angiotensin **I** confer greater retention on RPC columns compared to angiotensins **II** & **III**. Angiotensin **II** differs from angiotensin **III** only by the addition of an *N*-terminal aspartate. Under conditions typical for peptide chromatography (pH ≤ 2.0), angiotensins **II** & **III** are not resolved since the aspartate contains no charge and the retention coefficient (pH 2.0) is only 0.2. Usually, resolution of these two angiotensins is performed at alkaline pH, but with Discovery C18, baseline resolution is achieved at neutral pH. At pH 7.0 the retention coefficient of aspartate is -2.6 and thus significantly diminishes retention. Consequently, separating the angiotensins at neutral pH on Discovery C18 provides baseline resolution of all three components.

Peptides (Carboxyamidomethylated BSA Tryptic Digest)

Discovery columns provide high resolution of very complex peptide mixtures. Selectivity can be conveniently altered by use of different bonded phases. RP-AmideC16, with its embedded polar group, provides a unique selectivity compared to conventional alkyl bonded phases typically employed for peptide mapping.

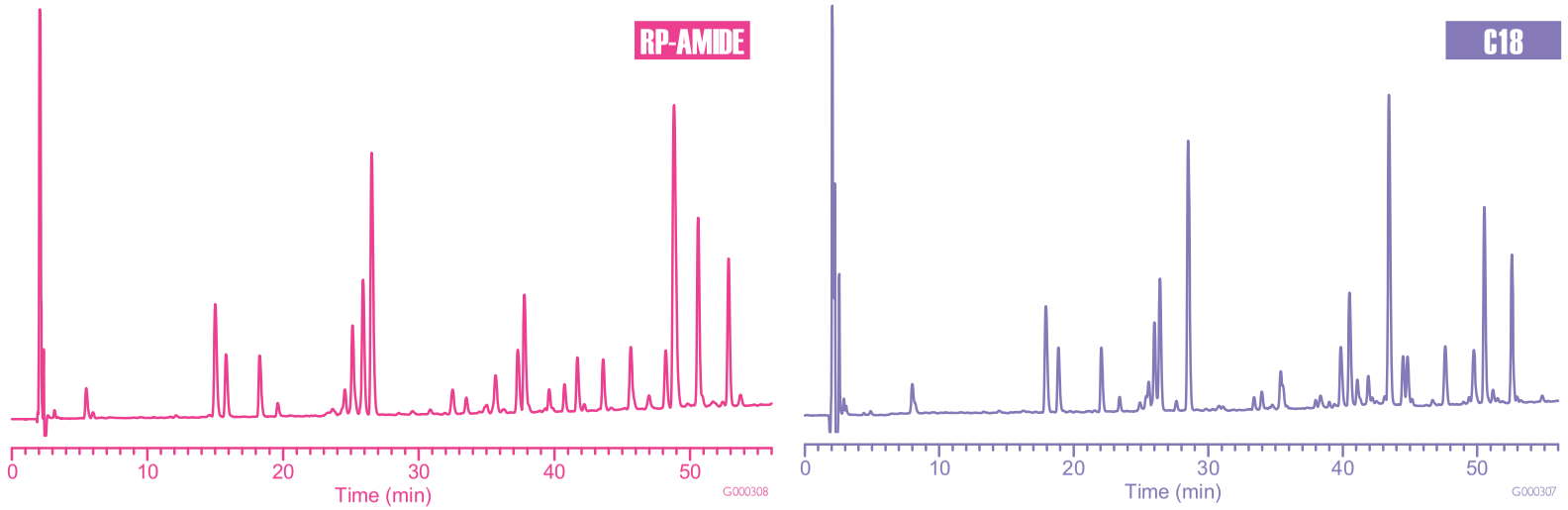


Peptides (Carboxyamido-methylated BSA Tryptic Digest)

25cm x 4.6mm columns,
5µm particles,
(A) 0.1% TFA, 1% MeCN in H_2O
(B) 0.1% TFA, 40% MeCN
1 mL/min
35°C
0-100% B in 130 min

Peptides (Cytochrome c Tryptic Digest):

Unique selectivity of bonded phases is illustrated with complex mixtures. The chromatograms illustrate unique selectivity for certain sample components on RP-AmideC16, compared to C18.



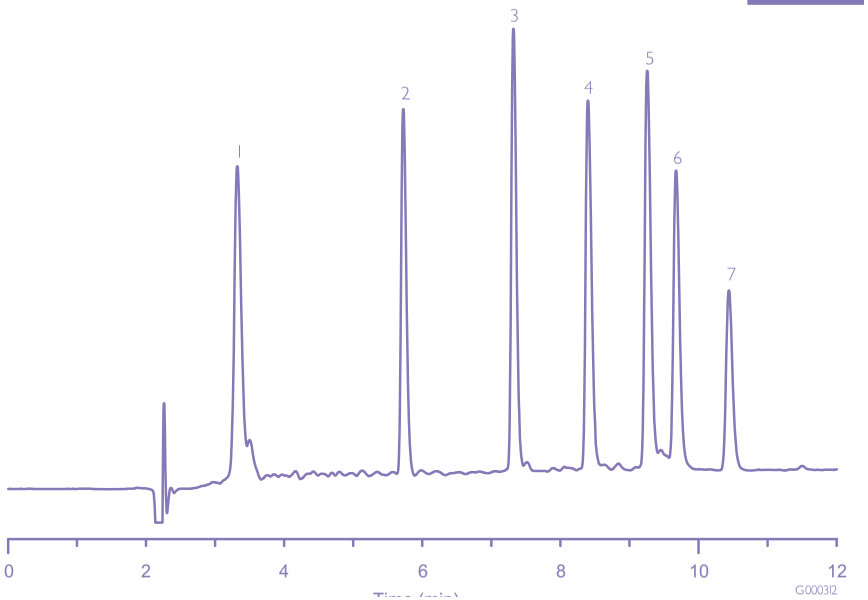
Peptides (Cytochrome c Tryptic Digest)

15cm x 4.6mm columns,
5µm particles,
(A) 0.1% TFA, 3% n-propanol in H_2O
(B) 0.1% TFA, 3% n-propanol in MeCN
1 - 37% B in 72 min
1.0mL/min
35°C

Peptides (Substance P and Fragments)

Discovery C18
15cm x 4.6mm column
5µm particles,
(A) 0.1% TFA in H_2O
(B) 0.1% TFA in MeCN
5 - 29% B in 6 min, then to
34% B in 5 min
1mL/min
35°C

Substance P:
RPKPQQFFGLM
Fragments
1. 1-4
2. 1-7
3. 1-9
4. 8-11
5. Holopeptide
6. 2-11
7. 7-11



Peptides (Substance P and Fragments)

Substance P is a vasoactive peptide which among other things, induces vasodilation and increases capillary permeability. Several features can be discerned from the chromatogram of this undecapeptide. Presence of an additional phenylalanyl residue in fragment 7 makes it substantially more hydrophobic than fragment 4, which lacks this additional residue. Presence of an additional phenylalanyl residue in fragment 3 also imparts significant hydrophobicity relative to fragment 2. The difference between fragment 3 and the holopeptide, the lack of the *C*-terminal amino acids leucine and methionine in the former, make the former much less hydrophobic, thereby resulting in earlier elution. This example demonstrates that in general, at acidic pH (2.0), *N*-terminal variants impact retention less than *C*-terminal variants, because of the α-amino group's positive charge, while the *C*-terminal carboxylate is neutral.

Phloroglucinol from Water

Discovery C18 column,
15cm x 4.6mm, 5µm particles,
MeOH:H_2O (60:40)
1mL/min
ambient temp.
UV, 254nm
10µL of each fraction

SPE Tube:
DPA6-S
600mg/3mL

Breakthrough Analysis
Breakthrough was defined as the point at which the concentration of phloroglucinol in the eluent from the tube was greater than that of a 2% solution of phloroglucinol in water. Concentrations were determined via HPLC-UV and by comparing peak heights of the phloroglucinol peak from each fraction to peak heights of phloroglucinol in standards.

SPE

SPE Procedure, Using Zymark RapidTrace SPE Workstation

Condition: 2mL MeOH, then 2mL H_2O

Apply Sample: 1 mL aliquots of 1mg/mL phloroglucinol in water were applied using a flow rate of 0.75mL/min; fractions were collected after each 1mL of sample was applied.

Breakthrough Results

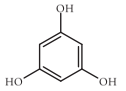
Fraction	Peak Height (mAU)
1	4.2
2	4.0
3	4.3
4	4.4
5	4.7
6	6.2
7	28.5
2% phloroglucinol standard	9.3

Breakthrough of phloroglucinol occurred while fraction 7 was applied to the DPA-6S SPE tube. This result corresponds to a loading capacity of about 12mg of phloroglucinol in water per gram of DPA-6S sorbent in this tube configuration.

Phloroglucinol from Water

Phloroglucinol (1,3,5-trihydroxybenzene or phloroglucine) was used as a representative compound for polyhydroxybenzene adsorption on Discovery DPA-6S polyamide sorbent. 600mg of bulk DPA-6S sorbent was packed into 3mL SPE tubes and samples were processed through the tubes.

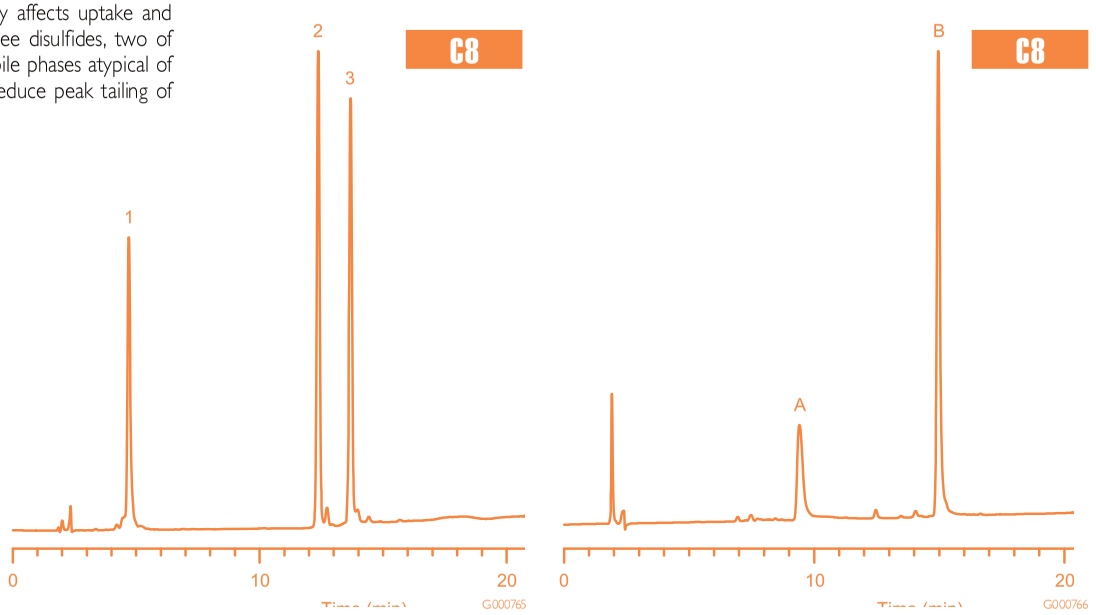
Phloroglucinol



G001274

Proteins (Bovine Insulin)

Insulin is a heterodimeric protein hormone that directly affects uptake and metabolism of glucose. The native protein contains three disulfides, two of which serve to crosslink the two subunits. Buffered mobile phases atypical of peptide chromatography are required to dramatically reduce peak tailing of subunit A.



Proteins (Bovine Insulin)

15cm x 4.6mm columns,
5µm particles,
(A) 50mM H_2NaPO_4, 50mM Na_2SO_4, pH 3.0 (w/H_3PO_4): MeCN (95:5)
(B) 50mM H_2NaPO_4, 50mM Na_2SO_4, pH 3.0 (w/H_3PO_4): MeCN (50:50)
33.3% to 73.3% B (20% to 38% MeCN) in 18 min
1mL/min, 35°C, UV, 220nM

1. Subunit A, oxidized (sulfonic acids; Sigma® I1633)
2. Holoenzyme (Sigma I5500)
3. Subunit B, oxidized (sulfonic acids; Sigma I6383)

Holoenzyme (Sigma I5500) reduced and carboxy-methylated
A. Subunit A
B. Subunit B

Tannic Acid from Water or Methanol

Tannic acid (gallotannic acid) is a naturally occurring substance found in tree barks, fruits, and other plant parts. Tannins are derivatives of gallic acid or flavanols, and comprise a broad group of plant-derived phenolic compounds which have the ability to precipitate proteins. Some tannins may be more toxic than others, depending upon the source. Tannins derived from nutgalls are believed to be carcinogens, while those found in tea and coffee are considered non-toxic. These compounds are soluble in water and alcohols and can be extracted from plant matter. Tannins may interfere with the analysis of bioactives in natural product research. Discovery DPA-6S polyamide SPE products can be used to remove tannins from aqueous and methanolic solutions in these applications. In this experiment, 300mg or 600mg of bulk DPA-6S sorbent was packed into 3mL SPE tubes and tannic acid solutions were processed through the tubes.

SPE

SPE Procedure, Using Zymark RapidTrace SPE Workstation

Condition: 2mL MeOH for methanolic samples
2mL MeOH followed by 2mL H_2O for aqueous samples.

Apply Sample: 1mL aliquots of 10mg/mL tannic acid in MeOH or H_2O were applied using a flow rate of 0.75mL/min; fractions were collected after each 1mL of sample was applied.

Breakthrough Results

DPA-6S Sorbent Mass (mg)	Fraction	Methanolic sample Peak Height (mAU)	Aqueous Sample Peak Height (mAU)
	1	3.7	3.0
	2	8.8	3.5
	3	77.1	6.3
300	4	466.5=breakthrough	21.2
	5	> 3000	26.2
	6	> 3000	28.7
	7	> 3000	201.1=breakthrough
600	7	breakthrough	-
	14	-	breakthrough
	2% acid standard	170.5	145.2

Equivalent results were obtained when using a slower flow rate (0.36mL/min) during sample application, indicating that capacity of DPA-6S for tannic acid does not depend heavily on flow rate. Capacity also seems to be linear with respect to sorbent mass. These results indicate that Discovery DPA-6S products can be used to remove tannic acid and other forms of the compound from aqueous or methanolic solutions, while allowing unretained species to pass through, free of these interfering species.

Tannic Acid from Water or Methanol

HPLC Analysis Conditions
Discovery C18 column,
15cm x 4.6mm, 5µm particles,
MeOH:H_2O (60:40)
1mL/min, ambient
UV, 254nm
10mL of each fraction

SPE Tube:
DPA-6S
300mg/3mL and 600mg/3mL

Breakthrough Analysis
Breakthrough was defined as the point at which the concentration of tannic acid in the eluent from the tube was greater than that of a 2% solution of tannic acid in methanol or water. Concentrations were determined via HPLC-UV and by comparing peak heights of the tannic acid peak from each fraction to peak heights of tannic acid in the appropriate standard.

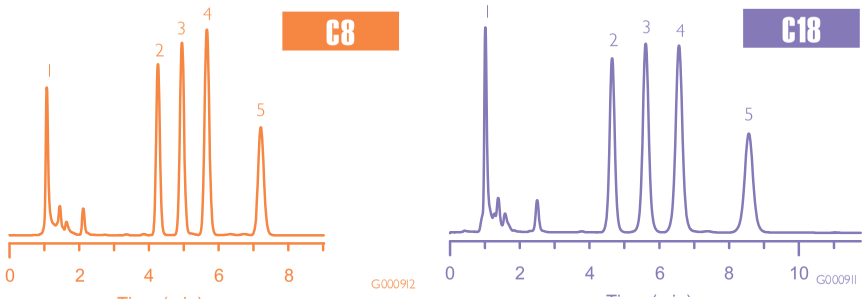
Fat Soluble Vitamins (A and E)

15cm x 4.6mm columns,
5µm particles,
2mL/min
30°C
UV, 290nm
10µL

Discovery C18
MeOH:H_2O (95:5)

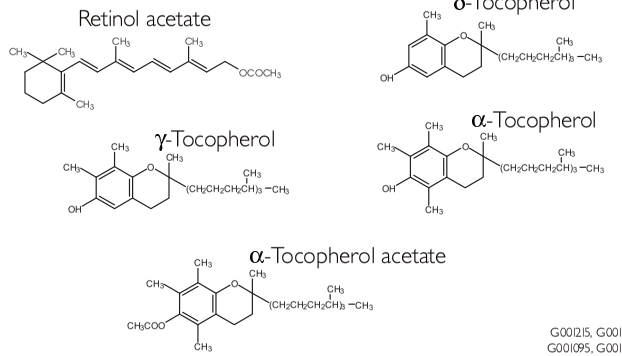
Discovery C8
MeCN:H_2O (90:10)

1. Retinol acetate (Vitamin A acetate), 50µg/mL
2. δ-Tocopherol, 165µg/mL
3. γ-Tocopherol, 200µg/mL
4. α-Tocopherol (Vitamin E), 292µg/mL
5. α-Tocopherol acetate (Vitamin E acetate), 405µg/mL



Fat Soluble Vitamins (A and E)

The three isomeric tocopherols (alpha, gamma, and delta) differ in the substitution pattern on the aromatic ring of the 2,2-dimethylchroman skeleton. The delta isomer has one methyl, the gamma analog has two, in the 7, 8 positions, and the alpha isomer has three, in the 5, 7, 8 positions. The hydrophobicity-based elution of the three tocopherols follows the same order. Alpha tocopheryl acetate, being much less polar than the tocopherols, is eluted last. Vitamin A acetate (retinol acetate) contains a series of five conjugated double bonds and is evidently the most polar of all the components, resulting in its fast elution on both C8 and C18 columns.

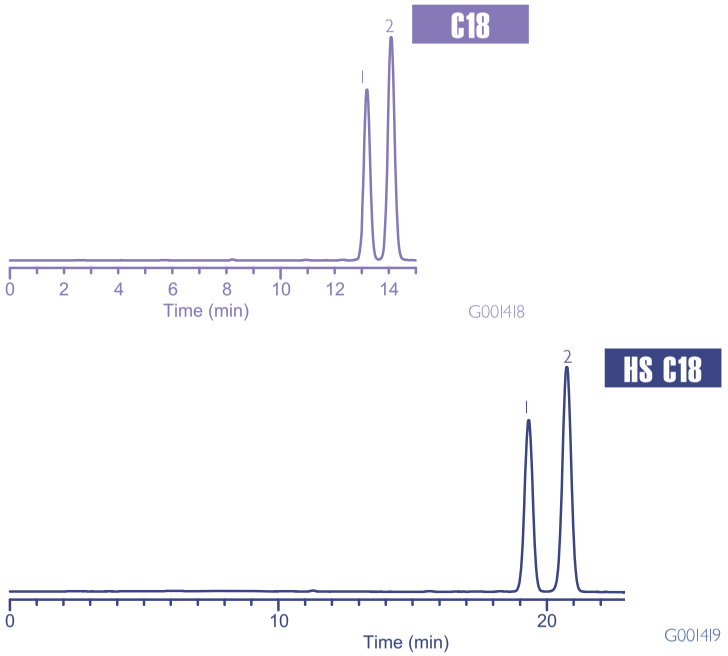


G001215, G001094, G001095, G001096, G001097

Fat Soluble Vitamins (D_2 and D_3)

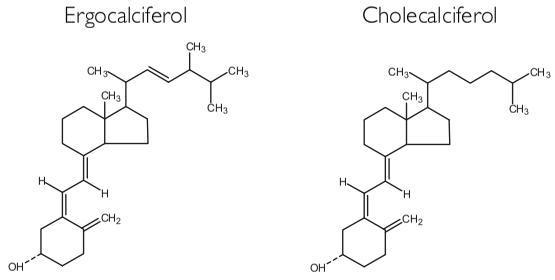
Discovery C18
15cm x 4.6mm column,
100% MeCN
0.8mL/min
30°C
UV, 290nm
10µL, 50µg/mL of each analyte

1. Ergocalciferol (Vitamin D_2)
2. Cholecalciferol (Vitamin D_3)



Fat Soluble Vitamins (D_2 and D_3)

Vitamin D_2 (ergocalciferol) is 9, 10-seco-ergosta-5,7, 10(19),22-tetraen-3-ol and the D_3 analog is 9, 10-secocholesta-5,7, 10-trien-3-ol. They differ in the number of double bonds (one more in D_2) and methyl groups (one more in D_2 in the form of a branched chain). Thus, they are closely related structures. The versatility of the C18 column in separating this pair in less than 15 minutes is evident. The D_2 analog, being more polar, is eluted first. The HS C18 column provides better resolution with slightly longer run times.

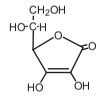


G001098, G001099

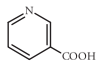
Water Soluble Vitamins

The separation of seven water soluble vitamins on three Discovery columns under gradient conditions is shown in this figure. Selectivity differences among the columns is evident from the reversal of thiamine and nicotinic acid peaks.

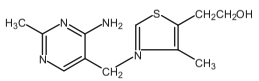
Ascorbic acid



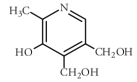
Nicotinic acid



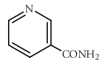
Thiamine



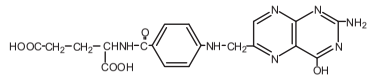
Pyridoxine



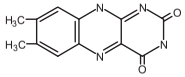
Nicotinamide

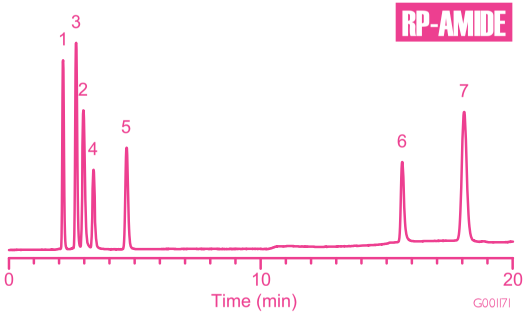


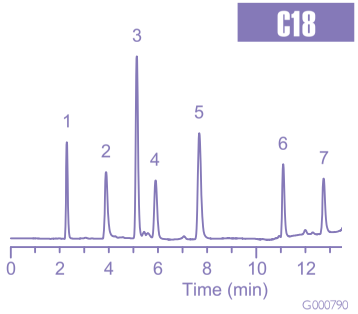
Folic acid

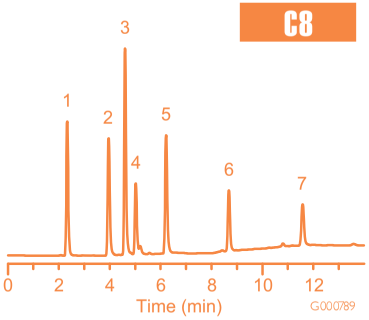


Riboflavin









G001122, G001216, G001124, G001217, G001218, G001127, G001130

Water Soluble Vitamins

RP-AmideC16
15cm x 4.6mm column,
5µm particles,
MeOH:50mM KH_2PO_4 in H_2O,
pH 4.5 (30:70), 35°C, UV, 220nm,
10µL

C18 and C8
15cm x 4.6mm columns,
5µm particles,
50mM KH_2PO_4, pH 4.5 to
MeOH:50mM KH_2PO_4, pH 4.5
(30:70)
12 min (Discovery C8) or
8 min (Discovery C18)
1mL/min, ambient temp., UV,
254nm, 1µL, 1µg/mL of each analyte

1. Ascorbic acid
2. Nicotinic acid
3. Thiamine
4. Pyridoxine
5. Nicotinamide
6. Folic acid
7. Riboflavin

Discovery SPE-96 Well Plates & Accessories

96-Well Plates

Discovery DSC-18 SPE-96 Plate, 25mg/well **575601-U**
Discovery DSC-18 SPE-96 Plate, 50mg/well **575602-U**
Discovery DSC-18 SPE-96 Plate, 100mg/well **575603-U**
Discovery DSC-18Lt SPE-96 Plate, 25mg/well **575604-U**
Discovery DSC-18Lt SPE-96 Plate, 50mg/well **575605-U**
Discovery DSC-18Lt SPE-96 Plate, 100mg/well **575606-U**
Discovery DSC-Si SPE-96 Plate, 25mg/well **575607-U**
Discovery DSC-Si SPE-96 Plate, 50mg/well **575608-U**
Discovery DSC-Si SPE-96 Plate, 100mg/well **575609-U**
Discovery DSC-PS/DVB SPE-96 Plate, 25mg/well **575610-U**
Discovery DSC-PS/DVB SPE-96 Plate, 50mg/well **575611-U**

96-Well Plate Accessories

96 Sq. Well Collection Plates, 0.35mL, PP, 50/pk **575651-U**
96 Sq. Well Collection Plates, 1mL, PP, 50/pk **575652-U**
96 Sq. Well Collection Plates, 2mL, PP, 50/pk **575653-U**
Disposable Reservoir/Waste Tray, PVC, 25/pk **575654-U**
96 Sq. Well Piercable Cap Mats, 50/pk **575655-U**
Reagent Reservoir ..... **R9259 - 100ea.**
Cluster Tube Rack ..... **Z372226 - 1pak**

PlatePrep Manifold and Manifold Replacement Parts

96 Well Plate Starter Kit with Manifold **575650-U**
Contents of kit: 1 Plate Prep Manifold; 1 96 Sq. Well Collection Plates, 2mL, PP; 2 Disposable Reservoir/Waste Trays, PVC; 1 96 Sq. Well Piercable Cap Mats; 5 Reagent Reservoirs; 1 Cluster Tube Rack

PlatePrep Vacuum Manifold **57192-U**
Acrylic Clear Top for Manifold **57193-U**
Polypropylene Base for Manifold **57194-U**
Gasket Kit for Manifold **57195-U**
Vacuum Gauge/Bleed Valve for Manifold **57161-U**

Improve your sample preparation with Discovery SPE-96 Well Plates!

Higher throughput and more...

consistent bedweight and flow rates for automated or robotic processing reduced height for larger volumes without leak-prone extensions standard dimensions that are common to most square well extraction plate designs ideal for fulfilling ISO, GMP, GLP requirements compatible with most vacuum manifolds and collection plates works with most robotic and automated sample processing systems reproducible from lot to lot, plate to plate, and well to well consistent capacities, recoveries and flow rates certificate of analysis included with each plate



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RapidTrace, TurboVap, Zymark - Zymark Corp.

HPLC and SPE Products for Pharmaceutical Analysis and Purification

Discovery HPLC Special Application Kits

DESCRIPTION	CAT. NO.
DISCOVERY SELECTIVITY PACKS[1]	
5cm x 2.1mm ID Columns	55720-U21
10cm x 2.1mm ID Columns	569853-U
15cm x 2.1mm ID Columns	55722-U21
5cm x 3.0mm ID Columns	55720-U30
10cm x 3.0mm ID Columns	569852-U
15cm x 3.0mm ID Columns	55722-U30
25cm x 3.0mm ID Columns	55724-U30
5cm x 4.0mm ID Columns	55720-U40
10cm x 4.0mm ID Columns	569851-U
15cm x 4.0mm ID Columns	55722-U40
25cm x 4.0mm ID Columns	55724-U40
5cm x 4.6mm ID Columns	55720-U
10cm x 4.6mm ID Columns	569850-U
15cm x 4.6mm ID Columns	55722-U
25cm x 4.6mm ID Columns	55724-U
DISCOVERY RP-AMIDEC16 VALIDATION PACKS[2]	
5cm x 2.1mm ID Columns	55705-U21
10cm x 2.1mm ID Columns	569802-U
15cm x 2.1mm ID Columns	55707-U21
5cm x 4.6mm ID Columns	55705-U
10cm x 4.6mm ID Columns	569803-U
15cm x 4.6mm ID Columns	55707-U
25cm x 4.6mm ID Columns	55709-U

DESCRIPTION	CAT. NO.
DISCOVERY C18 VALIDATION PACKS[2]	
5cm x 2.1mm ID Columns	55700-U21
10cm x 2.1mm ID Columns	569800-U
15cm x 2.1mm ID Columns	55702-U21
5cm x 4.6mm ID Columns	55700-U
10cm x 4.6mm ID Columns	569801-U
15cm x 4.6mm ID Columns	55702-U
25cm x 4.6mm ID Columns	55704-U
DISCOVERY C8 VALIDATION PACKS[2]	
5cm x 2.1mm ID Columns	55710-U21
10cm x 2.1mm ID Columns	569804-U
15cm x 2.1mm ID Columns	55712-U21
5cm x 4.6mm ID Columns	55710-U
10cm x 4.6mm ID Columns	569805-U
15cm x 4.6mm ID Columns	55712-U
25cm x 4.6mm ID Columns	55714-U
DISCOVERY CYANO VALIDATION PACKS[2]	
5cm x 2.1mm ID Columns	55715-U21
10cm x 2.1mm ID Columns	569806-U
15cm x 2.1mm ID Columns	55717-U21
5cm x 4.6mm ID Columns	55715-U
10cm x 4.6mm ID Columns	569807-U
15cm x 4.6mm ID Columns	55717-U
25cm x 4.6mm ID Columns	55719-U

Discovery SPE Tubes

DESCRIPTION	QTY.PKG.	CAT. NO.
DSC-18		
50mg/1mL	108	52601-U
100mg/1mL	108	52602-U
500mg/3mL	54	52603-U
500mg/6mL	30	52604-U
1g/6mL	30	52606-U
2g/12mL	20	52607-U
5g/20mL	20	52608-U
10g/60mL	16	52609-U
bulk packing	100g	52600-U
DSC-18Lt		
50mg/1mL	108	52610-U
100mg/1mL	108	52611-U
500mg/3mL	54	52613-U
500mg/6mL	30	52615-U
1g/6mL	30	52616-U
2g/12mL	20	52618-U
5g/20mL	20	52621-U
10g/60mL	16	52622-U
bulk packing	100g	52623-U
DPA-6S		
50mg/1mL	108	52624-U
250mg/3mL	54	52625-U
250mg/6mL	30	52626-U
500mg/6mL	30	52627-U
1g/12mL	20	52629-U
2g/20mL	20	52631-U
5g/60mL	16	52632-U
50g/in 800mL Büchner funnel	1	52634-U
bulk packing	50g	52633-U

2cm Supelguard Cartridges with 5µm Discovery Packings

Kits include one cartridge, a stand-alone holder, a piece of tubing, and 2 nuts and ferrules.

	4.0mm ID CARTRIDGE[3]		3.0mm ID CARTRIDGE		2.1mm ID CARTRIDGE	
DISCOVERY PHASE	KIT CAT. NO.	PK. OF 2 CAT. NO.	KIT CAT. NO.	PK. OF 2 CAT. NO.	KIT CAT. NO.	PK. OF 2 CAT. NO.
Discovery C18	505129	505137	59575-U	59576-U	505161	505188
Discovery RP-AmideC16	505080	505099	59577-U	59578-U	505102	505110
Discovery C8	59589-U	59590-U	59579-U	59580-U	59587-U	59588-U
Discovery HS C18	569275-U	569274-U	-	-	569277-U	569276-U
Discovery Cyano	59585-U	59586-U	569570-U	569571-U	59583-U	59584-U

[1] Four columns of equal dimensions, one of each Discovery phase (C18, RP-AmideC16, C8, Cyano).
[2] Identical columns made from three different bonded phase lots.
[3] For 4.0mm ID or 4.6mm ID analytical columns.

Discovery HPLC Columns

ID (mm)	LENGTH (cm)	CAT. NO.
DISCOVERY RP-AMIDEC16		
2.1	5	505005-21
2.1	10	569320-U
2.1	12.5	569329-U
2.1	15	505013-21
3.0	5	505005-30
3.0	10	569321-U
3.0	12.5	569330-U
3.0	15	505013-30
3.0	25	505064-30
4.0	5	505005-40
4.0	10	569322-U
4.0	12.5	569331-U
4.0	15	505013-40
4.0	25	505064-40
4.6	5	505005
4.6	10	569323-U
4.6	12.5	569332-U
4.6	15	505013
4.6	25	505064
DISCOVERY C18		
2.1	5	504947-21
2.1	10	569220-U
2.1	12.5	569229-U
2.1	15	504955-21
3.0	5	504947-30
3.0	10	569221-U
3.0	12.5	569230-U
3.0	15	504955-30
3.0	25	504971-30
4.0	5	504947-40
4.0	10	569222-U
4.0	12.5	569231-U
4.0	15	504955-40
4.0	25	504971-40
4.6	5	504947
4.6	10	569223-U
4.6	12.5	569232-U
4.6	15	504955
4.6	25	504971
DISCOVERY HS C18		
2.1	5	569253-U
2.1	7.5	569254-U
2.1	15	569255-U
4.6	5	569250-U
4.6	7.5	569251-U
4.6	15	569252-U

ID (mm)	LENGTH (cm)	CAT. NO.
DISCOVERY C8		
2.1	5	59352-U21
2.1	10	569420-U
2.1	12.5	569424-U
2.1	15	59353-U21
3.0	5	59352-U30
3.0	10	569421-U
3.0	12.5	569425-U
3.0	15	59353-U30
3.0	25	59354-U30
4.0	5	59352-U40
4.0	10	569422-U
4.0	12.5	569426-U
4.0	15	59353-U40
4.0	25	59354-U40
4.6	5	59352-U
4.6	10	569423-U
4.6	12.5	569427-U
4.6	15	59353-U
4.6	25	59354-U
DISCOVERY CYANO		
2.1	5	59355-U21
2.1	10	569521-U
2.1	12.5	569524-U
2.1	15	59356-U21
3.0	5	59355-U30
3.0	10	569522-U
3.0	12.5	569525-U
3.0	15	59356-U30
3.0	25	59357-U30
4.0	5	59355-U40
4.0	10	569523-U
4.0	12.5	569526-U
4.0	15	59356-U40
4.0	25	59357-U40
4.6	5	59355-U
4.6	10	569520-U
4.6	12.5	569527-U
4.6	15	59356-U
4.6	25	59357-U

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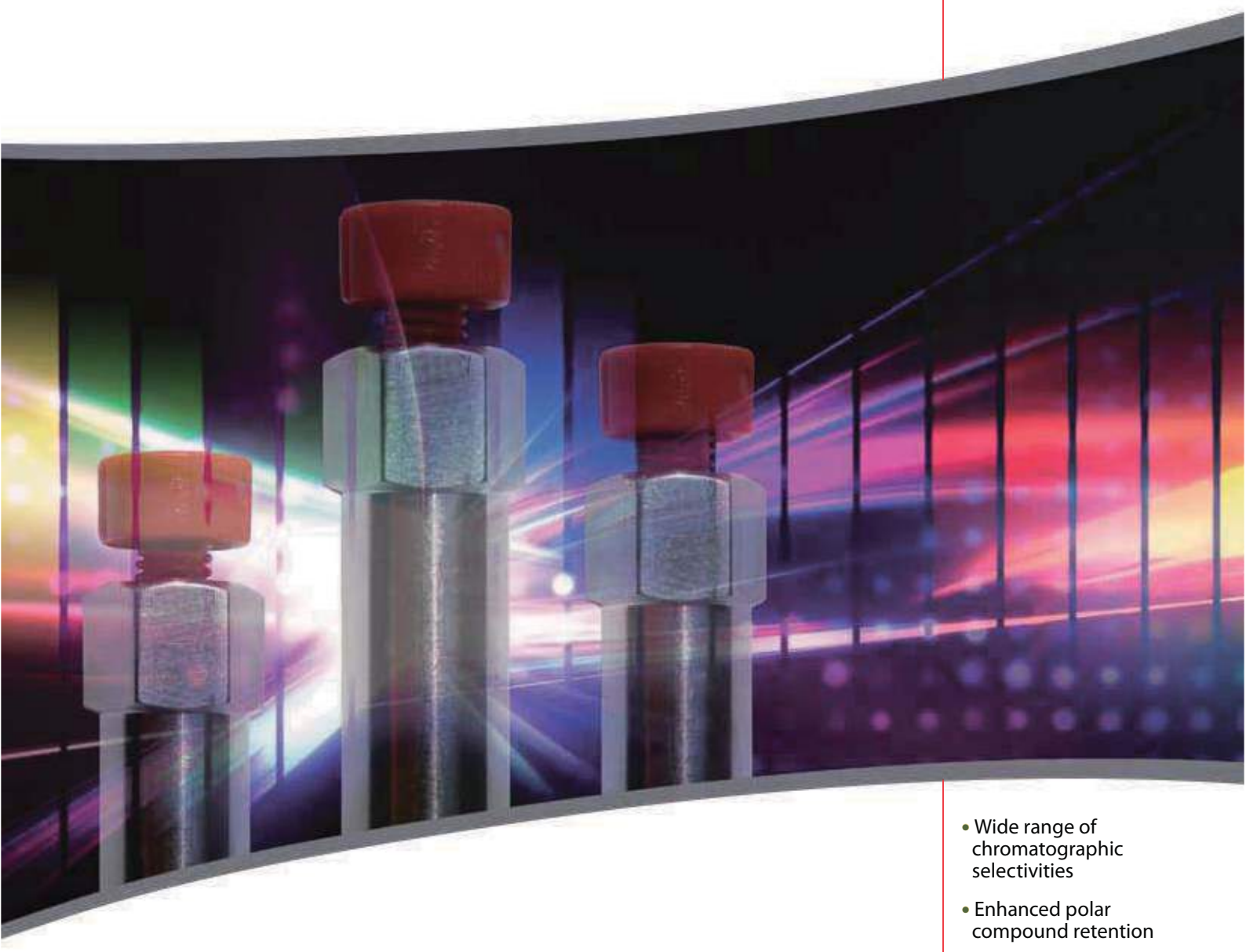
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CJW

Ascentis® HPLC Columns

SUPELCO Analytical

Elevated HPLC Performance from a Wide Range of Phases



- Wide range of chromatographic selectivities
- Enhanced polar compound retention
- Ideal for LC-MS and all modern applications

SIGMA-ALDRICH®



Ascentis: Elevated HPLC Performance

We have placed heavy emphasis on optimizing Ascentis phases with relation to the three terms of the resolution equation: efficiency, retention and selectivity. However, our strongest emphasis has been on the most powerful term, selectivity. Together, Ascentis bonded phases have a wide range of selectivities. It is likely that one or more Ascentis phase will accomplish any small molecule HPLC separation.

Packed in micro- to preparative hardware dimensions, Ascentis products cover all HPLC application areas, including the most sensitive trace-level analyses.

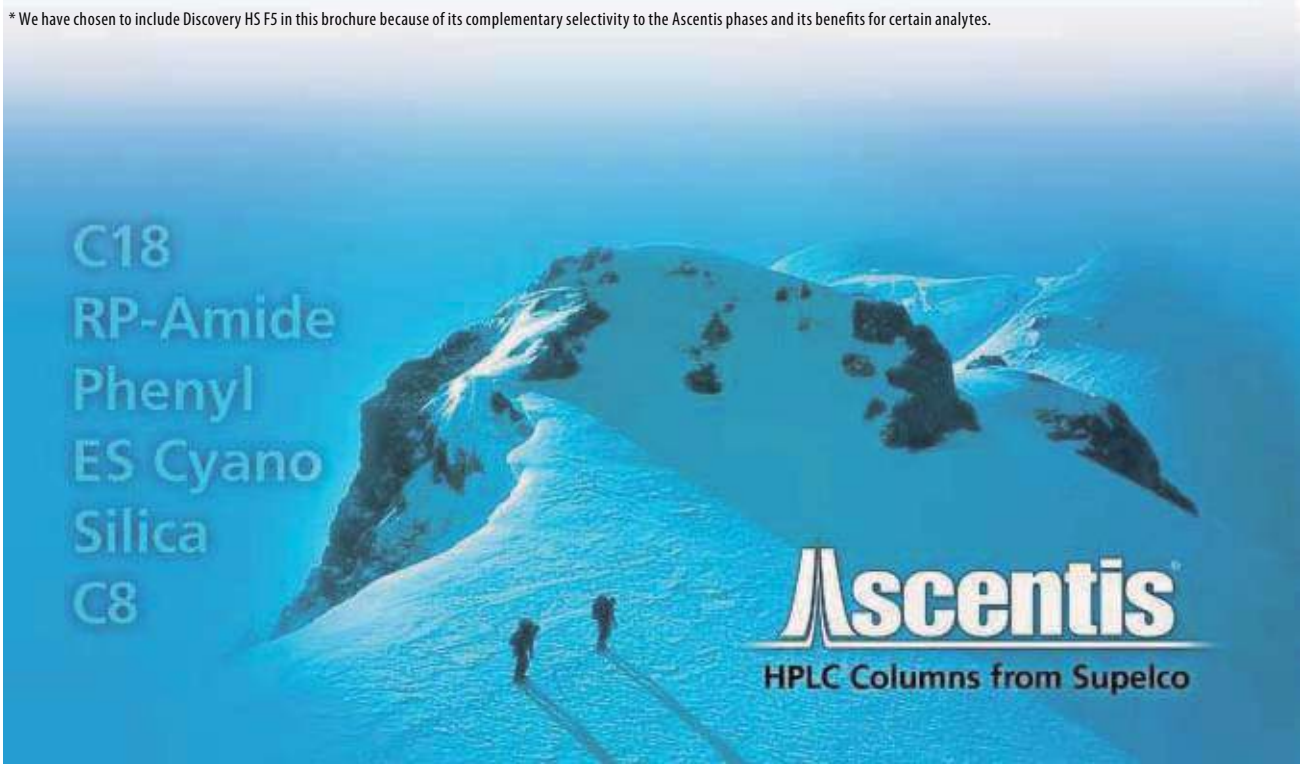
The General Features of the Ascentis Family Include:

- High purity, type B silica for inertness, reproducibility and stability
- Modern bonding processes that optimize bonded phase coverage and maximize stability, while minimizing bleed and unwanted secondary interactions
- Wide selection of bonded phase chemistries and bare silica
- Phases with enhanced polar compound retention
- Compatible with LC-MS and all of today's sensitive instruments and methods
- Scalable selectivity from analytical to preparative
- High surface area silica for high preparative loading capacity

Ascentis Characteristics

Phase	USP Code	Key Competitive Feature	Modes	Primary Uses	Page
Ascentis C18	**L1**	High surface area, inert surface	**Reversed-phase**	Small molecules and peptides	**9**
Ascentis RP-Amide	**L60**	Phase stability, low bleed	**Reversed-phase**	Excellent "first choice" alternative to C18 for routine RP method development. Polar molecules, especially phenolics and other H-bond donors, acids, bases (uncharged), anilines	**10**
Ascentis Phenyl	**L11**	Phase stability, low bleed	**Reversed-phase, HILIC**	Ring systems and strong dipoles, π-acids, π-electron acceptors, heteroaromatics, nitroaromatics	**12**
Ascentis ES Cyano	**L10**	Phase stability	**Reversed-phase, HILIC, 100% Aqueous**	Polar compounds, strong dipoles, tricyclic antidepressants	**14**
Ascentis Silica	**L3**	High loading capacity, controlled and uniform surface activity	**Normal phase (non-aqueous), HILIC**	Non-polar compounds (in NP mode), highly-polar compounds (in HILIC mode), nucleosides, amino acids	**16**
Ascentis C8	**L7**	High surface area, inert surface	**Reversed-phase**	Small molecules and peptides	**18**
Discovery® HS F5*	**L43**	Orthogonal selectivity to C18, ours is well-characterized	**Reversed-phase, HILIC, ion-exchange**	All electron and π-electron donors, bases (charged), positional isomers	**20**

* We have chosen to include Discovery HS F5 in this brochure because of its complementary selectivity to the Ascentis phases and its benefits for certain analytes.



Ascentis HPLC columns represent a continuum of improvement through innovations in HPLC technology.

Developing HPLC Methods on Ascentis

Selecting An Ascentis Column

Column Screening: The Ascentis & Discovery Method Development "Tool Kit"

We recommend every HPLC method developer have these five columns in their arsenal.

Ascentis C18 – Classic C18 selectivity will achieve most reversed-phase separations

Ascentis RP-Amide – For enhanced retention and performance of polar compounds, especially bases (uncharged) and compounds with H-bond potential

Ascentis Phenyl – For enhanced retention and performance of polar compounds, especially ring systems, dipoles, and nitroaromatics

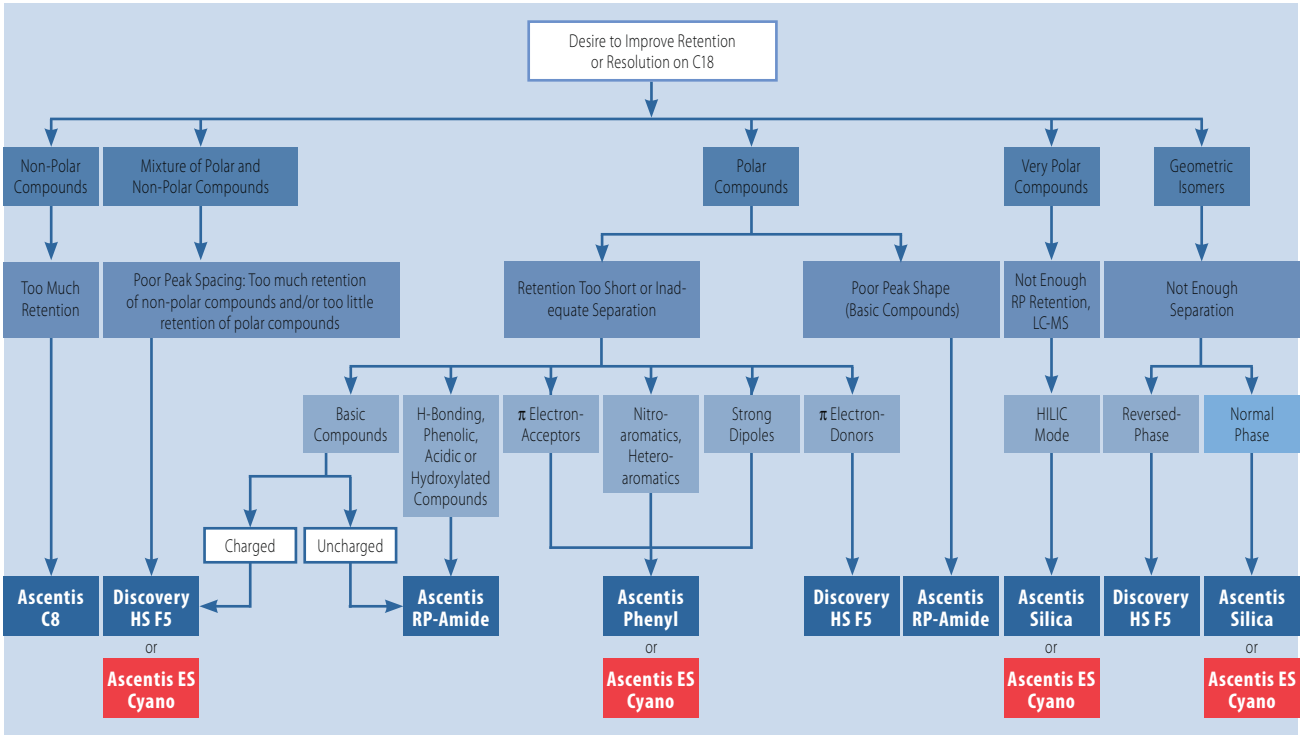
Ascentis ES Cyano – Extra stable for low pH mobile phases due to sterically protected phase. Useful for polar selectivity in reversed-phase mode. Also useful as an alternative to silica in HILIC mode

Discovery HS F5 – For enhanced retention and performance of polar compounds, especially bases (charged) and when the sample contains a mixture of non-polar and polar compounds

Simply screen these five columns in your desired mobile phase, using your preferred column.

Choosing an Ascentis or Discovery Phase Based on Compound Class and Separation Challenge or Objective

Typically, Ascentis C18 is the first choice for starting a new method. However, when a C18 doesn't give the desired separation or your sample contains compounds that are known to be difficult to retain or resolve on a C18, consider changing the stationary phase. The range of selectivity provided by Ascentis and Discovery phases makes this easy. The flow chart below helps guide the selection of Ascentis or Discovery phase based on the particular compound type or separation challenge. For more information about each phase, and the other Ascentis phases, please refer to their dedicated pages in this brochure.



Column selection guidelines for Ascentis and Discovery phases based on compound class and separation challenge or objective.

TRADEMARKS: ACE - **Advanced Chromatography Technologies;** Ascentis, Discovery, CHIROBIOTIC, CYCLOBOND, CHIRALDEX, CHROMASOLV - **Sigma-Aldrich Biotechnology LP**; Fused-Core - **Advanced Materials Technology, Inc.;** Nucleosil - **Machery-Nagel;** Prodigy - **Luna;** Symmetry, XTerra - **Waters Corporation;** Zorbax - **Agilent Technologies**



Harnessing the Power of Chromatographic Selectivity

Chromatographic resolution is a function of column efficiency (***N***), retention (***k***) and selectivity (α). It is usually written in the form of the resolution equation:

$$R = \frac{\sqrt{N}}{4} \times \frac{k}{k+1} \times \frac{\alpha - 1}{\alpha}$$

When resolution is plotted vs. these three parameters in Figure 1, it becomes apparent that selectivity has the greatest affect on resolution.

The Power to Accomplish Difficult Separations

One of the most important reasons why selectivity is leveraged in HPLC is to resolve closely-eluting compounds. A good example of this is the need to quantify a compound that elutes in the tail of a more abundant compound, perhaps a low-level impurity in the presence of the parent compound, like shown in the Figure 2. By altering the stationary phase, in this case going from a C18 to an RP-Amide, the impurity can be eluted before the main peak, thereby allowing more sensitive and reliable quantification.

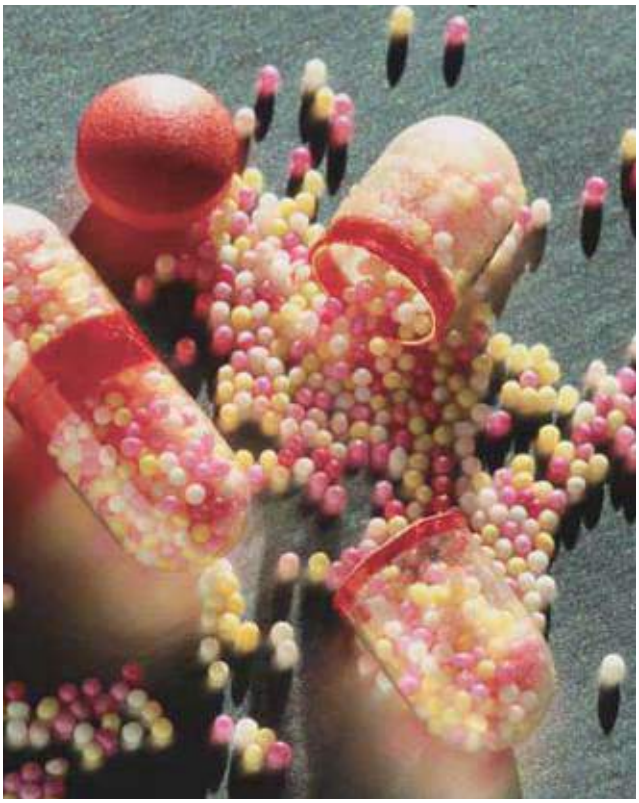


Figure 1. Affect of Selectivity on Improving Resolution

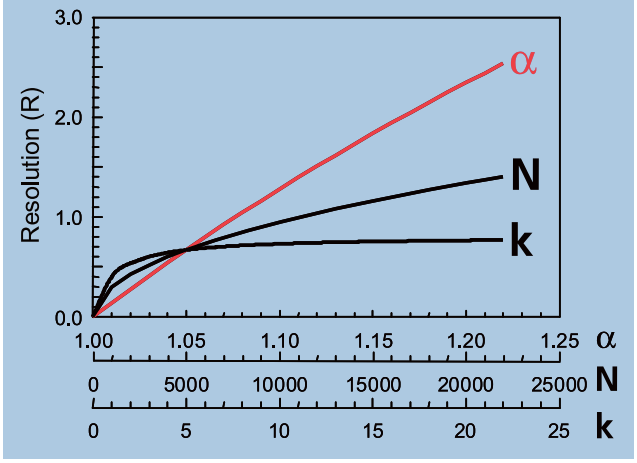
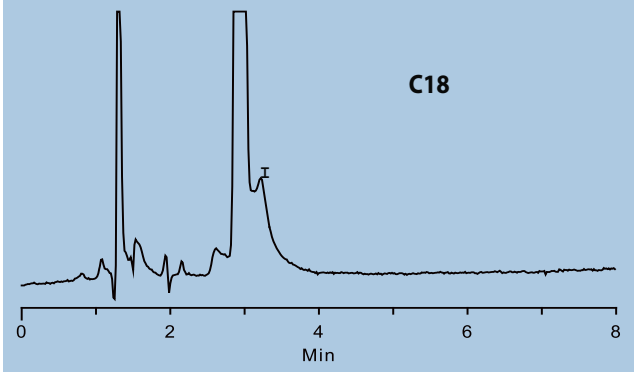
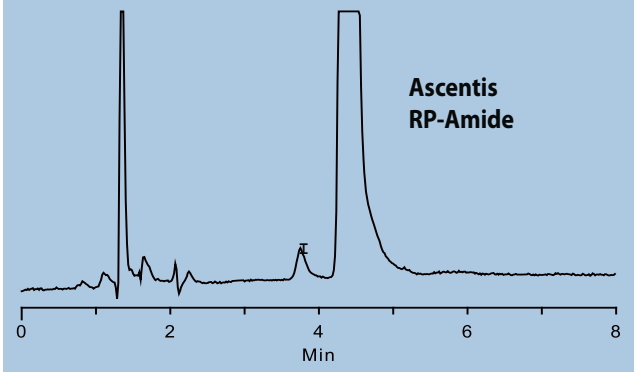


Figure 2. Impurity Eluted on the Downslope of the Main Peak on C18 — Difficult to Quantify



Impurity Eluted Before the Main Peak on Ascentis RP-Amide – Better Quantification



The power of chromatographic selectivity is demonstrated in this example. The C18 column elutes the impurity in the downslope of the major peak, limiting the ability to detect and quantify the impurity. By using a column with different selectivity, in this case an Ascentis RP-Amide, the impurity peak is eluted before the main peak.

Key Ascentis Application Areas

Polar Analytes: Enhanced Retention, Selectivity, and Compatibility with Highly-Aqueous Mobile Phases

Polar compounds are difficult to analyze by traditional reversed-phase because they lack the high proportion of hydrophobic character necessary for retention. Since most pharmaceutically- and biologically-active compounds are highly polar, this has presented a continual problem in HPLC. From the beginning of our commitment to HPLC innovation, we have focused on bonded phase to enhance polar compound retention.

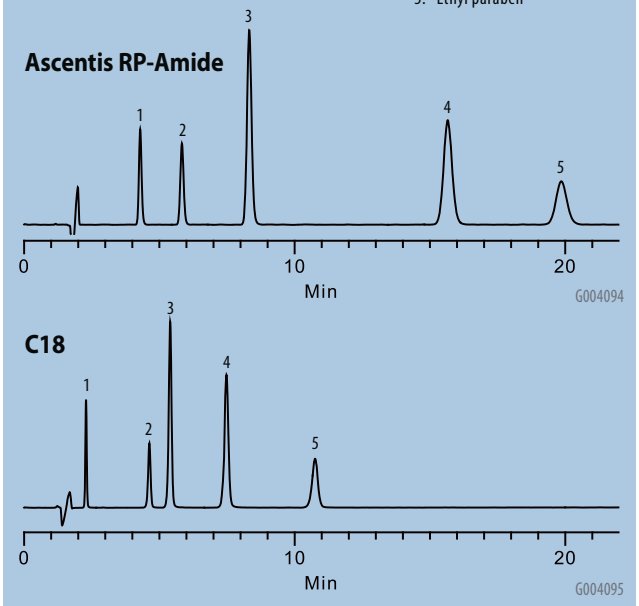
Stationary Phases with Enhanced Polar Compound Retention Compared to C18

Rather than relying solely on dispersive forces to achieve retention, our column portfolio contains bonded phases that lend additional retentive character toward analytes with specific polar functional groups.

Figure 3. H-bonding (Ascentis RP-Amide)

column: Ascentis RP-Amide & C18, 15 cm x 4.6 mm I.D., 5 µm particles
mobile phase: 70:30, water with 0.1% TFA:acetonitrile
flow rate: 1 mL/min
temp.: 35 °C
det.: UV at 220 nm
injection: 10 µL

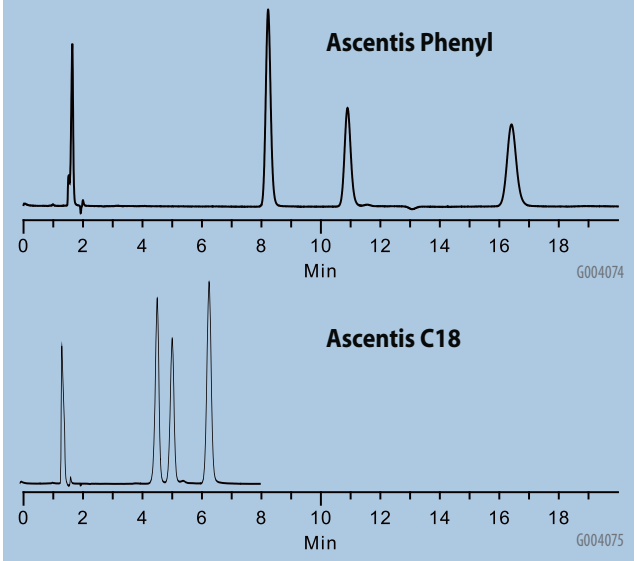
1. 4-Hydroxybenzoic Acid
2. Acetylsalicylic Acid
3. Benzoic Acid
4. 2-Hydroxybenzoic Acid
5. Ethyl paraben



Ascentis RP-Amide exhibits strong retention relative to C18 for phenols and organic acids.

Figure 4. π-π Interactions (Ascentis Phenyl)

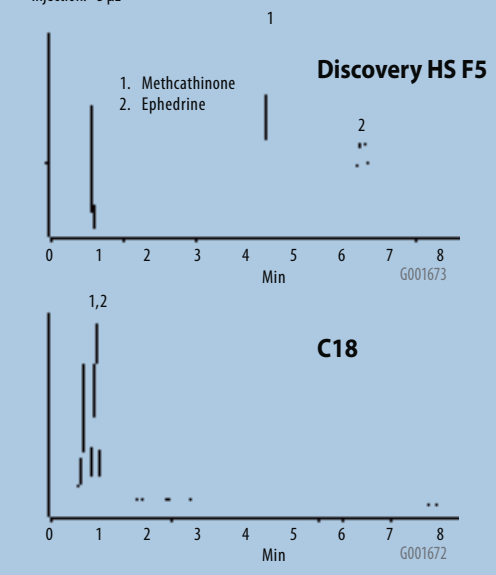
column: Ascentis C18, 15 cm x 4.6 mm I.D., 5 µm particles (581324-U)
Ascentis Phenyl, 15 cm x 4.6 mm I.D., 5 µm particles (581616-U)
mobile phase: 40:60, acetonitrile:water
flow rate: 1.0 mL/min.
temp.: 30 °C
det.: UV at 210 nm
injection: 5 µL
sample: nitrobenzene, m-dinitrobenzene, 1,3,5-trinitrobenzene



Ascentis Phenyl exhibits strong π-π interactions with the π-acidic nitroaromatics. Addition of each nitro group increases retention.

Figure 5. Ion Exchange (Discovery HS F5)

column: Discovery HS F5, 15 cm x 4.6 mm I.D., 5 µm particles (567516-U)
conventional C18, 15 cm x 4.6 mm I.D., 5 µm particles
mobile phase: 30:70, 10 mM ammonium acetate (pH 6.98): CH_3CN
flow rate: 2.0 mL/min.
temp.: 35 °C
det.: photodiode array
injection: 5 µL



Discovery HS F5 exhibits enhanced retention from ion exchange interactions with ionized analytes.



HILIC Mode: Enhanced Retention and High MS-Suitability

Highly-polar compounds, like underivatized amino acids, nucleosides and nucleotides, are not well-retained by reversed-phase HPLC. However, under HILIC (hydrophilic interaction chromatography) conditions, they can be retained. HILIC is a variation of normal phase HPLC where the mobile phase contains high percentages of organic modifier. It is also called "aqueous normal phase" or ANP. Under high organic conditions, polar interactions become prominent which can lead to increased retention. Ascentis Phenyl, Ascentis ES Cyano, Ascentis Silica and Discovery HS F5 exhibit HILIC character under highly-organic mobile phases. An added benefit of HILIC mobile phases is the high organic (often >90%) is amenable to MS detection.

Stability in Highly-Aqueous Mobile Phases

Unless working in HILIC mode, mobile phases for polar compounds are often highly-aqueous, with only small percentages of organic modifiers. Under such conditions, C18 phases are not wetted, which causes two problems. First, the bonded phase molecules coalesce resulting in phase collapse and subsequent loss of hydrophobic retention. Second, analytes have an unpredictable approach to the silica surface, resulting in irreproducible and unstable retention run-to-run and column-to-column. Ascentis Phenyl, Ascentis ES Cyano, Ascentis RP-Amide, and Discovery HS F5 are completely aqueous-compatible, and will not undergo phase collapse even in mobile phases that contain 100% water.

Figure 6. Separation of Nucleosides on Ascentis Phenyl

column: Ascentis Phenyl, 15 cm x 2.1 mm I.D., 5 µm particles (581613-U)
mobile phase: 10 mM ammonium formate (pH 3.0 with formic acid)
flow rate: 0.2 mL/min
temp.: 35 °C
det.: UV at 270 nm
injection: 1 µL

1. Cytidine (0.1 g/L)
2. Deoxycytidine (0.1 g/L)
3. Uridine (0.1 g/L)
4. Guanosine (0.1 g/L)
5. Adenosine (0.1 g/L)
6. Deoxyguanosine (0.1 g/L)
7. Deoxyadenosine (0.1 g/L)
8. Thymidine (0.1 g/L)

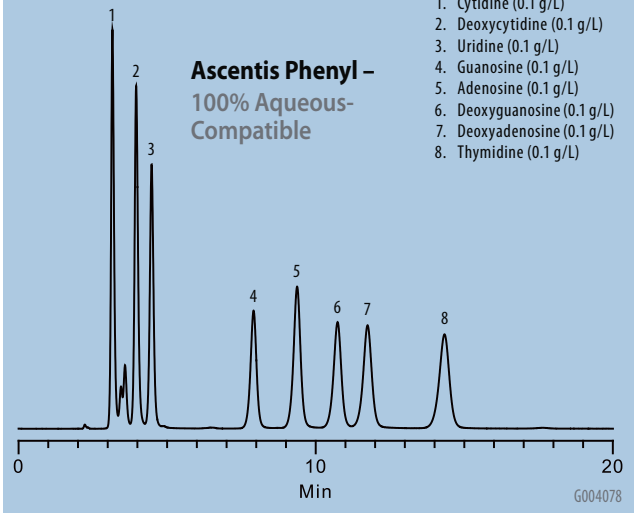
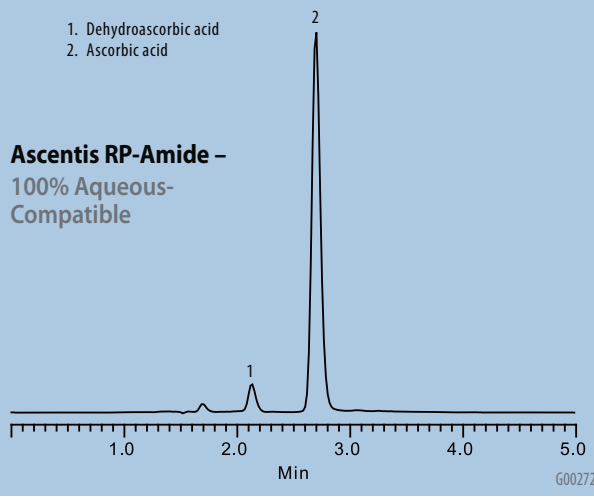


Figure 7. Separation of Organic Acids on Ascentis RP-Amide

column: Ascentis RP-Amide, 15 cm x 4.6 mm I.D., 5 µm particles (565324-U)
mobile phase: 25 mM monobasic potassium phosphate (pH 3.0 with phosphoric acid)
flow rate: 1 mL/min.
temp.: 35 °C
det.: UV at 230 nm
injection: 10 µL

1. Dehydroascorbic acid
2. Ascorbic acid



Selecting the Right Buffer

A partial list of common buffers and their corresponding useful pH range is supplied. Perhaps the most common buffer in HPLC is the phosphate ion. Although, with the growth of LC-MS, volatile buffers such as TFA, acetate, formate, and ammonia are becoming more frequently used. Remember, the purpose of a buffer in the mobile phase is to inhibit a pH change in the mobile phase after the introduction of a sample. When developing a method, it is important to select a mobile phase with a final pH at least one pH unit away from any analytes pK value. As a rule of thumb, one should work within a ±1 pH unit of the buffer pKa. Typical buffer concentrations for HPLC tend to be 10-100 millimolar level.

Buffer	pKa @ 25 °C	Useful pH Range
Trifluoroacetic acid (TFA)	0.5	<1.5
Phosphate 1	2.1	1.1 - 3.1
Formate	3.8	2.8 - 4.8
Acetate	4.8	3.8 - 5.8
Phosphate 2	7.2	6.2 - 8.2
Ammonia	9.2	8.2 - 10.2
Phosphate 3	12.3	11.3 - 13.3

LC-MS Compatibility Through Phase Stability, Retentivity and Inertness

In today's laboratory, HPLC columns and bonded phases must be compatible with mass spectrometric detection. Complete MS compatibility is an important design input for all Ascentis phases.

Negligible Phase Bleed

Loss of stationary phase can contribute to high background interference in all forms of detection, but it is most notable in MS detection where phase bleed can also lead to fouling of the instrument and subsequent downtime for cleaning and repair. Modern bonding procedures and an intelligent selection of the Ascentis phase chemistry combine to give all Ascentis phases low detectable bleed under MS and sensitive UV detection.

Amide Chemistry Avoids the Need for TEA and TFA Additives

Silanol-suppressing mobile phase additives, like TEA and TFA, are required for good peak shape on traditional HPLC phases. However, because they suppress the MS signal they should be avoided. Ascentis RP-Amide, by virtue of the embedded amide group, does not require silanol-suppressing additives for good peak shape. Formic acid is a suitable acidic modifier for use with Ascentis RP-Amide columns.

Ascentis pH Stability: Extending the Working pH Range

Occasionally, HPLC mobile phases outside the normal pH 2-7 range are desired to control sample stability, solubility or ionization state, or for compatibility with detection methods. A limitation of most silica-based HPLC phases is their instability outside this range where hydrolysis of the bonded phase and dissolution of the underlying silica can occur. Ascentis columns have excellent stability compared to competitive silica-based columns. The high bonded phase coverage and proprietary endcapping combine to increase resistance to hydrolysis and dissolution. As a result, Ascentis columns can be used successfully between pH 1.5-10 under certain conditions. Note, however, that it is important to avoid storing Ascentis columns, and any silica-based column, in harsh mobile phases.

Ascentis Provides Scalable Separations from Microbore to Preparative

Time and precious samples are wasted during scale-up if the analytical and preparative columns do not give the same elution pattern. The high surface area of the underlying Ascentis silica provides high loading capacity to purify larger quantities of material. Additionally, bonded phase and silica chemistry are uniform across 3,5, and 10 µm particle sizes. These features combine to ensure that analytical separations that are developed on Ascentis 3 or 5 µm particles are completely scalable to preparative separations on Ascentis 10 µm particles and larger columns. Additionally, separations developed on 5 or 10 µm particles can be scaled down for fast analysis on Ascentis 3 µm particles.

- Ascentis 10 µm particles in large column dimensions are ideal for isolating and purifying mg to gram amounts of compounds for further characterization.
- Ascentis 3 µm particles in short columns are ideal for rapid analysis and LC-MS applications.

Guidelines for Preparing Mobile Phases

It should be understood that slight variations in pH and buffer concentration could have a dramatic affect on the chromatographic process; consistent and specific techniques should be a regular practice in the preparation of mobile phases. A common practice is to place a sufficient amount of pure water into a volumetric flask and add an accurate amount of buffer. The pH of the solution should be adjusted, if necessary, and then dilute to final volume of water prior to adding or blending of organic solvents. Then, add a volumetrically measured amount of organic solvent to obtain the final mobile phase. Thorough blending, degassing, and filtering prior to use is also recommended.

To view a listing of suitable HPLC and LC-MS additives and solvents, visit ***sigma-aldrich.com/lc-ms-solvents***



Ascentis C18

The First Choice for Classic C18 Retention and Selectivity

Optimization of silica and bonded phases make Ascentis C18 a true workhorse for the vast majority of HPLC separations. High surface area and phase stability give it perfect character for demanding LC-MS and preparative separations.

Features:

- **Classic C18 selectivity**
- **High non-polar retentivity**
- **Symmetric peak shape**
- **Highly reproducible and stable**
- **Ideal for LC-MS**

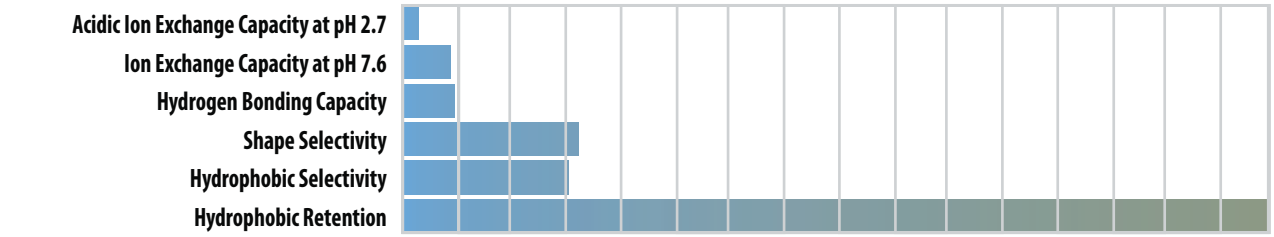
Key Applications:

General reversed phase, hydrophobic and polar compounds

Properties:

USP code:	L1
Bonded phase description:	Octadecyl
Endcapped:	Yes
Particle composition:	Type B silica gel
Particle purity:	<5 ppm metals
Particle shape:	Spherical
Particle size:	3, 5 and 10 µm
Pore size:	100 Å
Surface area:	450 m^2/g
Carbon load:	25%
pH range (recommended):	2-8
Extended pH range*:	1.5-10

Characterization of Chromatographic Performance on Ascentis C18



All competitive data obtained from M. R. Euerby, P. Perterson, J. Chromatogr. A, 994 (2003) 13-36; or M. R. Euerby, P. Perterson, W. Campbell, W. Roe, J. Chromatogr. A, 1154 (2007) 138-151. Ascentis data developed by Supelco/Sigma-Aldrich scientists using the Euerby methodology or obtained directly from cited references. Data for Aromatic selectivity is calculated as aTNB/NB/aTNB/DNT.

Use

The classic reversed-phase column, Ascentis C18 is suitable for any method that specifies a C18-type column. Its high surface area gives Ascentis C18 strong hydrophobic retention and high loading capacity for preparative applications.

LC-MS Implications

Ascentis C18 is low-bleed for clean ESI and APCI traces. The high retentivity means that the mobile phase can contain high levels of organic modifier that are more readily desolvated.

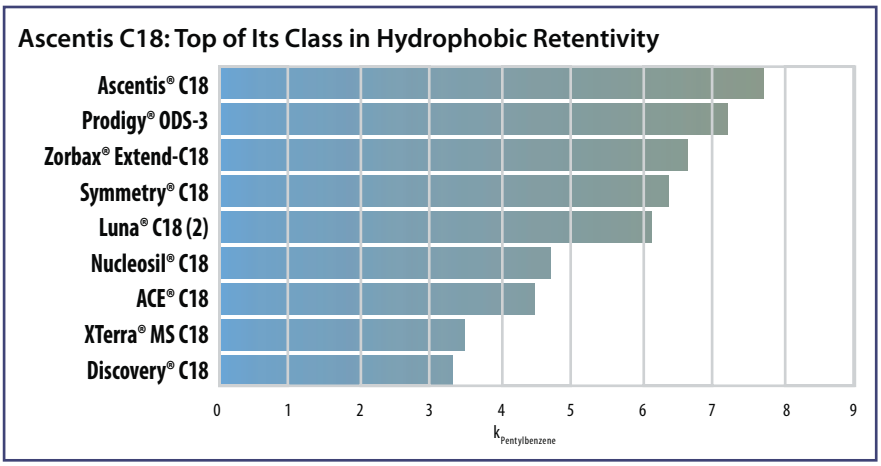
Notes

Modern C18 columns have very similar selectivity, even for basic compounds, because silica quality and bonding techniques have improved to the point that silanol effects are minimal. Unless quality with your current column is the issue, the main reasons for evaluating different brands of C18 columns are for improved peak shape and for slight changes in selectivity.

* Under certain conditions, the Ascentis family can be operated in the extended pH range. For more information, request an electronic file of "Acid/Base Stability of Silica Based on C8, C18, and Amide HPLC Columns" (T406018)



Ascentis C18 is one of the most retentive reversed-phase columns available. High retentivity extends the linear range of loading capacity, making Ascentis C18 ideal for separations that are or might be used for preparative applications. High retentivity also means Ascentis C18 can accommodate the highly-organic mobile phases encountered in LC-MS.



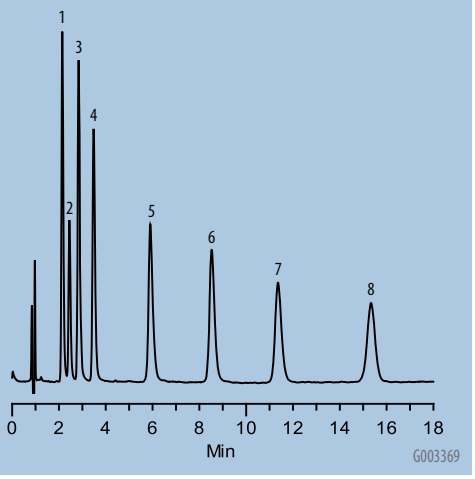
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Analysis of basic compounds at neutral pH often gives longer retention compared to acidic mobile phases, but sometimes causes poor peak shape due to silanol interactions. The highly-inert surface of Ascentis C18, as with all Ascentis phases, permits analysis in neutral pH mobile phases. In this example, a mix of tricyclic antide-pressants at pH 7 shows excellent peak shape on Ascentis C18.

Figure 8. Symmetrical Peaks for Basic Compounds Indicative of High Surface Deactivation of Ascentis Phases

column: Ascentis C18, 15 cm x 4.6 mm I.D., 5 µm particles (565324-U)
mobile phase: 30:70; 25 mM ammonium phosphate, pH 7.0: methanol
flow rate: 1.5 mL/min.
temp.: 35 °C
det.: UV at 254 nm
inj.: 20 µL

1. Desmethyl doxepin
2. Protriptyline
3. Desimpramine
4. Nortriptyline
5. Doxepin
6. Impramine
7. Amitriptyline
8. Trimpramine

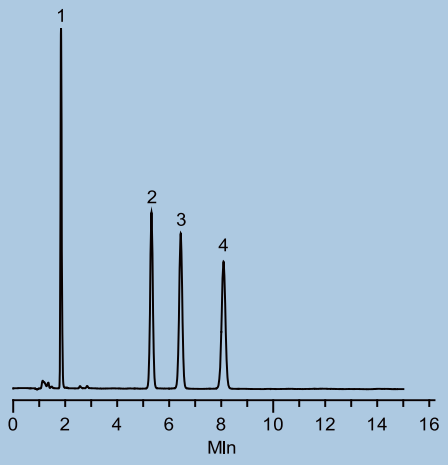


Ascentis C18 provides the selectivity and retention for a range of compounds including steroids. Ascentis C18 is a reliable first choice HPLC column that gives symmetric peak shape and excellent retention for even difficult compounds.

Figure 9. Estrogenic Steroids on Ascentis C18

column: Ascentis C18, 15 cm x 4.6 mm I.D., 5 µm particles (581324-U)
mobile phase: 55:45, water:acetonitrile
flow rate: 1 mL/min.
temp.: 35 °C
det.: UV at 220 nm
inj.: 10 µL

1. Estriol
2. α-Estriol
3. β-Estriol
4. Estrone





Ascentis RP-Amide

Ultra-Low Bleed Alkyl Amide Phase that Rivals C18 as a Generic Scouting Column. Excellent Peak Shape and Resolution, Especially for Polar Compounds or Mixtures of Compound Polarity

As pioneers in embedded polar group (EPG) phases for HPLC, Supelco is pleased to offer Ascentis RP-Amide, which has all the benefits of enhanced polar compound retention and selectivity, without any of the disadvantages of competitive EPG phases.

Features

- **Improved peak shape for bases compared to C18**
- **Different selectivity than C18 or C8 for wide range of polar compounds (especially acids)**
- **Lower bleed than competitive EPG phases**
- **100% aqueous compatible**

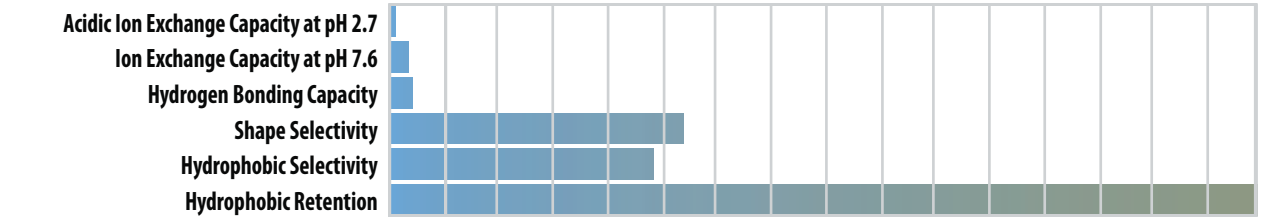
Key Applications

Small, water soluble molecules and peptides, H-bond donors, acids, phenols, basic compounds, polar compounds

Properties

USP code:	L60
Bonded phase description:	Stable amide group embedded in an 18-carbon chain
Endcapped:	Yes
Particle composition:	Type B silica gel
Particle purity:	<5 ppm metals
Particle shape:	Spherical
Particle size:	3, 5 and 10 µm
Pore size:	100 Å
Surface area:	450 m^2/g
Carbon load:	19.5%
pH range (recommended):	2-8
Extended pH range*:	1.5-10

Characterization of Chromatographic Performance on Ascentis RP-Amide



All competitive data obtained from M. R. Euerby, P. Perterson, J. Chromatogr. A, 994 (2003) 13-36; or M. R. Euerby, P. Perterson, W. Campbell, W. Roe, J. Chromatogr. A, 1154 (2007) 138-151. Ascentis data developed by Supelco/Sigma-Aldrich scientists using the Euerby methodology or obtained directly from cited references. Data for Aromatic selectivity is calculated as aTNB/NB/aTNB/DNT.

Use

Ascentis RP-Amide can be used for many of the same separations as a C18 while avoiding some of the disadvantages of C18 such as poor wettability in high aqueous mobile phases. In addition, it is much more retentive for those molecules that can interact by hydrophobic interactions and also by H-bonding with the amide group. Compared to alkyl-only phases, Ascentis RP-Amide has enhanced retention and selectivity for phenols, organic acids and other polar solutes due to strong H-bonding between the amide carbonyl (H-bond acceptor) and H-bond donors, like phenols and acids. Compared to other EPG phases, like carbamates, ureas, sulfonamides and ethers, Ascentis RP-Amide gives retention comparable to C18 and C8 for easy column comparison without the need to change mobile phase conditions.

LC-MS Considerations

Unlike other amide-based phases, Ascentis RP-Amide uses an amidosilane reagent and a one-step bonding method similar to C18. Polymeric reagents are also employed to achieve maximum stability and low bleed with all modern HPLC detectors.

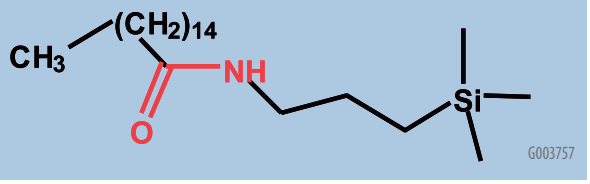
Notes

- Generally, acids are retained more and bases retained less on RP-Amide compared to C18 and C8 columns.
- Methanol can be comparable in elution strength to acetonitrile when compounds are retained by H-bonding mechanism on the RP-Amide phase.

* Under certain conditions, the Ascentis family can be operated in the extended pH range. For more information, request an electronic file of "Acid/Base Stability of Silica Based on C8, C18, and Amide HPLC Columns" (T406018)

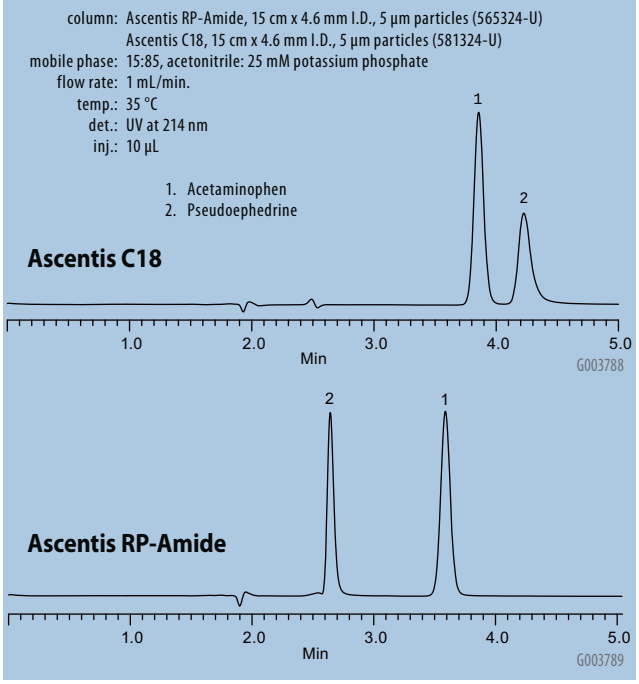


Figure 10. Structure of Ascentis RP-Amide



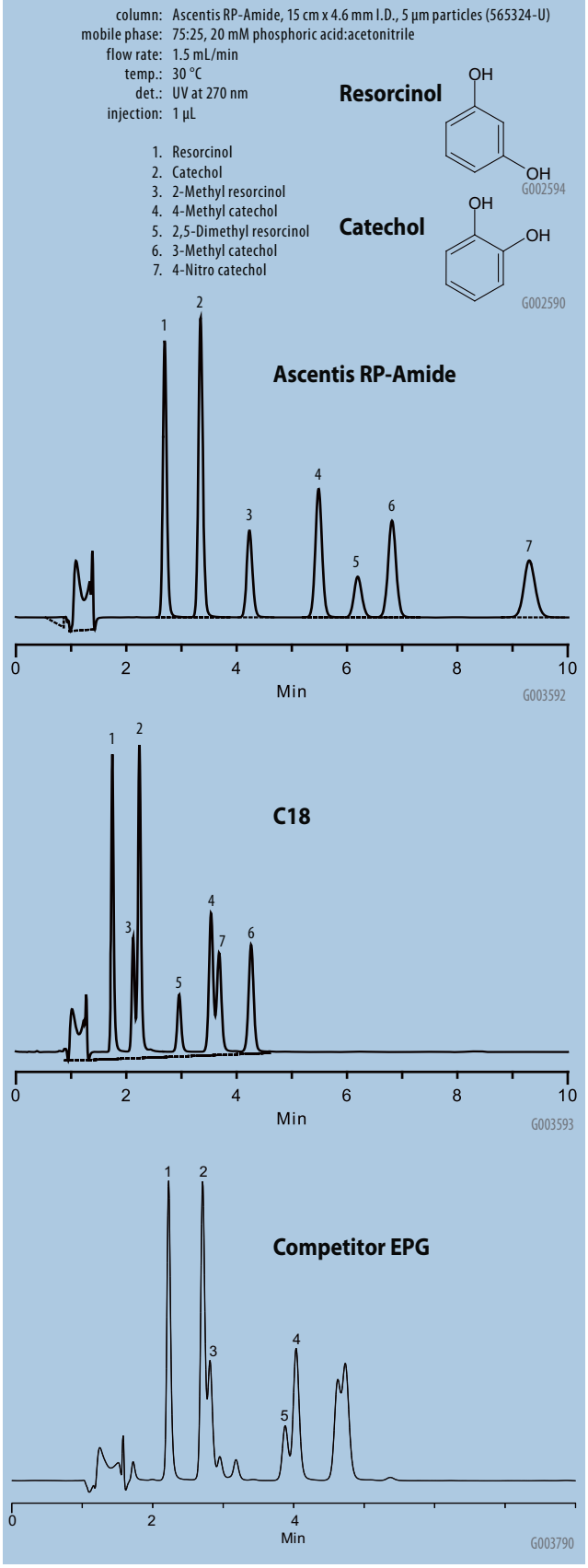
Because the amide group lies near the silica surface, it is believed to suppress tailing of basic solutes by electrostatic shielding (repulsion) or by interacting preferentially with the silanols (H-bonding between the phase and the substrate). The absence of unwanted silanol and other secondary interactions gives the Ascentis RP-Amide excellent peak shape for both acids and bases. This example of internal deactivation with acetaminophen and pseudoephedrine (Figure 11) shows the dramatic effect of changing stationary phase: not only are the peaks more symmetrical, but elution order is reversed.

Figure 11. Improved Efficiency, Selectivity and Resolution of Ascentis RP-Amide vs. C18



An Ascentis RP-Amide column is more retentive and selective for phenolic compounds, like catechols and resorcinols, compared to a C18 and an ether-type polar embedded phase (Figure 12). The ether phase does not have the ability to H-bond with phenolic groups like the amide group does. Although comparing an ether phase to a C18 phase may be useful if only slightly different selectivity is needed, the most dramatic results for acids such as phenols and carboxylic acids will be obtained with amide-based phases, like Ascentis RP-Amide.

Figure 12. Enhanced Phenolic Compound Retention via H-bonding on Ascentis RP-Amide





Ascentis Phenyl

Ultra-low Bleed Phenyl Phase with Enhanced Phenyl Selectivity

Phenyl-based reversed-phases were one of the first alternatives to C18 selectivity. Our Ascentis Phenyl has been improved to offer exceptional phase stability and enhanced phenyl retention. Ascentis Phenyl offers versatility by also operating in the HILIC mode.

Features

- **Low-bleed for MS or UV gradient applications due to the use of trifunctional bonding reagent**
- **Outstanding phenyl selectivity due to high phase loading and short butyl spacer**
- **100% aqueous-compatible for highly-polar compounds**

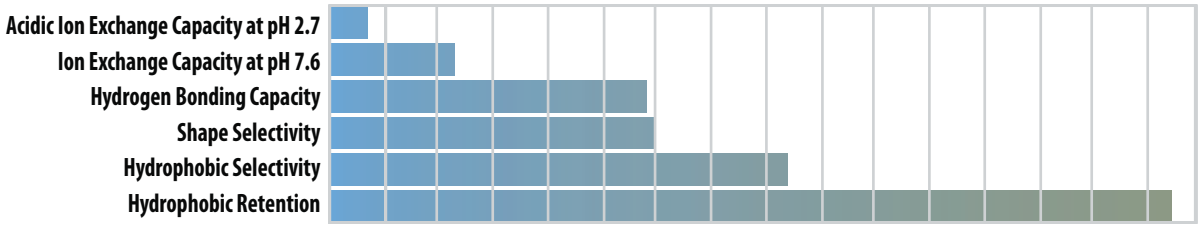
Key Applications

Small, water soluble molecules and peptides, π-acceptors, nitroaromatics, polar compounds, dipoles, heterocyclics, HILIC mode

Properties

USP code:	L11
Bonded phase description:	Phenyl ring with short butyl spacer
Endcapped:	Yes
Particle composition:	Type B silica gel
Particle purity:	<5 ppm metals
Particle shape:	Spherical
Particle size:	3, 5 and 10 µm
Pore size:	100 Å
Surface area:	450 m^2/g
Carbon load:	19.5%
pH range (recommended):	2-8
Extended pH range*:	1.5-10

Characterization of Chromatographic Performance on Ascentis Phenyl



All competitive data obtained from M. R. Euerby, P. Perterson, J. Chromatogr. A, 994 (2003) 13-36; or M. R. Euerby, P. Perterson, W. Campbell, W. Roe, J. Chromatogr. A, 1154 (2007) 138-151. Ascentis data developed by Supelco/Sigma-Aldrich scientists using the Euerby methodology or obtained directly from cited references. Data for Aromatic selectivity is calculated as aTNB/NB/aTNB/DNT.

Use

Phenyl phases are π-basic (electron donating) and are similar in overall retention to alkyl and EPG phases for easy column screening. The alternate selectivity of phenyl phases is often explained by the π-π interactions available through the phenyl ring. Compounds that appear to exhibit differential selectivity on the phenyl phase include:

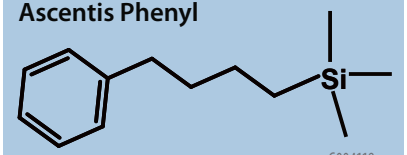
- hydrophobic bases (TCAs, tetracyclines)
- moderate bases (anesthetics and narcotic analgesics)
- benzodiazepines
- some acidic compounds such as ACE inhibitors and quinoline antibiotics
- nucleosides (e.g. cytidine)
- nitro, azide and sulfonyl compounds

Notes

- Methanol can be a more selective mobile phase component than acetonitrile.
- Activate HILIC mode by using highly-aqueous (>90%) mobile phases.

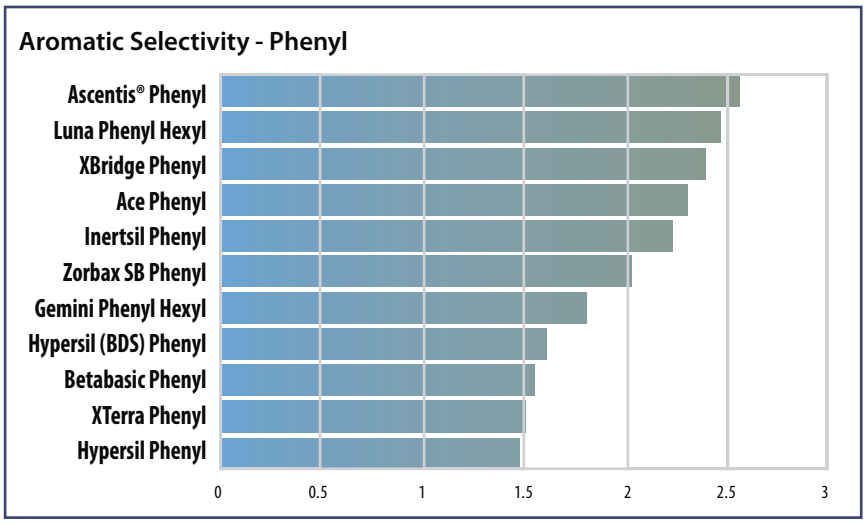
* Under certain conditions, the Ascentis family can be operated in the extended pH range. For more information, request an electronic file of "Acid/Base Stability of Silica Based on C8, C18, and Amide HPLC Columns" (T406018)

Figure 13. Structure of Ascentis Phenyl



Most commercially-available phenyl phases actually show a great deal of C18-like selectivity, negating their impact on improving the separation. With the highest level of true phenyl character among all phases tested, Ascentis Phenyl has excellent aromatic selectivity, making it a true alternative to traditional C18.

The short, butyl spacer of Ascentis Phenyl does not dilute the phenyl character as conventional hexyl spacers do. Figure 14 shows the stronger contribution of π-electron interactions from the phenyl ring on Ascentis Phenyl compared to the phenylhexyl phase allowing it to resolve buspirone and trazadone. The phenyl and alkyl selectivity tend to cancel each other out on the competitive phenylhexyl phase in this case.

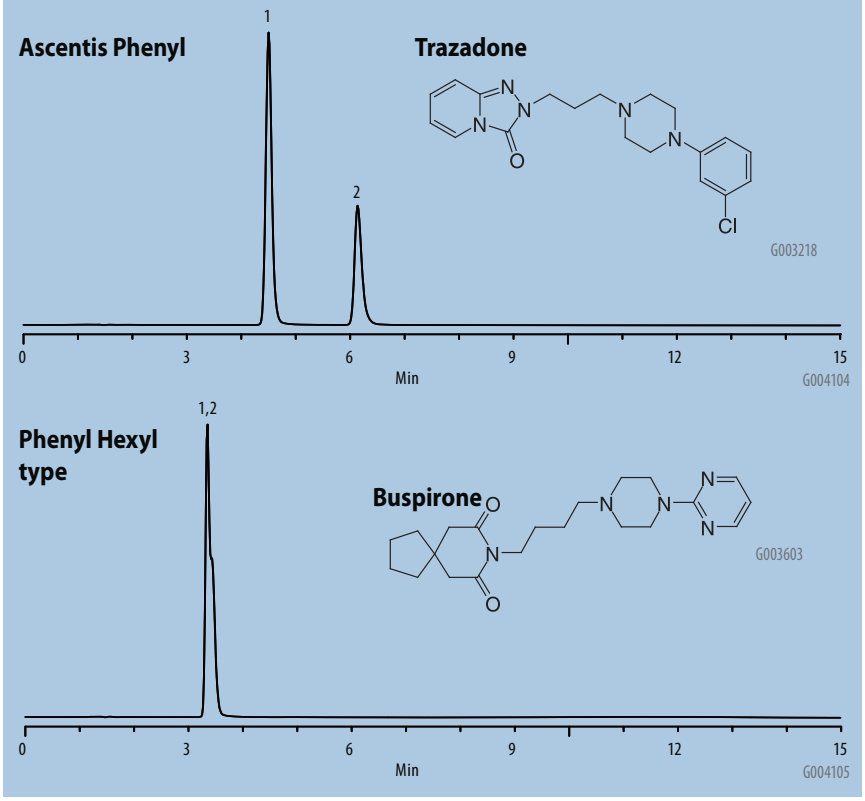


All competitive data obtained from M. R. Euerby, P. Perterson, J. Chromatogr. A, 994 (2003) 13-36; or M. R. Euerby, P. Perterson, W. Campbell, W. Roe, J. Chromatogr. A, 1154 (2007) 138-151. Ascentis data developed by Supelco/Sigma-Aldrich scientists using the Euerby methodology or obtained directly from cited references. Data for Aromatic selectivity is calculated as aTNB/NB/aTNB/DNT.

Figure 14. Better Phenyl Selectivity on Ascentis Phenyl Compared to Competitive Phases

column: Ascentis Phenyl, 15 cm x 4.6 mm I.D., 5 µm particles (581616-U)
mobile phase: 40:60, 10 mM ammonium acetate (pH 5.5 with acetic acid):acetonitrile
flow rate: 1 mL/min.
temp.: 35 °C
det.: UV at 254 nm
injection: 1 µL

1. Trazadone
2. Buspirone





Ascentis ES Cyano

Extra stable for low pH mobile phases due to sterically protected phase

Useful for polar selectivity in the reversed-phase mode, including π-π and dipole-dipole interacting compounds. Can also be used in HILIC mode and normal phase chromatography.

Features:

- **Enhanced stability at low pH**
- **Operates in reversed-phase, HILIC and normal phase modes of chromatography**
- **Low MS bleed**
- **100% aqueous compatible**
- **Available as 3 µm and 5 µm particles**

Key applications:

polar compounds, nitroaromatics, tricyclic antidepressants, steroids

Properties:

USP Code:	L10
Bonded phase description:	diisopropyl cyano propyl
Endcapped:	Yes
Particle composition:	Type B silica gel
Particle purity:	< 5 ppm metals
Particle shape:	Spherical
Particle size:	3 and 5 µm
Pore size:	100 Å
Surface area:	450 m^2/g
Carbon load:	10 %
pH range recommended:	1-8

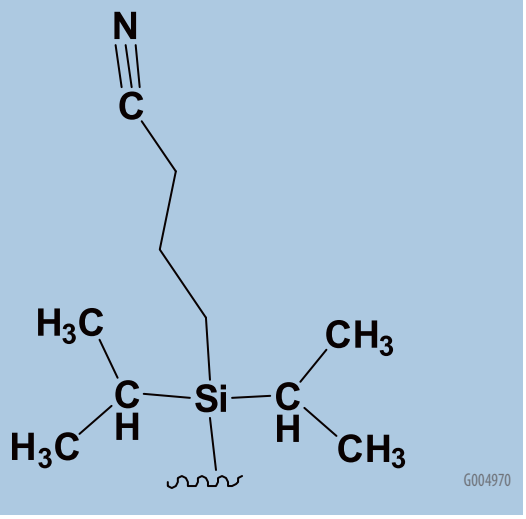
Use

Cyano phases have become very popular because of their unique selectivity for polar groups and double bonds. Their potential for dipole/dipole and dipole/induced-dipole interaction made them one of the earliest stationary phase functional groups when alternate selectivity was needed. In the past, stability of the cyano phase under reversed-phase and HILIC conditions has been poor. Exposure to aqueous organic mobile phases, acidic pH and elevated temperatures can create gradual retention and selectivity loss that is reportedly due to stationary phase hydrolysis. A new Ascentis ES Cyano column, based on 3 and 5 µm porous silica substrate, has been developed. This new phase compares very favorably in stability to C18, C8, Amide and Phenyl.

Notes

- Can be used in reversed, HILIC and normal phase modes
- It is best to dedicate a specific column to one mode of chromatography mentioned above.
- Methanol gives more selectivity than acetonitrile in the reversed phase mode.
- Cyano phases are used in EPA Method 8330 (1) for the analysis of explosives and nitroaromatics.

Figure 15. Structure of Ascentis ES Cyano



1. US EPA Method 8330A, "Nitroaromatics and Nitramines by High Performance Liquid Chromatography (HPLC)" Revision 1 (February 2007), obtained from the *www.epa.gov web site.*

Cyano columns have been used for the analysis of tricyclic antidepressants for some time. A comparison of the most popular competitor column and the Ascentis ES Cyano phase is shown to the right. Better resolution is seen using the ES Cyano than the competitor column for three critical peak pairs. In addition, note the selectivity change of the trimipramine and doxepin (peaks 1 and 2) between these two phases under these conditions.

Figure 16. Comparison of Tricyclic Antidepressants on Ascentis ES Cyano and a Competitor Cyano Phase

column: as indicated; 15 cm x 4.6 mm, 5 µm particle
mobile phase A: 20 mM potassium phosphate, dibasic (pH 7.0 with phosphoric acid)
mobile phase B: acetonitrile
mobile phase C: methanol
mixing proportions: A:B:C, 25:60:15
flow rate: 2.0 mL/min
temp.: 25 °C
det.: 215 nm
injection: 5 µL
sample: 100 µg /mL in 70:30, water: methanol

1. Trimipramine
2. Doxepin
3. Amitriptyline
4. Imipramine
5. Nordoxepin
6. Nortriptyline
7. Desipramine
8. Protriptyline

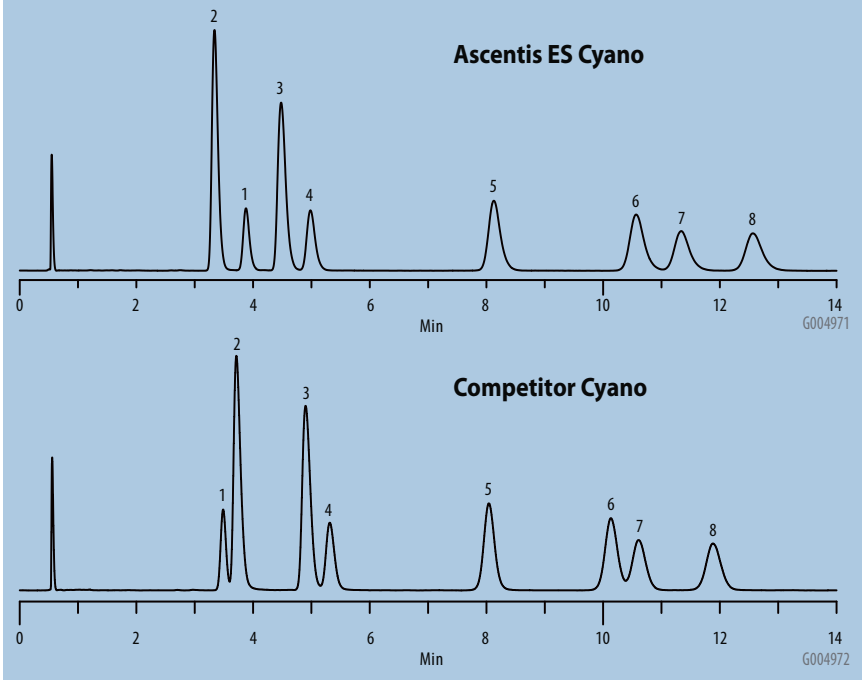
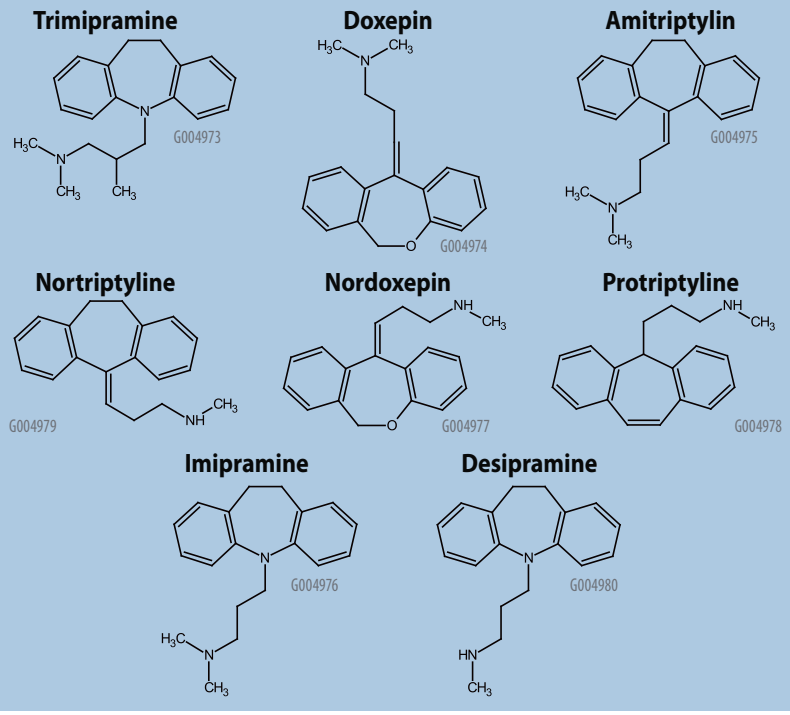


Figure 17. Structures of Tricyclic Antidepressants





Ascentis Silica

High Surface Area and High Surface Deactivation Combine to Give Ascentis Silica Exceptional Performance as a Normal Phase, HILIC and Preparative HPLC Material

Besides being the underlying support for all Ascentis phases, Ascentis Silica has applications in its own right. Silica is widely used to separate positional isomers in normal phase mode, and polar compounds in HILIC (aqueous normal phase modes). Silica is also used in organic synthesis to purify reaction mixtures. In each case, a high purity, controlled and uniform surface is necessary to impart the desirable chromatographic performance.

Features

- **High-loading capacity**
- **Operates in both normal-phase and HILIC modes**
- **Tested in both modes and shipped in ethanol, Ascentis Silica is ready to use in either mode**
- **Ultra-pure, spherical silica**
- **Available in 3, 5, and 10 µm**

Key Applications

Small molecular weight positional (geometric) isomers, non-polar compounds (in NP mode), vitamins, steroids, polar compounds (in HILIC mode)

Properties

USP code:	L3
Bonded phase description:	None (surface comprises silanol, -Si-OH, and siloxane, -Si-O-Si-, groups)
Endcapped:	No
Particle composition:	Type B silica gel
Particle purity:	<5 ppm metals
Particle shape:	Spherical
Particle size:	3, 5 and 10 µm
Pore size:	100 Å
Surface area:	450 m^2/g
Carbon load:	0%
pH range (recommended):	2-6

Use

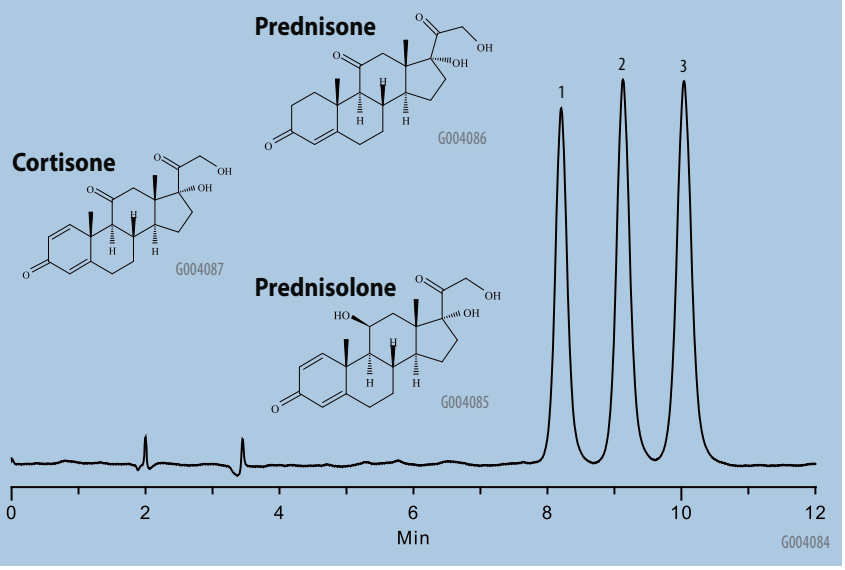
- Normal phase and HILIC HPLC modes
- Preparative chromatography
- Purification (organic synthesis)
- LC-MS

The classic use of silica columns is for normal phase HPLC. The rigid structure of the silica surface, as opposed to the flexible nature of bonded phases, allows it to distinguish between molecules with different footprints that may have the same hydrophobicity. Geometric isomers and closely-related substances, like the steroids shown in Figure 15, can be separated on Ascentis Silica under normal phase conditions. Normal phase is also widely used in preparative chromatography because the mobile phase is more easily removed by evaporation than the water-containing reversed-phase mobile phases.

Figure 18. Ascentis Silica: Normal Phase Separation of Geometric Isomers and Closely-Related Compounds

column: Ascentis Si, 15 cm x 4.6 mm I.D., 5 µm particles (581512-U)
mobile phase: 88:12, hexane:ethanol
flow rate: 1.0 mL/min.
temp.: 35 °C
det.: UV at 245 nm
injection: 10 µL
sample: 50 µg/mL in 85:15, hexane: 2-propanol

1. Cortisone
2. Prednisone
3. Prednisolone

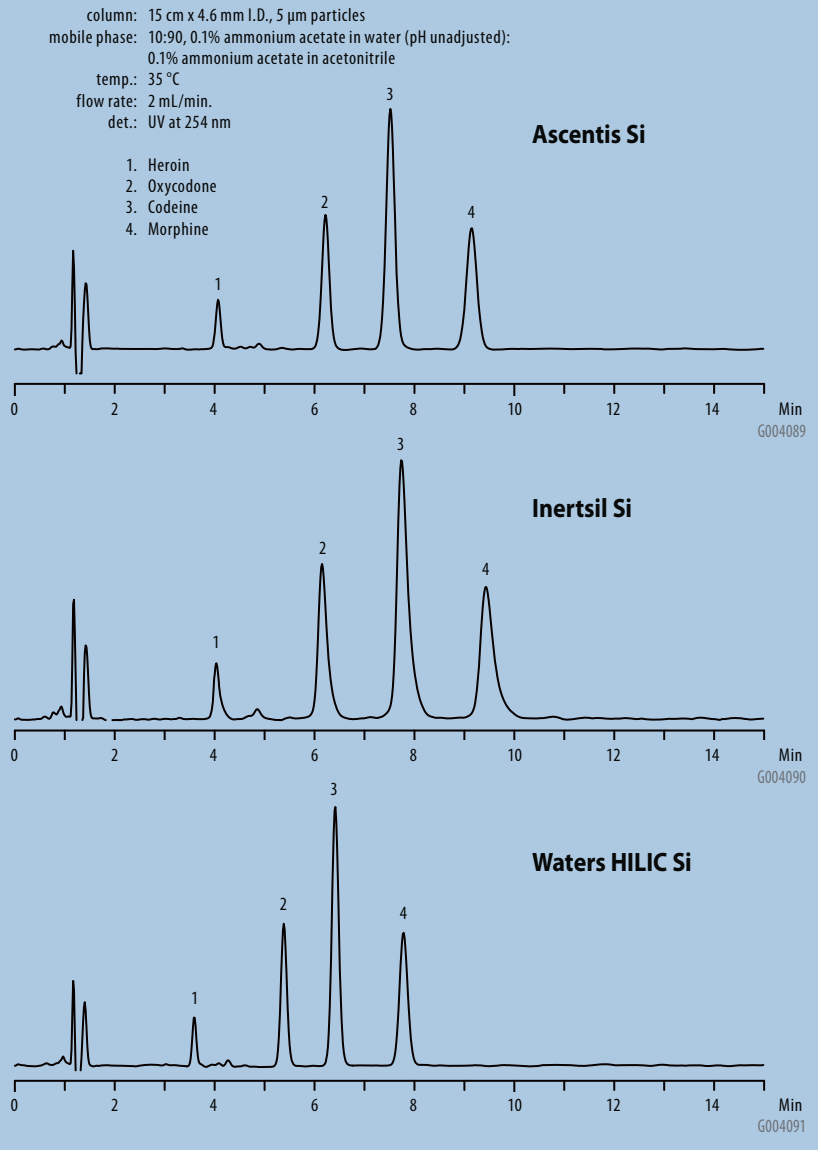


Ascentis Silica is used successfully in the aqueous normal-phase or HILIC mode. In this mode, water is the strong modifier and the organic is the weak modifier of the mobile phase. Like reversed-phase, HILIC offers the flexibility of using pH and ionic strength to control retention.

HILIC is ideal for very polar compounds and is highly compatible with LC-MS.

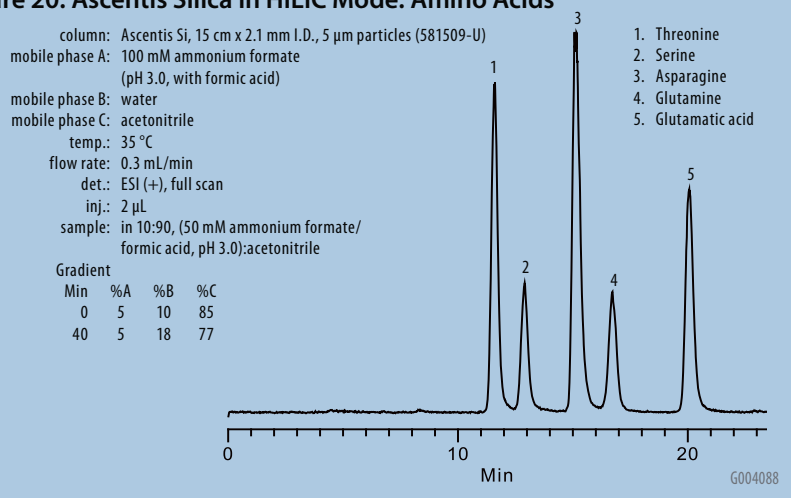
Elution order is generally opposite to that obtained under reversed-phase conditions. Figure 16 compares Ascentis Silica with two competing silicas, demonstrating better resolution by virtue of excellent peak shape and high retentivity.

Figure 19. Ascentis Silica in HILIC Mode Gives Better Peak Shape and Retention of Basic Drugs than Competitive Silicas



Polar biomolecules, like amino acids, nucleotides and nucleosides, typically require derivatization for their analysis by reversed phase HPLC. The HILIC mode offered by Ascentis Silica permits the retention and resolution of these compounds without derivatization, eliminating a time-consuming sample preparation step (Figure 17).

Figure 20. Ascentis Silica in HILIC Mode: Amino Acids





Ascentis C8

One of The Most Hydrophobic C8 Phases Available

Leveraging the improvements to silica and bonded phase properties that made Ascentis C18 so useful, its shorter alkyl chain cousin, Ascentis C8, is also suitable for routine HPLC and LC-MS.

Features:

- **Selectivity similar to C18 for non-polar compounds**
- **Different selectivity for polar compounds**
- **Less hydrophobic than C18, more hydrophobic than other C8 phase**
- **Symmetric peak shape**
- **Highly reproducible and stable**
- **Ideal for LC-MS**

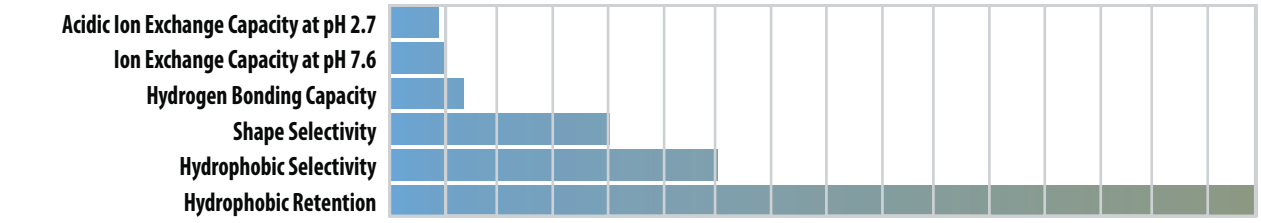
Key Applications:

Small, water soluble molecules and peptides, less hydrophobic retention than C18 but comparable selectivity, LC-MS

Properties:

USP code:	L7
Bonded phase description:	Octyl
Endcapped:	Yes
Particle composition:	Type B silica gel
Particle purity:	<5 ppm metals
Particle shape:	Spherical
Particle size:	3 and 5 µm
Pore size:	100 Å
Surface area:	450 m^2/g
Carbon load:	15%
pH range (recommended):	2-8
Extended pH range*:	1.5-10

Characterization of Chromatographic Performance on Ascentis C8

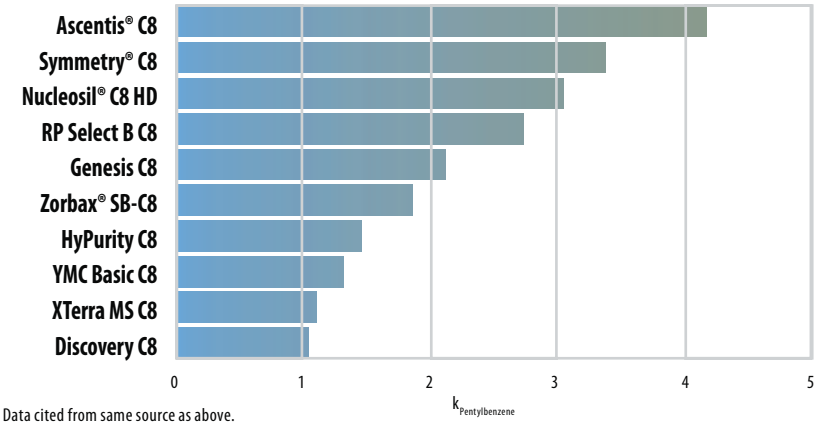


All competitive data obtained from M. R. Euerby, P. Perterson, J. Chromatogr. A, 994 (2003) 13-36; or M. R. Euerby, P. Perterson, W. Campbell, W. Roe, J. Chromatogr. A, 1154 (2007) 138-151. Ascentis data developed by Supelco/Sigma-Aldrich scientists using the Euerby methodology or obtained directly from cited references. Data for Aromatic selectivity is calculated as aTNB/NB/aTNB/DNT.

Use

Ascentis C8 is suitable for any method that specifies a C8-type column. Although C8 columns often show similar selectivity to C18 columns, shorter alkyl chains sometimes show different selectivity toward polar compounds because they can solvate differently with the mobile phase and interact differently due to the size and shape of certain molecules. Also, C8 reagents are smaller than C18 reagents and have improved primary phase coverage, thereby requiring less end-capping. Ascentis C8 has excellent peak shape and very high phase stability.

Ascentis C8: Top of Its Class in Hydrophobic Retentivity



Data cited from same source as above.

Among commercially available C8 columns, Ascentis C8 has the highest degree of hydrophobic retention. This permits the use of higher percentages of organic modifier, a benefit to LC-MS users.

* Under certain conditions, the Ascentis family can be operated in the extended pH range. For more information, request an electronic file of "Acid/Base Stability of Silica Based on C8, C18, and Amide HPLC Columns" (T406018)

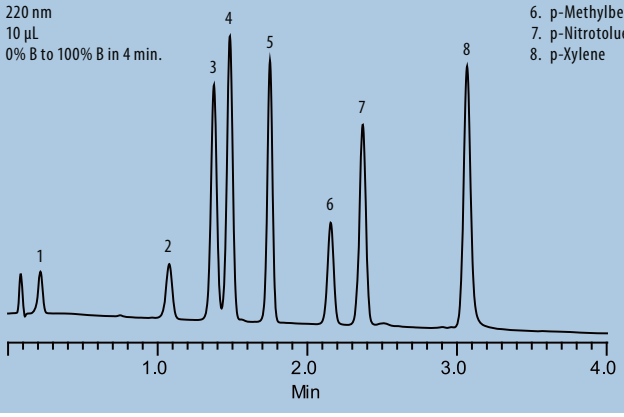


Ascentis C8 is an excellent choice for fast gradient analysis. Ascentis C8 is typically more retentive at low organic composition that C18 and less retentive at high organic composition. Furthermore, Ascentis C8 has better aqueous compatibility for gradients that start at 100% aqueous composition.

Figure 21. Fast Gradient Analysis on Ascentis Columns

column: Ascentis C8, 3 cm x 3.0 mm I.D., 5 µm particles (581440-U)
mobile phase A: 95:5, 10 mM ammonium phosphate:acetonitrile, pH 2.5
mobile phase B: 40:60, 10 mM ammonium phosphate:acetonitrile, pH 2.5
flow rate: 3.5 mL/min
temp.: 35 °C
det.: 220 nm
inj.: 10 µL
gradient: 0% B to 100% B in 4 min.

1. p-Toluidine
2. p-Nitroaniline
3. p-Nitrophenol
4. p-Cresol
5. p-Nitrobenzoic acid
6. p-Methylbenzoic acid
7. p-Nitrotoluene
8. p-Xylene



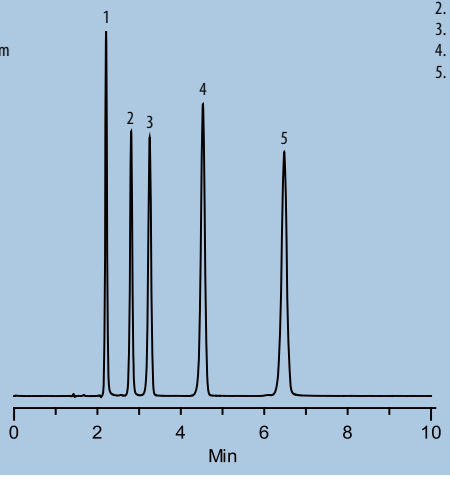
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Ascentis C8 often yields enhanced retention than Ascentis C18 for small polar molecules under highly aqueous conditions. Greater retention for Ascentis C8 may be related to greater wettability of Ascentis C8 as compared to Ascentis C18.

Figure 22. Polar Molecules Under Highly Aqueous Conditions

column: Ascentis C8, 15 cm x 4.6 mm I.D., 5 µm particles (581424-U)
mobile phase: 3:97, methanol:water with 0.1% TFA
flow rate: 1 mL/min.
temp.: 35 °C
det.: UV at 220 nm
inj.: 10 µL

1. L-tartaric
2. Lactic Acid
3. Citric Acid
4. Fumaric Acid
5. Acrylic Acid



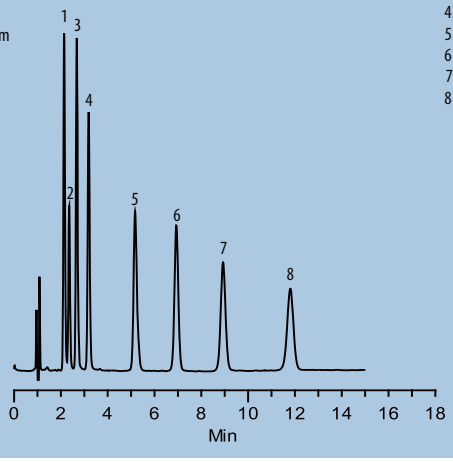
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Analysis of bases at neutral pH often yields enhanced retention over acidic mobile phase but sometimes causes poor peak shape with C18 and C8 columns due to silanol interaction. In this example, a mix of tricyclic antidepressants at pH 7 shows excellent peak shape on Ascentis C8.

Figure 23. Pharmaceutical Bases at pH 7

column: Ascentis C8, 15 cm x 4.6 mm I.D., 5 µm particles (581424-U)
mobile phase: 30:70; 25 mM ammonium phosphate, pH 7.0: methanol
flow rate: 1.5 mL/min.
temp.: 35 °C
det.: UV at 254 nm
inj.: 20 µL

1. Desmethyl Doxepin
2. Protriptyline
3. Desimpramine
4. Nortriptyline
5. Doxepin
6. Impramine
7. Amitriptyline
8. Trimpramine



G003370



Discovery HS F5

Unique Reversed-phase Selectivity Compared to C18 and C8

Discovery HS F5 provides reversed-phase separations that are distinctly different from C18 columns. However, compounds will generally elute within the same retention time window, making most C18 methods easily transferable.

Features

- **Unique (orthogonal) selectivity compared to C18 and C8**
- **Stable, low-bleed LC-MS separations**
- **Both reversed-phase and HILIC modes**
- **Possesses multiple types of interactions: dispersive, dipole-dipole, π-π, charge-transfer**

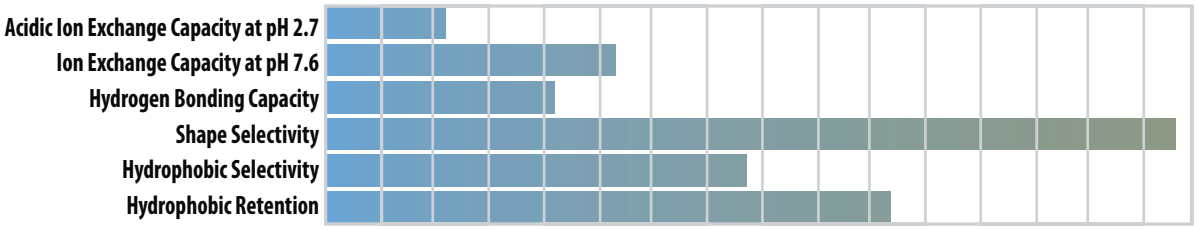
Key Applications

Small, water soluble molecules and peptides, polar compounds, basic compounds, positional isomers

Properties

USP code:	L43
Bonded phase description:	Pentafluorophenylpropyl
Endcapped:	Yes
Particle composition:	Type B silica gel
Particle purity:	<10 ppm metals
Particle shape:	Spherical
Particle size:	3, 5 and 10 µm
Pore size:	120 Å
Surface area:	300 m^2/g
Carbon load:	12%
pH range (recommended):	2-8

Characterization of Chromatographic Performance on Discovery HS F5



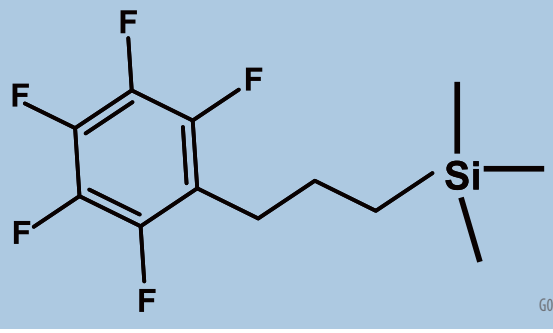
All competitive data obtained from M. R. Euerby, P. Perterson, J. Chromatogr. A, 994 (2003) 13-36; or M. R. Euerby, P. Perterson, W. Campbell, W. Roe, J. Chromatogr. A, 1154 (2007) 138-151. Ascentis data developed by Supelco/Sigma-Aldrich scientists using the Euerby methodology or obtained directly from cited references. Data for Aromatic selectivity is calculated as aTNB/NB/aTNB/DNT.

Notes

Compared to a C18: Generally, bases are retained longer on the HS F5 than on a C18, hydrophobic compounds are retained less. Increasing the organic content of a C18 separation 5 to 10 percent will generally provide similar retention on a HS F5. Also, as a general rule, solutes with log $P_{o/w}$ values less than 2.5 will be retained longer on HS F5 compared to a C18.

Compared to a phenyl phase: Although aromatic in nature, the pentafluorophenylpropyl (F5) phase does not resemble a phenyl phase in retention or selectivity. The F5 is a strong Lewis acid due to the electron withdrawing effects of five fluorine groups; the F5 ring is electron deficient whereas the phenyl ring is electron rich.

Figure 24. Structure of Discovery HS F5





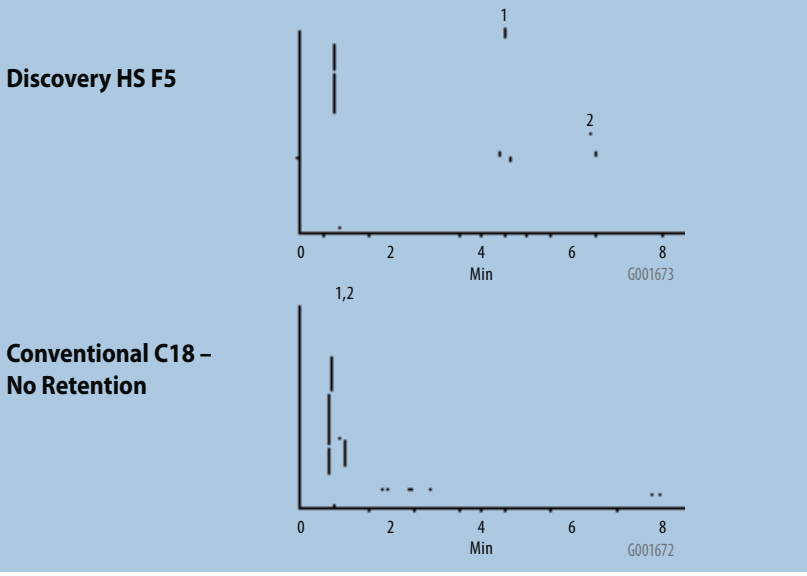
Guidelines for Transferring a C18 Method to Discovery HS F5

Generally, bases are longer retained on the HS F5 than on a C18. Increasing the organic content of a C18 separation 5 to 10 percent will generally provide similar retention on a HS F5. Results with other compounds are highly variable. However, it is generally true that solutes with $logP_{o/w}$ values less than 2.5 will be retained longer on HS F5 compared to a C18. The degree of difference is highly solute dependent.

Figure 25. HS F5 Provides Excellent Separation - Solutes Are Not Retained on C18

column: Discovery HS F5, 15 cm x 4.6 mm I.D., 5 µm particles (567516-U)
Conventional C18, 15 cm x 4.6 mm I.D., 5 µm particles
mobile phase: 30:70, 10 mM Ammonium Acetate (pH 6.98): CH_3CN
flow rate: 2.0 mL/min
temp.: 35 °C
det.: Photodiode Array
inj.: 5 µL

1. Methcathinone (100 µg/mL)
2. (+/-) Ephedrine (200 µg/mL)

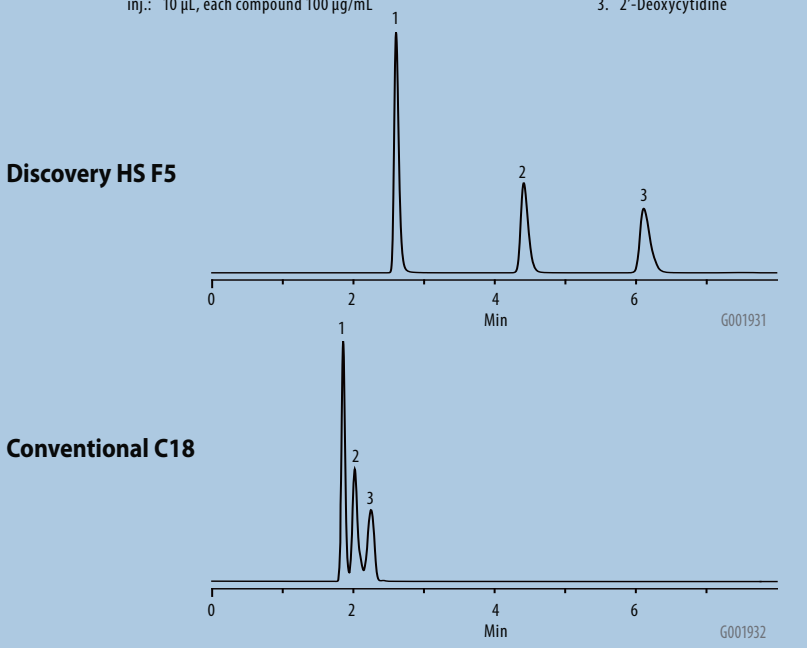


In Figure 25, cytidine and related compounds provide another example of the power of HS F5 to provide unique and valuable separations compared to a C18. An added benefit of the HS F5 is its resistance to phase collapse under 100% aqueous conditions.

Figure 26. Unique Selectivity of HS F5 Resolves Compounds Better than C18

column: Discovery HS F5, 15 cm x 4.6 mm I.D., 5 µm particles (567516-U)
Conventional C18, 15 cm x 4.6 mm I.D., 5 µm particles
mobile phase: 10 mM KH_2PO_4, pH 3.0 with H_3PO_4, (C18 separation has 5% CH_3CN)
flow rate: 1 mL/min
temp.: 30 °C
det.: UV at 280 nm
inj.: 10 µL, each compound 100 µg/mL

1. Cytidine
2. Cytosine
3. 2′-Deoxycytidine





Ascentis® Express

Extreme Performance on Any LC System

The demand for increased sample throughput and speed of results has driven HPLC users to search for breakthroughs in HPLC instrument and column technology. Although improvements have been realized, setbacks have been encountered. Reductions in column ruggedness, costly replacements of existing instrumentation, and difficulties in transferring methods to new systems have often made these past "improvements" unappealing to analysts.

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By simply changing to Ascentis Express Columns, sample throughput can be improved by 400%!

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And no new instrumentation is required!

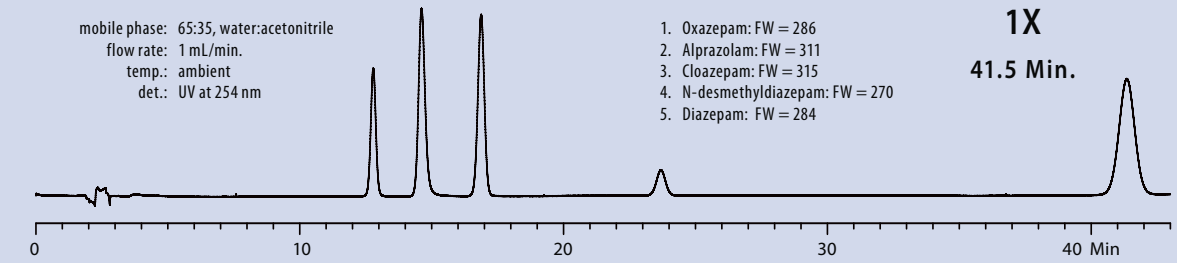
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Do More Work in Less Time without Changing your Method

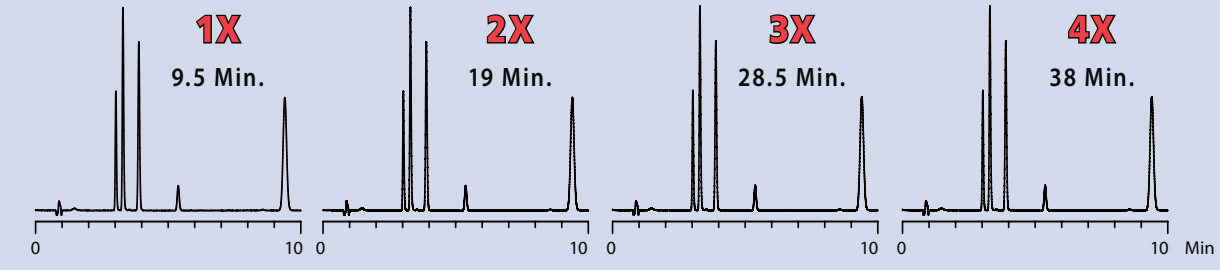
With identical conditions, the Ascentis Express C18 column performs **4X** as many separations as a standard C18 column in less time.

CONDITIONS				Theoretical Plates	Standard C18 Throughput	**Ascentis C18 Throughput**
Sample Prep	Flow Rate	System Pressure	HPLC System			
SAME	SAME	SAME	SAME	SAME	1X	4X

C18, 25 cm x 4.6 mm I.D., 5 µm particles



Ascentis Express C18, 10 cm x 4.6 mm I.D., 2.7 µm particles (53827-U)





Ordering Information

Particle Size	ID (mm)	Length (cm)	Ascentis C18	Ascentis RP-Amide	Ascentis Phenyl	Ascentis ES Cyano	Ascentis Silica	Ascentis C8	Discovery HS F5
3 µm									
	1	5	581311-U	565309-U	inquire	inquire	inquire	581412-U	inquire
	1	10	581364-U	565389-U	581600-U	inquire	581520-U	581435-U	inquire
	1	15	581365-U	65566-U	581601-U	inquire	581521-U	581436-U	inquire
	2.1	2	581312-U	565313-U	inquire	inquire	inquire	581413-U	inquire
	2.1	3	581313-U	565314-U	581602-U	inquire	581522-U	581414-U	567501-U
	2.1	5	581300-U	565300-U	581603-U	577308-U	581500-U	581400-U	567500-U
	2.1	10	581301-U	565301-U	581604-U	577309-U	581501-U	581401-U	567502-U
	2.1	15	581302-U	565302-U	581605-U	577310-U	581502-U	581402-U	567503-U
	3	2	581314-U	565315-U	inquire	inquire	inquire	581415-U	inquire
	3	3	581302-U	565310-U	581606-U	inquire	581523-U	581403-U	567505-U
	3	5	581307-U	565311-U	inquire	inquire	inquire	581404-U	inquire
	3	10	581308-U	565312-U	581607-U	inquire	581503-U	581405-U	567581-U
	4.6	2	581315-U	565316-U	inquire	inquire	inquire	581416-U	inquire
	4.6	3	581316-U	565317-U	inquire	inquire	inquire	581417-U	567509-U
	4.6	5	581320-U	565320-U	581608-U	577311-U	581504-U	581406-U	567504-U
	4.6	10	581321-U	565321-U	581609-U	577312-U	581505-U	581407-U	567505-U
	4.6	15	581322-U	565322-U	581610-U	inquire	581506-U	581408-U	567507-U
5 µm									
	2.1	2	581368-U	565391-U	inquire	inquire	inquire	581439-U	inquire
	2.1	3	581327-U	565331-U	inquire	inquire	inquire	581430-U	inquire
	2.1	5	581303-U	565303-U	581611-U	577300-U	581507-U	581420-U	567508-U
	2.1	10	581326-U	565304-U	581612-U	577301-U	581508-U	581419-U	567510-U
	2.1	15	581304-U	565305-U	581613-U	577303-U	581509-U	581421-U	567511-U
	2.1	25	581305-U	565306-U	581614-U	inquire	581510-U	581422-U	567512-U
	3	2	581328-U	565332-U	inquire	inquire	inquire	581431-U	inquire
	3	3	581369-U	565392-U	inquire	inquire	inquire	581440-U	inquire
	3	5	581329-U	565333-U	inquire	inquire	inquire	581432-U	inquire
	4.6	2	581330-U	565335-U	inquire	inquire	inquire	581433-U	inquire
	4.6	3	581331-U	565336-U	inquire	inquire	inquire	581434-U	inquire
	4.6	5	581323-U	565323-U	581615-U	577304-U	581511-U	581423-U	567513-U
	4.6	10	inquire	565328-U	inquire	577305-U	inquire	inquire	567515-U
	4.6	15	581324-U	565324-U	581616-U	577306-U	581512-U	581424-U	567516-U
	4.6	25	581325-U	565325-U	581617-U	577307-U	581513-U	581425-U	567517-U
	10	5	581340-U	565340-U	inquire	inquire	inquire	inquire	567518-U
	10	10	581341-U	565341-U	inquire	inquire	inquire	inquire	567537-U
	10	15	581342-U	565343-U	inquire	inquire	inquire	inquire	567519-U
	10	25	581343-U	565344-U	581618-U	inquire	581514-U	inquire	567520-U
	21.2	5	581344-U	565345-U	inquire	inquire	inquire	inquire	inquire
	21.2	25	581347-U	565348-U	581619-U	inquire	581515-U	inquire	567523-U
10 µm									
	4.6	15	581350-U	565352-U	inquire	inquire	inquire	inquire	inquire
	4.6	25	581351-U	565353-U	inquire	inquire	581524-U	inquire	inquire
	10	5	581352-U	565354-U	inquire	inquire	inquire	inquire	inquire
	10	10	581353-U	565355-U	inquire	inquire	inquire	inquire	inquire
	10	15	581354-U	565356-U	inquire	inquire	inquire	inquire	inquire
	10	25	581355-U	565357-U	inquire	inquire	581516-U	inquire	inquire
	21.2	5	581356-U	565358-U	inquire	inquire	inquire	inquire	inquire
	21.2	10	581357-U	565359-U	inquire	inquire	inquire	inquire	inquire
	21.2	15	581358-U	565360-U	inquire	inquire	inquire	inquire	567528-U
	21.2	25	581359-U	565361-U	inquire	inquire	581517-U	inquire	567529-U

	ID (mm)	Length (cm)	Particle Size (µm)	Ascentis C18	Ascentis RP-Amide	Ascentis Phenyl	Ascentis Silica	Ascentis C8	Discovery HS F5
Ascentis Supelguard Cartridges									
Kit	2.1	2	3	581376-U	inquire	inquire	inquire	inquire	567571-U
Pack of 2	2.1	2	3	581377-U	inquire	inquire	inquire	inquire	567570-U
Pack of 2	2.1	2	5	581370-U	565372-U	inquire	inquire	inquire	567574-U
Kit	2.1	2	5	581371-U	565373-U	inquire	inquire	inquire	567575-U
Pack of 2	3	2	5	581374-U	565374-U	inquire	inquire	inquire	inquire
Kit	3	2	5	581375-U	565375-U	inquire	inquire	inquire	inquire
Kit	4	2	3	581378-U	inquire	inquire	inquire	inquire	567573-U
Pack of 2	4	2	3	581379-U	inquire	inquire	inquire	inquire	567572-U
Pack of 2	4	2	5	581372-U	565370-U	581620-U	581518-U	581426-U	567576-U
Kit	4	2	5	581373-U	565371-U	581621-U	581519-U	581427-U	567577-U

Kits include one cartridge, stand alone holder, a piece of tubing, 2 nuts and 2 ferrules.

Ascentis Validation Packs									
	4.6	15	5	581390-U	565394-U	581695-U	inquire	inquire	inquire
	4.6	25	5	581391-U	565395-U	581696-U	inquire	inquire	inquire

Validation Packs include 3 columns, each from a different bond lot.

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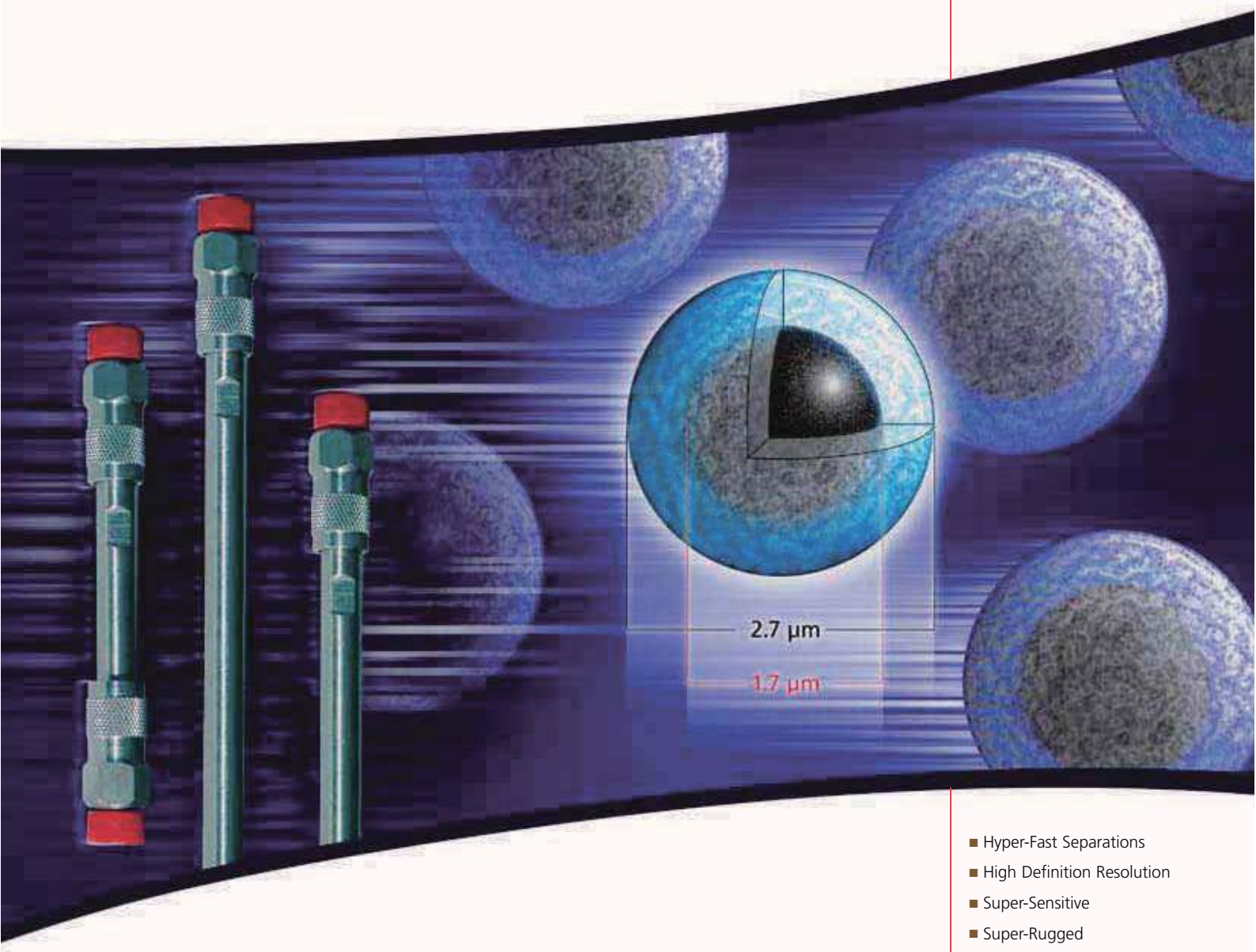
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Ascentis Express HPLC Columns with Fused-Core Technology

Extreme Performance on **Any** LC System

SUPELCO Analytical



- Hyper-Fast Separations
- High Definition Resolution
- Super-Sensitive
- Super-Rugged

SIGMA-ALDRICH®



A Breakthrough in HPLC Performance

The Fused-Core Advantage

Ascentis Express provides the high speed and high efficiency of sub-2 µm particles, but at approximately half the backpressure for the same column length. This lower pressure means that Ascentis Express can be run on conventional HPLC and LC-MS systems, as well as mid-pressure, UPLC™ and other ultra-high pressure systems. Lower pressure also means longer columns can be used for additional resolving power. Ascentis Express offers these benefits over sub-2 µm particles, along with excellent column lifetime.

At the heart of Ascentis Express is the 2.7 µm Fused-Core™ particle which comprises a 1.7 µm solid core and a 0.5 µm porous shell (Figure 1). Compared to totally porous particles, the Fused-Core particles have a much shorter diffusion path because of the solid core. This partial porosity reduces axial dispersion of solutes and minimizes peak broadening. Other features, such as a very tight particle size distribution and high packing density, result in Ascentis Express columns that are capable of 240,000 N/m. This is comparable to the efficiency of sub-2 µm particle columns and nearly twice the efficiency possible with 3 µm particles.

While the Ascentis Express efficiency is as high as sub-2 µm columns, the larger particle size delivers approximately half the backpressure for the same column dimensions and conditions. This allows Ascentis Express to turn any HPLC system into an extreme performance workhorse for your lab

Figure 1. Fused-Core Structure of Ascentis Express Compared to Totally Porous Particles

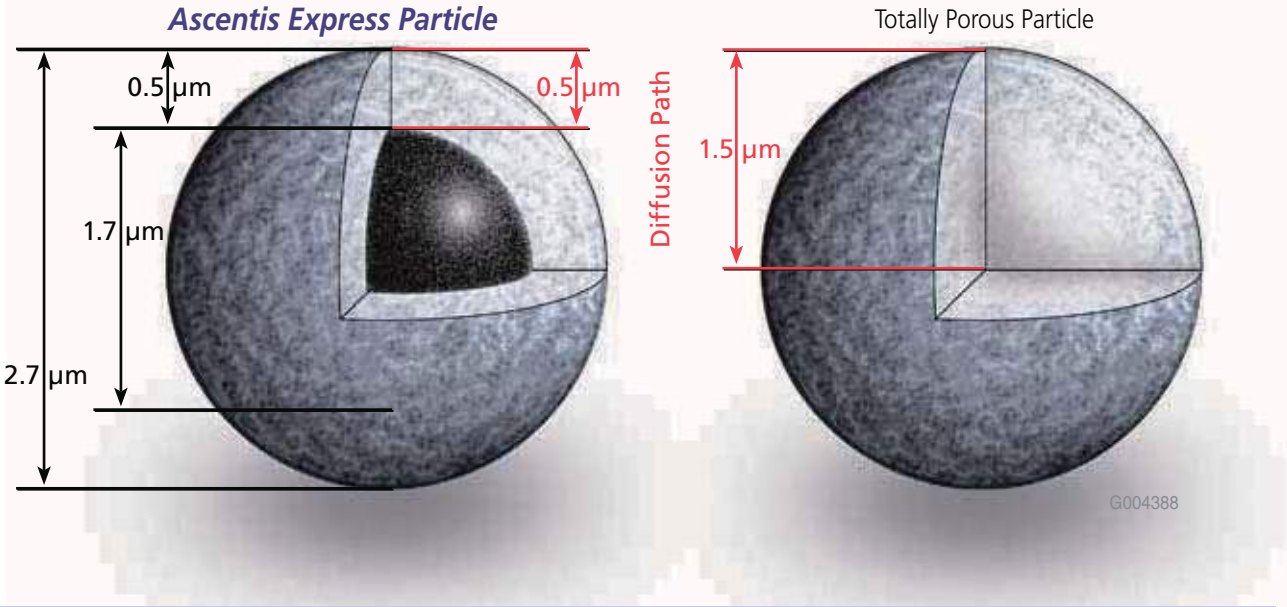


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Ascentis Express FAQs

What is unique about Ascentis Express?

Ascentis Express columns provide a breakthrough in HPLC performance. Based on Fused-Core particle technology, Ascentis Express provides the benefits of sub-2 µm particles but at much lower backpressure. These benefits include the capability of providing fast HPLC and higher resolution chromatography. The Fused-Core particle consists of a 1.7 µm solid core and a 0.5 µm porous shell. A major benefit of the Fused-Core particle is the small diffusion path (0.5 µm) compared to conventional fully porous particles. The shorter diffusion path reduces axial dispersion of solutes and minimizes peak broadening.

What phases are available in Ascentis Express?

Currently, C18, C8, RP-Amide, and HILIC (bare silica) phases are available for Ascentis Express.

When are additional phases expected?

Additional phases are being developed. The best way to track new products is to visit *sigma-aldrich.com/express* for the latest updates.

Can I use Ascentis Express on any type of HPLC system?

Ascentis Express HPLC columns are capable of use on standard HPLC systems as well as UHPLC systems. Columns are packed in high pressure hardware capable of withstanding the pressures used in UHPLC systems.

Is there anything I need to do to my HPLC system to use Ascentis Express?

Nothing special is required to use Ascentis Express HPLC columns. To obtain the full benefits of Ascentis Express, one should minimize dispersion or instrument bandwidth in the HPLC system (tubing, detector flow cell) as well as confirm the detector response system is set at a fast level. For more information, request Guidelines for Optimizing Systems for Ascentis Express Columns (T407102) or visit *sigma-aldrich.com/express* and download.

How can I measure my instrument bandwidth (IBW) and determine what columns can be used with minimal efficiency loss created by too much internal instrument volume?

For simple instructions on how to measure IBW, request *Guide to Dispersion Measurement* (T408143) or visit our website *sigma-aldrich.com/express* and download.

Do I need special fittings and tubing to connect Ascentis Express columns?

While operating pressures may not exceed the 400 bar (6,000 psi) capability of your traditional instruments, sustained pressures of about 200 bar (3,000 psi) will exceed the recommended pressure for conventional PEEK tubing and fittings at the column inlet. We recommend changing to stainless steel fittings in all high pressure locations and have designed special low-dispersion connectors (pg. 14) that will stay tight at pressures of 1,000 bar (15,000 psi) or greater, even when elevated column temperatures are employed.

Can I use Ascentis Express on a UHPLC system?

Yes. Ascentis Express columns are packed in a way making them suitable for these ultra high pressure instruments. In fact, Ascentis Express outperforms sub-2 µm columns on many applications since Ascentis Express provides the benefits of sub-2 µm particles but at much lower backpressure.

Can Ascentis Express columns be used for LC-MS?

Ascentis Express Fused-Core particles were designed with LC-MS in mind. Even extremely short column lengths exhibit sufficient plate counts to show high resolving power. The flat van Deemter plots permit resolution to be maintained at very high flow rates to maximize sample throughput. All Ascentis stationary phases have been evaluated for MS compatibility during their development, and the Express phases are no exception. A bonus of Ascentis Express columns for high throughput UHPLC and LC-MS is that they are extremely rugged and highly resistant to plugging, a very common failure mode for competitor columns.

What flow rate should I use with Ascentis Express columns?

Based on the minimum in the van Deemter curves, higher flows than 5 µm particle columns are required in order to maximize Ascentis Express column efficiency.

Ascentis Express HPLC Column ID	Suggested Starting Point for Flow Rate
4.6 mm I.D.	1.6 mL/min
3.0 mm I.D.	0.8 mL/min
2.1 mm I.D.	0.4 mL/min

Are guard columns available?

Guard columns packed with Ascentis Express are currently not available. Ascentis Express columns are rugged and almost all users prefer operation of Ascentis Express columns without a guard column. If you would like to use a guard column, we recommend the Ascentis guard columns.

Hyper-Fast Separations

Double the Speed

- Designed for high flow rates
- Half the backpressure of sub-2 µm particles

Compared to sub-2 µm particles, the 2.7 µm Ascentis Express particles generate approximately half the back-pressure. This permits both longer columns and faster flow rates.

Figure 2 shows the separation of a steroid mixture on Ascentis Express (top) and a conventional sub-2 µm column (lower) of the same dimensions. Because higher flow rates on Ascentis Express – even doubled in this example – generate similar backpressure, hyper fast separations are possible that have efficiency and resolution equal to the sub-2 µm particle column.

Shown in Figure 3 is a comparison against a traditional 15 cm, 5 µm column and a 5 cm, Ascentis Express. The chromatograms further illustrate the high-speed capabilities of Ascentis Express at backpressures manageable by all HPLC systems. High flow rates are quite amenable to Ascentis Express HPLC columns due to the Fused-Core particle.

Figure 2. Hyper-Fast Separations on Ascentis Express: Twice the Speed at Equivalent Pressure

columns: Ascentis Express C18, 10 cm x 2.1 mm I.D., 2.7 µm particles (53823-U) and sub-2 µm particle column (same dimensions)
mobile phase: 49:51 or 55:45, water:acetontrile
flow rate: 0.4 or 0.2 mL/min.
temp.: ambient
det.: UV at 200 nm
injection: 1 µL

1. Estradiol
2. β-Estradiol
3. Impurity
4. Estrone
5. Estrone degradant

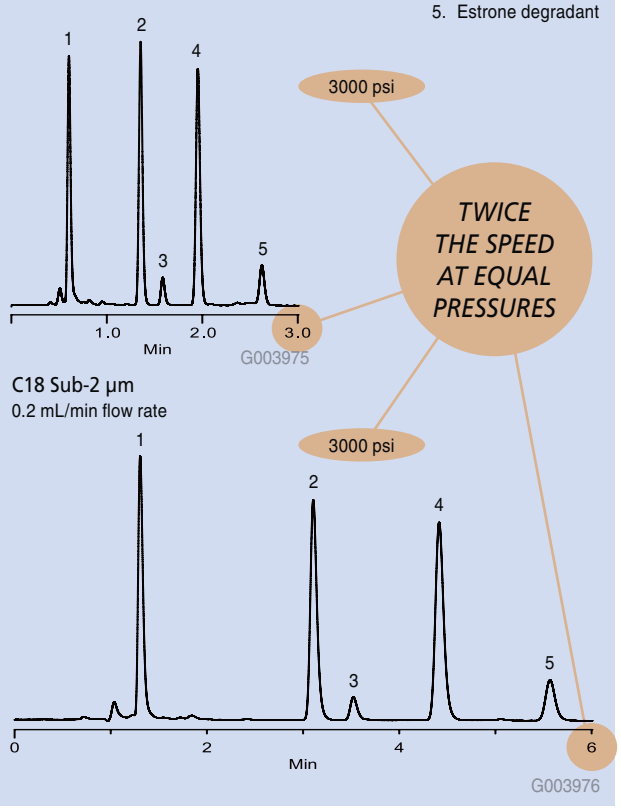
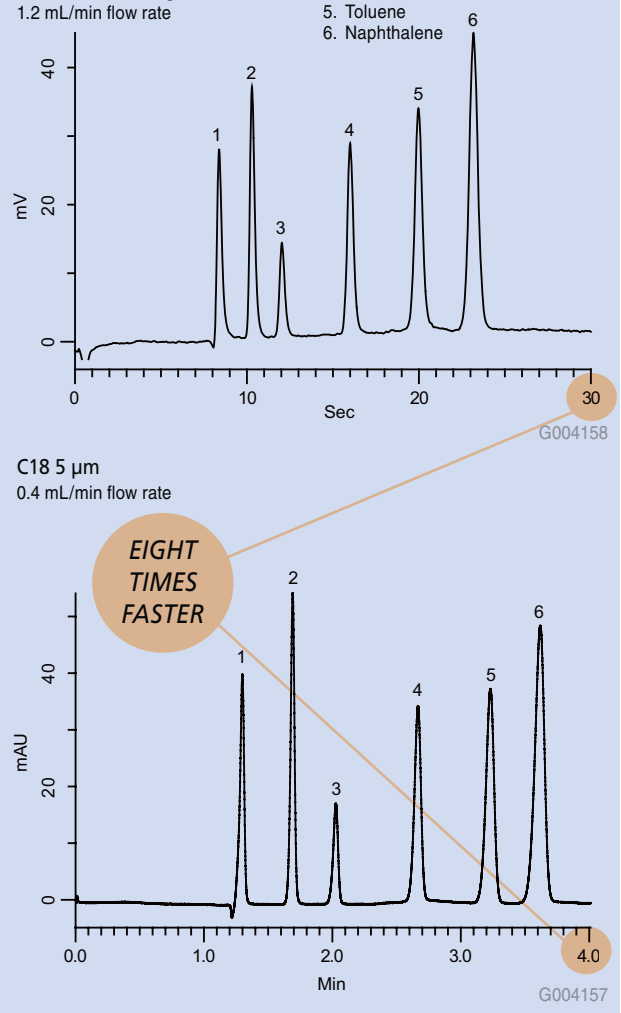


Figure 3. Hyper-Fast Separations on Ascentis Express: Eight Times the Speed of Traditional Columns

column: Ascentis Express C18, 5 cm x 3.0 mm I.D. and 5 µm particle column, 15 cm x 3.0 mm I.D.
mobile phase: 31:69, water:acetonitrile
flow rate: 1.2 mL/min or 0.4 mL/min
temp.: 35° C
inj.: 0.5 µL

1. Uracil
2. Phenol
3. Acetophenone
4. Benzene
5. Toluene
6. Naphthalene



High Definition "HD"-Resolution

Double the Efficiency

- Short analyte diffusion path
- Twice the efficiency of 3 µm particles
- Longer columns permit doubling the plates over sub-2 µm particles

Compared to conventional 3 µm and 5 µm particles, Ascentis Express HPLC columns provide sharper peaks under the same conditions. By simply swapping in an Ascentis Express HPLC column of the equivalent dimensions to your current 3 µm and 5 µm particle HPLC columns, an improvement in resolution can be achieved. This improvement is shown in Figure 4. Note: Remember Ascentis Express HPLC column recommended flow rates are higher than that for conventional 3 µm and 5 µm particles.

Ascentis Express and sub-2 µm columns of the same dimensions give approximately the same number of theoretical plates (efficiency). However, because Ascentis Express columns are more permeable and exhibit half the backpressure, you can use longer columns for even more resolving power. The high backpressure generated by the sub-2 µm particles precludes the use of longer columns, even on ultra-high pressure systems under ambient conditions.

An example of the HD-Resolution is shown in Figure 5 where the additional theoretical plates on the 10 cm Ascentis Express column provided significantly better resolution of β-estradiol and the impurity compared to the 5 cm sub-2 µm column at comparable backpressures.

Figure 4. HD-Resolution on Ascentis Express: Sharper Peaks than Traditional Columns

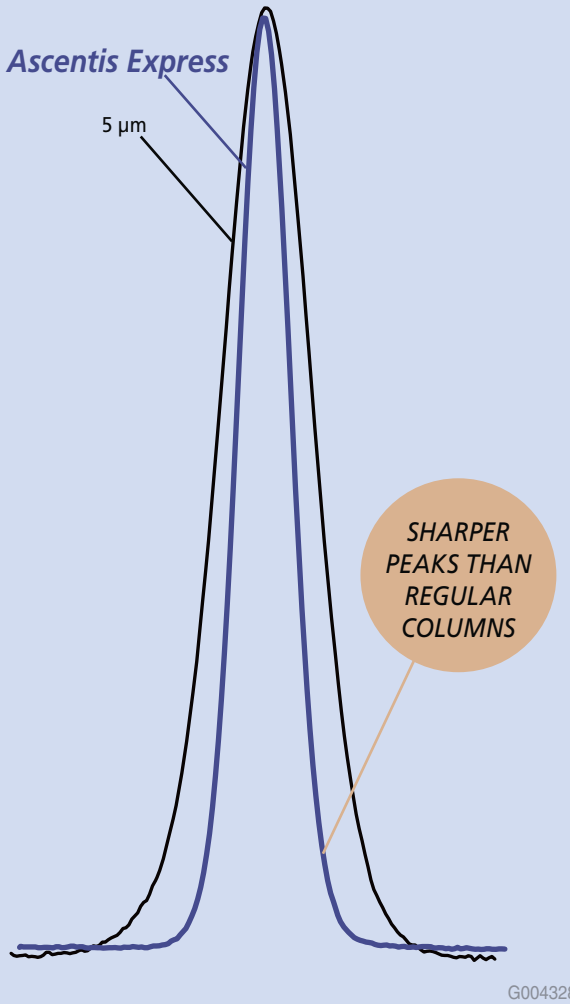
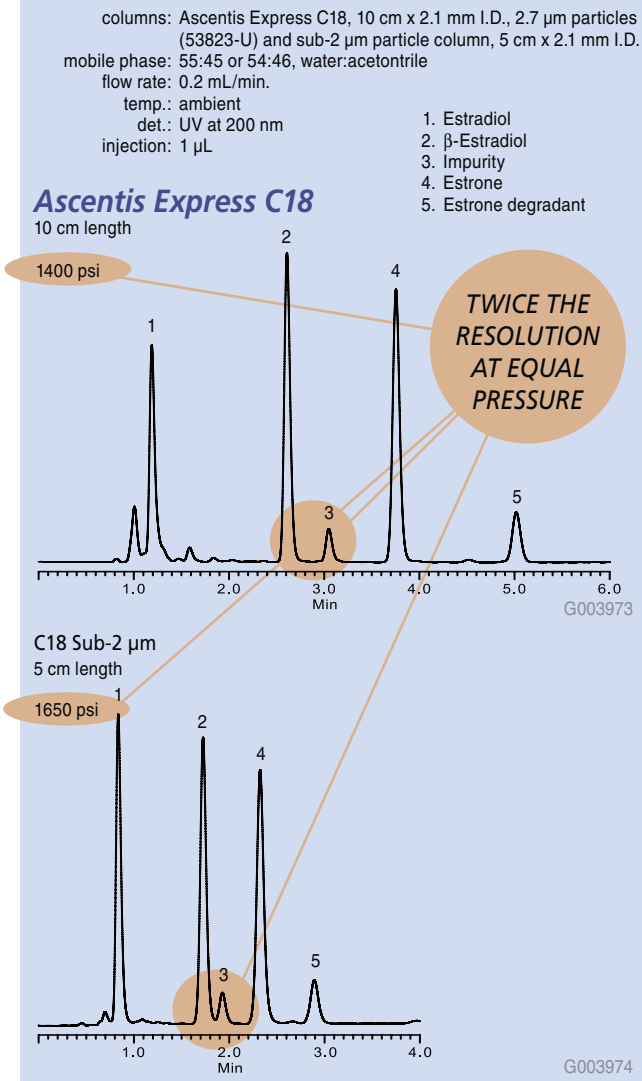


Figure 5. HD-Resolution on Ascentis Express Compared to Sub-2 µm Columns



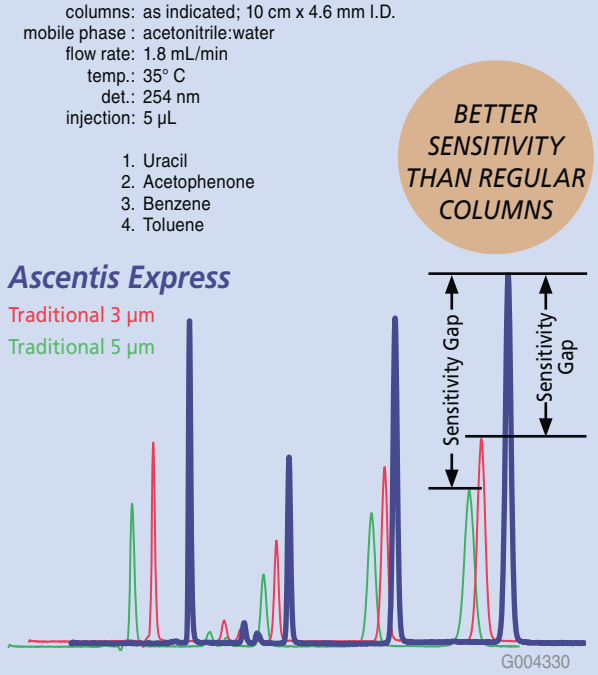
Super-Sensitive

High Sample Loading Capacity and Signal/Noise for Trace Analysis

- High column efficiency for high S/N
- High sample loading from thick, porous shell layer

Trace analysis benefits from high column efficiency. Efficient peaks are taller and provide higher S/N ratios. As discussed in earlier sections of this brochure, the Ascentis Express columns can provide higher efficiency than any traditional particle. The added sensitivity of the higher efficiency Ascentis Express particles is visualized as the "sensitivity gap" in Figure 6.

Figure 6. Higher Efficiency of Ascentis Express Provides Better Sensitivity than Traditional Columns



Although they have a solid core, the 0.5 µm-thick "shell" of the Fused-Core particles provides roughly 75% of the surface area as a totally porous particle of the same diameter. Only the pores with very long diffusion paths are fused in the Ascentis Express HPLC columns. The resulting particles have effective surface areas of ~225 m^2/g; comparable to totally porous particles. The higher surface area gives higher sample loading capacity compared to sub-2 µm particles, as evidenced by the symmetry vs. concentration relationship in Figure 7. Above 5 ppm, the sub-2 µm experiences sample overload and subsequent loss of peak shape.

Figure 7. Higher Loading Capacity of Ascentis Express Compared to Sub-2 µm Particles

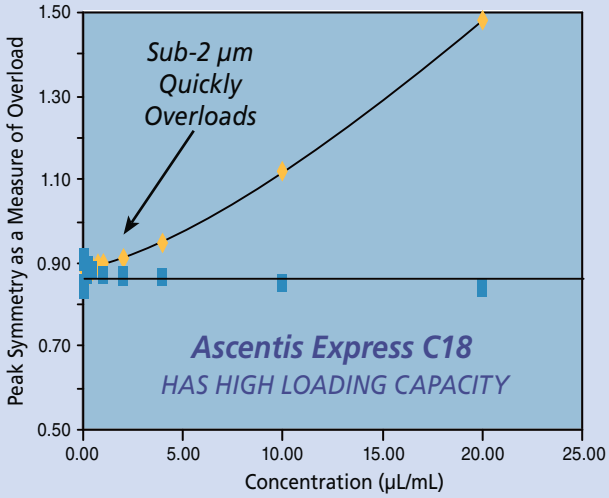
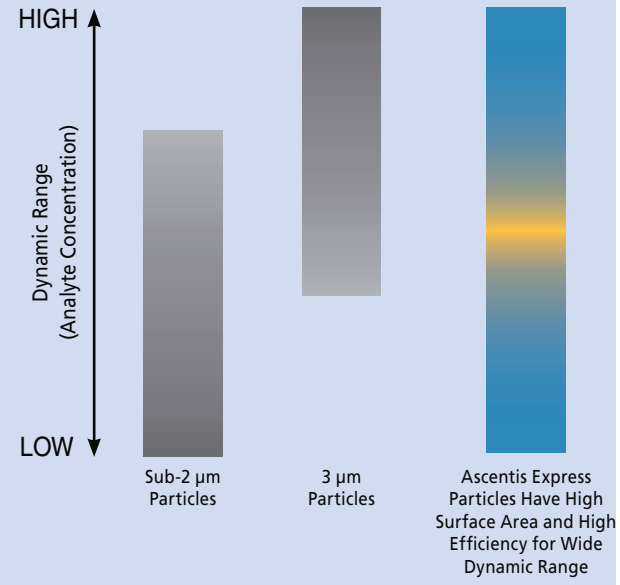


Figure 8 shows how Ascentis Express extends the dynamic range. It has the high efficiency of sub-2 µm particles needed for trace analysis, and the high surface area of totally porous particles needed for high sample capacity.

Figure 8. Extended Dynamic Range of Ascentis Express



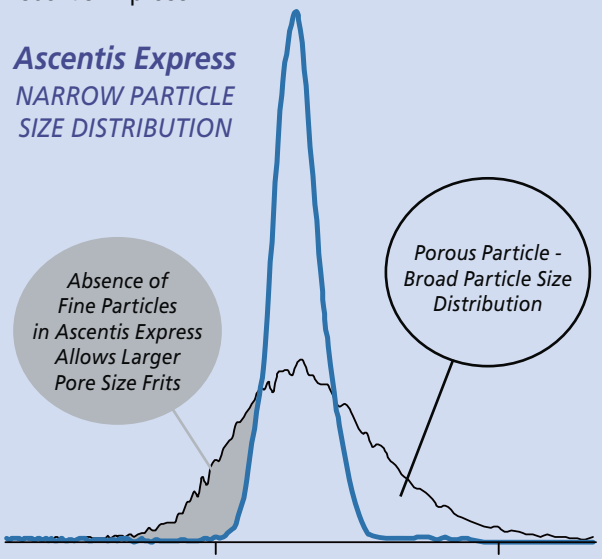
Super-Rugged Columns

Extended Column Lifetime Compared to Both 3 µm and sub-2 µm Columns

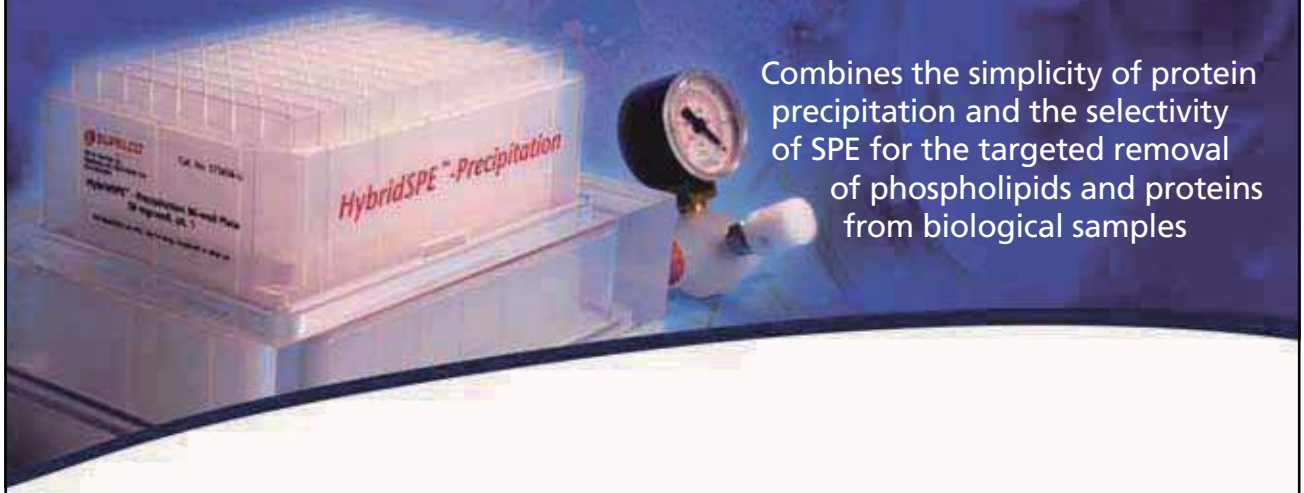
- Narrow particle size distribution allows use of 2 µm frits
- Dense particles for more stable bed

Fused-Core particles are produced in a way that yields an extremely narrow particle size distribution (Figure 9). This narrow particle size distribution permits the use of frits with nominal 2 µm pores, the same as used on most columns packed with 5 µm particles. In comparison, sub-2 µm particles require frits with much smaller pore size – 0.5 µm or smaller – that are prone to fouling, lead to peak-splitting and high backpressure, and ultimately shorten the column lifetime. Another feature of the Fused-Core particles that contributes to their ruggedness is that they are denser than totally porous particles and form highly stable beds in the packed column.

Figure 9. Narrow Particle Size Distribution of Ascentis Express



Sample Prep Simplicity



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Alternative Selectivity with Ascentis Express RP-Amide

Ascentis Express RP-Amide can solve

- Co-eluting peaks
- Unresolved components
- Poor retention of polar compounds
- Peak tailing of basic compounds
- Silanol interactions causing poor reproducibility

While the Ascentis Express C18 provides classic reversed-phase selectivity, the Ascentis Express RP-Amide provides increased selectivity for polar compounds, especially those that can act as a hydrogen-bond donor. Other attributes of the RP-Amide include improved peak shape for bases, 100% aqueous compatibility, and low bleed for LC-MS applications.

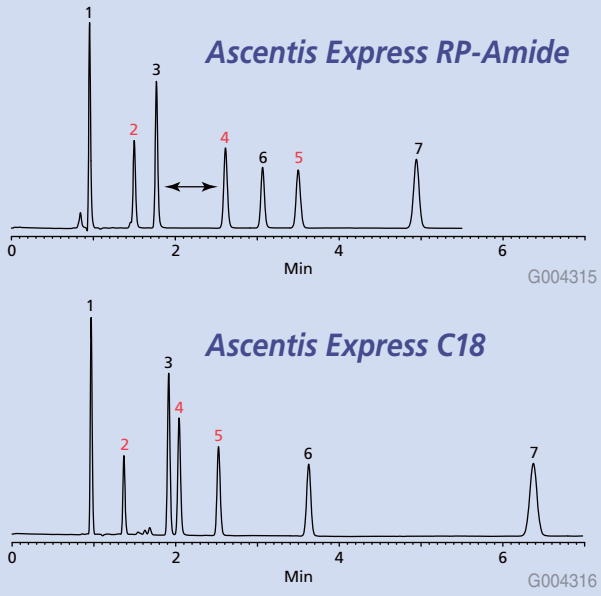
The amide group provides enhanced selectivity with analytes that have hydrogen bonded to a heteroatom. Phenols, carboxylic acids, amines and, to a lesser extent, alcohols show enhanced retention on the RP-Amide phase when compared to neutral non-polar analytes. An example of the power of the hydrogen bonding mechanism is shown in Figure 10. The Ascentis Express C18 and RP-Amide columns are compared. The analyte mixture contains neutral, non-polar analytes (benzene and toluene) and protic analytes (p-methoxyphenol, p-nitrobenzoic acid, and p-chlorophenol). As observed from the chromatograms in Figure 1, the neutral molecules show slightly reduced retention on the RP-Amide, but the protic molecules show greatly enhanced retention yielding a chromatogram with very different selectivities and even a change in elution order. The potential for solving separations difficulties is tremendous.

Two other points should be noted. The Ascentis Express RP-Amide has the same high efficiency as the Ascentis Express C18 with the same low back-pressure. Secondly, both separations were carried out in the same mobile phase. This is important since it simplifies method development. If a separation is not adequate on an Express C18, there is no need to change mobile phase to optimize the separation, simply switch to the Ascentis Express RP Amide and if protic moieties are present, a change in selectivity will be achieved.

Figure 10. Alternative Selectivity Provided by Ascentis Express RP-Amide Compared to C18

columns: Ascentis Express RP-Amide, 10 cm x 4.6 mm I.D.
Ascentis Express C18, 10 cm x 4.6 mm I.D.
mobile phase: 40:60, 0.1% formic acid in water:methanol
flow rate: 1.0 mL/min
temp.: 25° C
det.: 254 nm
injection: 5 µL

1. Uracil
2. p-Methoxyphenol
3. Acetophenone
4. p-Nitrobenzoic acid
5. p-Chlorophenol
6. Benzene
7. Toluene



Ascentis Express RP-Amide Applications

- Natural products
- Phenolics
- Bases
- Metabolites
- Polar Compounds

Polar Compound Retention with Ascentis Express HILIC

Benefits of HILIC Separation

- Retention of highly polar analytes like metabolites
- Complimentary selectivity to reversed-phase chromatography
- Increased MS sensitivity
- Quick transfer from final steps of sample prep (SPE, protein precipitation, etc.)

HILIC chromatography is gaining popularity due to increased retention of polar compounds. Many classes of polar compounds can be retained in HILIC. These include polar neutrals, polar acids, and polar and non-polar basic amines. Both polar and ionic interactions can contribute to retention and selectivity in this mode of chromatography.

How HILIC works

HILIC separates compounds by using a mostly organic mobile phase across a polar stationary phase, causing solutes to elute in order of increasing polarity-the opposite of Reversed-Phase. Retention in HILIC is likely to be a combination of hydrophilic interaction, ion-exchange, and some reversed-phase retention. A typical mobile phase consists of 60-95% acetonitrile and an aqueous buffer. 10-20 mM ammonium acetate or ammonium formate are useful due to volatility and solubility. The sample solvent should be similar in type and strength as the mobile phase. The sample solvent can contain a higher amount of organic than the mobile phase, but should not contain more water than the mobile phase.

Shown in Figure 11 is a comparison of the analysis of highly polar molecules on Ascentis Express HILIC and Ascentis Express C18.

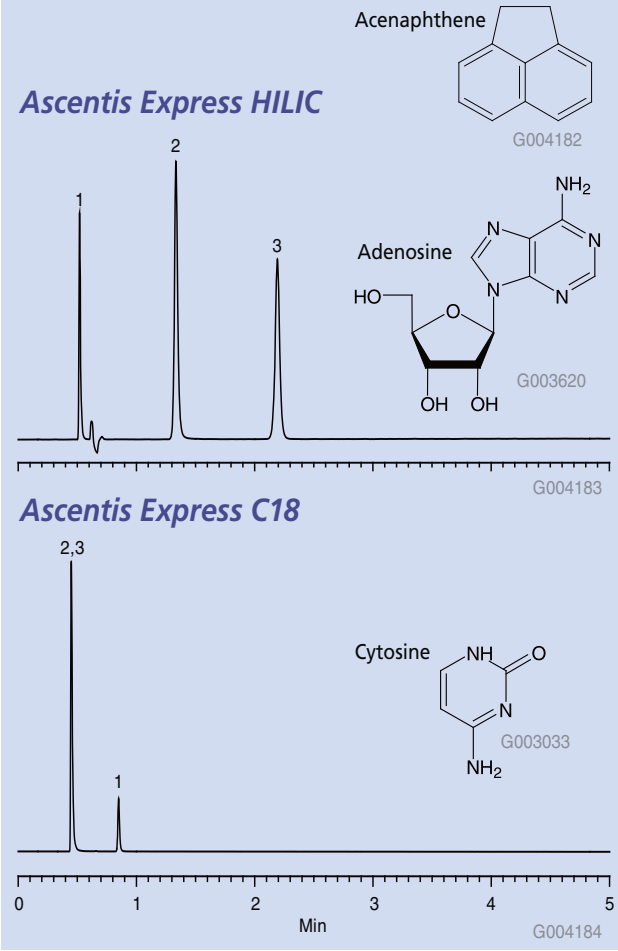
Ascentis Express HILIC Applications

- Amino acids
- Small, polar acids – (metabolomics)
- Biogenic amines – (neurotrans-mitters, contaminants in food & beverage)
- Phosphates – (pesticides, herbicides)
- Sugars
- Drug metabolites and conjugates

Figure 11. Comparison of the Analysis of Polar Molecules on Ascentis Express HILIC and Ascentis Express C18

columns: Ascentis Express HILIC, 10 cm x 2.1 mm ID, 2.7 µm particles (53939-U)
Ascentis Express C18, 10 cm x 2.1 mm ID, 2.7 µm particles (53823-U)
mobile phase: 10:90; 100 mM ammonium formate, pH 3.0 with concentrated formic acid:acetonitrile
flow rate: 0.4 mL/min
temp.: 35 °C
det.: UV at 254 nm
injection: 1 µL

1. Acenaphthene, 80 µg/mL in mobile phase
2. Adenosine, 35 µg/mL in mobile phase
3. Cytosine, 75 µg/mL in mobile phase



Improving HPLC Sample Throughput

Do More Work in Less Time Without Changing Your Method

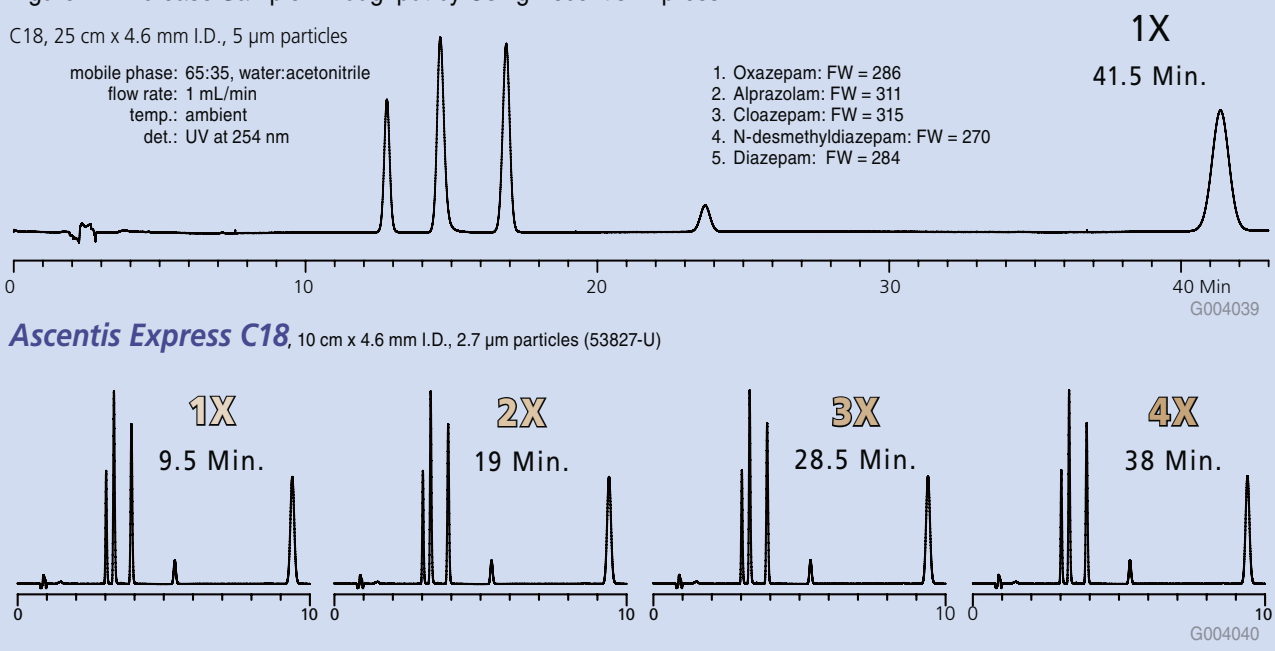
The demand for increased sample throughput and speed of results has driven HPLC users to search for breakthroughs in HPLC instruments and column technology. Although improvements have been realized, setbacks have been encountered. Reduction in column ruggedness, costly replacements of existing instrumentation, and difficulties in transferring methods to new systems have often made these past improvements unappealing to analysts.

The Fused-Core HPLC particle technology behind Ascentis Express permits 4- to 6-fold reduction in analysis time, with a subsequent increase in sample throughput compared to conventional HPLC columns, without sacrificing resolution or column ruggedness and without the need to change systems or sample prep procedures The current high resolution column for traditional HPLC methods is a 25 cm column packed with 5 µm particles.

Until now, this dimension provided the most efficiency within the pressure limit of a conventional HPLC system. With the high efficiency Ascentis Express, one can now achieve the same number of plates as a 25 cm column packed with 5 µm particles with a 10 cm column or even more efficiency and resolution with a 15 cm Ascentis Express column. Therefore, by simply changing columns and keeping all other conditions the same, you can reduce the runtime and increase the resolution of your method.

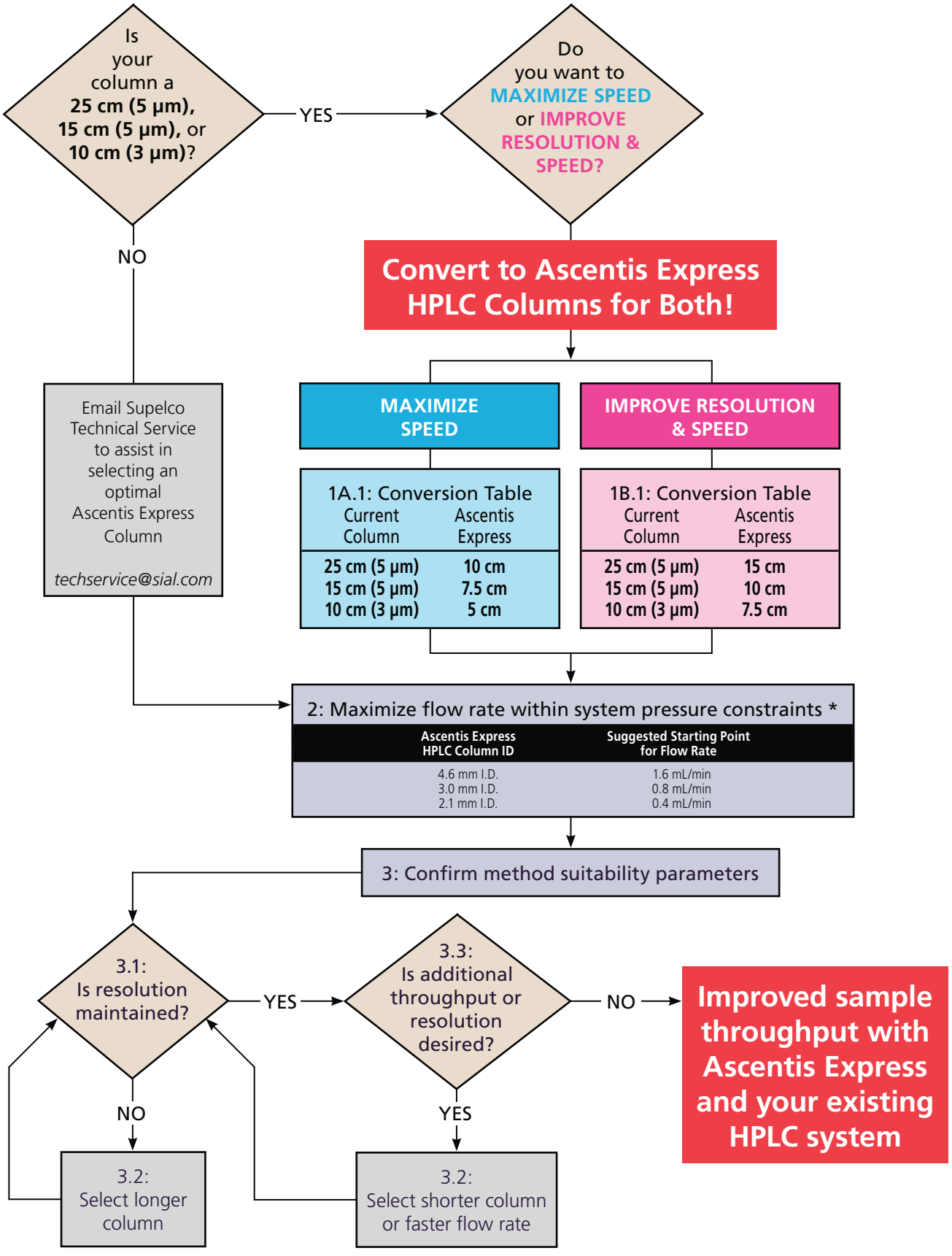
Figure 12 compares the resolution of a five-component sample on 25 cm, 5 µm C18 and 10 cm Ascentis Express C18 columns. Each column has approximately the same number of theoretical plates and hence the same resolving power. However the shorter Ascentis Express column delivers this separation in a much shorter time, in this case less than one-fourth the time as the 25 cm column.

Figure 12. Increase Sample Throughput by Using Ascentis Express



Ready to do more work in less time? See the flow chart on the next page.

Selecting the Optimal Ascentis Express Column



*Read *Guidelines for Optimizing Systems for Ascentis Express Columns* (T407102) and *Guide to Dispersion Measurement* (T408143).

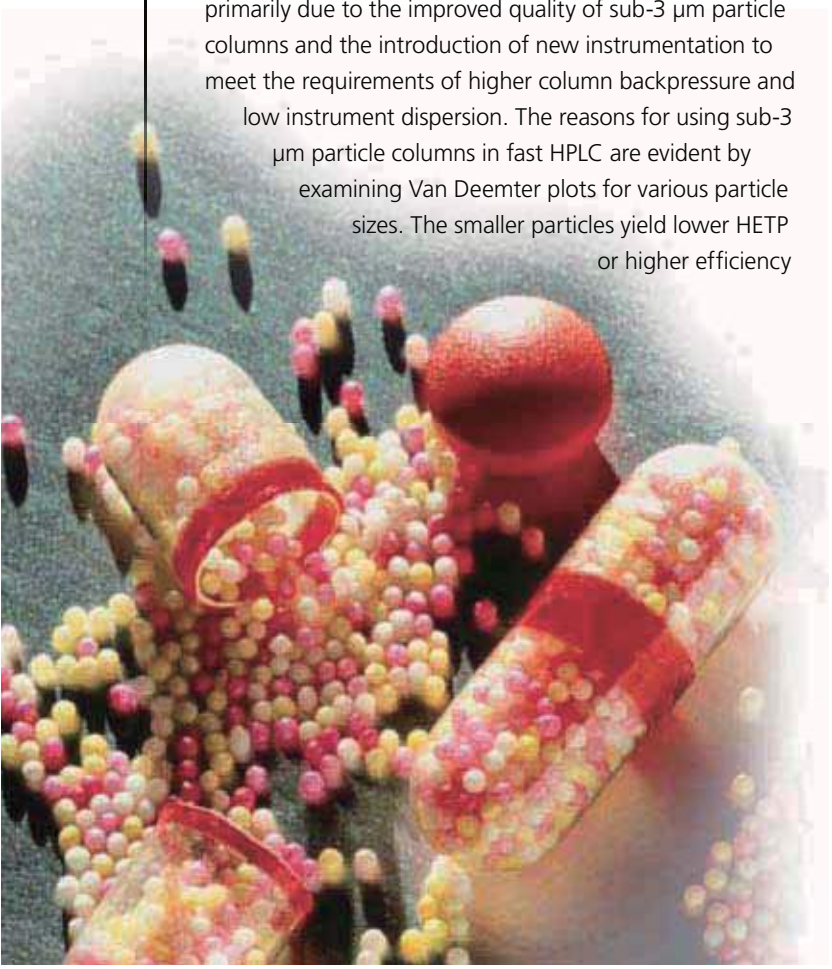
Fast HPLC for Rapid Screening of Pharmaceutical Compounds

Ideal for Walk-up LC-MS Systems

HPLC is critical to the discovery, development and eventual commercialization of pharmaceutical products. HPLC is the benchmark analytical method in the pharmaceutical industry due to its ability to score such high marks in analytical validation characteristics including accuracy, precision, limit of detection, specificity, linearity and range, and ruggedness. No other analytical techniques can consistently score high in all characteristics on compounds and matrices that are of interest to the pharmaceutical industry.

Furthermore, it has been generally accepted that a typical HPLC analysis takes 15-30 minutes with some as great as an hour. When multiplied by the number of samples to be analyzed either in discovery or product release, the total instrument time required is staggering. This overwhelming amount of instrument time has resulted in a growing number of instruments, around-the-clock analysis, and a push for faster methods.

Fast HPLC, using short columns (3-10 cm) packed with small particles (<3 µm) and high flow rates has recently become an effective means to reduce analysis time. This is primarily due to the improved quality of sub-3 µm particle columns and the introduction of new instrumentation to meet the requirements of higher column backpressure and low instrument dispersion. The reasons for using sub-3 µm particle columns in fast HPLC are evident by examining Van Deemter plots for various particle sizes. The smaller particles yield lower HETP or higher efficiency per unit length. Furthermore, the optimum flow rate is higher for smaller particles. Smaller particle columns have less efficiency loss at high flow rates because mass transfer is less sensitive to velocity changes as illustrated by "flatter" Van Deemter plots.



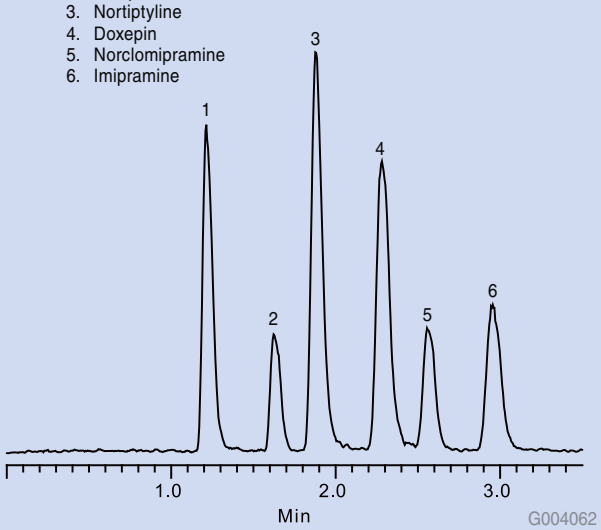
Unfortunately, column backpressure increases at a greater rate than column efficiency as you decrease particle size. This increase in backpressure is so great for sub-2 µm particle columns that they are practically unusable using standard HPLC systems.

Shown in Figures 13-15 are the chromatograms for the separation of three sets of closely related pharmaceutical compounds. These examples include both basic and neutral as well as polar and non-polar compounds. While each example utilizes 2.1 mm I.D. columns, three different flow rates and three unique mobile phase conditions are presented to demonstrate the versatility of fast HPLC with Fused-Core particle columns.

Figure 13. TCAs on Ascentis Express

column:	Ascentis Express C18, 10 cm x 2.1 mm ID (53823-U)
instrument:	Jasco X-LC
mobile phase A:	100 mM ammonium acetate (pH 7.0; titrated with ammonium hydroxide)
mobile phase B:	water
mobile phase C:	methanol
mobile phase ratios:	A:B:C = 10:30:60
flow rate:	0.3 mL/min
temp.:	55 °C
det.:	Thermo LCQ Advantage; ESI(+), m/z 250-320
injection:	1 µL

1. Nordoxepin
2. Desipramine
3. Nortiptyline
4. Doxepin
5. Norclomipramine
6. Imipramine





Shown in Figure 13 is the separation of six tricyclic antidepressants (TCAs). The separation of these closely related compounds was performed under isocratic mobile phase conditions with mass spectrometric (MS) detection. Baseline resolution was achieved with a total separation time of 3 minutes demonstrating not only the potential speed of the Ascentis Express columns but also the resolving power. Note the MS compatible mobile phase and flow rate. Furthermore, the use of 2.1 mm I.D. columns provides a reduction in solvent consumption compared to typical flow rates for 4.6 mm I.D. or monolithic columns.

Data in Figure 14 further illustrates the speed in which closely related compounds can be resolved using the Fused-Core particle. In this example, four β-blockers are resolved in less than one minute under isocratic conditions utilizing MS detection. While a 10 cm column was utilized for the TCAs separation, a 5 cm column was used for the β-blockers example.

The separation of three steroids as well as a related impurity and degradant is shown in Figure 15. A high mobile phase flow rate of 0.6 mL/min was utilized and is suitable for Ascentis Express columns due to the Van Deemter curve associated with these columns. Isocratic mobile phase conditions were utilized as well as UV detection at 200 nm, a common detection wavelength for impurity profiling. Again, baseline resolution was achieved for all compounds with a total runtime of less than two minutes. It should be noted that the isocratic conditions used in these examples further enhances sample throughput versus gradient conditions due to no need for column re-equilibration. With a backpressure of just 4500 psi, this analysis could be performed on almost any HPLC system. A similar separation was attempted using a sub-2 µm particle column but was not possible given the same instrument constraints put on the Ascentis Express column.

Figure 14. β-Blockers on Ascentis Express

column: Ascentis Express C18, 5 cm x 2.1 mm ID (53822-U)
instrument: Agilent 1100
mobile phase A: 0.1% acetic acid in water
mobile phase B: 0.1% acetic acid in acetonitrile
mobile phase ratios: A:B = 74:26
flow rate: 0.2 mL/min
temp.: 35 °C
det.: ABI 3200 QT; ESI(+), MS/MS
injection: 1 µL

1. Atenolol
2. Pindolol
3. Timolol
4. Metoprolol

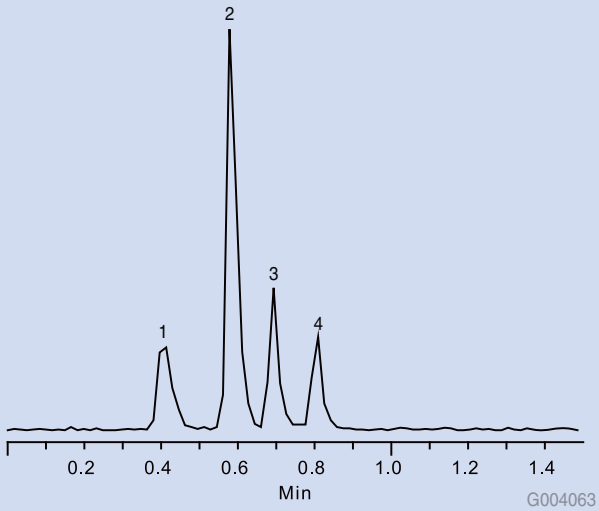
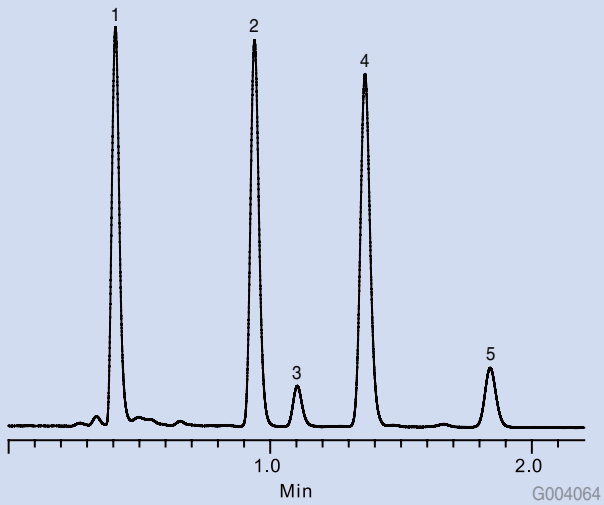


Figure 15. Steroids on Ascentis Express

column: Ascentis Express C18, 10 cm x 2.1 mm ID (53823-U)
instrument: Jasco X-LC
mobile phase: 55:45 water:acetonitrile
flow rate: 0.6 mL/min
temp.: ambient
det.: 200 nm
injection: 1 µL

1. Estriol
2. β-Estradiol
3. Impurity
4. Estrone
5. Estrone degradant



Ultra-High Resolution HPLC: Column Coupling

Maximize the Resolution of UHPLC systems

Column coupling in HPLC is gaining interest since LC systems are being designed to withstand column back pressures of up to 15,000 psi. Column coupling is a simple and practical way to increase resolution by simply increasing column length. Because Ascentis Express HPLC columns provide higher efficiencies at any pressure compared to 3 µm and sub-2 µm particles, the coupling of Ascentis Express columns enables significantly higher resolution than any other column on any commercial HPLC system.

Efficiencies greater than 150,000 plates/column are possible and demonstrated in the isocratic separation of benzene and toluene with various deuterium substitutions.

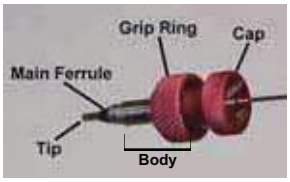
Figure 16 shows the efficiency obtained by coupling 5 Ascentis Express 15 cm columns together.

Column Coupling Applications

- Natural product chemistry
- Tryptic digests
- Synthetic peptide mapping
- Stress studies of APIs
- LC-NMR

High Performance HPLC Fittings/Interconnects

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Key Benefits

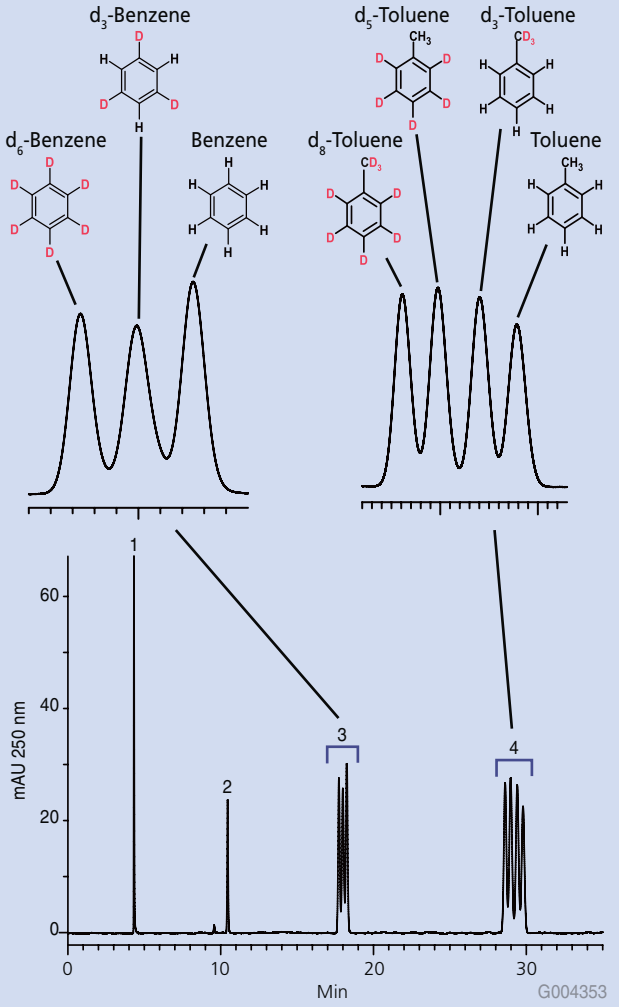
- Eliminate dead volume that contributes to peak broadening and decreased resolution
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- Fingertight fittings, no tools required
- Rated to 15,000 psi

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Figure 16. Column Coupling of Ascentis Express Provides over 100,000 Plates per Separation

column: Ascentis Express C18, 15 cm x 3 mm I.D., x5
mobile phase: 56:44, water:acetonitrile
flow rate: 0.6 mL/min
temp.: 60° C
pressure: 13500 psi (930 bar)

1. Uracil
2. Acetophenone
3. Benzene
4. Toluene



TRADEMARKS:
Ascentis, HybridSPE – **Sigma-Aldrich Biotechnology LP**
Fused-Core – **Advanced Materials Technology**
UPLC – **Waters Associates, Inc.**



Ordering Information

Analytical

ID (mm)	Length (cm)	Ascentis Express C18	Ascentis Express C8	Ascentis Express RP-Amide	Ascentis Express HILIC
2.1	3	53802-U	53839-U	53910-U	53933-U
2.1	5	53822-U	53831-U	53911-U	53934-U
2.1	7.5	53804-U	53843-U	53912-U	53938-U
2.1	10	53823-U	53832-U	53913-U	53939-U
2.1	15	53825-U	53834-U	53914-U	53946-U
3.0	3	53805-U	53844-U	53915-U	53964-U
3.0	5	53811-U	53848-U	53916-U	53967-U
3.0	7.5	53812-U	53849-U	53917-U	53969-U
3.0	10	53814-U	53852-U	53918-U	53970-U
3.0	15	53816-U	53853-U	53919-U	53972-U
4.6	3	53818-U	53857-U	53921-U	53974-U
4.6	5	53826-U	53836-U	53922-U	53975-U
4.6	7.5	53819-U	53858-U	53923-U	53977-U
4.6	10	53827-U	53837-U	53929-U	53979-U
4.6	15	53829-U	53838-U	53931-U	53981-U

Capillary

	Ascentis Express C18 Length		Ascentis Express C8 Length	
	5 cm	15 cm	5 cm	15 cm
75 µm I.D.	53982-U	54219-U	53983-U	54229-U
100 µm I.D.	53985-U	54256-U	53987-U	54260-U
200 µm I.D.	53989-U	54261-U	53991-U	54262-U
300 µm I.D.	53992-U	54271-U	53997-U	54272-U
500 µm I.D.	53998-U	54273-U	53999-U	54275-U

Ascentis Express Properties

Stationary Phase Support

- Ultra-pure, Type B silica
- 1.7 µm solid core particle with 0.5 µm porous silica shell (effective 2.7 µm)
- 150 m^2/gram surface area (comparable to ~225 m^2/g porous particle)
- 90 Å pore size

Bonded Phase

	Coverage µmoles/m^2	pH Range	Endcapping
C18	*3.5*	*2-9*	*Yes*
C8	*3.7*	*2-9*	*Yes*
RP-Amide	*3.0*	*2-9*	*Yes*
HILIC	*n/a*	*2-8*	*No*

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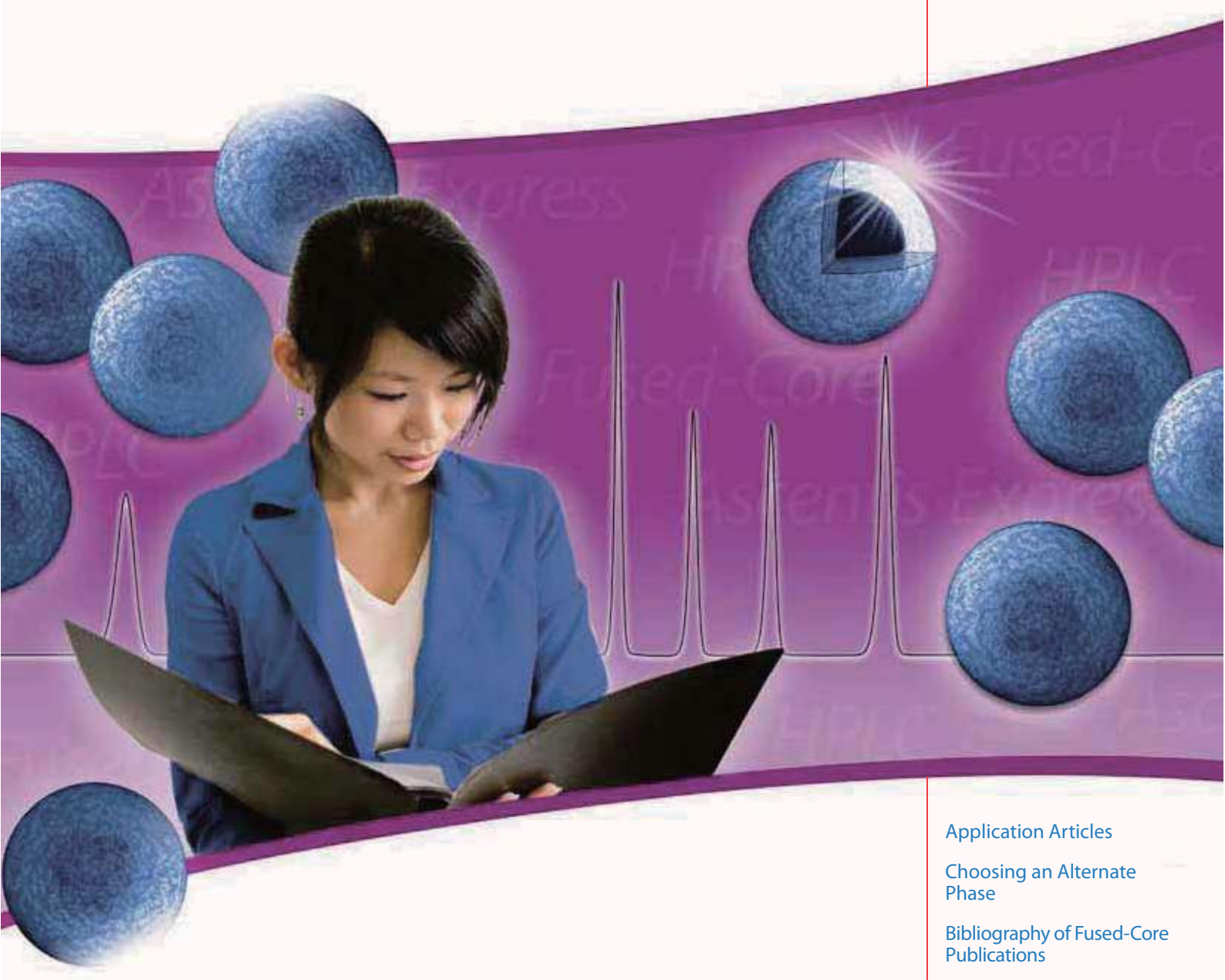
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Ascentis® Express HPLC Resource Guide

SUPELCO® Analytical



- Application Articles
- Choosing an Alternate Phase
- Bibliography of Fused-Core Publications
- Practical Recommendations for Success
- Listing of Available Technical Literature

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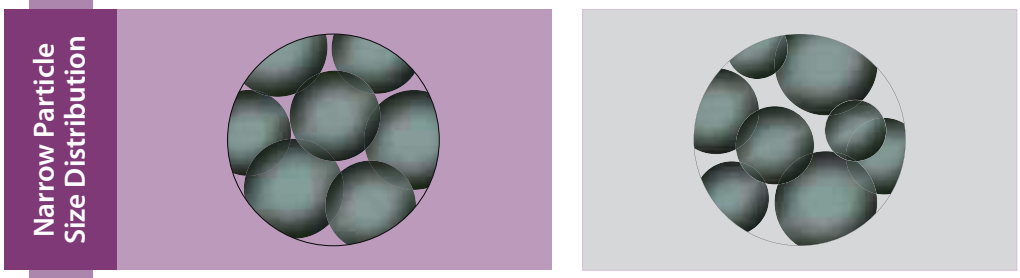
The Fused-Core™ Advantage

Extreme performance on any LC system

Half the backpressure of sub-2 µm columns
Twice the performance of 5 µm columns

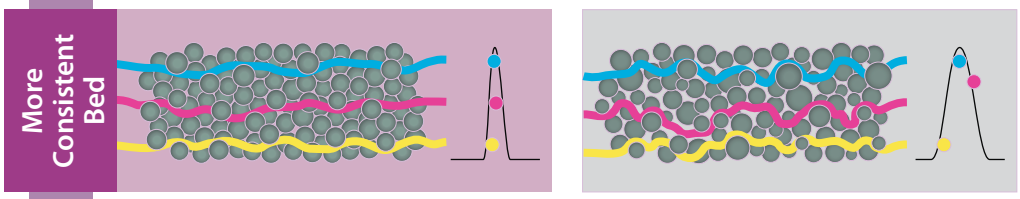
Narrow Particle Size Distribution

Fused-Core Particles | **Traditional Porous Particles**



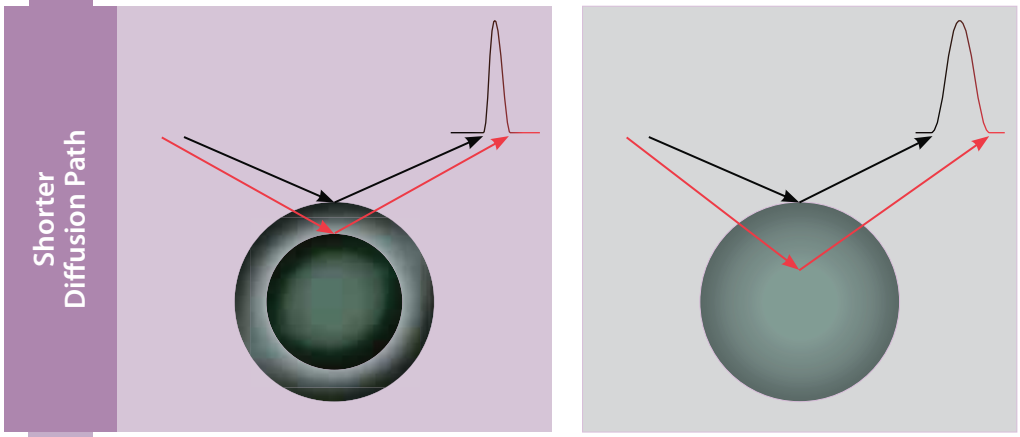
The innovative manufacturing process for Fused-Core particles produces a very narrow particle size distribution. A narrow particle size distribution allows for the use of large porosity frits that resist clogging, resulting in a **more rugged column**. Traditional porous particles are not manufactured in a way to yield extremely narrow particle size distributions.

More Consistent Bed



The "A" term in the van Deemter equation accounts for the effects of inhomogeneities in the packed bed of an HPLC column. Narrow particle size distributions form a more consistent packed bed and a consistent path length, **minimizing analyte diffusion** through the column. This eddy diffusion is effectively independent of mobile phase velocity.

Shorter Diffusion Path



The short diffusion path of the Fused-Core particle **yields sharper peaks** than traditional porous particle columns. The minimized resistance to mass transfer, the "C" term in the van Deemter equation, of the Fused-Core particle provides sharper peaks than traditional porous particles. The short diffusion path also **permits the use of higher flow rates** without peak broadening.

Introducing Ascentis Express…

Now, High Speed and High Efficiency HPLC Separations are Possible on Any LC System

Increasing speed and resolution of HPLC analyses are drivers for innovation in both HPLC column and hardware design. While columns packed with 5 µm particles have been the standard, reducing particle size has been the strategy of many column manufacturers and users alike. Smaller particles result in faster chromatography. The cost for the improved speed is higher column backpressures. To obtain the benefit of the small particles, instrumentation beyond conventional HPLC is required.

Ascentis Express columns provide a breakthrough in HPLC column performance. Based on Fused-Core particle technology, Ascentis Express provides the benefits of high speed of much smaller particles but at a backpressure suitable to conventional HPLC systems. Due to this fundamental performance advantage, Ascentis Express can benefit both conventional HPLC users as well as UPLC™ or other ultra pressure system users.



Exceeding the Performance of Other "Fast" HPLC Particles

Designed to deliver speed and resolution on all LC systems, Ascentis Express meets and exceeds the benefits of competitive particles, including 3 µm and sub-2 µm particles. Under the same conditions, Ascentis Express columns deliver the same efficiencies at half the backpressure of sub-2 µm particles and nearly twice the efficiency of 3 µm particles.

Compared to Sub-2 µm Particles:

Advantage: *Ascentis Express columns can be run successfully on conventional, mid-pressure and ultra high pressure HPLC and LC-MS instruments.*

Advantage: *Double the flow rate. Run Ascentis Express columns at higher flow rates for faster analyses.*

Advantage: *Double the column length. Longer Ascentis Express columns can be used, giving additional resolving power.*

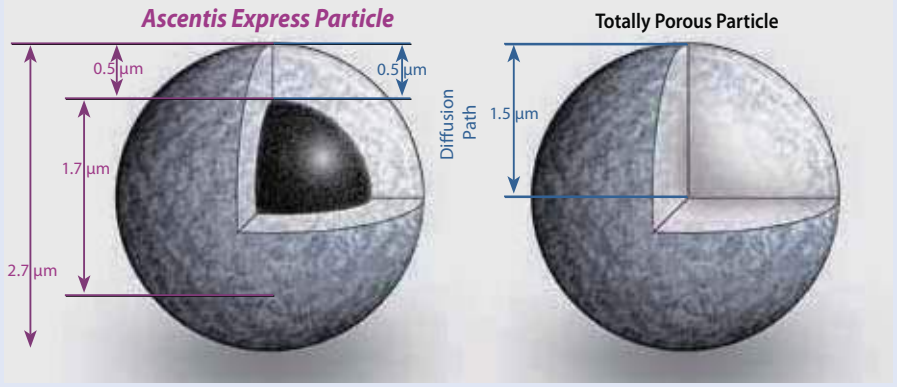
Compared to 3 µm Particles:

Advantage: *Double the efficiency. Ascentis Express columns have nearly twice the column efficiency of 3 µm particles.*

Practical Recommendations for Success

- Use 0.005 in. I.D. inlet and outlet tubes. Broadening is much less sensitive to the tube length than to the I.D. Minimize lengths of the inlet and outlet tubes for best performance, but do not worry about having a few extra centimeters of length if it makes maintenance or column installation easier.
- If high pressure becomes a problem, then use acetonitrile as modifier and elevate the column temperature whenever possible. If methanol, THF, or another more viscous modifier is required, then elevating the temperature becomes even more beneficial. Even a modest temperature increase will greatly reduce the mobile phase viscosity and the required pressure while improving mass transfer.
- Use only 4.6 mm diameter Fused-Core columns on conventional HPLC systems to minimize broadening problems from the remaining system components. Extra column broadening worsens as the column diameter is decreased.
- Keep the sample volumes small — 5 µL or less if the peaks of interest elute early ($k = 1$). Up to 20 µL is acceptable if k exceeds 10.
- Avoid sample solvents that are stronger than the mobile phase.
- Use data rates of 10 Hz or greater, and watch out for bunching factors.

Figure 1. Fused-Core Structure of Ascentis Express Compared to Totally Porous Particles



The Particle Platform Innovations Behind Ascentis Express

Like most modern HPLC particles, Ascentis Express particles are high surface area spheres made from high purity silica gel. The total particle diameter is 2.7 µm. However, here the comparison ends. What sets apart Ascentis Express from conventional HPLC particles is the patent pending Fused-Core technology. Ascentis Express particles comprise a solid 1.7 µm diameter silica core that is encapsulated in a 0.5 µm thick layer of porous silica gel.

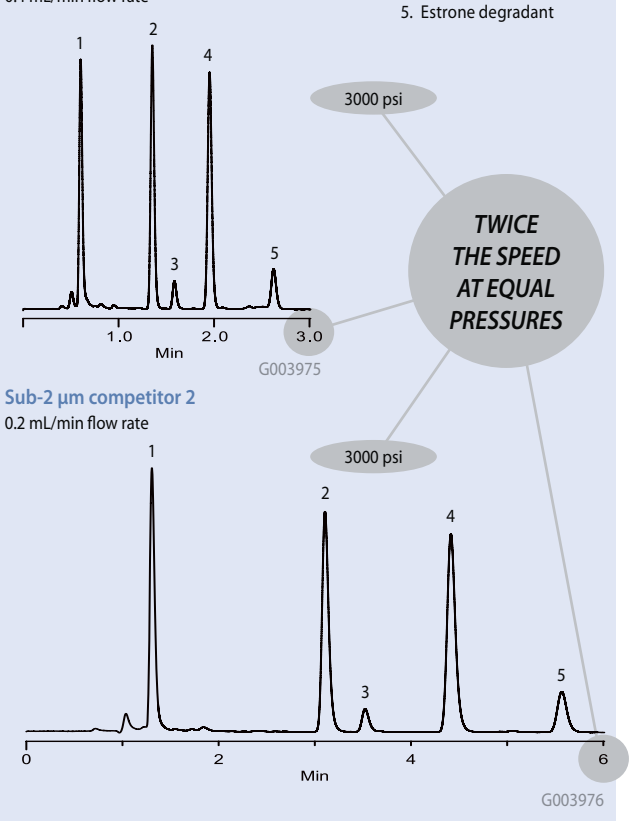
There are five distinct properties of Ascentis Express particles that account for their high performance and are worth emphasizing:

1. **The solid core**
   Because of the solid core, analytes cannot diffuse as deeply into the particle, resulting in less band broadening, and hence higher efficiency and sensitivity, compared to totally porous particles of the same diameter.
2. **The 0.5 µm porous shell surrounding the solid core**
   The porous shell gives the particles a surface area comparable to totally porous particles for excellent phase loading and sample capacity.
3. **The total particle diameter (2.7 µm)**
   Compared to sub-2 µm porous particles, Ascentis Express yields half the column backpressure, allowing longer columns and faster flow rates (Figures 2 and 3).
   Compared to 3 µm porous particles, Ascentis Express yields nearly twice the efficiency (Figure 4).
4. **The narrow particle size distribution.**
   Compared to both sub-2 µm and 3 µm particles, Ascentis Express provides longer column lifetime because the narrow particle size distribution allows us to use larger pore size frits (2 µm vs. 0.5 µm) that are less susceptible to fouling.
5. **The high particle density**
   By virtue of the solid core, Ascentis Express particles yield a more densely packed bed for added stability and long column lifetime.

Figure 2. Hyper-Fast Separations on Ascentis Express

column: Ascentis Express C18, 10 cm x 2.1 mm I.D., 2.7 µm particles (53823-U) and sub-2 µm particle column (same dimensions)
mobile phase: 49:51 or 55:45, water:acetontrile
flow rate: 0.4 or 0.2 mL/min.
temp.: ambient
det.: UV at 200 nm
injection: 1 µL

1. Estradiol
2. β-Estradiol
3. Impurity
4. Estrone
5. Estrone degradant



Ascentis Express: High Speed, High Efficiency Separations Adaptable Equally to R&D and Routine Analysis Settings

The recent introduction of UPLC™ and other ultra high pressure LC systems addressed the need for high throughput separations. However, speed is not the only important criteria: the need for more sensitivity, more resolution and improved ruggedness of the technique has lead to a continual stream of new LC and LC-MS instruments. Coupled with the large installed base of conventional HPLC instruments, the result is that most laboratories have a mixture of instruments, old and new. Whereas columns packed with sub-2 µm particles require ultra high pressure instruments, Ascentis Express columns can be run on any LC system. Methods developed on Ascentis Express can be readily and reliably validated and transferred from R&D to routine analysis labs, whether across the building or across the world.

We hope this article has sparked an interest in Ascentis Express and the benefits it can bring to your laboratory. Subsequent articles will develop the Ascentis Express message by focusing on specific features and application areas.

Figure 3. HD-Resolution on Ascentis Express Compared to Sub-2 µm Columns

column: Ascentis Express C18, 10 cm x 2.1 mm I.D., 2.7 µm particles (53823-U) and sub-2 µm particle column, 5 cm x 2.1 mm I.D.
mobile phase: 55:45 or 54:46, water:acetontrile
flow rate: 0.2 mL/min.
temp.: ambient
det.: UV at 200 nm
injection: 1 µL

1. Estradiol
2. β-Estradiol
3. Impurity
4. Estrone
5. Estrone degradant

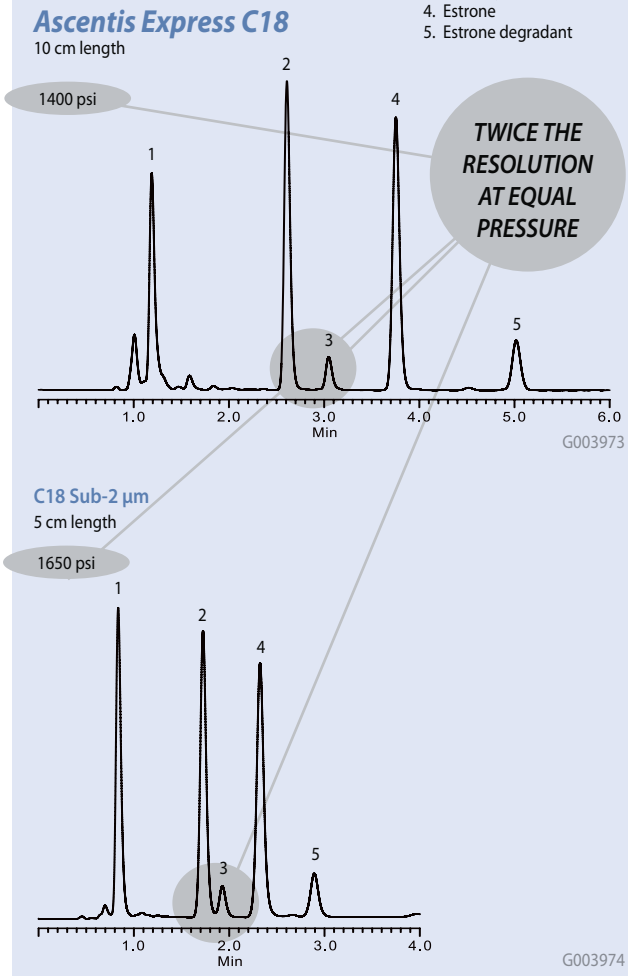
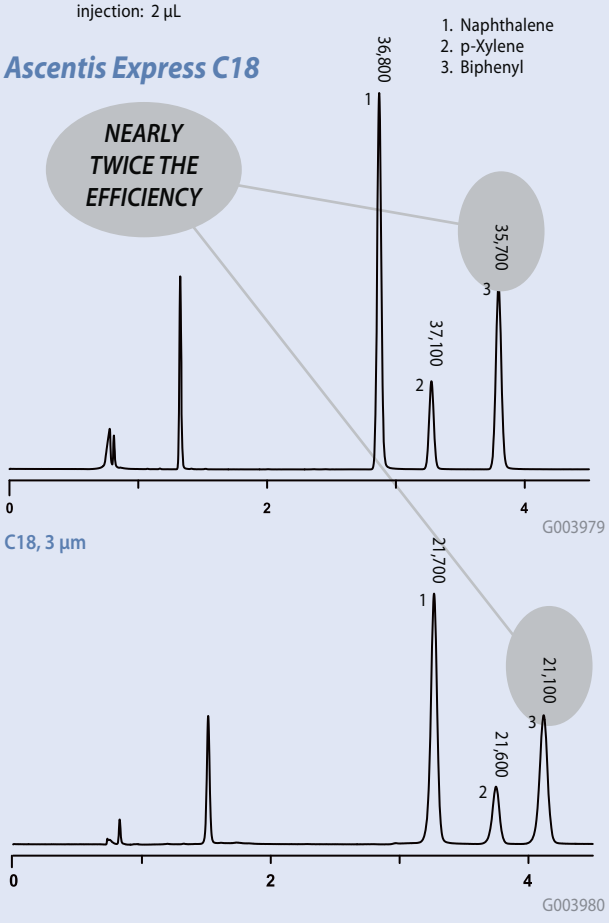


Figure 4. HD-Resolution on Ascentis Express Compared to 3 µm Particles

column: Ascentis Express C18, 15 cm x 4.6 mm I.D., 2.7 µm particles (53829-U) and C18, 15 cm x 4.6 mm I.D., 3 µm particles
mobile phase: 35:65 or 27.5:72.5, water:acetontrile
flow rate: 1.5 mL/min.
temp.: ambient
det.: UV at 220 nm
injection: 2 µL

1. Naphthalene
2. p-Xylene
3. Biphenyl



Rapid, Sensitive, General-Purpose Cleaning Validation Using Ascentis Express HPLC Columns

Contributed Article

The following was generated by an outside source using Sigma-Aldrich products. Technical content provided by:

S. Bannister, M. Talbott, F. Hanciles
Xcelience LLC, Tampa, FL

Verification of the removal of drug residue from multi-product manufacturing equipment is required by GMP regulations and the suitability of applied analytical methods is judged with a combination of sensitivity, selectivity, and because the release of equipment is dependent - speed. The FDA does not set quantitative acceptance specifications, but the commonly used limit is based on not more than 0.1% of a dose carried over into a single dose of the next product. Translation of this into an analytical limit combines the total product contact area, the mass (or volume) of product contacting the surface, the mass (or volume) of each dose unit, the sampled area, the rinse volume and the fraction of the rinse sample used for analysis. The requisite limits are commonly measured in ng/mL of injected sample.

The ubiquity of HPLC in drug analysis makes it an attractive choice for cleaning validation. Methods qualified for cleaning validation are often adaptations of drug-substance methods. The original methods are capable of determining the drug and its related impurities, but the ability to simultaneously measure multiple closely related analytes comes at the expense of run time and is not needed in cleaning validation.

This work was undertaken to investigate the use of rapid gradients using recently introduced FCP columns on conventional instrumentation in the development of general-purpose methods for cleaning validation. The benefits include high sensitivity and reductions in the time needed to set up and run the method.

Resolution, limits of detection and quantitation, and run time in HPLC analyses are improved by reducing the width of eluted bands. Contributions to bandwidth include both column (particle size, packing structure and resistance to mass transfer in the stationary and mobile phases) and extracolumn volumes (injection, unswept and tubing). Columns packed with 5 µm fully porous particles have been the standard for conventional HPLC for twenty-five years. Smaller-particle packings (3 µm) have been available almost as long and offer higher efficiency (lower band dispersion)

Figure1. Acidic and Neutral Drug Panel

column: Ascentis Express C18, 10 cm x 4.6 mm I.D. (53827-U)
mobile phase A: water with 0.1% phosphoric acid
mobile phase B: acetonitrile with 0.1% phosphoric acid
temp.: ambient
flow rate: 1.76 mL/min
det.: UV at 215 nm
inj.: 100 µL
gradient:

Min	%A	%B
0	70	30
2	60	40
4	5	95

1. Hydrochlorothiazide (9)
2. Chlorthalidone (2)
3. Prednisolone (2)
4. Pravastatin (4)
5. Carbamazepine (2)
6. Diclofenac (14)
7. Ibuprofen (15)
8. Progesterone (2)

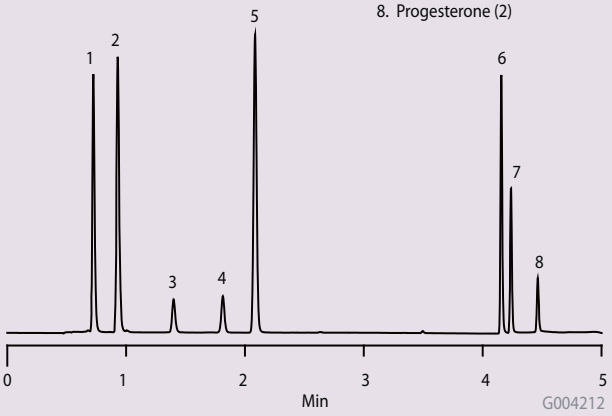
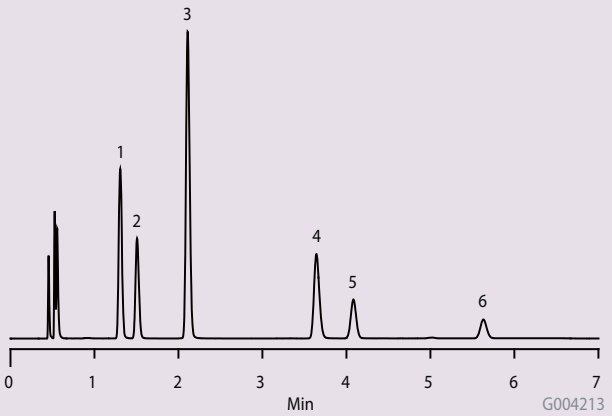


Figure 2. Basic Drug Panel

column: Ascentis Express C18, 10 cm x 4.6 mm I.D. (53827-U)
mobile phase A: water with 0.05M potassium phosphate and 0.1% TEA and 0.6% OSA-Na at pH = 2.9
mobile phase B: acetonitrile
temp.: ambient
flow rate: 1.76 mL/min
det.: UV at 215 nm
inj.: 100 µL
gradient:

Min	%A	%B
0	63	37
5	59	41

1. Quinidine (5)
2. Dipyridamole (29)
3. Propranolol (12)
4. Haloperidol (8)
5. Amlodipine (29)
6. Fluoxetine (3)



dispersion) on conventional instrumentation, but require higher pumping pressures due to lower bed permeability. Efficiency can be further increased by the use of particles smaller than 3 µm but only with the use of instrumentation optimized with respect to both pressure and extra-column effects.

Supelco has recently introduced reversed-phase packings based on 2.7 µm silica particles in which a 0.5 µm layer of 90-Å porous silica has been deposited onto a 1.7 µm solid spherical core. Advantages of columns packed with these particles include high efficiency, lower backpressure due to a very narrow particle size distribution, and smaller efficiency losses with increasing velocity due to improved mass-transfer kinetics in the shallow porous layer. The narrow particle size distribution allows the use of larger pore column frits, which combined with the greater stability of the packed bed should produce longer column lifetimes in routine use.

The high resolving power of gradient elution in the analysis of closely related substances is the result of the reduction of peak width as a band moves through the column. The back of the band is accelerated by the stronger solvent. A broad gradient will elute a wide range of substances and a steep gradient will elute them quickly.

Versatile Separations

To judge the utility of Ascentis Express columns in cleaning validation, an Agilent 1100 component system with standard components (including a 10 mm/13 µL flow cell) was used to develop a short gradient separation using Ascentis Express C18, 10 cm x 4.6 mm for each of two panels: eight acidic or neutral drugs (AN) and six basic drugs (B). For each separation, the flow rate was 1.76 mL/min, detection was at 215 nm, and 100 µL injections were made of aqueous solutions representing the final equipment rinse. The separations are shown in Figures 1 & 2. Limits of detection (ng/mL) are listed next to each analyte in Figures 1 and 2.

These separations demonstrate the capabilities of Ascentis Express columns on conventional, robust, instrumentation in rapid analyses of multiple drugs at low ppb levels suitable for development as methods for cleaning validations in multiproduct manufacturing facilities.

Selecting the Right Buffer

A partial list of common buffers and their corresponding useful pH range is supplied. Perhaps the most common buffer in HPLC is the phosphate ion. Although, with the growth of LC-MS, volatile buffers such as TFA, acetate, formate, and ammonia are becoming more frequently used. Remember, the purpose of a buffer in the mobile phase is to inhibit a pH change in the mobile phase after the introduction of a sample. When developing a method, it is important to select a mobile phase with a final pH at least one pH unit away from any analytes pK value. As a rule of thumb, one should work within a ±1 pH unit of the buffer pKa. Typical buffer concentrations for HPLC tend to be 10-100 millimolar level.

Buffer	pKa @ 25 °C	Useful pH Range
Trifluoroacetic acid (TFA)	0.5	<1.5
Phosphate 1	2.1	1.1 - 3.1
Formate	3.8	2.8 - 4.8
Acetate	4.8	3.8 - 5.8
Phosphate 2	7.2	6.2 - 8.2
Ammonia	9.2	8.2 - 10.2
Phosphate 3	12.3	11.3 - 13.3

Guidelines for Preparing Mobile Phases

It should be understood that slight variations in pH and buffer concentration could have a dramatic affect on the chromatographic process; consistent and specific techniques should be a regular practice in the preparation of mobile phases. A common practice is to place a sufficient amount of pure water into a volumetric flask and add an accurate amount of buffer. The pH of the solution should be adjusted, if necessary, and then dilute to final volume of water prior to adding or blending of organic solvents. Then, add a volumetrically measured amount of organic solvent to obtain the final mobile phase. Thorough blending, degassing, and filtering prior to use is also recommended.

To view a listing of suitable HPLC and LC-MS additives and solvents, visit *sigma-aldrich.com/lc-ms-solvents*

Ascentis Express Peptide ES-C18 Expands the Fused-Core Particle Platform into Bioseparations

Introduction

Ascentis Express Peptide ES-C18 columns were specifically engineered to separate higher molecular weight compounds such as peptides and small proteins. These columns contain advanced Fused-Core particles that have bigger pores (160 Å versus 90 Å in standard Ascentis Express), which greatly expands the application range for Ascentis Express columns.

Key Applications for Ascentis Express Peptide ES-C18:

- Pharmaceutical/therapeutic peptides
- Peptide mapping
- Natural and synthetic peptide analysis
- Oligonucleotide analysis

Key Advantages:

- Higher peak capacity providing greater resolution
- Amenable to higher flow rates for faster analysis
- Exceptional ruggedness providing long column lifetime

Ascentis Express Peptide ES-C18 columns utilize a steric-protected C18 bonded-phase with extremely high resistance to acid-catalyzed hydrolysis of the siloxane bond that attaches the C18 chain to the surface. Thus, the combination of low pH and elevated temperature operation of the column is well tolerated. Peptide separations are efficiently conducted using low pH mobile phase modifiers, often at 0.01-0.1% concentration, most popularly employing trifluoroacetic acid (TFA), and the related perfluorocarboxylic acids, pentafluoropropionic acid (PFPA) and heptafluorobutyric acid (HFBA). These acids exhibit desirable low UV transparency, volatility, and peptide ion-pairing properties. Additional opportunities for low pH operation include the normal short chain carboxylic acids, formic acid and acetic acid, as well as mineral acids, such as phosphoric acid (0.001-0.02 M).

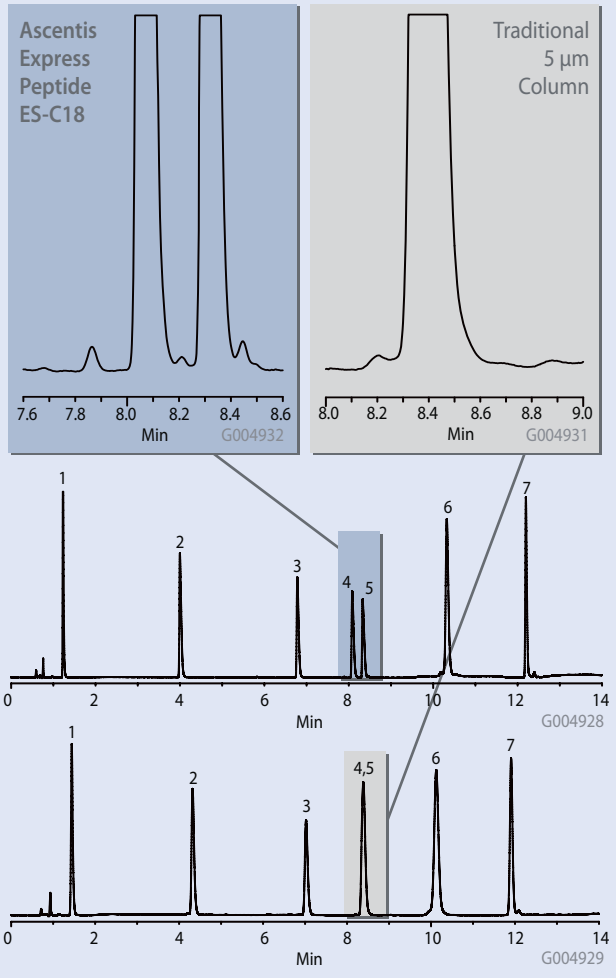
Shown in Figure 1 is the chromatographic separation of a peptide mix. The peptide mix contains a range of peptides in terms of molecular weight, basicity, and hydrophobicity. Excellent peak shape and peak width are achieved with a standard acetonitrile gradient and 0.1% TFA modifier. The resolution of small baseline impurities are shown in the inset, demonstrating the resolving power of the Ascentis Express Peptide ES-C18 column versus a traditional 5 µm column.

Figure 1. Comparison of Peptide Test Mix with Ascentis Express Peptide ES-C18 and Traditional Column

column: Ascentis Express Peptide ES-C18, 10 cm x 4.6 mm I.D. (53324-U)
mobile phase A: 10% acetonitrile / 90% water / 0.1% trifluoroacetic acid
mobile phase B: 75% acetonitrile / 25% water / 0.1% trifluoroacetic acid
gradient: 0% to 50% B in 15 min
flow rate: 1.5 mL/min.
det: UV at 220 nm
temp: 30 °C
injection: 5 µL

Peptide Test Mix

1. Gly-Tyr MW = 252
2. Val-Tyr-Val MW = 379
3. Met Enkephalin MW = 574
4. Angiotensin II MW = 1032
5. Leu-Enkephalin MW = 555.62
6. Ribonuclease MW = 13,700
7. Bovine Insulin MW = 5733



For more information on the Ascentis Express Peptide ES-C18, request brochure T410043 (MII).

Improving the Current USP Method for the Analysis of Lansoprazole Drug Substance Using HPLC Columns Based on Fused-Core Particle Technology

Contributed Article

The following was generated by an outside source using Sigma-Aldrich products. Technical content provided by:

Kai Li, Jiajie He, and Xiaoya Ding
PPD - 8551 Research Way, Suite 90, Middleton, WI 53562

Introduction

Compendial methods from the USP (United States Pharmacopeia) are widely used in pharmaceutical drug product and raw materials testing. However, not all methods in the USP use modern technologies. In chromatographic methods, it is not uncommon that older brands of columns are specified. Therefore, the USP methods are under continuous revision to improve existing procedures or to allow the user to obtain better results.

Due to the improved resolving power of Fused-Core particles, the method was optimized with a shorter runtime without sacrificing resolution.

In an effort to improve the compliance of drug product, drug substance, and excipient monographs with current scientific/regulatory standards, USP is seeking the submission of proposals for improved methods. The intent is to replace the current procedures that may be deficient, flawed, or unsafe (e.g. *http://www.usp.org/USPNF/submitMonograph/improveMon.html)*. Requests for revision of an existing monograph are encouraged by USP in light of advances in analytical technologies. Furthermore, ease of operation, suitability for automation, and potential for high-throughput analysis can be considered in a revision. To develop the best possible analytical test method for its intended use, a fully integrated method development process such as the selection of column, mobile phase, detection technology, and LC hardware by utilizing the most advanced technologies viable should be considered to ensure the methods are robust, consistent, and easy to use.

In this study, the USP method for lansoprazole was considered for improvement. Several drawbacks in the current USP monograph for lansoprazole prompted the investigation. These drawbacks include sample solution instability, use of different columns and samples preparations for the evaluation of assay and impurity, the requirement of using internal standard for assay and a long HPLC runtime (60 min). A new HPLC column, Ascentis Express C18, based on Fused-Core particle technology was investigated for this study. The Ascentis Express HPLC column claims high efficiencies as a result of a 0.5 µm layer of porous silica on a 1.7 µm solid silica core. An additional advantage to the column is that standard HPLC instrumentation can be used as opposed to UHPLC that is required for sub-2 µm columns.

Results and Discussion

Initially, a traditional 5 µm C18 column as specified in the USP monograph was compared to the 2.7 µm Ascentis Express C18 using the standard USP conditions for chromatographic purity for lansoprazole (1, 2). Improved resolution and sensitivity were obtained using the Fused-Core column that allowed us to make several significant improvements to the method. Due to the improved resolving power of Fused-Core particles, the method was optimized with a shorter runtime without sacrificing resolution. The total run time was reduced from 60 min to 40 min (Table 1). Moreover, the improved sensitivity allowed for the reduction in concentration of the test sample for chromatographic purity from 250 mg/mL to 100 mg/mL, the level required for assay in the USP monograph. Therefore, simultaneous evaluation of assay and chromatographic purity is achieved. Finally, a change of diluent pH, was implemented to improve sample solution stability removing the requirement of injecting sample within 10 minutes after preparation.

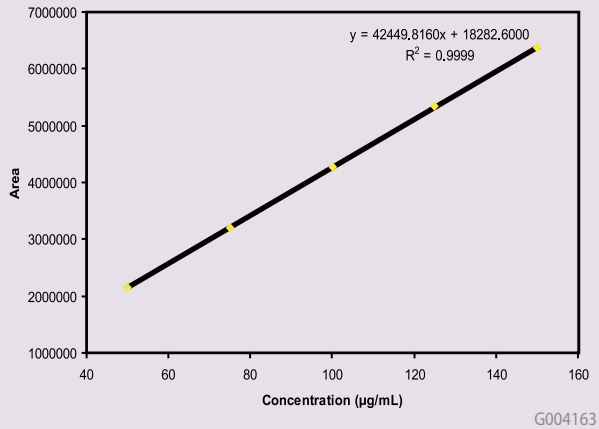
Table 1. Method Parameters for Improved Lansoprazole Method

column:	Ascentis Express C18, 15 cm x 4.6 mm, 2.7 µm (53829-U)
mobile phase A:	Water
mobile phase B:	Acetonitrile: 0.5% Triethylamine in Water, pH=7.0 [80:20]
flow rate:	0.8 mL/minute
column temp.:	Ambient
autosampler Temp.:	5 °C
injector volume:	15 µL
detector wavelength:	285 nm
run time:	40 min

gradient:

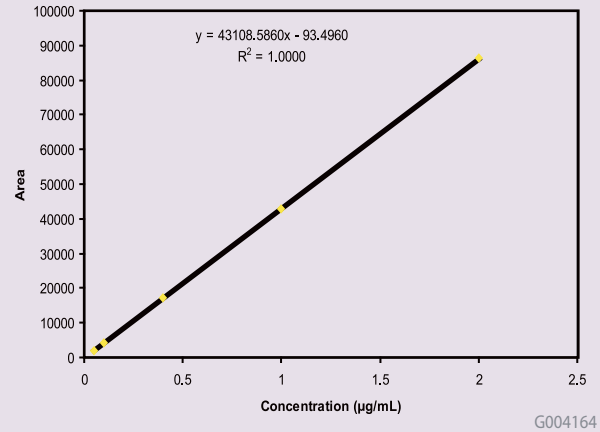
Time (Min)	%A	%B
0.0	90	10
30.0	20	80
35.0	20	80
35.1	90	10
40.0	90	10

Figure 1. Linearity Curve from 50 to 150% Nominal Concentration



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Figure 2. Linearity Curve from 0.05 to 2.0% Nominal Concentration

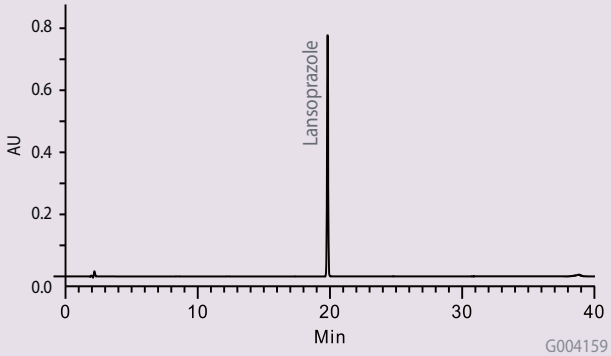


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The new method was shown to be linear from 0.05% to 150% of nominal concentration of 100 mg/mL, with quantitation limit less than 0.05%. The broad range of linearity allows for simultaneous impurity and assay analysis. The linearity data are shown in Figures 1 and 2. The RSD of 5 replicate injections of standard solution was 0.11%. In additional experiments, the method was evaluated by analysis of degraded lansoprazole drug substance. Lansoprazole was stressed under four separate conditions by exposure to acid, base, heat and hydrogen peroxide. The chromatograms of the acid and peroxide exposed drug substance along with the unstressed drug substance are shown for reference. The resolving power of the Ascentis Express HPLC column makes it very suitable for these types of studies.

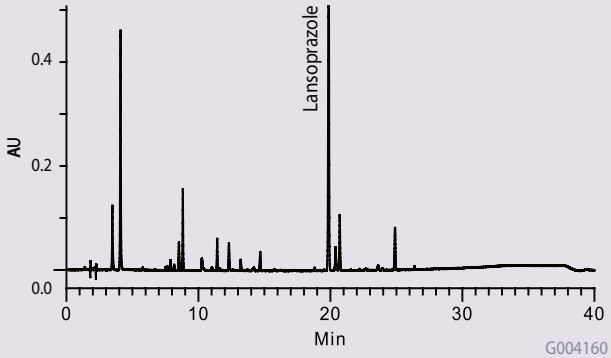
Figure 3. Analysis of Lansoprazole Using Improved Method with Ascentis Express C18 HPLC Column

Unstressed Lansoprazole



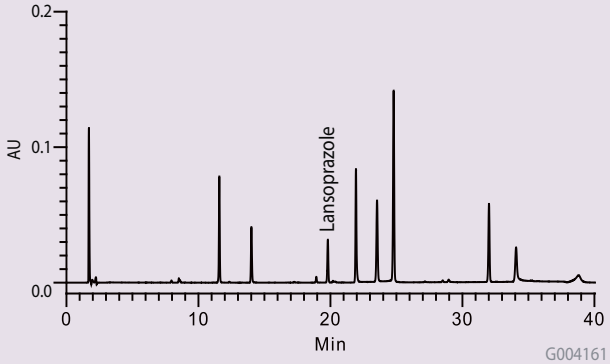
G004159

Aged Resolution Solution



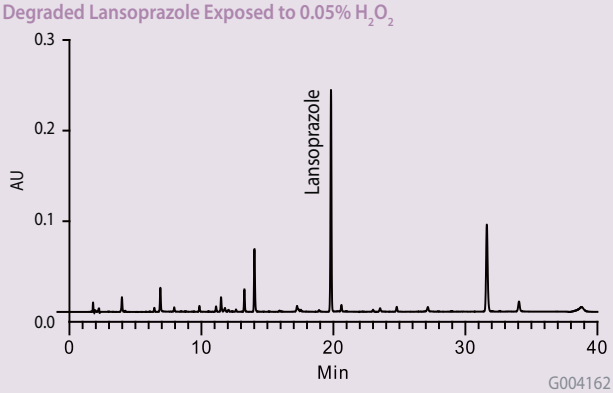
G004160

Degraded Lansoprazole Exposed to 0.1 N HCl



G004161

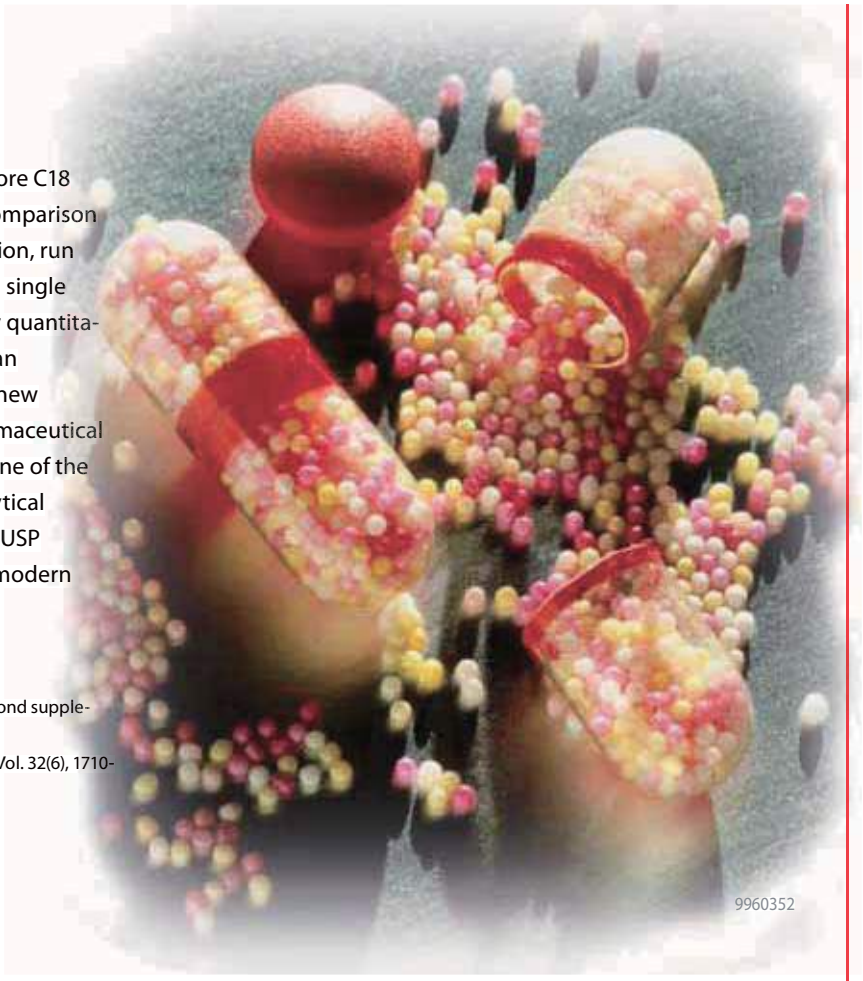
Degraded Lansoprazole Exposed to 0.05% H_2O_2



G004162

Conclusion

The method developed using 2.7 µm Fused-Core C18 column provided significant improvements in comparison with the original USP method in terms of resolution, run time and sensitivity. As a result, the consolidated single method can be used for both assay and impurity quantitation. The advantages of Fused-Core columns as an alternative for sub-2 µm columns without using new UHPLC instruments could be appealing for pharmaceutical testing. Furthermore, this paper has presented one of the ways (a road map) that could be utilized by analytical scientists in the pharmaceutical field to improve USP monographs for their intended purposes using modern analytical technologies.

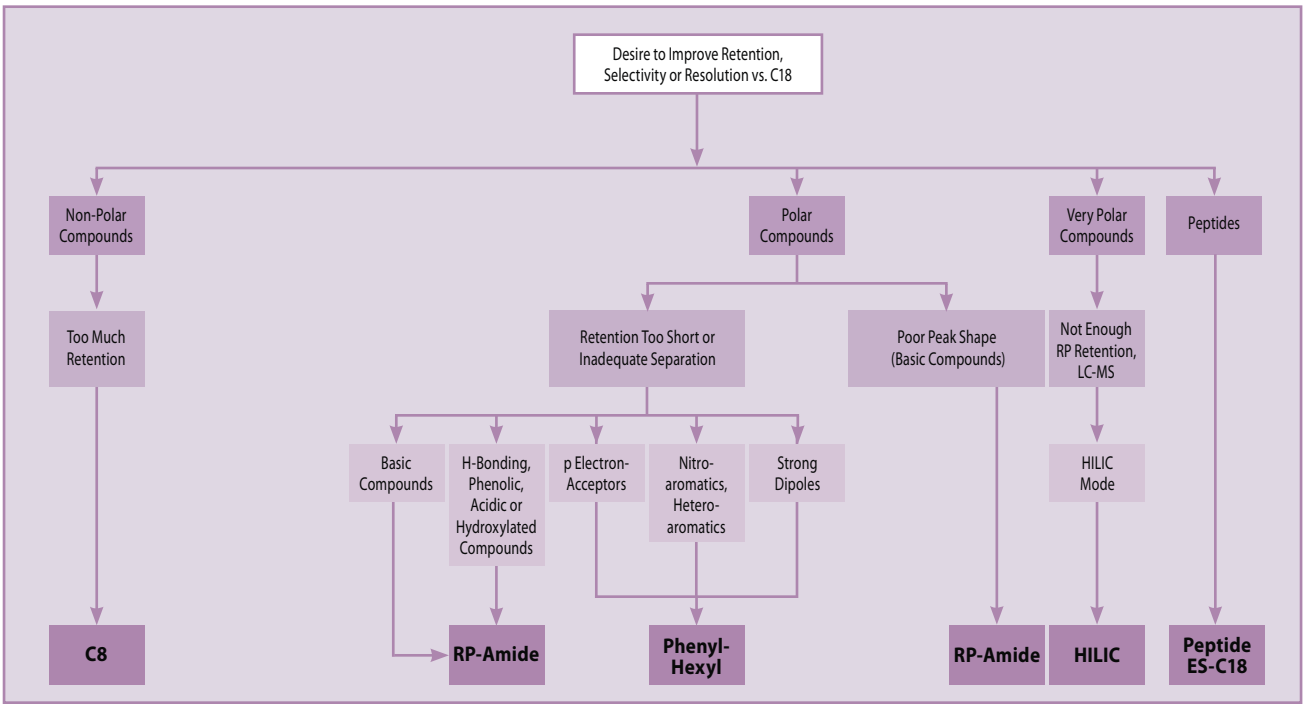


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1. USP Monograph: Lansoprazole, USP 30-NF 25 through second supplement.
2. Pharmacopeial Forum, In-Process Revision, Lansoprazole, Vol. 32(6), 1710-1712 (2006).

Selecting an Ascentis Express Phase

Ascentis Express C18 is the first choice for starting a new method. However, when a C18 doesn't give the desired separation or your sample contains compounds that are known to be difficult to retain or resolve on a C18, consider changing stationary phases. The range of selectivity provided by Ascentis Express makes this easy. The flow chart below helps guide in the selection of an Ascentis Express phase, based on the particular compound type or separation challenge.



Profiling of Stevia rebaudiana Extract by Accurate Mass Using HILIC and Reversed-Phase Chromatography

Introduction

There is growing public interest in low-calorie alternatives to carbohydrate-based sweeteners. Synthetic sweeteners are often regarded as having an undesirable aftertaste. Recent publications have shown a dramatic increase in attention toward natural extracts including the *Stevia rebaudiana* plant, not only for its sweetening effect but also for additional health benefits attributed to the plant. The major sweetening components are stevioside, rebaudioside A, rebaudioside C, and dulcoside A, each of which is over 300 times sweeter than sucrose-based sweeteners. The concern with the human consumption of the stevia leaf had been attributed to the possible mutagenic properties of steviol, but more recent studies conducted by the World Health Organization have established the safety for steviol and its glycosides.

In this study, an evaluation of the *Stevia rebaudiana* plant extract was conducted using modern chromatographic and mass spectrometry techniques for the determination of extracted components. The purpose was to evaluate the utility of performing two different modes of chromatographic separation for component identification. An accurate mass time of flight (TOF) mass spectrometer was used in the detection and identification of components. A novel software package was then utilized for the determination of common components between the two chromatographic modes and to depict the impact of chromatographic selectivity.

The concept behind the study was to utilize both reversed-phase chromatography and HILIC chromatography for the determination of extract components. By using two different modes of selectivity, components that co-retain, do not retain, or do not elute under one chromatographic mode may be resolved under a separate mode. By resolving a component chromatographically, a more accurate assessment of the component can be made without relying specifically on accurate mass data.

With traditional reversed-phase chromatography, analytes are primarily retained on an alkyl based stationary phase by partitioning interaction between the non polar stationary phase and the analyte. Though this mode of chromatography is widely accepted for separation of moderately polar to non-polar compounds, highly polar analytes often have minimal or no retention on these phases. More popular polar embedded stationary phases address this issue with the addition of a polar functional group within the alkyl chain. Polar embedded phases can enhance retention of polar compounds, but it is not a solution for all applications. Often highly polar analytes require alternative modes of chromatographic retention. In particular, HILIC chromatography allows for alternative selectivity by utilizing a highly polar stationary phase with a relatively non polar mobile phase. Under HILIC conditions, the partitioning of analytes is achieved through a preferential solvation of an aqueous environment on the polar surface. More polar analytes will partition more into the surface solvent and thus be retained longer than a less polar analyte. In addition to the partitioning, the polar surface of the stationary phase allows for adsorptive interactions via hydrogen bonding, dipole, etc. When ionic samples are separated, the potential for ion-exchange interactions also exists and in many cases becomes the dominant retention mechanism. Using silica-based stationary phases, ionized surface silanol groups may interact via ion-exchange with positively charged analytes.

Experimental

In this study, both reversed-phase and HILIC separations were conducted using the Ascentis® Express RP-Amide and Ascentis Express HILIC. The polar embedded group of the Amide was chosen over traditional C18 phases to increase the retention of the polar analytes in the stevia


Stevia rebaudiana

extract. The Ascentis HILIC allowed for alternative selectivities for polar analytes. Because of the large amount of unknown components in the stevia extract, using both reversed-phase and HILIC modes enabled orthogonal selectivity to resolve co-retained components and enable better determination of components in the extract with confirmation between the two modes.

Stevia leaves were obtained from Sigma Aldrich (S5381). Sample extraction of the stevia leaves was performed by weighing 400 mg of crushed stevia leaves into a 7 mL amber vial. A total of 4 mL of 50:50 acetonitrile:water was added and the sample was vortexed and sonicated for 3 minutes. The sample was then centrifuged for 2 minutes at 15000 rpm. The supernatant was then collected and analyzed directly.

The sample extract was analyzed using a gradient elution profile for both HILIC and reversed-phase chromatographic modes. Analysis was conducted using an Agilent® 1200SL Rapid Resolution system in sequence with an Agilent 6210 TOF mass spectrometer. The TOF enabled the use of accurate mass for determination of components. The acquired data was processed using the Mass Hunter software package. The data was pushed to the Mass Profiler package for statistical comparison of the two chromatographic modes. This software package enabled the identification of common components between the two chromatographic separations of the stevia extract. By performing this type of statistical comparison, the components attributed to the stevia extract were differentiated from components attributed to chromatographic anomalies. From this comparison the major components of the stevia extract were determined. Available standards were then used to confirm the identification of several of the components.

Results and Discussion

Figure 1 and Figure 2 represent the total ion chromatogram for the stevia extract under both HILIC and reversed-phase conditions. Both of these chromatographic separations demonstrate the complexity of the stevia extract. Table 1 depicts the major components that were common in both the reversed-phase and HILIC separations of the stevia extract. More than 250 components were identified with this comparison, but only the major components were targeted in this study. The highlighted components in Table 1 depict co-retention of analytes under reversed-phase conditions. A good example of using this orthogonal approach is observed in the case of steviobioside and ducloside A. Under the reversed-phase separation, these components were co-retained. By performing the separation under HILIC conditions, steviobioside and ducloside A were well separated. Other unidentified major components that were unresolved under the reversed-phase conditions were also separated under the HILIC conditions. The data in
Table 1 also depicts the selectivity difference between the two chromatographic modes. Polar components that were poorly retained in the reversed-phase conditions were

(continued on page 16)

Figure 1. Component Chromatogram of Stevia Extract on Ascentis Express HILIC

column: Ascentis Express HILIC, 15 cm x 2.1 mm I.D., 2.7 µm with upchurch inline filter
flow: 0.2 mL/min.
mobile phase A: 2 mM ammonium formate (98:2 acetonitrile:water)
mobile phase B: 2 mM ammonium formate (80:20 acetonitrile:water)
temp.: 35 °C
inj. vol.: 1 µL
system: Agilent 1200SL 6210 TOF, ESI(+)
datafile: 1228082.d

gradient:

Time	%A	%B	Flow
0.00	100	0	0.2
10.00	100	0	0.2
40.00	0	100	0.2
45.00	0	100	0.2
45.01	100	0	0.4
57.00	100	0	0.2
60.00	100	0	0.2

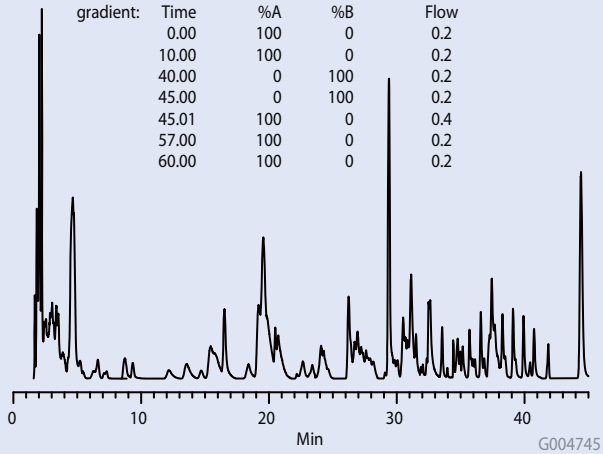
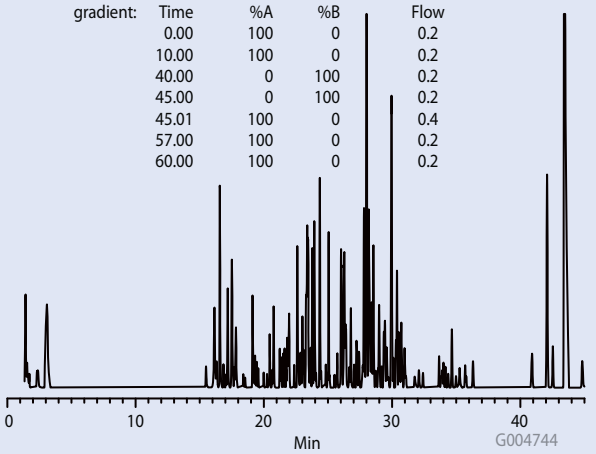


Figure 2. Component Chromatogram of Stevia Extract on Ascentis Express RP-Amide

column: Ascentis Express RP-Amide, 15 cm x 2.1 mm I.D., 2.7 µm with Upchurch inline filter
flow: 0.2 mL/min.
mobile phase A: 10 mM ammonium formate water
mobile phase B: 10 mM ammonium formate (95:5 acetonitrile:water)
temp.: 35 °C
inj. vol.: 1 µL
system: Agilent 1200SL 6210 TOF, ESI(+)
datafile: 012009002.d

gradient:

Time	%A	%B	Flow
0.00	100	0	0.2
10.00	100	0	0.2
40.00	0	100	0.2
45.00	0	100	0.2
45.01	100	0	0.4
57.00	100	0	0.2
60.00	100	0	0.2



Bibliography of Fused-Core Publications

Title: Comprehensive two-dimensional liquid chromatography to quantify polyphenols in red wines.
Authors: Paola Dugo, Francesco Cacciola, Paola Donato, Diego Airado-Rodríguez, Miguel Herrero, Luigi Mondello
Affiliation: Dept of Food & Environment, University of Messina, Messina, Italy; Dept of Pharmaceutical Chemistry, University of Messina, Messina, Italy; Dept of Analytical Chemistry, University of Extremadura Avda, Badajoz, Spain; Campus-Biomedico, Roma, Italy
Journal: Journal of Chromatography A, 2009

Title: Serial coupled columns reversed-phase separations in high-performance liquid chromatography – Tool for analysis of complex real samples
Authors: Luigi Mondello, Miguel Herrero, Francesco Cacciola, Paola Donata, Daniele Giuffrida, Giacomo, Dugo, Paola Dugo
Affiliation: Dept of Pharmaceutical Chemistry; University of Messina, Messina,Italy; Campus-Biomedico, Roma, Italy; Dept of Food & Environment, University of Messina, Messina, Italy
Journal: Journal of Chromatography A, 2008, 208-215

Title: Characterization of new types of stationary phases for fast liquid chromatographic applications
Authors: Szabolcs Fekete, Jenö Fekete, Katalin Ganzler
Affliation: Formulation Development, Gedeon Richter Plc, Budapest X, Hungary; Dept of Inorganic & Analytical Chemistry; Budapest University of Technology & Economics
Journal: Journal of Pharmaceutical and Biomedical Analysis, 2009

Title: The use of partially porous particle columns for the routine, generic analysis of biological samples for pharmacokinetic studies in drug discovery by reversed-phase ultra-high performance liquid chromatography-tandem mass spectrometry
Authors: David N. Mallett, César Ramírez-Molina
Affliation: GlaxoSmithKline Medicines Research Centre; Respiratory CEDD DMPK & Immuno-Inflammation CEDD DMPK; Stevenage, Herts, United Kingdom
Journal: Journal of Pharmacuetical and Biomedical Analysis, 2009, 100-107

Title: Shell and small particles; Evaluation of new column technology
Authors: Szabolcs Fekete, Jenö Fekete, Katalin Ganzler
Affiliation: Formulation Development, Gedeion Richter Plc, Budapest X, Hungary; Dept. of Inorganic & Analytical Chemistry; Budapest University of Technology & Economics, Budapest, Hungary
Journal: Journal of Pharmaceutical and Biomedical Analysis, 2008

Title: Modeling of the Mass-Transfer Kinetics in Chromatographic Columns Packed with Shell and Pellicular Particles
Authors: Krzysztof Kaczmarski, Georges Guiochon
Affiliation: Dept of Chemical & Process Engineering; Rzesnow University of Technology, Rzeszow, Poland; Dept of Chemistry, University of Tennessee, Knoxville, Tennessee; Div of Chemical Sciences, Oak Ridge National Lab, Oak Ridge, Tennessee
Journal: Analytical Chemistry 2007, 4648-4656

Title: Mass-Transfer Kinetics in a Shell Packing Material for Chromatography
Authors: Georges Guiochon, Alberto Cavazzini, Fabrice Gritti, Krysztof Kaczmarski, Nicola Marchetti
Affiliation: Dept of Chemistry, University of Tennessee, Knoxville, Tennessee; Div of Chemical Sciences, Oak Ridge National Lab, Oak Ridge, Tennessee; Faculty of Chemistry, Rzeszow University of Technology, Rzeszow, Poland
Journal: Analytical Chemistry, 2007, 5972-5979

Title: Comprehensive Off-Line, Two-Dimensional Liquid Chromatography. Application to the Separation of Peptide Digests
Authors: Georges Guiochon, Nicola Marchetti, Jacob N Fairchild
Affiliation: Dept of Chemistry, University of Tennessee, Knoxville, Tennessee, Div of Chemical Sciences, Oak Ridge National Lab, Oak Ridge, Tennessee
Journal: Analytical Chemistry 2008, 2756-2767

Title: Comparison between the loading capacities of columns packed with partially and totally porous fine particles. What is the effective surface area available for adsorption?
Authors: Georges Guiochon, Fabrice Gritti
Affiliation: Dept of Chemistry, University of Tennessee, Knoxville, Tennessee; Div of Chemical Sciences, Oak Ridge National Lab, Oak Ridge, Tennessee
Journal: Journal of Chromatography A, 2007, 107-122

Title: Comparison between the efficiencies of columns packed with fully and partially porous C18-bonded silica materials
Authors: Georges Guiochon, Fabrice Gritti, Alberto Cavazzini, Nicola Marchetti
Affiliation: Dept of Chemistry, University of Tennessee, Knoxville, Tennessee; Div of Chemical Sciences, Oak Ridge National Lab, Oak Ridge, Tennessee; Dept of Chemistry, University of Ferrara, Ferrara, Italy
Journal: Journal of Chromatography A, 2007, 289-303

Title: Gradient elution separation and peak capacity of columns packed with porous shell particles
Authors: Georges Guiochon, Nicola Marchetti, Alberto Cavazzini, Fabrice Gritti
Affiliation: Dept of Chemistry, University of Tennessee, Knoxville, Tennessee, Div of Chemical & Analytical Sciences, Oak Ridge National Lab, Oak Ridge, Tennessee, Dept of Chemistry, University of Ferrara, Ferrara, Italy
Journal: Journal of Chromatography A 2007, 203-211

Title: Comparative study of the performance of columns packed with several new fine silica particles. Would the external roughness of the particles affect column properties?
Authors: Georges Guiochon, Fabrice Gritti
Affiliation: Dept of Chemistry, University of Tennessee, Knoxville, Tennessee; Div of Chemical Sciences, Oak Ridge National Lab, Oak Ridge, Tennessee
Journal: Journal of Chromatography A, 2007, 30-46

Title: High peak capacity separations of peptides in reversed-phase gradient elution liquid chromatography on columns packed with porous shell particles
Authors: Georges Guiochon, Nicola Marchetti
Affiliation: Dept of Chemistry, University of Tennessee, Knoxville, Tennessee; Div of Chemical Sciences, Oak Ridge National Lab, Oak Ridge, Tennessee
Journal: Journal of Chromatography A, 2007, 206-216

Title: Evaluation of the properties of a superficially porous silica stationary phase in hydrophilic interaction chromatography
Authors: David V McCalley
Affiliation: Center for Research in Biomedicine, University of the West of England, Frenchay, Bristol, United Kingdom
Journal: Journal of Chromatography A, 2008, 85-91

Title: Optimization of two-dimensional gradient liquid chromatography separations
Authors: Pavel Jandera, Petr Cesla, Tomás Hájek
Affiliation: Dept of Analytical Chemistry, University of Pardubice, Pardubice, Czech Republic
Journal: Journal of Chromatography A, 2008

Title: Comprehensive two-dimensional liquid chromatography separations of pharmaceutical samples using dual Fused-Core columns in the 2nd dimension
Authors: Anthony J Alexander, Lianjia Ma
Affiliation: Analytical R & D, Bristol Myers Squibb Co, New Brunswick NJ
Journal: Journal of Chromatography A, 2009, 1338-1345

Title: Determination of fatty alcohol ethoxylates with diphenic anhydride derivatization and liquid chromatography with spectrophotometric detection. A comparative study with other anhydrides.
Authors: G. Ramis-Ramos, A. Micó-Tormos, F. Bianchi, E. F. Simó-Alfonso
Affiliation: Dept de Química Analitica, Universitat de València, Valencia, Spain
Journal: Journal of Chromatography A, 2009, 3023-3030

Title: Determination of fatty alcohol ethoxylates by derivatisation with maleic anhydride followed by liquid chromatography with UV-vis detection
Authors: G. Ramis-Ramos, A. Micó-Tormos, C. Collado-Soriano, J. R, Torres-Lapasió, E. Simó-Alfonso
Affiliation: Dept de Química Analitica, Universitat de València, Valencia, Spain
Journal: Journal of Chromatography A, 2008, 32-41

Title: On-column epimerization of dihydroartemisinin: An effective analytical approach to overcome the shortcomings of the International Pharmacopoeia monograph
Authors: Francesco Gasparrini, Walter Cabri, Alessia Ciogli, Ilaria D'Acquarica, Michela Di Mattia
Affiliation: Analytical Development, R & D Dept.,Pomezia, Italy; Dept di Chimica e Tecnologie del Farmaco, Sapienza Università di Roma, Rome, Italy
Journal: Journal of Chromatography B, 2008, 180-191

Title: Use of partially porous column as second dimension in comprehensive two-dimensional system for analysis of polyphenolic antioxidants
Authors: Paola Dugo, Francesco Cacciola, Miguel Herrero, Paola Donato, Luigi Mondello
Affiliation: Dipartimento de Scienze degli Alimenti e dell'Ambiente, Facoltà di Scienze, Messina, Italy; Dipartimento Farmacia-chimco, Facoltà di Farmacia, Università di Messina, Messina, Italy; Campus-Biomedico, Roma, Italy
Journal: Journal of Separation Science, 2008, 3297-3308

Title: High peak capacity separation of peptides through the serial connection of LC shell-packed columns
Authors: Paola Donato, Paola Dugo, Francesco Cacciola, Giovanni Dugo, Luigi Mondello
Affiliation: Dipartimento Farmacia-chimco, Facoltà di Farmacia, Università di Messina, Messina, Italy; Dipartimento de Scienze degli Alimenti e dell'Ambiente, Facoltà di Scienze, Messina, Italy; Campus-Biomedico, Roma, Italy
Journal: Journal of Separation Science, 2009, 1129-1136

Title: Maximizing peak capacity and separation speed in liquid chromatography
Authors: Patrik Petersson, Andre Frank, James Heaton, Melvin R. Euerby
Affiliation: AstraZeneca R&D Lund, Lund, Sweden; AstraZeneca, R&D Charnwood, Loughborough, Leicestershire, England, UK
Journal: Journal of Separation Science, 2008, 2346-2357

Title: Tryptic digest analysis by comprehensive reversed phase x two reversed phase liquid chromatography (RP-LC x 2RP-LC) at different pH's
Authors: Isabelle François, Deirdre Cabooter, Koen Sandra, Frédéric Lynen, Gert Desmet, Pat Sandra
Affiliation: Separation Sciences Group & Pfizer Analytical Research Centre, Ghent University, Ghent, Belgium; Dept. of Chemical Engineering, Vrije Universiteit Brussel, Brussels, Belgium; Research Institute for Chromatography, Kortrijk, Belgium
Journal: Journal of Separation Science, 2009, 1137-1144

Title: Fused-core particle technology as an alternative to sub-2-µm particles to achieve high separation efficiency with low backpressure
Authors: Jennifer M. Cunliffe, Todd D. Maloney
Affiliation: Pfizer Global Research & Development, Michigan Laboratories, Ann Arbor
Journal: Journal of Separation Science, 2007

Title: High specific activity tritium-labeled N-(2-methoxybenzyl)-2,5-dimethoxy-4-iodophenethylamine (INBMeO): A high-affinity 5-HT2A receptor-selective agonist radioligand
Authors: David E. Nichols, Stewart P. Frescas, Benjamin R. Chemel, Kenneth S. Rehder, Desong Zhong, Anita H. Lewin
Affiliation: Dept. of Medicinal Chemistry & Molecular Pharmacology, School of Pharmacy & Pharmaceutical Sciences, Purdue University, West Lafayette, Indiana; Center for Organic & Medicinal Chemistry, Research Triangle Instutite, Durham, NC
Journal: Bioorganic & Medicinal Chemistry, 2008, 6116-6123

Title: Fused Core Particles for HPLC Columns
Authors: Joseph J. Kirkland, Timothy J. Langlois, Joseph J. DeStefano
Affiliation: Advanced Materials Technology
Journal: American Laboratory, 2007

Title: Sub-2-Micron Performance With a Conventional HPLC Instrument Using 2.7-Micron Fused Core Particles
Authors: Thomas L. Chester
Affiliation: Dept. of Chemistry, University of Cincinnati, Cincinnati, OH
Journal: American Laboratory, 2009

Title: Fused-Core Silica Column High-Performance Liquid Chromatography/Tandem Mass Spectrometric Determination of Rimonabant in Mouse Plasma
Authors: Yunsheng Hsieh, Christine J. G. Duncan, Jean-Marc Brisson
Affiliation: Drug Metabolism & Pharmacokinetics Dept., Schering-Plough Research Institute, Kenilworth, NJ
Journal: Anal. Chem., 2007, 79 (15), pp 5668–5673

Title: Discovery of Pyridine-Containing Imidazolines as Potent and Selective Inhibitors of Neuropeptide Y Y5 Receptor
Authors: Makoto Ando, Nagaaki Sato, Tsuyoshi Nagase, Keita Nagai, Shiho Ishikawa, Hirobumi Takahashi
Affiliation: Tsukuba Research Institute, Merck Research Laboratories, Banyu Pharmaceutical Co, Ltd, Tsukuba, Japan
Journal: Bioorganic & Medicinal Chemistry, 2009

Title: Discovery of potent and orally active 3-alkoxy-5-phenoxy-N-thiazolyl benzamides as novel allosteric glucokinase activators
Authors: Tomoharu Iino, Daisuke Tsukahara, Kenji Kamata, Kaori Sasaki, Sumika Ohyama, Hideka Hosaka
Affiliation: Banyu Tsukuba Research Institute, Banyu Pharmaceutical Co Ltd, Tsukuba, Japan
Journal: Bioorg Med Chem. 2009 Apr 1;17(7):2733-43

Title: Achiral Liquid Chromatography with Circular Dichroism Detection for the Determination of Carnitine Enantiomers in Dietary Supplements and Pharmaceutical Formulations
Authors: Ángel Ríos, Fernando de Andrés, Gregorio Castañeda
Affiliation: Dept. of Analytical Chemistry & Food Technology, University of Castilla-La Mancha, Ciudad Real, Spain
Journal: Journal of Pharmaceutical and Biomedical Analysis, 2009

Title: Characterization of new types of stationary phases for fast liquid chromatographic applications
Authors: Szabolcs Fekete, Jenö Fekete, Katalin Ganzler
Affiliation: Formulation Development, Gedeon Richter Plc, Budapest, Hungary; Budapest University of Technology & Econmics, Dept. of Inorganic & Analytical Chemistry, Budapest, Hungary
Journal: Journal of Pharmaceutical and Biomedical Analysis, 2009

Title: Comprehensive Two-Dimensional Liquid Chromatography Separations of Pharmaceutical Samples using Dual Fused-Core Columns in the Second Dimension
Authors: Anthony J. Alexander, Lianjia Ma
Affiliation: Analytical Research & Development, Bristol Myers Squibb Co, New Brunswick, NJ
Journal: Journal of Chromatography A, 2009, Pages 1338-1345

Title: Curcumin Structure-Function, Bioavailability, and Efficacy in Models of Neuroinflammation and Alzheimer's Disease
Authors: Aynun N. Begum, Mychica R. Jones, Giselle P. Lim, Takashi Morihara, Peter Kim, Dennis D. Heath
Affiliation: Dept. of Medicine & Neurology & Psychiatry & Biobehavioral Sciences and the Semel Institute, UCLA, Los Angeles, CA; Greater LA Healthcare System, Geriatric Research Education Clinical Center, Sepulveda, CA; Cancer Prevention & Control Program, Moores UCSD Cancer Center, UCSD, San Diego, CA; Dept. of Post-Genomics & Diseases, Division of Psychiatry & Behavioral Proteomics, Osaka University Graduate School or Medicine, Osaka, Japan
Journal: J Pharmacol Exp Ther. , 2008, 196-208

Title: Liposome-Encapsulated Curcumin Suppresses Growth of Head and Neck Squamous Cell Carcinoma In vitro and in Xenografts through the Inhibition of Nuclear Factor kB by an AKT-Independent Pathway
Authors: Dorothy Wang, Mysore S. Veena, Kerry Stevenson, Christopher Tang, Baran Ho, Jeffrey D, Suh
Affiliation: Dept. of Surgery & Pathology, VA Greater LA Healthcare System; David Geffen School of Medicine, UCLA, Los Angeles, CA; Dept of Psychiatry & Biobehavioral Sciende, Semel Institute, UCLA, Los Angeles, CA; Dept. of Experimental Therapeutics, MD Anderson Cancer Center, University of Texas, Houston, TX
Journal: Clinical Cancer Research, 2008

Title: Analysis of Impurities in Streptomycin and Dihydrostrepomycin by Hydrophilic Interaction Chromatography/Electrospray Ionization Quadrupole Ion Trap/Time-of-Flight Mass Spectrometry
Authors: Shin-ichi Kawano
Affiliation: Analytical Applications Dept., Shimadzu Corp., Kyoto, Japan
Journal: Rapid Communications in Mass. Spectrometry, 2009, 907-914

Title: Determination of Fatty Alcohol Ethoxylates by Derivatization with Phthalic Anhydride followed by Liquid Chromatography with UV-vis Detection
Authors: G. Ramis-Ramos, A. Micó-Tormos, E. F. Simó-Alfonso
Affiliation: Dept de Química Analitica, Universitat de València, Valencia, Spain
Journal: Journal of Chromatography A, 2009, 47-53

Title: Highly Efficient Peptide Separations in Proteomics: Part 1. Unidimensional High Performance Liquid Chromatography
Authors: Koen Sandra, Mahan Moshir, Filip D'hondt, Katleen Verleysen, Koen Kas, Pat Sandra
Affiliation: Dept. of Chemical Engineering, Vrije Universiteit Brussel, Brussels, Belgium
Journal: Journal of Chromatography B, 2008, 48-63

Title: Multidimensional LCxLX analysis of Phenolic and Flavone Natural Antioxidants with UV-electrochemical coulometric and MS Detection
Authors: Tomás Hájek , Veronika Skerikova, Petr Cesla, Katerina Vynuchalova, Pavel Jandera
Affiliation: Dept of Analytical Chemistry, University of Pardubice, Pardubice, Czech Republic
Journal: Journal of Separation Science, 2008, 3309-3328

Title: Separation of Natural Product using columns packed with Fused-Core Particles
Authors: P. Yang, G.R. Litwinski, M. Pursch, T. McCabe, K. Kuppannan
Affiliation: The Dow Chemical Company, Analytical Sciences, Midland, MI
Journal: J. Sep Sci., 2009, 1816-1822

(continued from page 13

Table 1. Major Component Retention Comparison Between HILIC and Reversed-Phase Modes

Component	Accurate Mass	Ascentis Express HILIC	Ascentis Express RP-Amide
		RT	RT
	137.0476	44.397	1.429
	120.0574	34.695	3.075
	102.0473	29.394	3.077
	368.1698	18.414	15.502
	120.0574	31.082	17.166
	402.1518	15.471	17.196
	162.1405	8.727	19.128
	378.2242	8.736	19.13
Rebaudioside A/E	966.4281	34.439	21.755
	516.1254	20.784	23.016
	498.1154	20.714	23.016
Stevioside	804.3743	26.52	23.63
Steviolbioside	642.3234	19.213	24.356
Dulcoside A	788.3817	26.247	24.475
	338.2448	2.248	25.737
	176.1555	2.049	26.026
	284.2134	3.372	26.028
	246.1977	3.359	26.06
	380.255	2.002	26.672
	284.2131	2.811	27.881
	360.083	1.867	28.187
	444.2002	1.825	30.391
Steviol	318.2186	1.91	32.19
	592.2655	2.239	42.539

Figure 3. Stevia Extract on Ascentis Express RP-Amide, Extracted Ion Chromatogram for Steviol

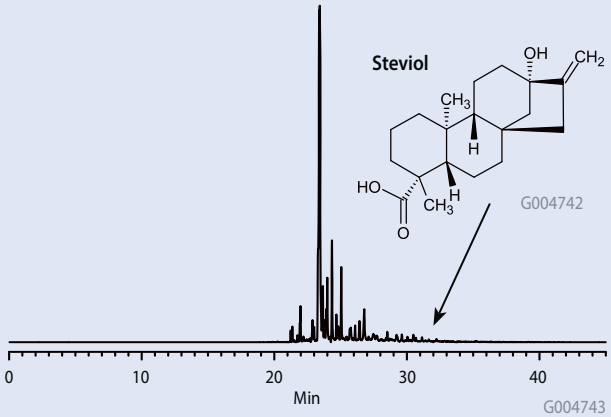
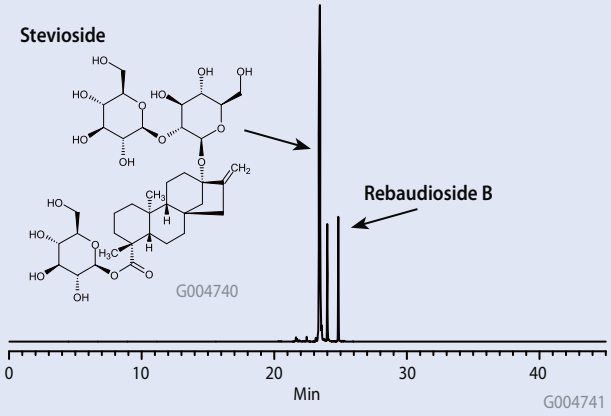


Figure 4. Stevia Extract on Ascentis Express RP-Amide, Extracted Ion Chromatogram for Stevioside



strongly retained under HILIC conditions. In two cases, where known components were identified, it was necessary to use standards to confirm their retention. Figures 3 and 4 depict the extracted ion chromatogram for the accurate mass of steviol and stevioside. As can be seen in both chromatograms, multiple peaks are observed for each of the accurate masses. In the case of stevioside, it is isobaric with rebaudioside B making identification difficult. A stevioside standard (Sigma Aldrich) was used for positive identification. In addition, the reversed-phase separation of the extract resulted in multiple peaks observed for the accurate mass of steviol. This was due to fragments from additional glycosides that resulted in a steviol fragment ion, again it was necessary to confirm the steviol retention with a standard.

Conclusions

The profiling of the *Stevia rebaudiana* extract demonstrates the utility of performing orthogonal chromatographic modes when handling complex samples. The two modes of chromatography were complimentary for the determination of major components from the stevia extract. In most cases where coelution occurred in one chromatographic mode, the components were separated under the orthogonal mode. Though component identification was made easier through the accurate mass of the TOF, it was still necessary to have good chromatographic resolution to confirm component identity. In both cases, the Fused-Core™ particle demonstrated the ability to perform complex matrix analysis in both HILIC and reversed-phase separations.



HPLC Seminars on the Web - 24/7

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- Ultra-high Performance using Fused-Core™ HPLC Columns
- The Use of Alternate Selectivity in Reversed-Phase HPLC
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Colors of the World: Fast Separation of Dyes with Ascentis Express

Dyes surround us everywhere every day. They can be found in common places like the printing ink in magazines or books and in plastics, textiles, and leather, but also in unusual places like diesel fuel and tattoo color. Most of these synthetic colors are based on aromatic ring structures containing heteroatoms and tend to have a high potential for causing cancer; as a result, they are not intended for use in food coloring. But since 2003, there have been several incidents of Sudan I contamination in chili powder. This situation necessitates the analysis of spice mixtures to determine if they have been adulterated (1, 2).

Further, a sensitive HPLC method is needed for quality control testing of dyes and the identification of byproducts. Supelco's Ascentis Express HPLC columns provide outstanding sensitivity and resolution for such applications.

Method Development for Dyes

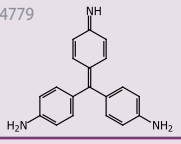
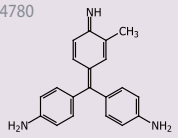
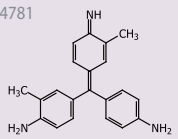
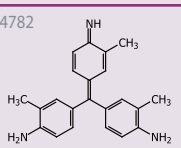
Table 1 contains a list of dyes added to one sample and dissolved in a mixture of methanol and acetonitrile. The sample was injected on an Ascentis Express C8 HPLC column under varying mobile phase conditions to determine the best separation parameters. Temperature, injection volume, detector settings, and flow rate were kept constant.

The chemical and physical properties of the dyes differ strongly, so the first step in developing a suitable HPLC method was the use of a gradient run ranging from 25% acetonitrile to 100% acetonitrile (B) and 0.1% formic acid in water as an aqueous counterpart (A). The UV chromatogram of the combined wavelengths 360, 550, and 620 nm showed good chromatography of all compounds except for the poor peak shape of Sudan 410 at 17.35 minutes (Figure 1A).

To optimize that peak shape, methanol was added to the organic mobile phase (acetonitrile:methanol, 90:10); the gradient run was repeated, resulting in better peak shape for Sudan 410 (Figure 1B). In a final experiment, the gradient profile was changed and optimum conditions were attained (see Table 2). Figure 1C shows the step-by-step improvements in the chromatography.

Only three runs were needed to get the final method, showing how easy and fast it is to develop methods with Ascentis Express columns. Further, Ascentis Express columns contain Fused-Core particles that allow for faster run times; even separations performed on standard HPLC systems can be sped up by up to 30% with Ascentis Express.

Table 1. Structure and Mass of the Dyes in the Sample Mixture. Most of the Compounds are Detected as $[M+H]^+$ Ions except (5), which gives $[M]^+$ Ions

Peak No.	Structure	Name / Exact Mass
1	G004779 	Parafuchsin $C_{19}H_{17}N_3$ 287.142247
2	G004780 	Basic Fuchsin $C_{20}H_{19}N_3$ 301.157897
3	G004781 	Methylfuchsin $C_{21}H_{21}N_3$ 315.173547
4	G004782 	Newfuchsin $C_{22}H_{23}N_3$ 329.189197

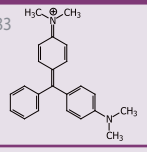
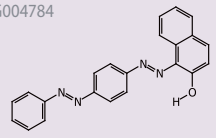
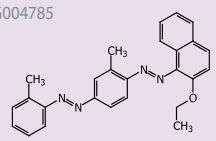
Peak No.	Structure	Name / Exact Mass
5	G004783 	Malachite Green $C_{23}H_{25}N_2$ 329.201773
6	G004784 	Sudan III $C_{22}H_{16}N_{4O}$ 352.132411
7	G004785 	Sudan 410 $C_{26}H_{24}N_{4O}$ 408.195011

Table 2. Initial and Final HPLC Method Settings for Separation of the Seven Dyes Listed in Table 1, After Optimization

Fixed Parameters

column:	Ascentis Express C8, 10 cm × 4.6 mm I.D., 2.7 µm particles
flow rate:	0.8 mL/min
temp:	55 °C
UV DAD:	200–950 nm
MS:	ESI(+), SPS target 500 m/z, stability 100%, trap lvl. 100%, optimize normal, range 100–1500 m/z, nebulizer 50 psi, dry gas 12 L/min, dry temp. 365 °C.
injection volume:	3 µL
run time:	25 min (5 min posttime)

Variable Parameters

Initial Conditions

solvents: (A) water with 0.1% formic acid
(B) acetonitrile

gradients:

Time	%A	%B
0.0	75	25%
1.5	75	25%
15.0	0	100%
22.0	0	100%
25.0	75	25%

Final Conditions

(A) water with 0.1% formic acid
(B) acetonitrile:methanol (90:10)

Time	%A	%B
0.0	75	25%
1.5	75	25%
15.0	2	98%
22.0	2	98%
25.0	75	25%

Figure 1. UV Chromatograms of Sudan III and Sudan 410. (A) Initial Conditions, (B) Addition of Methanol to Mobile Phase, (C) Final Conditions after Adjusting Gradient

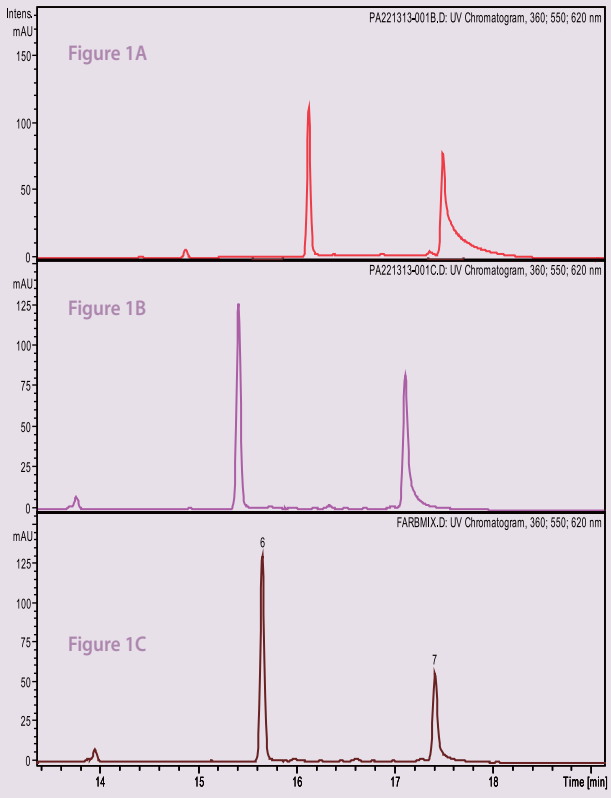
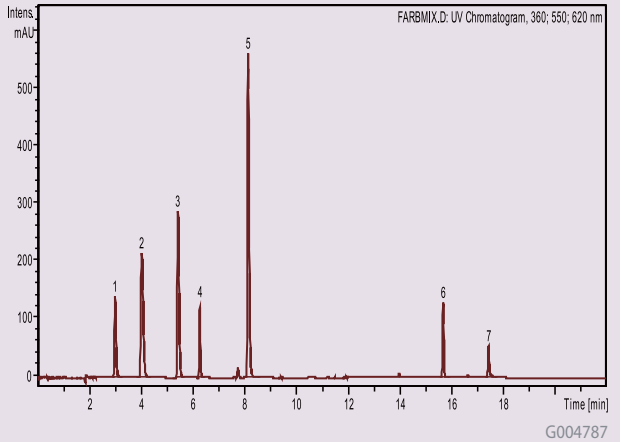


Figure 1 shows UV chromatograms of Sudan III (Peak 6) and Sudan 410 (Peak 7) after three optimization steps. An organic phase mixture of methanol:acetonitrile (10:90) and a final gradient composition of 98% organic mobile phase resulted in the best overall peak shapes with a minimum of tailing of compounds (Peak 7). Figure 3 shows the final chromatogram with very good separation of all analytes.

Figure 2 is a UV chromatogram of the final HPLC method. Resolution, sensitivity, and peak symmetry were optimal for all analytes. The total run time on a standard HPLC instrument (Agilent 1100) was 25 minutes, but the separation could easily be performed faster on ultra-performance instruments.

Figure 2. UV Chromatogram of the Final HPLC Method

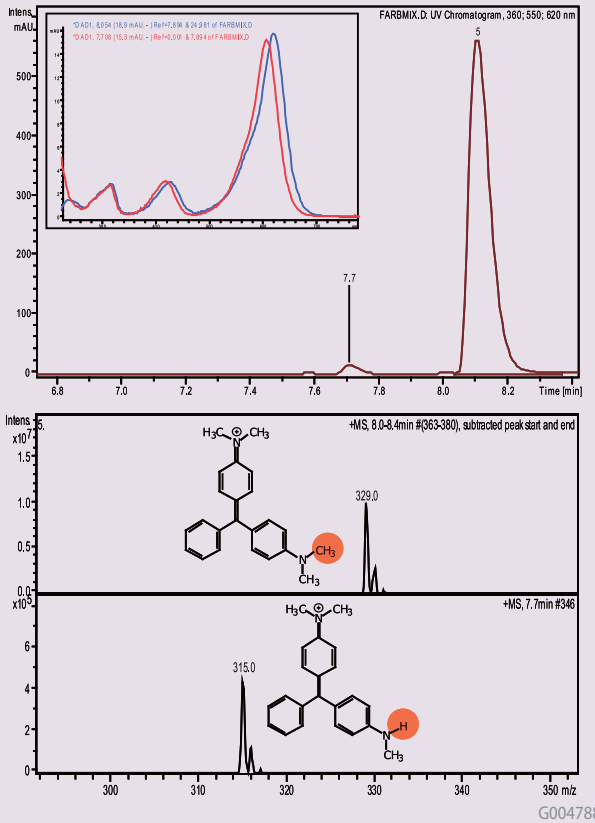


Ascentis Express HPLC Columns: High Efficiency and LC-MS Compatibility

Using Ascentis Express columns on standard HPLC, fast LC, and ultra-performance instruments can yield heightened sensitivity (Figure 2). Mass detectors in LC-MS systems are very sensitive to contaminants in solvents and column bleed, both of which are very low with Ascentis Express columns combined with the right set of Fluka® LC-MS solvents and additives. Both aspects, high efficiency and low column bleed, are basic requirements in trace analysis of small target analyte concentrations or in identification of byproducts which may influence dramatically the quality and application of dyes. Figure 3 shows an example of the identification of low concentrations of byproducts even in very complex mixtures. The unknown substance at the retention time of 7.68 minutes shows a nearly identical UV spectrum to Malachite Green (Peak 5 at 8.10 minutes), but the mass is 14 Da lower. This may correspond to the exchange of a methyl residue with a proton at a position in the Malachite Green molecule that has no influence on the chromophore. Only the displayed molecular structures fit the UV and mass spectroscopic results.

Figure 3. Expanded View of UV Chromatogram Showing Unknown Impurity at 7.7 min. and Malachite Green (5)

The inset shows the UV spectra of malachite green (blue) and the unknown impurity (red). The mass spectra are of malachite green (top) and unknown impurity (bottom).



G004788



To get optimal results from your LC-MS system and accurate UV and mass spectra of impurities with a high signal-to-noise level, it is best to use high purity LC-MS solvents from Fluka and high performance HPLC columns such as Ascentis Express from Supelco.

References

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2. Rapid Alert System for Food and Feed (RASFF). 2004. Annual Report. European Commission of Health & Consumer Protection Directorate General.

Ascentis Express Properties

Stationary Phase Support

- Ultra-pure, Type B silica
- 1.7 µm solid core particle with 0.5 µm porous silica shell (effective 2.7 µm)
- 150 m^2/gram surface area (comparable to ~225 m^2/g porous particle)
- 90 Å pore size, 160 Å for Peptide ES C-18

Bonded Phase

	Coverage µmoles/m^2	pH Range	Endcapping
C18	*3.5*	*2-9*	*Yes*
C8	*3.7*	*2-9*	*Yes*
RP-Amide	*3.0*	*2-9*	*Yes*
HILIC	*n/a*	*2-8*	*No*
Phenyl-Hexyl	*3.4*	*2-9*	*Yes*
Peptide ES-C18	*3.5*	*1-9*	*No*

Ascentis Express RP-Amide:

Combining an Embedded Polar Group Stationary Phase and Fused-Core Particles

Ascentis Express RP-Amide HPLC columns are the most recent product additions to the Supelco HPLC product line. Combining an embedded polar group (EPG) stationary phase with the Fused-Core particles, Ascentis Express RP-Amide provides a host of useful benefits to the HPLC chromatographer. The benefits come from both the phase technology and the particle technology and can be summarized as:

Fused-Core Benefits

- Higher efficiency than traditional HPLC columns (3 and 5 µm)
- Half of the backpressure of sub 2 micron columns
- Capable of UHPLC performance on traditional HPLC systems

RP-Amide Benefits

- Alternative reversed-phase selectivity to C18
- Improved peak shape for bases
- 100% aqueous compatible reversed-phase column

At the heart of the Ascentis Express RP-Amide is the 2.7 µm Fused-Core particle that comprises a 1.7 µm solid core and a 0.5 µm porous shell. Compared to totally porous particles, the Fused-Core particles have a much shorter diffusion path because of the solid core. This partial porosity reduces dispersion of solutes and minimizes peak broadening. Other features, such as a very tight particle size distribution and high packing density, result in Ascentis Express columns capable of delivering extreme performance to any HPLC system. In fact, there have been many reports on the vast improvements in efficiency and speed provided by Ascentis Express HPLC columns versus traditional HPLC columns. The improvements provide UHPLC performance on traditional HPLC systems.

While the Ascentis Express C8 and C18 provide classic reversed-phase selectivity, the RP-Amide phase offers an alternative selectivity. Supelco first commercially introduced the EPG phase in 1988. At that time, large tailing factors for basic analytes continued to plague conventional C18 and C8 bonded phases. The EPG phase was found to improve peak shape of basic analytes. The early generation EPG phases were based on a two-step bonding process (Figure 1). The first step was the bonding of an aminopropylsilane to the bare silica surface creating a surface with amine functionality. In step two, palmitoyl chloride was reacted with the amine to create a long chain amide. Not all amines would be converted in the process, leaving a mixed system. These early generation EPG phases suffer from poor reproducibility.

Next generation phases, including Ascentis Express RP-Amide, are produced using a one-step process (Figure 2). In the single step process, no free amino ligands occur since the amide is introduced as a whole unit. This one-step bonding process yields excellent batch-to-batch reproducibility. Interestingly, not all EPG phases on the market use the modern, one-step bonding approach.

Improved Peak Shape for Basic Compounds

As previously mentioned, Ascentis Express RP-Amide phase reduces silanol interactions with basic analytes improving peak shape. A good test to demonstrate this effect is highly basic compounds using a mobile phase pH of 7. At this pH, many of the residual silanols are in the ionized form and the basic compounds are protonated.
The protonated (charged) bases interact with the charged silanols via ion exchange and result in a tailing peak. A test

Figure1. Early Generation Two-step Bonding Process for EPG Amide Phases

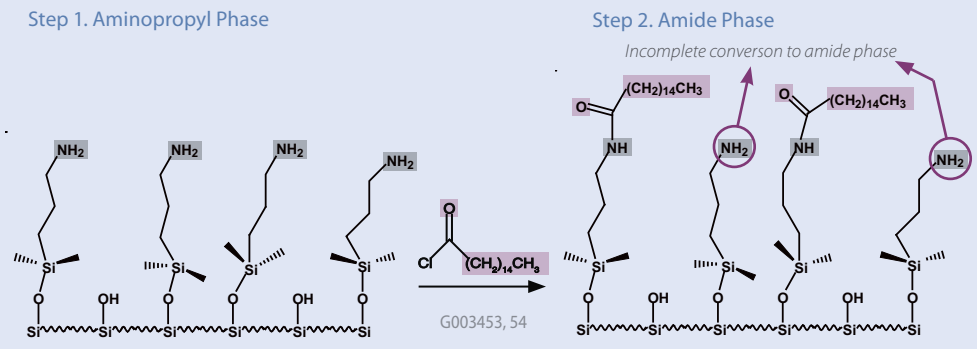
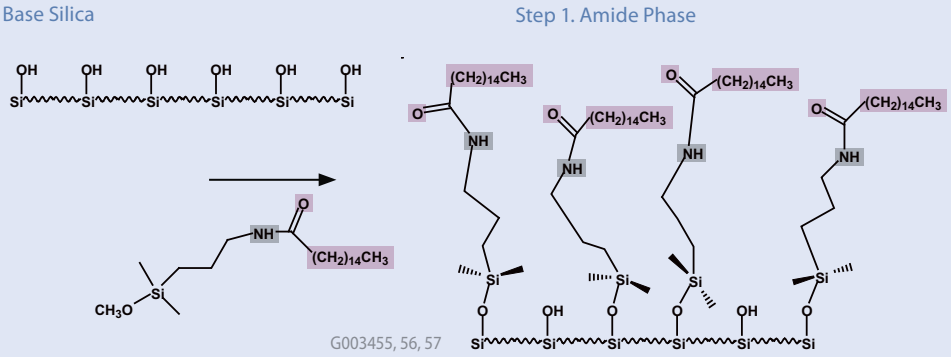


Figure 2. Next Generation One-step Bonding Process for EPG Amide Phases



mix of tricyclic antidepressants was analyzed on Ascentis Express RP-Amide and a C18 column with a mobile phase pH of 7 (Figure 3). As shown in Figure 3, the RP-Amide produces more symmetrical peaks than the C18 for these difficult test probes. Asymmetry data is summarized in Figure 4 for doxepin, imipramine, and amitriptyline.

Alternative Selectivity

Ascentis Express RP-Amide provides increased selectivity for polar compounds, especially those that can act as a hydrogen-bond donor. Phenols, carboxylic acids, amines, and to a lesser extent, alcohols show enhanced retention on the RP-Amide phase when compared to neutral, non-polar analytes. An example of the power of the hydrogen bonding mechanism is shown in Figure 5. The phenolic nature of catechols and resorcinols provides a good test for demonstrating enhanced selectivity of the RP-Amide phase. The RP-Amide phase shows complete baseline resolution of these related compounds while the C18 phase shows reduced retention, resolution, and selectivity for the phenolics. In comparing the Ascentis Express RP-Amide to the Waters™ BEH Shield RP18,
a competitive EPG phase, the selectivity is very similar. The difference in this example is the Ascentis Express RP-Amide yields a backpressure half of the 1.7 µm column. This difference in backpressure means the Ascentis Express column is suitable for traditional HPLC systems while the 1.7 µm column is not.

The selectivity differences between the RP-Amide and the C18 can be a useful tool in method development. In many cases, when peaks co-elute on a C18 phase, the RP-Amide can be substituted to achieve separation without a change in mobile phase.

Figure 3. Separation of Tricyclic Antidepressants on Ascentis Express RP-Amide and Conventional C18

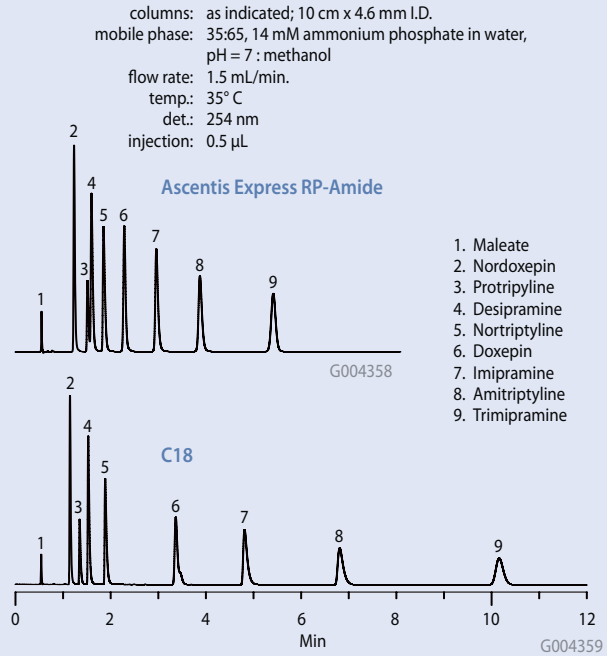


Figure 4. Asymmetry Factors for Difficult Bases on Ascentis Express RP-Amide and Conventional C18

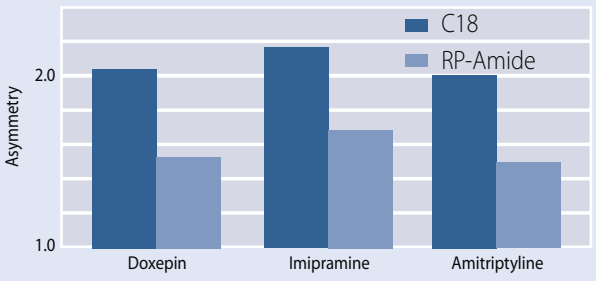
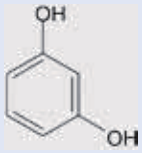


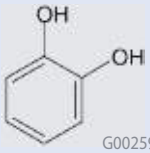
Figure 5. Separation of Phenolics on Ascentis Express RP-Amide & C18, & Waters BEH Shield RP18, 1.7 µm

columns: as indicated; 10 cm x 2.1 mm I.D.
mobile phase A: 20 mM phosphoric acid, pH 2 (unadjusted)
mobile phase B: water
mobile phase C: acetonitrile
mobile phase ratios: A:B:C = 75:5:20
flow rate: 0.3 mL/min.
temp.: 35° C
det.: 270 nm
injection: 1 µL
sample: 50 mg/L ea. in 20 mM phosphoric acid

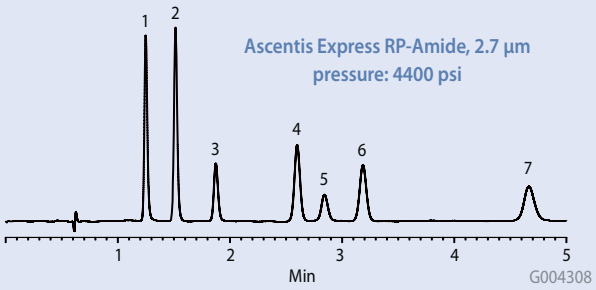
1. Resorcinol
2. Catechol
3. 2-Methylresorcinol
4. 4-Methylcatechol
5. 2,5-Dimethylresorcinol
6. 3-Methylcatechol
7. 4-Nitrocatechol

Resorcinol 

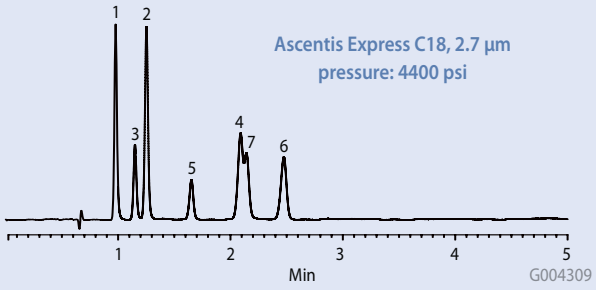
G002594

Catechol 

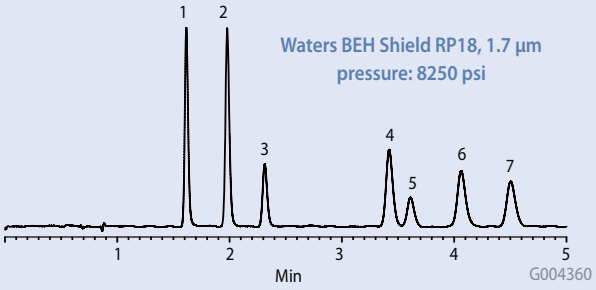
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G004308



G004309

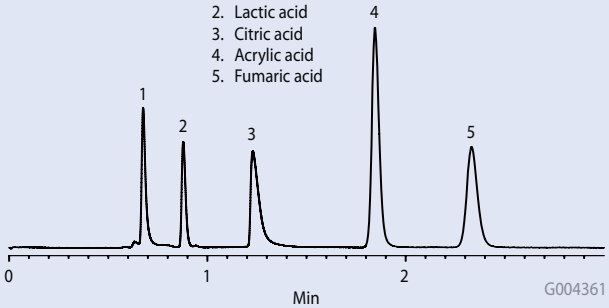


G004360

Figure 6. Separation of Small Organic Acids Under 100% Aqueous Conditions

column: Ascentis Express RP-Amide, 10 cm x 2.1 mm I.D.
mobile phase: 0.1% TFA (v/v) in water
flow rate: 0.3 mL/min.
temp.: 35° C
det.: 210 nm
injection: 1 µL
sample: in mobile phase; tartaric acid, 2 g/L; lactic acid, citric acid, 4 g/L; acrylic acid, 0.5 g/L; fumaric acid, 0.2 g/L

1. Tartaric acid
2. Lactic acid
3. Citric acid
4. Acrylic acid
5. Fumaric acid



G004361

Aqueous Compatible Reversed-Phase Column

Ascentis Express RP-Amide provides stable and reproducible analyte retention in 100% aqueous mobile phases. Many C18 phases are known to suffer from phase collapse under highly aqueous mobile phase conditions causing loss of retention. Shown in Figure 6 is a mix of organic acids analyzed under 100% aqueous conditions. Excellent selectivity and peak shape is noted for all the test probes, even citric acid, which is a notoriously difficult analyte.

Conclusion

Ascentis Express RP-Amide is a blend of modern phase technology and innovative particle technology. The Fused-Core particle provides benefits in terms of speed, resolution, sensitivity, and ruggedness. The one-step RP-Amide bonding chemistry provides benefits in terms of selectivity, aqueous stability, and improved peak shape for bases.

Ascentis Express Phenyl-Hexyl:

Combining the popular Phenyl-Hexyl Stationary Phase and Fused-Core Particles

Even though new column technologies have more than doubled the plates per meter possible with traditional 5 µm columns, resolution still cannot be routinely achieved in every case without the ability to adjust retention and selectivity by proper selection of column stationary and mobile phases. This article features Ascentis Express Phenyl-Hexyl phase, a new addition to the Fused-Core column family, and describes how column selectivity and higher efficiency can be coupled to achieve much faster separations than have previously been possible.

The vast majority of UHPLC separations have been carried out with C18 columns in the classic reversed-phase (RP) mode; however, suppliers now offer many different phases. Although no one would dispute the fact that UHPLC columns with different phases are needed, very little has been published yet on the performance that can be expected from UHPLC columns having different, complementary selectivity to C18 and C8. Two of the most popular polar-RP phases are RP-Amide, which is often categorized as an embedded polar-group phase, and Phenyl, which can interact with solutes by π-π mechanisms. A brief retention and selectivity comparison for the Ascentis Express column family is given in Table 1.

C18 and C8 phases are highly popular because they are stable, reproducible, and easy-to-use. Retention correlates closely with log P values, which have been established for many solutes. Solute ionization causes retention to decrease in a predictable manner and is relatively easy to control by adding dilute acids, bases, and buffers to the mobile phase. Changing the organic component of the mobile phase between acetonitrile and methanol (or other solvents) allows the user to tweak resolution because solvation affects phase structure and selectivity. Temperature is also a useful variable for optimizing phase selectivity. Columns with C18 and C8 phases will frequently give optimum resolution when solutes are nonpolar or slightly polar; however, columns with polar-RP phases such as RP-Amide or Phenyl-Hexyl will often show improved retention and selectivity for more polar solutes. It should be emphasized that even polar-RP phases have a significant alkyl phase character in addition to their polar character. The same mobile phase solvents and techniques may be employed with polar-RP phases, with comparable phase stability to C18.

Table 1. Brief Overview of Ascentis Express Column Retention and Selectivity

Ascentis Express Fused-Core Phase	Principle Retention Mode	Principle Solute Interaction
C18	Reversed-Phase (RP)	Hydrophobic (dispersive)
C8	Reversed-Phase (RP)	Hydrophobic (dispersive)
RP-Amide	RP with embedded polarity	Hydrophobic and H-bonding
Phenyl-Hexyl	RP with pendant aromaticity	Hydrophobic and π-π
HILIC (Silica)	HILIC (or normal phase)	Hydrophilic (dipole, H-bonding, ion exchange)

The RP-Amide phase is complementary to C18 because the amide group has several unique features: 1) strong interaction by H-bonding when solutes can donate or accept protons, 2) effective shielding of silanols by internal H-bonding between amide group and silica surface, and 3) the ability to wet and operate well, even in 100% aqueous solvents. H-bonding allows solutes with carboxyl and phenol groups to be retained much longer and separate much better on RP-Amide than on C18 or C8. Shielding prevents solutes with amino groups from interacting with silanols and can result in shorter retention and sharper peaks on amide phases. Another interesting feature of amide phases is that methanol and other alcohols become much stronger solvents when H-bonding between phase and solute occurs. Except for the special situations listed above, an RP-Amide phase often performs similar to C18 due to the long alkyl chain extending away from the surface.

The Phenyl phase has unique selectivity arising from solute interaction with the aromatic ring and its delocalized electrons. It is complementary (orthogonal) to both C18 and RP-Amide phases because of this unique aromaticity. An unsubstituted phenyl ring is a π-donor or Lewis base, which interacts strongly with π-acceptors and any electron-deficient Lewis acid. Phenyl phases also tend to exhibit good shape selectivity, which may originate from solute multipoint interaction with the planar ring system. More retention and selectivity will often be observed for solutes with aromatic electron-withdrawing groups (fluorine, nitro, etc.) or with a delocalized heterocyclic ring system such as the benzodiazepine compounds.

UHPLC Results with Ascentis Express Phenyl-Hexyl

Low-pressure drop with high efficiency and a flat van Deemter curve have been confirmed for Phenyl-Hexyl, as shown in Figure 1. In general, more than twice the column efficiency of 5 µm particles can be expected for all Ascentis Express Fused-Core columns at pressures that are easily managed with all HPLC instruments. Note that 20,000 plates have been achieved for a 10 cm x 3 mm I.D. column operating at optimum flow. A Jasco X-LC HPLC instrument was used for the study. Figure 2 illustrates the benzodiazepine chemical structures used in this study. As shown in Figure 3, the selectivity of Ascentis Express Phenyl-Hexyl is very similar to that of other commercial Phenyl columns, so methods can be readily transferred between columns.
The difference in efficiency and pressure drop for the two porous 3 µm columns can be explained by different particle size distributions.

Figures 4-5 show comparisons of five benzodiazepines separated on the four Ascentis Express RP phases in water:acetonitrile and water:methanol mobile phases. No additives were employed in order to observe the interaction between these polar solutes and the different phases; however, a dilute buffer will normally be used for development of a validated method. The addition of 10-20 mM buffer at neutral pH typically has little or no effect upon the separation with these highly deactivated column phases.

Figure 1. Flow Performance of Ascentis Express Phenyl-Hexyl Column with Neutral Probes

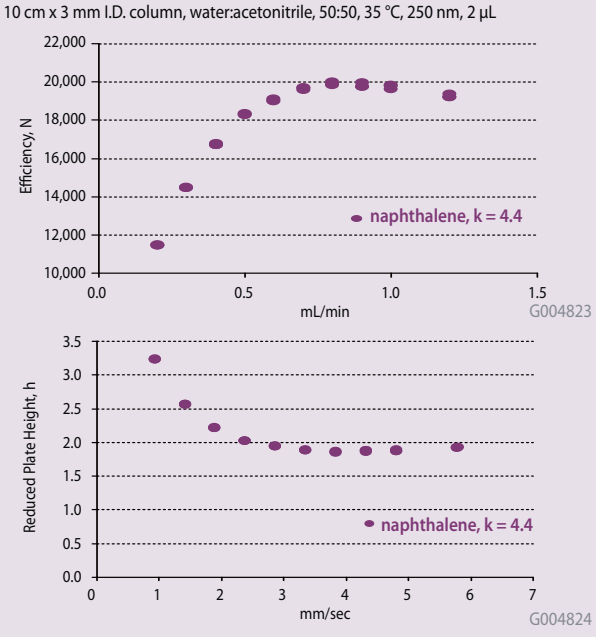


Figure 2. Benzodiazepine Structures

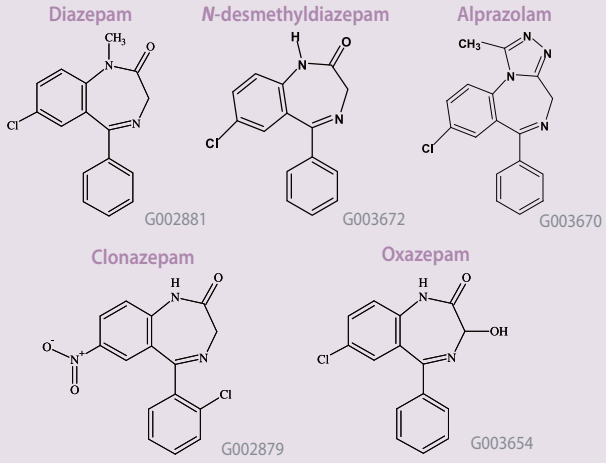
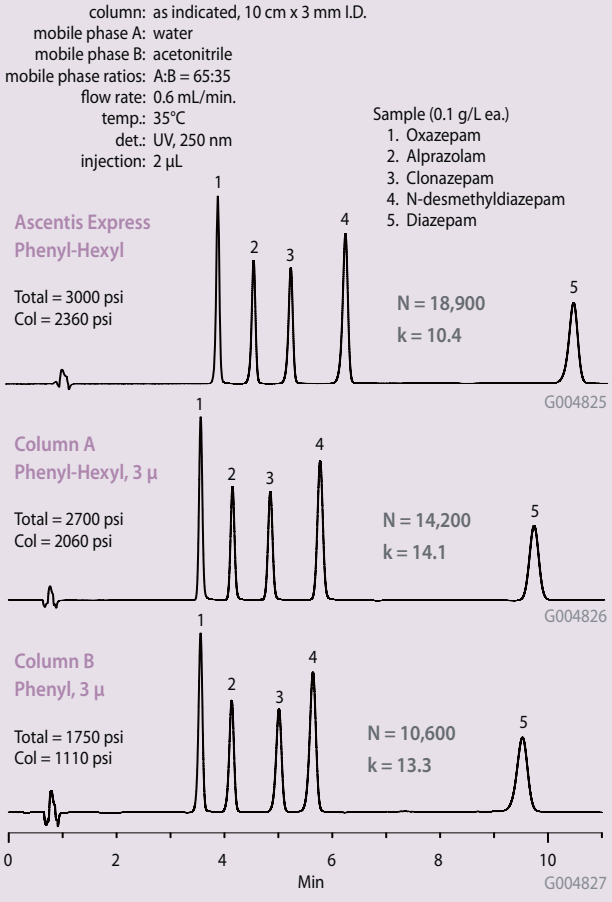


Figure 3. Comparison of Phenyl Column Selectivity for Benzodiazepines



Note that overall retention in acetonitrile is similar for the four bonded phases, but elution order is different. The two less polar compounds, diazepam and desmethyldiazepam, elute late and show the same order for all columns due to predominance of hydrophobic interactions. The more polar solutes, however, elute earlier and interact differently with Phenyl-Hexyl and the other phases.

Reference

1. Kazakevitch, Y. V., et al. J. Chromatogr., A. 2005, 1082, 158–165.

With this test sample and operating conditions, three of the four Ascentis Express RP columns provide good resolution with different selectivity, however, Phenyl-Hexyl shows the best retention and selectivity.

A switch to water:methanol in Figure 5 shows a dramatic change in retention for Ascentis Express Phenyl-Hexyl. In water:methanol mobile phase, the phenyl group interacts much more strongly than the other phases with the solute heterocyclic ring system, presumably by a π-π mechanism. Kazakevitch (1) has published evidence that methanol forms only monolayer coverage on aromatic phases (and also thinly solvates other phases), which allows the aromatic selectivity to shine through more strongly. Elution order for the polar compounds also changes from that of water:acetonitrile conditions. For this test sample, Ascentis Express Phenyl-Hexyl selectivity is clearly superior in water:methanol to the other phases.

Figure 4. Benzodiazepines in 35% Acetonitrile Mobile Phase with no Additive

column: Ascentis Express, as indicated, 10 cm x 3 mm I.D., 2.7 µm particles
mobile phase A: water
mobile phase B: acetonitrile
mobile phase ratios: A:B = 65:35
flow rate: 0.6 mL/min.
pressure: 3000 psi total, 2360 psi column
temp.: 35 °C
det.: UV, 250 nm
injection: 2 µL

Sample (0.1 g/L ea.)
1. Oxazepam
2. Alprazolam
3. Clonazepam
4. N-desmethyldiazepam
5. Diazepam

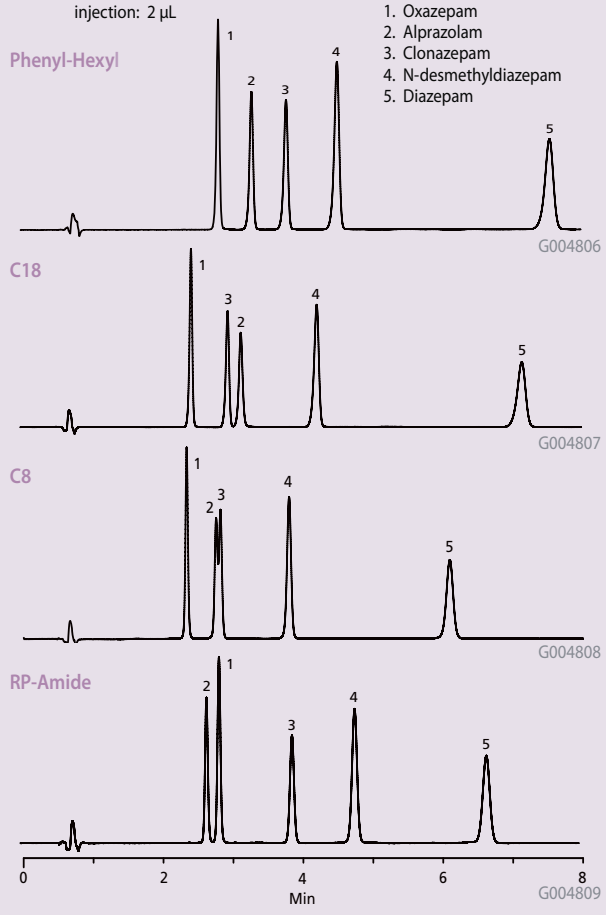
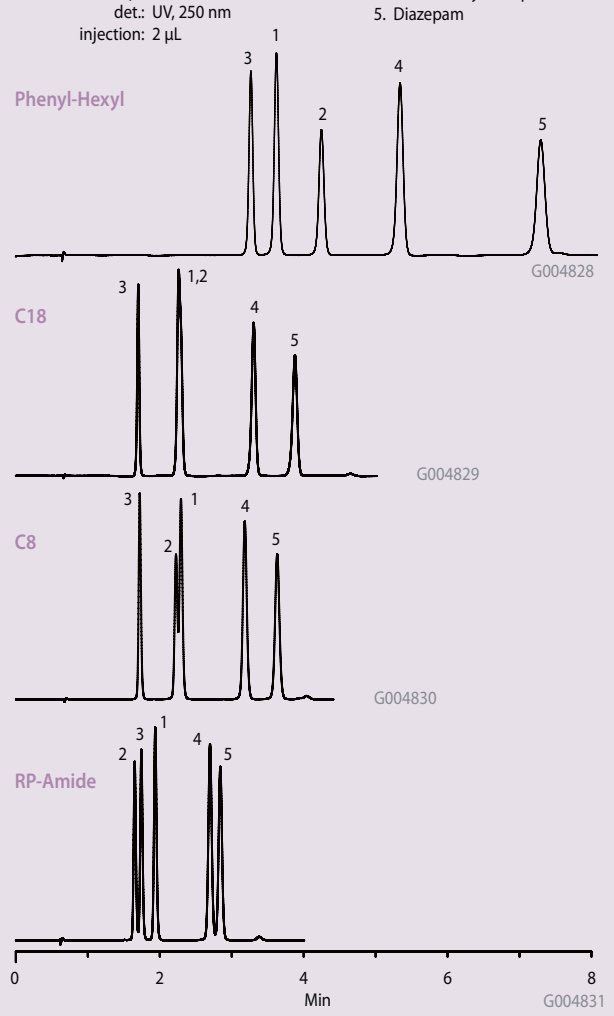


Figure 5. Benzodiazepines in 60% Methanol Mobile Phase with no Additive

column: Ascentis Express, as indicated10 cm x 3 mm I.D.
mobile phase A: water
mobile phase B: methanol
mobile phase ratios: A:B = 40:60
flow rate: 0.6 mL/min
pressure: 4200 psi total; 3420 psi column
temp.: 35 °C
det.: UV, 250 nm
injection: 2 µL

Sample (0.1 g/L ea.)
1. Oxazepam
2. Alprazolam
3. Clonazepam
4. N-desmethyldiazepam
5. Diazepam



Conclusion

A new Phenyl-Hexyl phase has been paired with Fused-Core particles to complete the primary Ascentis Express column family. High performance with lower pressure drop than other UHPLC columns has been confirmed for all Fused-Core particle phases. Ascentis Express Phenyl-Hexyl correlates well to other Phenyl phases for easy method development or method transfer. Selectivity for benzodiazepine compounds has been compared to the other Ascentis Express RP phases in water:acetonitrile and water:methanol. The extra retention possible with Phenyl phases in water:methanol has been demonstrated for these heterocyclic aromatic compounds. The potential for faster, more sensitive assays using Ascentis Express Phenyl-Hexyl and all Ascentis Express phases has been shown.



Ascentis Express FAQs

What is unique about Ascentis Express?

Ascentis Express columns provide a breakthrough in HPLC performance. Based on Fused-Core particle technology, Ascentis Express provides the benefits of sub-2 µm particles but at much lower backpressure. These benefits include the capability of providing fast HPLC and higher resolution chromatography. The Fused-Core particle consists of a 1.7 µm solid core and a 0.5 µm porous shell. A major benefit of the Fused-Core particle is the small diffusion path (0.5 µm) compared to conventional fully porous particles. The shorter diffusion path reduces axial dispersion of solutes and minimizes peak broadening.

Can I use Ascentis Express on any type of HPLC system?

Ascentis Express HPLC columns are capable of use on standard HPLC systems as well as UHPLC systems. Columns are packed in high pressure hardware capable of withstanding the pressures used in UHPLC systems.

Is there anything I need to do to my HPLC system to use Ascentis Express?

Nothing special is required to use Ascentis Express HPLC columns. To obtain the full benefits of Ascentis Express, one should minimize dispersion or instrument bandwidth in the HPLC system (tubing, detector flow cell) as well as confirm the detector response system is set at a fast level. For more information, request Guidelines for Optimizing Systems for Ascentis Express Columns (T407102) or visit *sigma-aldrich.com/express* and download.

Can I use Ascentis Express on a UHPLC system?

Yes. Ascentis Express columns are packed in a way making them suitable for these ultra high pressure instruments. In fact, Ascentis Express outperforms sub-2 µm columns on many applications since Ascentis Express provides the benefits of sub-2 µm particles but at much lower backpressure.

Can Ascentis Express columns be used for LC-MS?

Ascentis Express Fused-Core particles were designed with LC-MS in mind. Even extremely short column lengths exhibit sufficient plate counts to show high resolving power. The flat van Deemter plots permit resolution to be maintained at very high flow rates to maximize sample throughput. All Ascentis stationary phases have been evaluated for MS compatibility during their development, and the Express phases are no exception. A bonus of Ascentis Express columns for high throughput UHPLC and LC-MS is that they are extremely rugged and highly resistant to plugging, a very common failure mode for competitor columns.

What flow rate should I use with Ascentis Express columns?

Based on the minimum in the van Deemter curves, higher flows than 5 µm particle columns are required in order to maximize Ascentis Express column efficiency.

Ascentis Express HPLC Column ID	Suggested Starting Point for Flow Rate
4.6 mm I.D.	1.6 mL/min
3.0 mm I.D.	0.8 mL/min
2.1 mm I.D.	0.4 mL/min

Key Technical Literature (available by request through technical service)

Code	Publication Title
T409113	Method Optimization using Alternative Selectivities in Fused-Core Particle HPLC Column Technology
T409110	Increased Bioanalytical Throughput Using Fused-Core HPLC with Selective Phospholipid Depletion
T409041	Extended Performance of LC Instruments with Fused-Core Particle Columns
T408141	Utilizing Fused-Core Technology for LC-MS Applications
T408088	Transfer and Speedup of Methods to Fused-Core Particle Columns
T408087	Optimization of HPLC Instrumentation for High Efficiency Separations
T408077	Achieving Sub-2 µm LC-MS Performance at Moderate Pressures using Fused-Core Particle Technology
T408035	High-Resolution HPLC Through Coupling Columns
T408034	High Resolution HPLC Performance Under Both Isocratic and Gradient Conditions
T408033	Achieving Optimum UHPLC Column Performance by Measuring and Reducing Overall System Dispersion
T408031	Achieving Ultra-HPLC Column Performance with Older Instruments
T407127	Achieving Efficient Bioanalytical Separations at Moderate Pressures using Fused-Core Particle Technology
T407078	Optimizing HPLC Particles and Column Dimensions for Fast, Efficient Separations
T407102	Guidelines for Optimizing Performance with Ascentis Express HPLC Columns
T408143	Guide to Dispersion Measurement

Ordering Information

Analytical Ascentis Express Columns

ID (mm)	Length (cm)	C18	C8	Phenyl-Hexyl	HILIC	RP-Amide	Peptide ES -C18
2.1	2	**53799-U**	—	—	—	—	—
2.1	3	**53802-U**	**53839-U**	**53332-U**	**53933-U**	**53910-U**	**53299-U**
2.1	5	**53822-U**	**53831-U**	**53334-U**	**53934-U**	**53911-U**	**53301-U**
2.1	7.5	**53804-U**	**53843-U**	**53335-U**	**53938-U**	**53912-U**	**53304-U**
2.1	10	**53823-U**	**53832-U**	**53336-U**	**53939-U**	**53913-U**	**53306-U**
2.1	15	**53825-U**	**53834-U**	**53338-U**	**53946-U**	**53914-U**	**53307-U**
3.0	3	**53805-U**	**53844-U**	**53341-U**	**53964-U**	**53915-U**	**53308-U**
3.0	5	**53811-U**	**53848-U**	**53342-U**	**53967-U**	**53916-U**	**53311-U**
3.0	7.5	**53812-U**	**53849-U**	**53343-U**	**53969-U**	**53917-U**	**53312-U**
3.0	10	**53814-U**	**53852-U**	**53345-U**	**53970-U**	**53918-U**	**53313-U**
3.0	15	**53816-U**	**53853-U**	**53346-U**	**53972-U**	**53919-U**	**53314-U**
4.6	3	**53818-U**	**53857-U**	**53347-U**	**53974-U**	**53921-U**	**53316-U**
4.6	5	**53826-U**	**53836-U**	**53348-U**	**53975-U**	**53922-U**	**53318-U**
4.6	7.5	**53819-U**	**53858-U**	**53351-U**	**53977-U**	**53923-U**	**53323-U**
4.6	10	**53827-U**	**53837-U**	**53352-U**	**53979-U**	**53929-U**	**53324-U**
4.6	15	**53829-U**	**53838-U**	**53353-U**	**53981-U**	**53931-U**	**53328-U**

Capillary Ascentis Express Columns

Length (cm)	I.D. (µm)	Cat. No.
C18		
5	75	**53982-U**
15	75	**54219-U**
5	100	**53985-U**
15	100	**54256-U**
5	200	**53989-U**
15	200	**54261-U**
5	300	**53992-U**
15	300	**54271-U**
5	500	**53998-U**
15	500	**54273-U**
C8		
5	75	**53983-U**
15	75	**54229-U**
5	100	**53987-U**
15	100	**54260-U**
5	200	**53991-U**
15	200	**54262-U**
5	300	**53997-U**
15	300	**54272-U**
5	500	**53999-U**
15	500	**54275-U**

Ascentis Express Guard Columns



Universal Guard Holder

Description	Cat. No.
Holder w/EXP Titanium Hybrid Ferrule -- cartridge not included with holder	**53500-U**

Ascentis Express Guard Cartridges

Description	I.D. (mm)	Pkg. Size	Cat. No.
C18	2.1	3	**53501-U**
C18	3.0	3	**53504-U**
C18	4.6	3	**53508-U**
C8	2.1	3	**53509-U**
C8	3.0	3	**53511-U**
C8	4.6	3	**53512-U**
RP-Amide	2.1	3	**53514-U**
RP-Amide	3.0	3	**53516-U**
RP-Amide	4.6	3	**53519-U**
HILIC	2.1	3	**53520-U**
HILIC	3.0	3	**53521-U**
HILIC	4.6	3	**53523-U**
Phenyl-Hexyl	2.1	3	**53524-U**
Phenyl-Hexyl	3.0	3	**53526-U**
Phenyl-Hexyl	4.6	3	**53531-U**
Peptide ES-C18	2.1	3	**53536-U**
Peptide ES-C18	3.0	3	**53537-U**
Peptide ES-C18	4.6	3	**53542-U**

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Fax: (+82) 31 329 9090

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Fax: (+60) 3 5635 4116

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Free Fax: 01 800 712 9920
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Fax: (+52) 722 276 1601

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Free Fax: 0800 022 9089
Tel: (+31) 78 620 5411
Fax: (+31) 78 620 5421

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Free Tel: 0800 936 666
Free Fax: 0800 937 777
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Fax: (+61) 2 9841 0500

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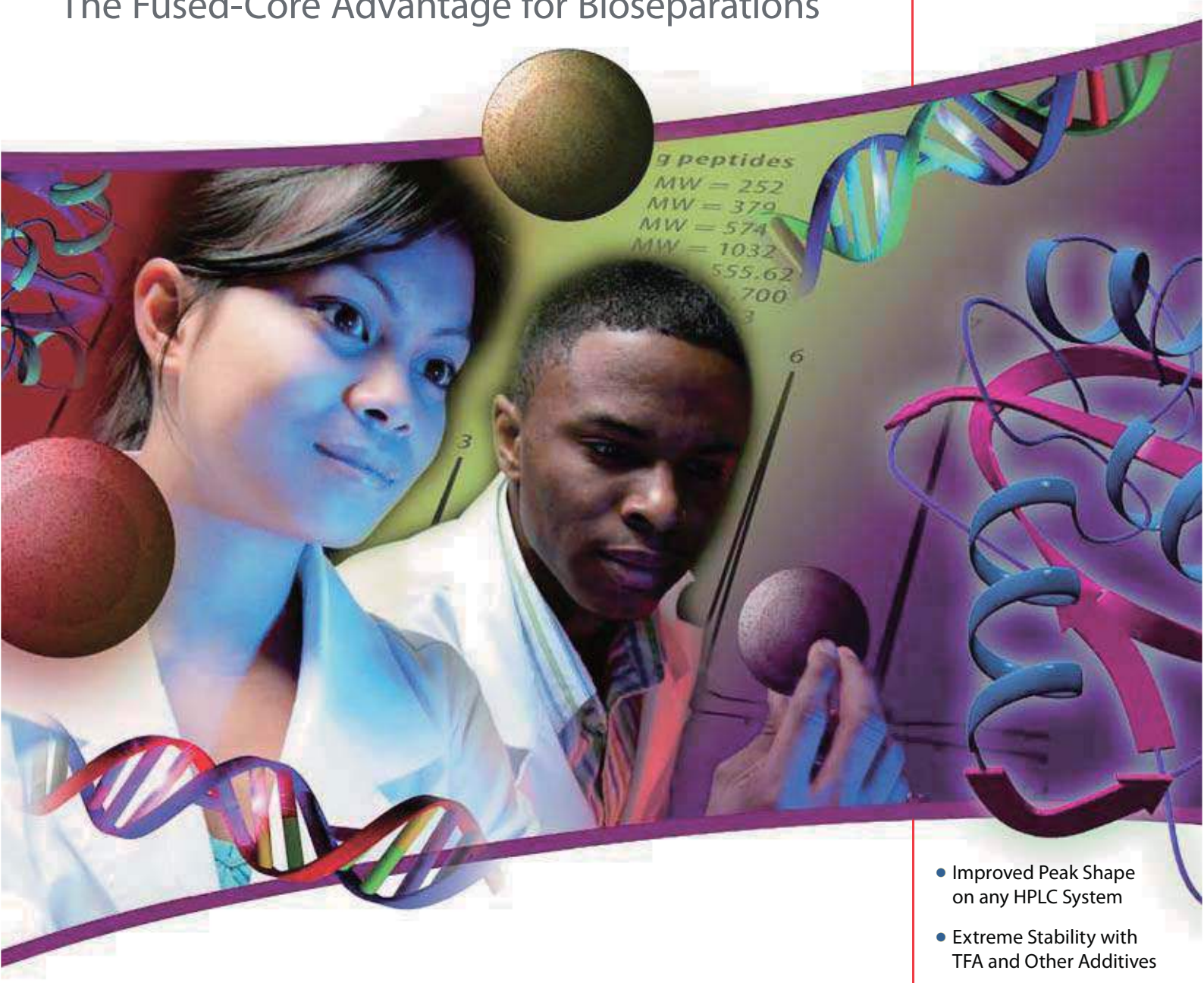
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LRW
T409118A

Ascentis Express Peptide ES-C18 HPLC Columns

The Fused-Core Advantage for Bioseparations

SUPELCO Analytical



- Improved Peak Shape on any HPLC System
- Extreme Stability with TFA and Other Additives
- Rugged HPLC Column Design

A Breakthrough in Bioseparations Performance

Ascentis Express Peptide ES-C18

Ascentis® Express Peptide ES-C18 is a high-speed, high-performance liquid chromatography column based on a new 160Å Fused-Core™ particle design. The Fused-Core particle provides a thin porous shell of high-purity silica surrounding a solid silica core. This particle design exhibits very high column efficiency for high MW solutes (up to 20 kDa) due to the shallow diffusion paths in the 0.5-micron thick porous shell and the small overall particle size of 2.7-microns. The non-end-capped, sterically protected C18 bonded phase of Ascentis Express Peptide ES-C18 provides a stable, reversed phase packing with a pore structure and pore size that is optimized for reversed-phase HPLC separations of peptides and polypeptides, using typical acidic mobile phases favored for protein structure-function and proteomic applications.

Table 1. Specifications for Ascentis Express Peptide ES-C18

Silica	High Purity Type B
Phase	Sterically protected C18
pH range	1 – 9
Temperature	100 °C
Average pore diameter	160 Å
Surface area, nitrogen	80 sq.m/g
Pore volume	0.30 mL/g
Particle density	1.3 g/cc

Ordering Information

Ascentis Express Peptide ES-C18 Columns

I.D. (mm)	Length (cm)				
	3	5	7.5	10	15
2.1	53299-U	53301-U	53304-U	53306-U	53307-U
3.0	53308-U	53311-U	53312-U	53313-U	53314-U
4.6	53316-U	53318-U	53323-U	53324-U	53328-U

Applications

The Ascentis Express Peptide ES-C18 columns are best utilized with mobile phases that are mixtures of acetonitrile and water or methanol and water. Higher levels of the organic solvent component will typically reduce the retention of the sample compounds. Using elevated temperatures (e.g., 40 – 100 °C) will reduce the viscosity of the mobile phase and allow the use of faster flow rates and lower column pressure for high sample throughput. Gradient-elution techniques using 5 -10% organic component as the initial mobile phase and increasing to 100% organic component as the final mobile phase often can affect separations of complex sample mixtures in minimal time.

Ionizable compounds, such as acids and bases, are generally best separated with mobile phases buffered at pH of 2 to 3. The use of 10-50 mM buffers is always recommended for optimum results and long-term stability when separating ionizable compounds.

Ascentis Express Peptide ES-C18 columns utilize a steric-protected C18 bonded phase with extremely high resistance to acid-catalyzed hydrolysis of the siloxane bond that attaches the C18 chain to the surface. Thus, the combination of low pH and elevated temperature operation of the column is well tolerated. Peptide separations are efficiently conducted using low pH mobile phase modifiers, often at 0.1% concentration. Most popularly employing trifluoroacetic acid (TFA), and the related perfluorocarboxylic acids, pentafluoropropionic acid (PFPA) and heptafluorobutyric acid (HFBA). These acids exhibit desirable low UV transparency, volatility, and peptide ion pairing properties. Additional opportunities for UV detection at low pH operation is with mineral acids such as phosphoric acid (1-20 mM). For MS detection 0.1% formic acid is most commonly employed (sometimes acetic acid), but significant benefit to peak shape can be realized with 0.1% formic acid adjusted to pH 3.5 (with ammonium hydroxide, for instance), especially with basic peptides. This is likely due to greater availability of formate anion for ion pairing.

Pharmaceutical Peptides

Many peptides have been investigated as therapeutic pharmaceutical drugs and are active vasodilators, vasoconstrictors, hormones, and neuropeptides. Using reversed-phase HPLC, it is possible to solve the tasks of identification, purity monitoring, and quantitative analysis in many cases, including those where the application of other methods is impossible.

Synthetic Peptides

The difficulty with synthetic peptides involves the production of many "deletion variants". A deletion may occur at any point in the peptides synthesis and so several versions of the peptide are produced which are absent one, two or three amino acids from the desired product. This makes for an interesting chromatographic problem because the resultant peptide mix contains peptides that are very similar in structure.

Peptide Mapping

Protein analysis and characterization has become more crucial due to many biopharmaceutical advances. Peptide mapping via LC-MS is one such technique that is commonly used today. A typical procedure involves the preparation of a tryptic digest from the protein, with subsequent characterization using reversed-phase, gradient HPLC separation followed by mass spectral analysis and database search.

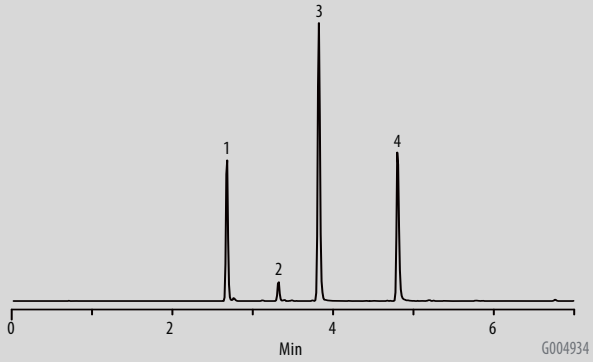
Difficult Separations on Ascentis Express Peptide ES-C18

Figure 1. Basic Peptides

column: Ascentis Express Peptide ES-C18, 10 cm x 2.1 mm I.D. (53306-U)
mobile phase A: 0.1% additive in water
mobile phase B: 25:75, (0.4 % additive):acetonitrile
additive: formic acid, pH 3.5 (adjusted with ammonium hydroxide)
gradient: initial = 15% B, slope = 2% MeCN / column volume
flow rate: 0.3 mL/min
temp.: 35 °C
det.: ESI(+)-TOF
injection: 1 µL
sample: 5 mg/L peptide 1 & 3, 1 mg/L peptide 2, 15 mg/L peptide 4

Peptide probes (listed in order of elution):

1.	ac-GGGLGGAGGLKG	monoisotopic mass: 941.5
2.	ac-KYGLGGAGGLKG	monoisotopic mass: 1118.6
3.	ac-GGAVKALKGLKG	monoisotopic mass: 1139.7
4.	ac-KYALKALKGLKG	monoisotopic mass: 1330.8



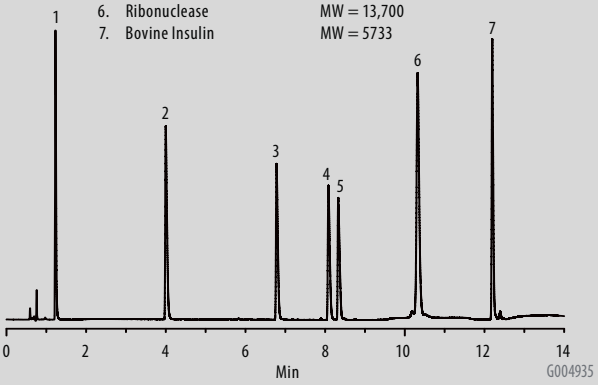
G004934

Figure 2. Peptide Test Mix

column: Ascentis Express Peptide ES-C18, 10 cm x 4.6 mm I.D. (53324-U)
mobile phase A: 90:10, (0.1 % TFA):acetonitrile
mobile phase B: 25:75, (0.1% TFA):acetonitrile
gradient: initial = 0% B to 50% B in 15 min.
flow rate: 1.5 mL/min
temp.: 30 °C
det.: UV at 220 nm
injection: 5 µL

The test mix employed contains the following peptides

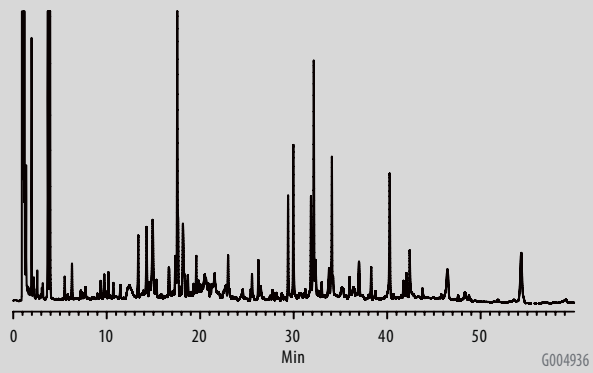
1.	Gly-Tyr	MW = 252
2.	Val-Tyr-Val	MW = 379
3.	Met Enkephalin	MW = 574
4.	Angiotensin II	MW = 1032
5.	Leu-Enkephalin	MW = 555
6.	Ribonuclease	MW = 13,700
7.	Bovine Insulin	MW = 5733



G004935

Figure 3. Carbonic Anhydrase Tryptic Digest

column: Ascentis Express Peptide ES-C18, 10 cm x 4.6 mm I.D. (53324-U)
mobile phase A: 0.1 % TFA in water
mobile phase B: 40:60, (0.1% TFA):acetonitrile
gradient: initial = 3% B to 100% B in 53 min.
flow rate: 1.0 mL/min
temp.: 30 °C
det.: UV at 215 nm
injection: 20 µL

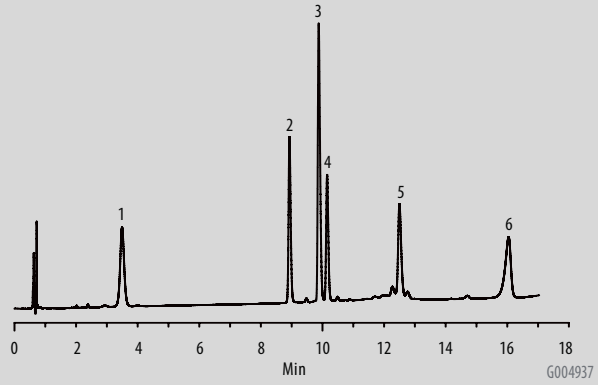


G004936

Figure 4. Small Proteins

column: Ascentis Express Peptide ES-C18, 10 cm x 4.6 mm I.D. (53324-U)
mobile phase A: 90:10, (0.1% TFA):acetonitrile
mobile phase B: 25:75, (0.1% TFA):acetonitrile
gradient: initial = 25% B to 40% B in 15 min.; then to 60% B at 20 min.
flow rate: 1.5 mL/min
temp.: 30 °C
det.: UV at 220 nm
injection: 4 µL

1.	Ribonuclease	MW = 13,700
2.	Porcine Insulin	MW = 5,780
3.	Bovine Insulin	MW = 5,730
4.	Human Insulin	MW = 5,800
5.	Cytochrom C	MW = 12,327
6.	Lysozyme	MW = 14,700



G004937

TRADEMARKS: Ascentis is a registered trademark of Sigma-Aldrich Biotechnology LP. Fused-Core is a trademark of Advanced Materials Technologies, Inc.

Competitor Comparison

Basic Peptides

Columns run under equivalent conditions of gradient slope (Δ % MeCN per column volume).

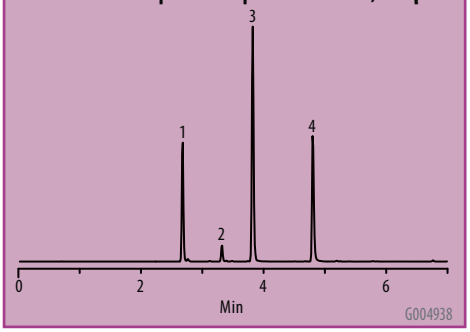
column: C18, 10 cm x 2.1 mm I.D.
mobile phase A: 0.1% additive in water
mobile phase B: 25:75, (0.4 % additive):acetonitrile
additive: formic acid, pH 3.5 (adjusted with ammonium hydroxide)
gradient: initial = 15% B, slope = 2% MeCN / column volume
flow rate: 0.3 mL/min
temp.: 35 °C
det.: ESI(+)-TOF
injection: 1 µL
sample: 5 mg/L peptide 1 & 3, 1 mg/L peptide 2, 15 mg/L peptide 4

Peptide probes (listed in order of elution):

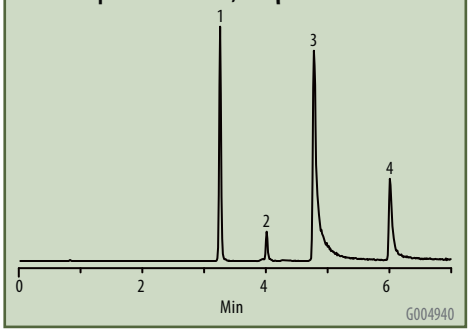
1. ac-GGGLGGAGGLKG Monoisotopic mass: 941.5
2. ac-KYGLGGAGGLKG Monoisotopic mass: 1118.6
3. ac-GGAVKALKGLKG Monoisotopic mass: 1139.7
4. ac-KYALKALKGLKG Monoisotopic mass: 1330.8

Peptide probes increase in basicity and hydrophobicity.

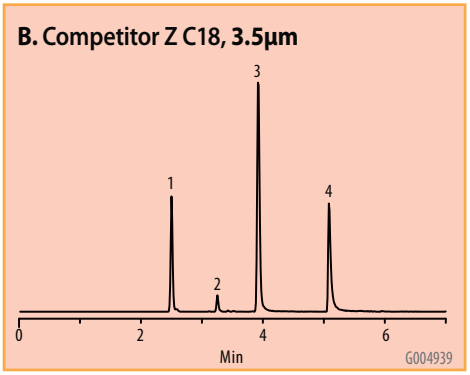
A. Ascentis Express Peptide ES-C18, 2.7µm



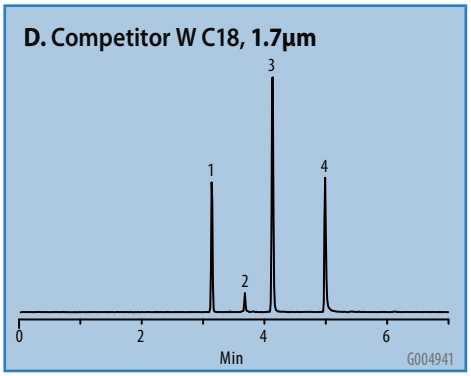
C. Competitor V C18, 1.5µm



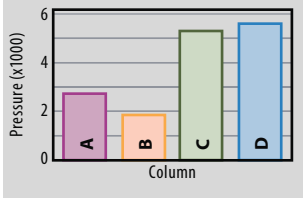
B. Competitor Z C18, 3.5µm



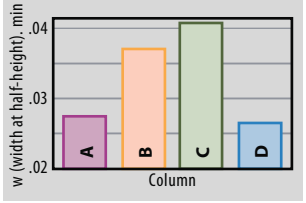
D. Competitor W C18, 1.7µm



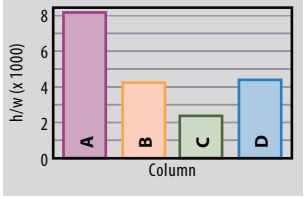
Column Backpressure



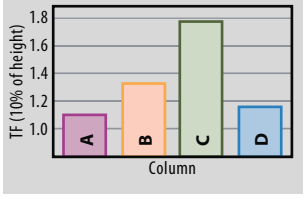
Avg Peak Width of Basic Peptides



Avg h/w of Basic Peptides



Avg Tailing Factor of Basic Peptides



Experimental Setup: Columns and Elution Gradients

Column	µm	Pore (Å)	ID (mm)	L (cm)	CV (mL)*	start %B	Grad slope [Δ % MeCN / CV]
A. Ascentis Express Peptide ES-C18	2.7	160	2.1	10	0.190	15	2
B. Competitor Z C18	3.5	300	2.1	10	0.216	15	2
C. Competitor V C18	1.5	120	2.0	10	0.205	15	2
D. Competitor W C18	1.7	130	2.1	10	0.186	15	2

* CV determined as follows: t_0 = r.t. of unretained component. d_0 = r.t. of unretained component with ZDV union in place of column. **CV** = (t_0 - d_0) x mL/min

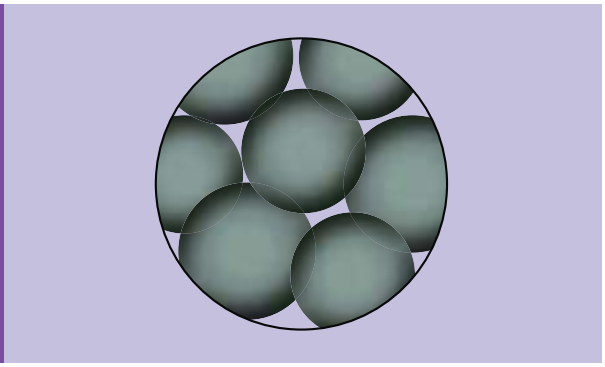
Some Quantitative Comparisons

Column	Peak 1			Peak 2			Peak 3			Peak 4		
	$w_{½}$	$h/w_{½}$	$TF_{0.1}$	$w_{½}$	$h/w_{½}$	$TF_{0.1}$	$w_{½}$	$h/w_{½}$	$TF_{0.1}$	$w_{½}$	$h/w_{½}$	$TF_{0.1}$
A. Ascentis Express Peptide ES-C18, 2.7 µm	0.0258	9725	1.20	0.0224	1520	1.00	0.0344	11321	1.00	0.0267	9706	1.30
B. Competitor Z C18, 3.5 µm	0.0344	4082	1.14	0.0344	572	1.25	0.0387	8267	1.08	0.0387	3871	1.74
C. Competitor V C18, 1.5 µm	0.0344	4418	1.03	0.0344	548	1.06	0.0516	3044	2.69	0.0430	1281	2.38
D. Competitor W C18, 1.7 µm	0.0258	7568	1.10	0.0241	1203	1.20	0.0241	1942	1.00	0.0301	6684	1.30

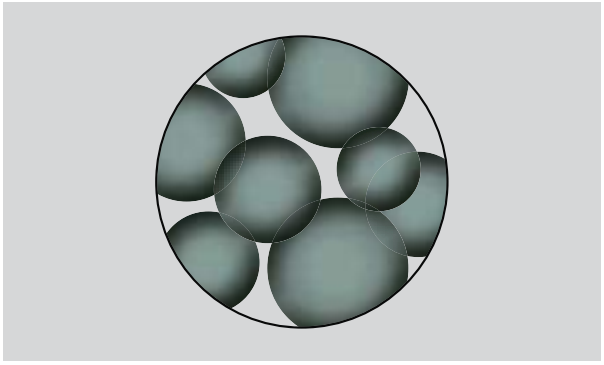
The Fused-Core Advantage

Narrow Particle Size Distribution

Fused-Core Particles

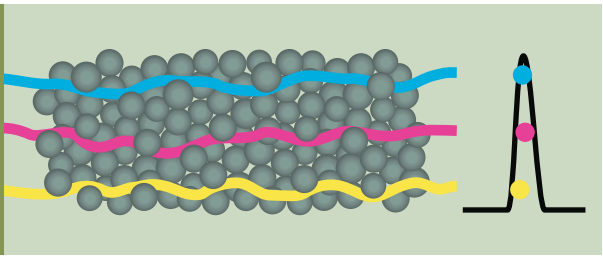


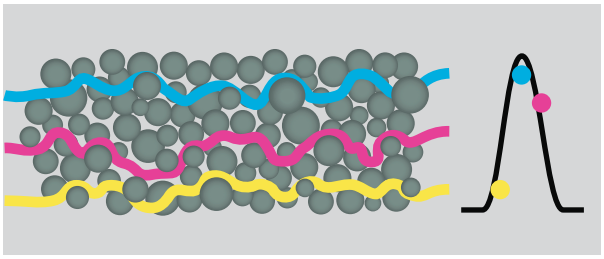
Traditional Porous Particles



The innovative manufacturing process for Fused-Core particles produces a very narrow particle size distribution. A narrow particle size distribution allows for the use of large porosity frits that resist clogging, resulting in a **more rugged column**. Traditional porous particles are not manufactured in a way to yield extremely narrow particle size distributions.

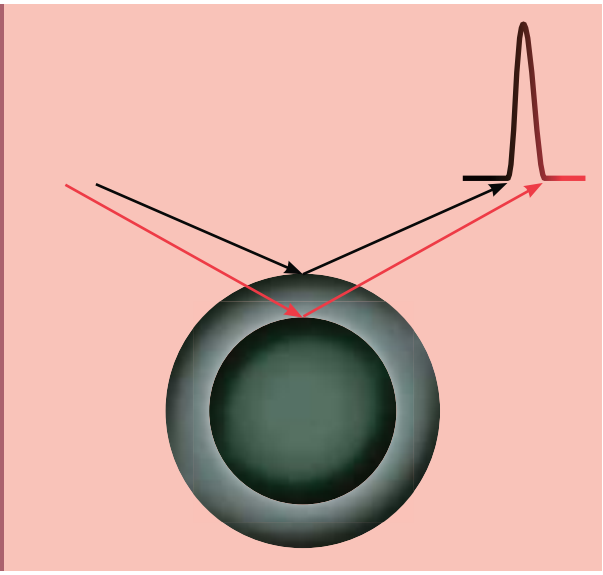
More Consistent Bed

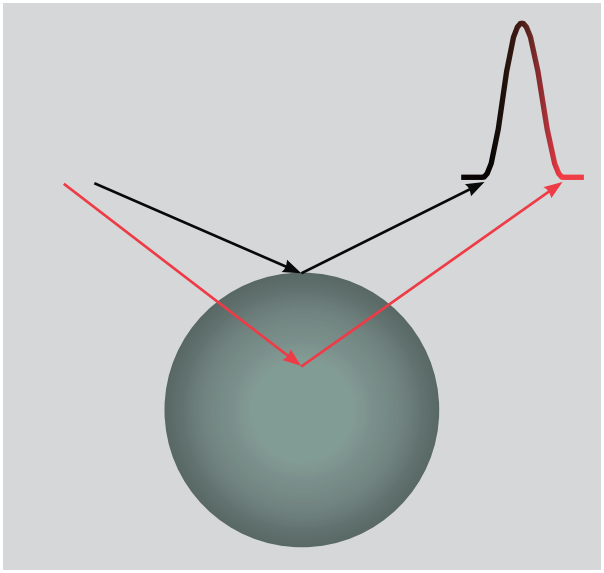




The "A" term in the van Deemter equation accounts for the effects of inhomogeneities in the packed bed of an HPLC column. Narrow particle size distributions form a more consistent packed bed and a consistent path length, **minimizing analyte diffusion** through the column. This eddy diffusion is effectively independent of mobile phase velocity.

Shorter Diffusion Path





The short diffusion path of the Fused-Core particle **yields sharper peaks** than traditional porous particle columns. The minimized resistance to mass transfer, the "C" term in the van Deemter equation, of the Fused-Core particle provides sharper peaks than traditional porous particles. The short diffusion path also **permits the use of higher flow rates** without peak broadening.

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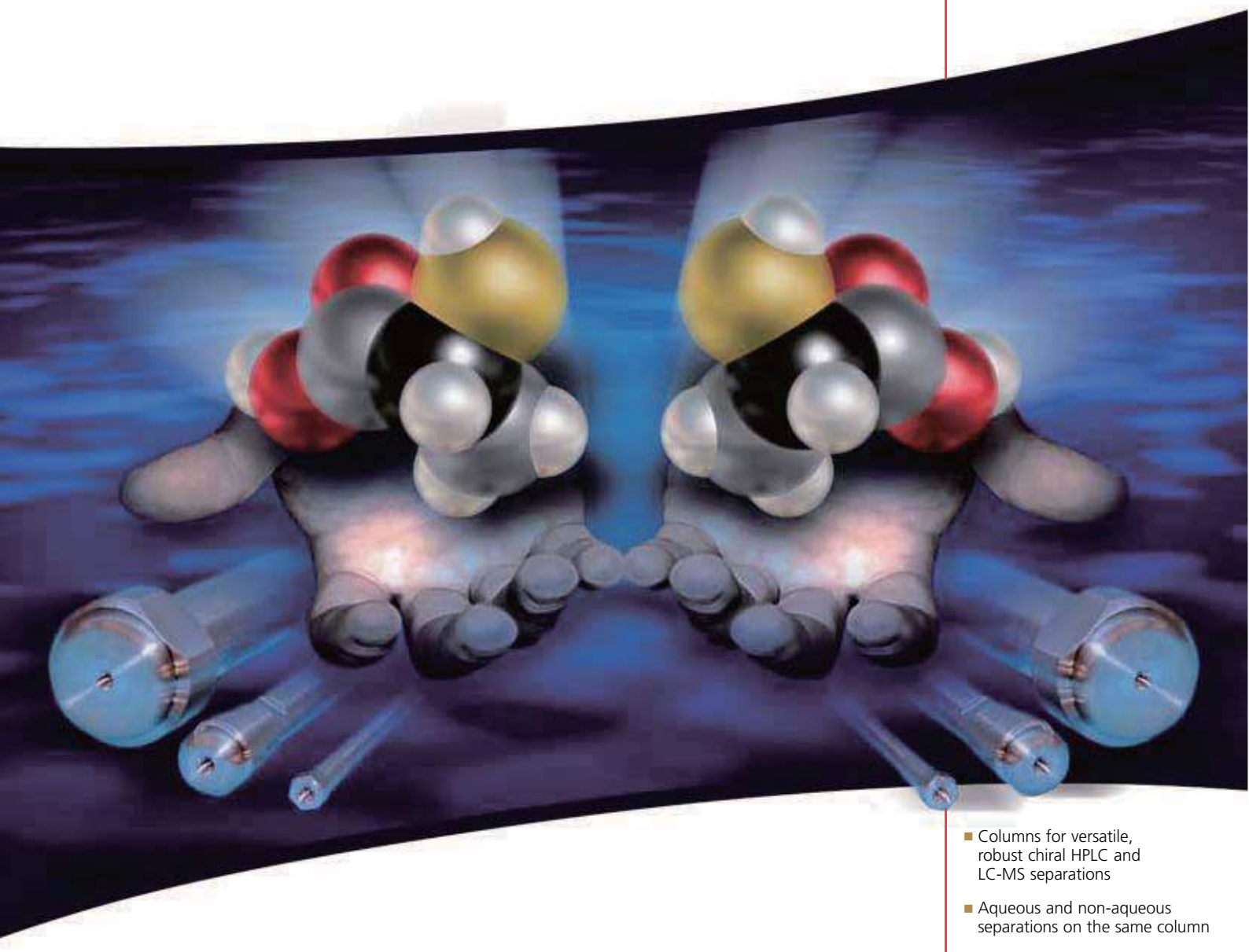
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CHIROBIOTIC

"Chiral by Nature"

SUPELCO® Analytical



- Columns for versatile, robust chiral HPLC and LC-MS separations
- Aqueous and non-aqueous separations on the same column
- No solvent or additive memory effects
- Wide applicability, especially suited to polar and ionizable compounds
- Predictable scale-up from analytical to prep



CHIROBIOTIC

Versatile Chiral HPLC and LC-MS Separations of Polar, Ionizable and Neutral Compounds

CHIROBIOTIC™ CSPs (chiral stationary phases) interact with polar, ionizable and neutral analytes via multiple molecular interactions. This versatility means that the same CHIROBIOTIC column can be successfully used in a variety of mobile phases, a significant benefit over CSPs that operate only in a single mode, normal or reversed-phase, for example, and must be dedicated to those mobile phase systems. However, the most interesting feature of CHIROBIOTIC CSPs is the **presence of ionic interactions**, which allows them to be used in polar ionic and reversed-phase modes for sensitive LC-MS operation.

Key application areas

- **Drug Discovery** – High enantioselectivity, fast screening protocols, scalability to prep, reproducibility for reliable methods, polar and non-polar analytes
- **Organic Synthesis** – Compatible with all HPLC solvents to optimize sample solubility, fully scalable to prep
- **Bioanalytical, Drug Metabolism** – High throughput, MS-compatibility, aqueous samples, short run times, rugged columns
- **Amino Acid and Peptide Analysis** – Resolves underivatized natural and synthetic chiral amino acids and peptides, different selectivity and higher preparative capacity than C18 for achiral amino acids

What is the CHIROBIOTIC family?

Developed originally by Advanced Separations Technologies (Astec), the CHIROBIOTIC family comprises highly enantioselective CSPs based on macrocyclic glycopeptides that have been bonded through multiple covalent linkages to high purity silica particles. CHIROBIOTIC CSPs offer flexibility in choice of mobile phase conditions, both aqueous and non-aqueous, and are ideal for analytical and preparative separations of neutral, polar and ionic compounds.

How do CHIROBIOTIC CSPs separate enantiomers?

CHIROBIOTIC CSPs offer six different types of molecular interactions: ionic, H-bond, π-π, dipole, hydrophobic and steric. They also possess multiple inclusion sites that influence selectivity based on the molecular shape of the analyte. The optimization of enantiomer resolution is achieved by changing the mobile phase to leverage the types and relative strengths of the various interactions.

What makes CHIROBIOTIC CSPs unique?

The bonded macrocyclic glycopeptide itself (Figure 1), in terms of its morphology, molecular composition and multiple covalent linkages to the silica surface, is what makes CHIROBIOTIC CSPs unique and gives them significant and valuable benefits over other CSPs. The truly differentiating feature of CHIROBIOTIC CSPs is the presence of ionic interactions. These interactions are unique to CHIROBIOTIC CSPs and are responsible in large part for their desirable retention characteristics toward polar and ionizable analytes in aqueous and non-aqueous solvents.

How do the CHIROBIOTIC CSPs differ?

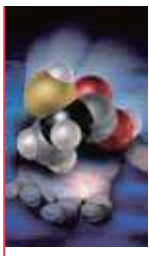
The various CHIROBIOTIC phases share the benefits of robustness, flexibility in mobile phase options, ionic interactions, compatibility with polar compounds and LC-MS and preparative scalability. However, CHIROBIOTIC CSPs differ in selectivity, primarily because of their differing number and types of interaction sites, and the number, type and accessibility of ionic sites in the bonded macrocyclic glycopeptide.

The CHIROBIOTIC CSP Family

CHIROBIOTIC CSPs are based on 5, 10 or 16 µm, high purity, porous silica gel. They differ in the nature of the bonded macrocyclic glycopeptide and resulting enantioselectivity.

- **CHIROBIOTIC V and V2*** – Vancomycin
- **CHIROBIOTIC T and T2*** – Teicoplanin
- **CHIROBIOTIC R** – Ristocetin
- **CHIROBIOTIC TAG** – Teicoplanin Aglycone

*CHIROBIOTIC V and T differ from V2 and T2, respectively, in their bonding chemistry that gives them different selectivity and preparative capacity for certain classes of analytes.

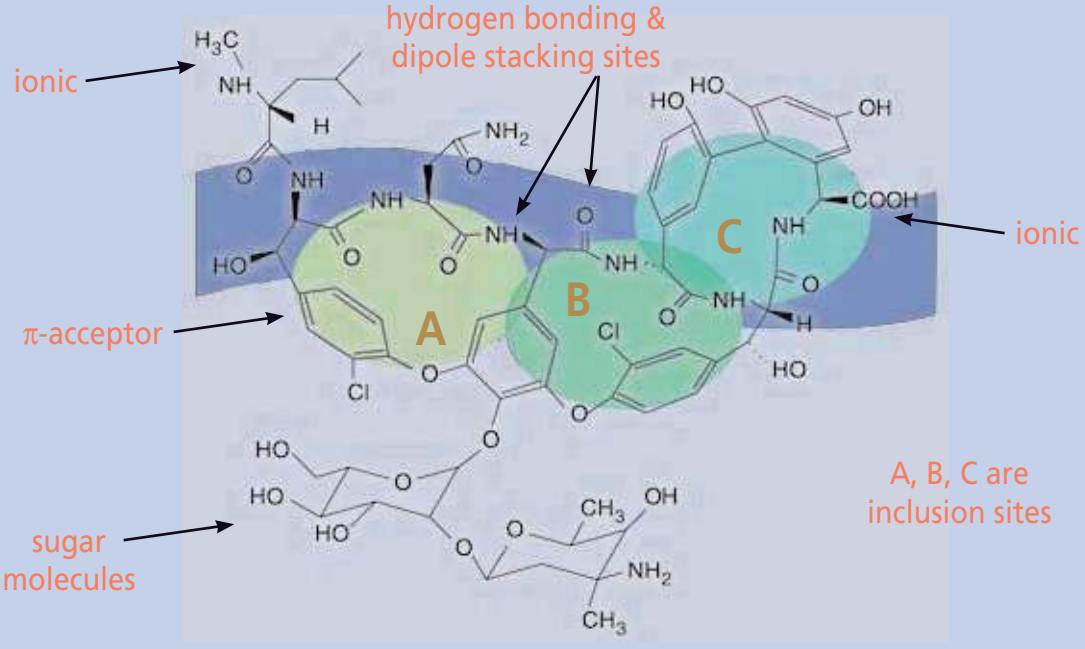


Key features of CHIROBIOTIC CSPs:

- **Aqueous and non-aqueous separations on the same column** – CHIROBIOTIC CSPs have H-bond, ionic, dispersive, π-π, dipole stacking, steric and inclusion mechanisms, usually multiple types of interactions per analyte.
- **Wide applicability** – Applications cover a very broad range of compound classes, with the different CHIROBIOTIC CSPs showing complementary selectivity.
- **LC-MS compatibility** – The wide choice of mobile phases makes CHIROBIOTIC CSPs ideal for LC-MS, where analyte ionization and detection sensitivity are of critical concern.
- **No solvent or additive memory effect** – The same CHIROBIOTIC column can be used alternately in polar, reversed-phase and normal phase solvents without damage, unlike cellulosic and amylosic phases that require dedicated operation.
- **Robust columns with long lifetimes** – Each macrocyclic glycopeptide molecule is linked to the silica surface via four or five covalent bonds for exceptional stability and long column life. They are designed to withstand high pressure and flow rates, as well as rapid changes in mobile phase conditions.
- **Solvent choices maximize sample solubility** – CHIROBIOTIC CSPs operate in highly aqueous and non-aqueous polar mobile phases for polar compound solubility. They also operate in normal phase mobile phases to maximize solubility of non-polar compounds. CHIROBIOTIC CSPs are compatible with all organic solvents.
- **Excellent preparative scalability and capacity** – From narrowbore to prep, separations on CHIROBIOTIC are fully scalable, even with polar analytes. By relying on primarily aqueous eluents, the use and disposal of toxic organic solvents are eliminated. Additionally, preparative methods in the non-aqueous polar ionic mode are just as easy to process as normal phase solvents.
- **Fast kinetics for speed and efficiency** – The kinetics of the molecular interactions between the analyte and the CHIROBIOTIC CSP are fast, providing efficient separations and relatively short retention times.
- **Orthogonal selectivity to other CSPs** – The six CHIROBIOTIC CSPs are different from each other, and from other types of CSPs to offer choices in enantioselectivity, like reversal of elution order.

Figure 1. Proposed Structure of Vancomycin-based CHIROBIOTIC V and V2

CHIROBIOTIC chiral HPLC stationary phases are macrocyclic glycopeptides attached to the surface of high purity, porous silica by four or more covalent bonds. Vancomycin is shown here, but all four CHIROBIOTIC CSPs possess multiple functional groups that can undergo different types of interactions. The CHIROBIOTIC surface is essentially ionic, allowing the use of polar ionic and aqueous mobile phases. Additionally, the glycopeptide structure has several inclusion sites that provide selectivity based on the molecular structure of the analyte.





Incorporating CHIROBIOTIC CSPs into Your Chiral Column Screening Protocol

We recommend that you incorporate CHIROBIOTIC into your routine screening protocol. Experience has shown that one or more of the CHIROBIOTIC CSPs, particularly V2, T and TAG, will perform the majority of chiral separations. Even if other CSPs give adequate resolution, a CHIROBIOTIC CSP may allow use of mobile phases that are better suited to your sample and detection method, or the CHIROBIOTIC method may be faster, more efficient or more robust. A CHIROBIOTIC method may also have advantages from a preparative standpoint in terms of solvent selection and sample capacity.

For developing a new chiral HPLC method, we have created and use routinely in our laboratories a simple and rapid chiral column screening protocol (Table 1). It is important to keep in mind that a single CHIROBIOTIC column possesses multiple types of molecular interactions that are different in each of the four distinct modes. The same column can be exposed to all of the conditions outlined in the screening protocol shown in Table 1 without any change or loss of performance. This versatility is just one advantage that CHIROBIOTIC CSPs have over other CSPs.

The four CHIROBIOTIC CSPs we recommend in the screening protocol are available in 25 cm or 10 cm column kits. Also, you can further expand the screening field by incorporating the CYCLOBOND™ bonded cyclodextrin and P-CAP™ chiral polymer CSPs into your screening protocol to accommodate other types of compounds not covered by the routine screen.

Table 1. The CHIROBIOTIC Screening Protocol

columns: CHIROBIOTIC V2, T, R and TAG
procedure: Method development follows a simple strategy that tests polar ionic, polar organic, reversed-phase and normal phase modes.

Separation Mode	Description	Types of Compound	Screening Mobile Phase	Parameters to Optimize
Polar Ionic	Polar organic solvents (CH_3OH or CH_3CN) containing small amounts of acid and base or salt	Acids, Bases, Zwitterions	(100:0.1:0.1, v:v:v) CH_3OH:Acetic Acid: Triethylamine	Change acid-base ratio, change the type of acid or base, add a volatile salt (test different ammonium salts)
Reversed-Phase	Typical RP eluents, water or buffers with CH_3OH or CH_3CN	Acids, Bases, Zwitterions, Neutrals	(30:70) CH_3CN:20mM Ammonium Acetate, pH 4.0	Change the % and type of organic modifier, adjust pH, buffer type and ionic strength
Polar Organic	Polar organic solvents without ionic additives	Neutrals	100% Ethanol	Use other polar organic solvents or blends
Normal Phase	Non-polar organic solvents with polar solvent modifiers	Neutrals	(30:70) Ethanol:Heptane	Increase % of polar modifier, change both solvents

Method Optimization: Acid-Base Ratio, Temperature and Flow Rate in Polar Ionic Mode

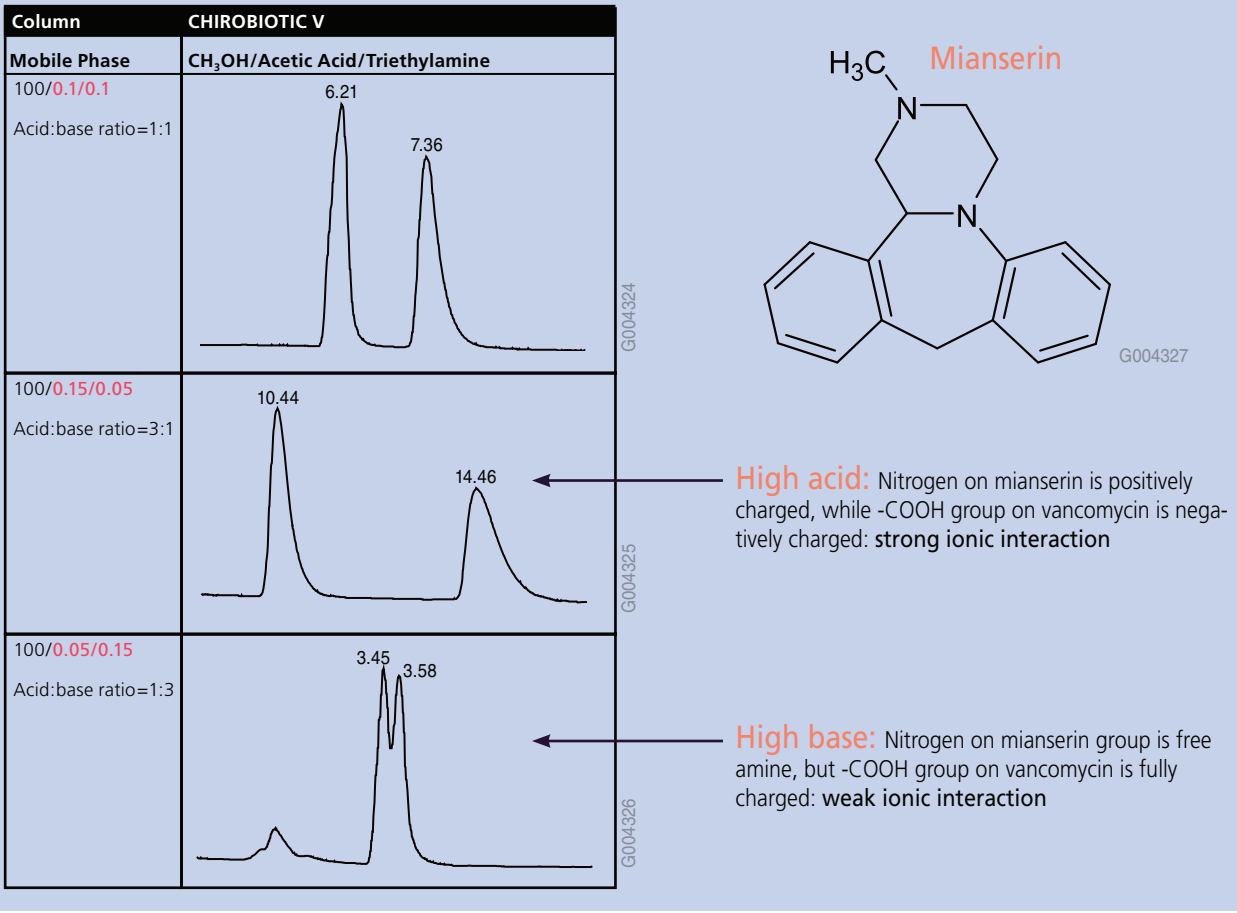
Using CHIROBIOTIC CSPs in the polar ionic mode has the highest probability of success. Optimizing resolution usually involves changing the contribution to retention of ionic interactions between the analytes and functional groups in the macrocyclic glycopeptide structure by:

- Changing the ratio of acid to base (Figure 2)
- Adding a soluble, volatile salt (instead of the acid and base) directly to the methanol

The acid, base or salt that is ultimately selected is based on its compatibility with the detection method (e.g. LC-MS), sample solubility and whether the separation will be scaled up to preparative.



Figure 2. Demonstration of Polar Ionic Mode Mechanism: Effect of Acid:Base Ratio



TRADEMARKS:
CHIROBIOTIC, CYCLOBOND, HybridSPE, P-CAP – **Sigma-Aldrich Biotechnology LP**



CHIROBIOTIC: Ideally Suited for LC-MS of Polar, Ionizable and Neutral Compounds

Each of the various ionization sources has an optimal set of mobile phase conditions. Outside this set, ionization may be suppressed with resulting loss in sensitivity. CHIROBIOTIC phases are uniquely able to operate across all mobile phase systems. CSPs that are limited to normal phase operation, like many cellulosic and amylosic CSPs, reduce the options in detection methods.

ESI – Operate CHIROBIOTIC CSPs in reversed-phase and unique polar ionic modes.

APCI – Operate CHIROBIOTIC CSPs in polar ionic mode.

APPI – Operate CHIROBIOTIC CSPs in normal phase mode.

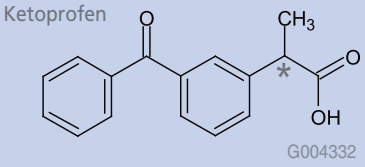
Typical polar ionic mobile phases are methanol with low concentrations (0.1 – 0.001%) of volatile salts like ammonium acetate or ammonium formate. Figures 3 and 4 show examples of CHIROBIOTIC CSPs for LC-MS in reversed-phase and polar ionic mode mobile phases, respectively.

In addition to mobile phase compatibility, the allowable high flow rates and short columns make them ideally suited to fast MS applications.

CHIROBIOTIC columns can be used in conjunction with HybridSPE™-PPT plates to enhance sensitivity by completely removing endogenous proteins and phospholipids. This approach was used to resolve the enantiomers of clenbuterol on a CHIROBIOTIC T column in Figure 4.

Figure 3. ESI-MS of Ketoprofen on CHIROBIOTIC R in Reversed-phase Mode

column: CHIROBIOTIC R, 15 cm x 2.1 mm, 5 µm particles (13019AST)
mobile phase: (30:70) CH_3OH:20 mM ammonium acetate, pH 5.6
flow rate: 0.2 mL/min.
det.: ESI(-)
temp.: 35 °C
analyte: Ketoprofen



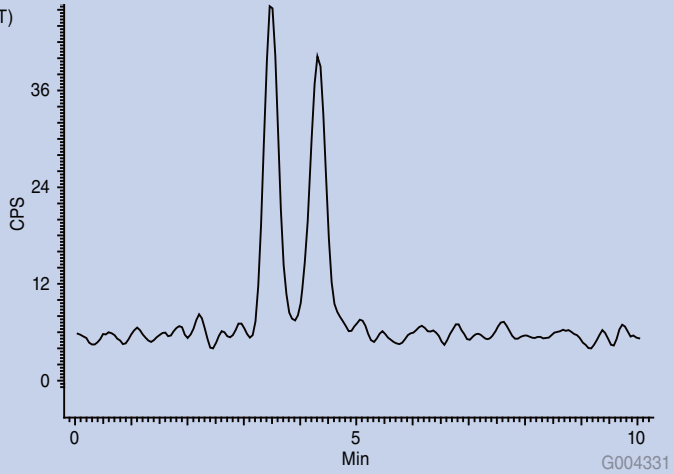
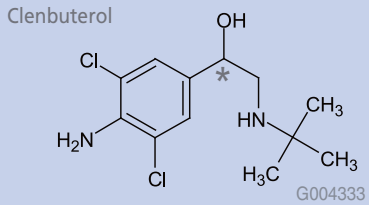
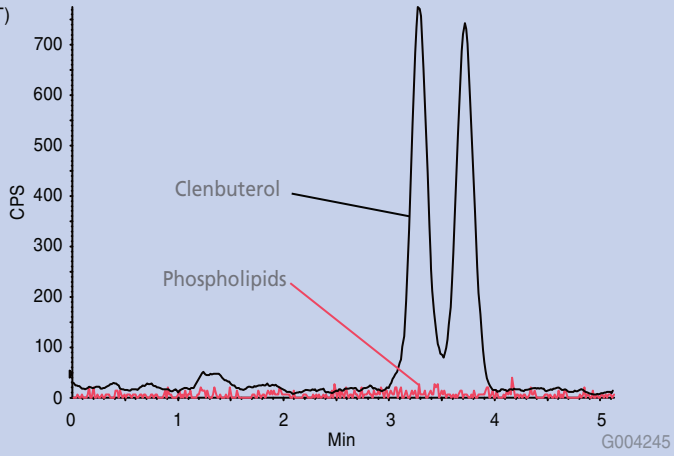


Figure 4. ESI-MS of Clenbuterol Extracted from Plasma on CHIROBIOTIC T in Polar Ionic Mode

column: CHIROBIOTIC T, 10 cm x 2.1 mm, 5 µm particles (12018AST)
mobile phase: 10 mM ammonium formate in CH_3OH
flow rate: 0.3 mL/min.
det.: ESI(+)
temp.: 30 °C
analyte: Clenbuterol in rat plasma (10 ng/mL)





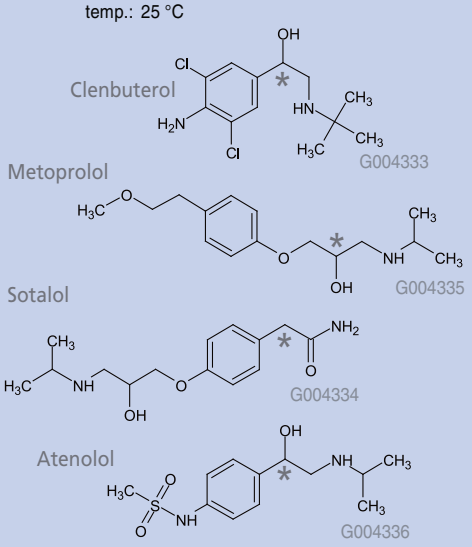


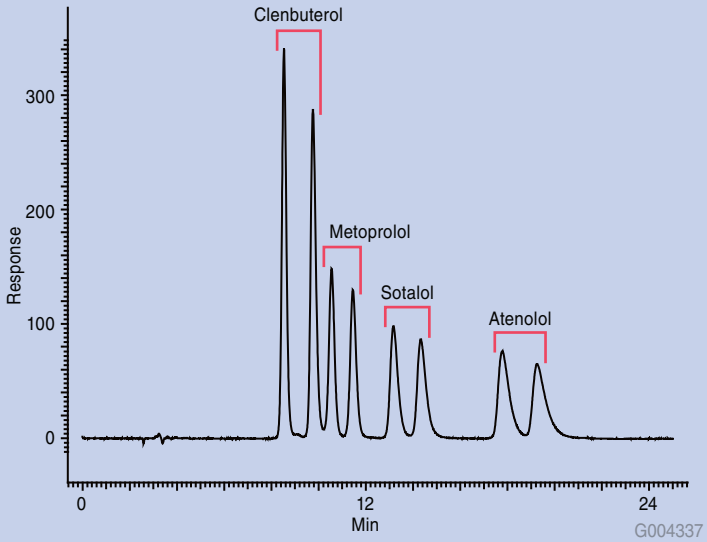
Unique Polar Ionic Mode

A valuable feature of CHIROBIOTIC CSPs, the novel and very versatile polar ionic mode is popular because its mobile phases are polar organic solvents containing volatile additives that are ideally suited for preparative and LC-MS applications. An example is shown in Figure 5. Additionally, compared to normal phase separations, the polar ionic mode has speed, efficiency and sensitivity advantages, all valuable assets for LC-MS.

Figure 5. Beta-Receptors on CHIROBIOTIC T in Polar Ionic Mode

column: CHIROBIOTIC T, 25 cm x 4.6 mm, 5 µm particles (12024AST)
mobile phase: 15 mM ammonium formate in CH_3OH
flow rate: 1 mL/min.
det.: UV at 220 nm
temp.: 25 °C







Multi-modal Interactions Permit Use in Aqueous and Non-aqueous Solvents

All CHIROBIOTIC CSPs possess multiple interaction sites on the same column. Changing the mobile phase affects the relative strength of specific types of interactions. The power and flexibility of multi-modal CHIROBIOTIC CSPs are demonstrated in Figures 6 through 10. The vancomycin-based CHIROBIOTIC CSPs were used successfully in four different modes.

Polar Ionic Mode

A valuable feature of CHIROBIOTIC, the novel and very versatile polar ionic mode mobile phase system is desirable because of its high volatility and beneficial ionization effect for LC-MS (Figure 6).

Reversed-phase Mode

Also highly suitable for LC-MS and polar analytes, reversed-phase (RP) is a mode familiar to all chromatographers. CHIROBIOTIC CSPs have RP character and can be used in a wide range of buffers and solvents (Figure 7).

Polar Organic Mode

Enantiomers of polar neutral analytes have been successfully separated on CHIROBIOTIC in the polar organic mode where the mobile phase is typically a polar organic solvent or solvent blend. Reaction mixtures, even in pyridine, can be run on CHIROBIOTIC in this mode (Figure 8).

Normal Phase Mode

Normal phase chiral separations are desirable to maintain solubility of hydrophobic compounds and when analyzing reaction mixtures in non-polar organic solvents. CHIROBIOTIC CSPs have the flexibility to operate in normal phase mode. The same column can be used with normal phase and polar/aqueous solvents and additives without memory effects (Figure 9).

Figure 6. Polar Ionic Mode

column: CHIROBIOTIC V2, 25 cm x 4.6 mm, 5 µm particles (15024AST)
mobile phase: 15 mM ammonium formate in CH_3OH
flow rate: 1 mL/min.
det.: UV at 230 nm
temp.: 25 °C
analyte: Fluoxetine

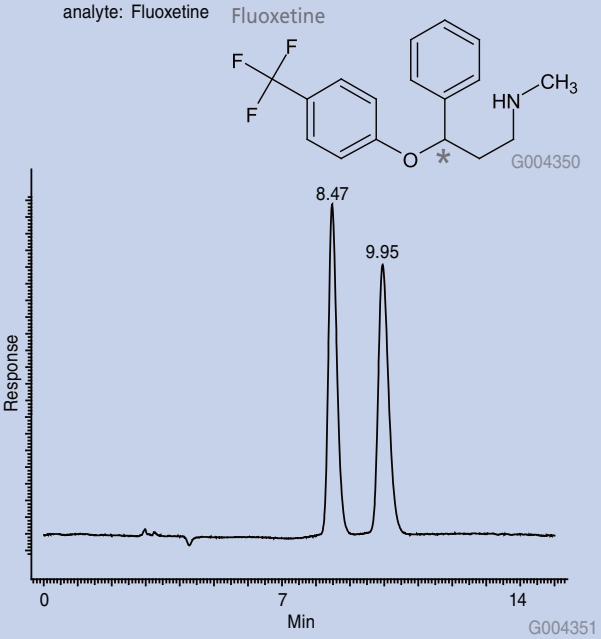


Figure 7. Reversed-phase Mode

column: CHIROBIOTIC V, 25 cm x 4.6 mm, 5 µm particles (11024AST)
mobile phase: (30:70) CH_3CN:5 mM ammonium acetate, pH 4.1
flow rate: 1 mL/min.
det.: UV at 254 nm
temp.: 25 °C
analyte: Warfarin

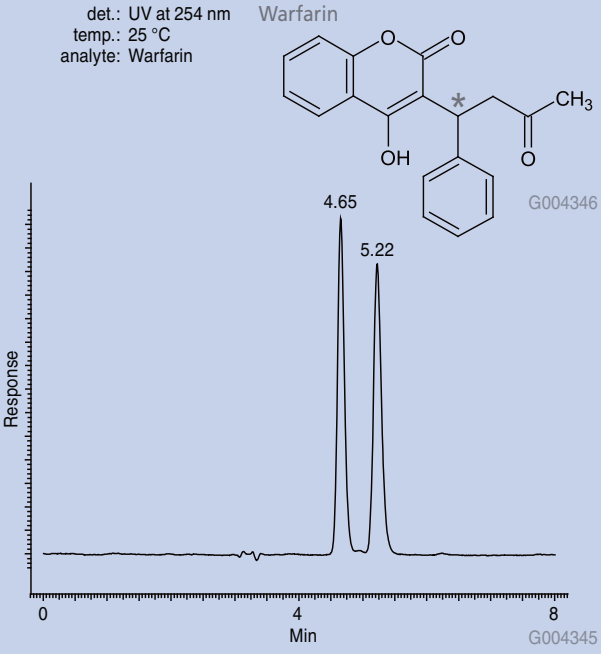




Figure 8. Polar Organic Mode

column: CHIROBIOTIC V2, 25 cm x 4.6 mm, 5 µm particles (15024AST)
mobile phase: CH_3OH
flow rate: 1 mL/min.
det.: UV at 230 nm
temp.: 25 °C
analyte: Thalidomide

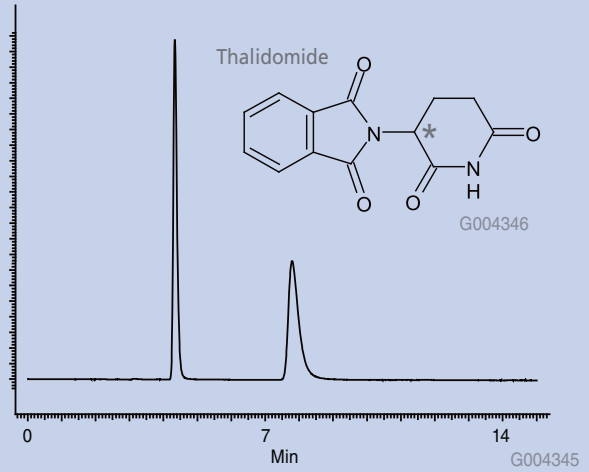
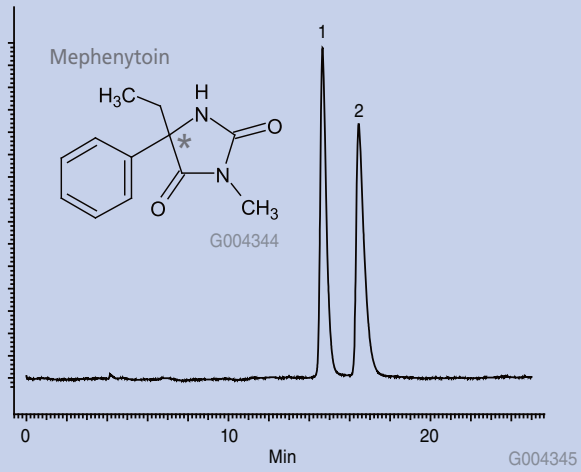


Figure 9. Normal Phase Mode

column: CHIROBIOTIC V, 25 cm x 4.6 mm, 5 µm particles (11024AST)
mobile phase: (95:5) hexane:ethanol
flow rate: 1 mL/min.
det.: UV at 205 nm
temp.: 25 °C
analyte: Mephenytoin



Preparative Applications Using CHIROBIOTIC CSPs

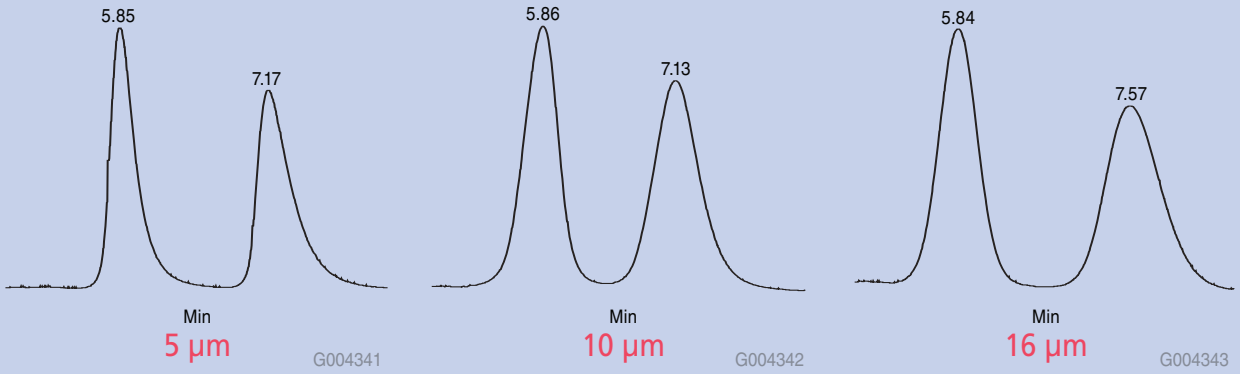
- Scalability across all CHIROBIOTIC particle sizes
- Low retention times give high throughput

CHIROBIOTIC columns can be used in all preparative HPLC techniques, including elution and recycle chromatography, mass-directed prep, SFC and simulated moving bed (SMB). Scale-up is highly predictable because the same bonded phase chemistry is employed across all particle sizes. Multiple covalent bonds attach the CHIROBIOTIC macrocyclic glycopeptides to the silica surface, meaning no CSP ligand will contaminate the product. Preparative separations on CHIROBIOTIC columns often have speed and efficiency benefits over other CSPs. In terms of loading capacity, a 25 cm x 21.2 mm column has medium to high loadings, from a few mg to over 300 mg per injection.

Prep separations on CHIROBIOTIC are reproducible and scalable. Figure 10 shows the separation of phenylalanine isomers in reversed-phase mode on columns packed with 5, 10, and 16 µm particles of CHIROBIOTIC T.

Figure 10. Scalability Across CHIROBIOTIC CSP Particle Sizes

column: CHIROBIOTIC T, 25 cm x 4.6 mm
mobile phase: (50:50) ethanol:water
flow rate: 0.9 mL/min.
det.: UV at 220 nm





Preparative Applications (contd.)

A significant advantage of CHIROBIOTIC for preparative applications is the fact that the mobile phase can be chosen to optimize sample solubility – a critical preparative consideration. The examples here show preparative CHIROBIOTIC separations in three different mobile phase systems.

Preparative Reversed-phase and Polar Ionic Modes

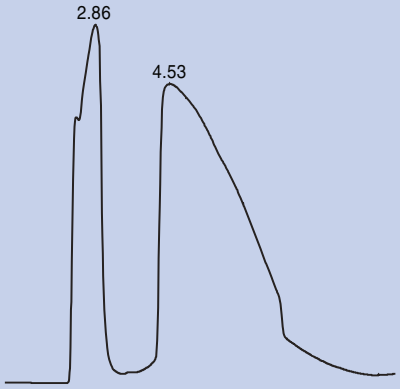
Preparative separations in reversed-phase and polar ionic mode solvents have benefits over normal phase preparative separations in terms of solvent safety and waste disposal costs. Figure 11 shows the use of CHIROBIOTIC TAG in a preparative separation in polar ionic mode.

Preparative Polar Organic Mode

Figure 12 shows the analytical and preparative separations of thalidomide enantiomers on CHIROBIOTIC T. The analytical scale gave an α value of 3.35 in 100% methanol and a retention time under 10 minutes. However, since thalidomide is fairly insoluble in pure methanol, it was possible to add 20% dioxane to the mobile phase to increase solubility 3.5-fold while still achieving the necessary separation.

Figure 11. Preparative Separation on CHIROBIOTIC TAG in Polar Ionic Mode

column: CHIROBIOTIC TAG, 25 cm x 21.2 mm, 5 µm particles (14044AST)
mobile phase: 0.1% ammonium acetate in CH_3OH
flow rate: 35 mL/min.
det.: UV at 300 nm
throughput: 20 mg/g CSP/hr.
load: 200 mg in 6 mL
analyte: N-Acetyl Tryptophan

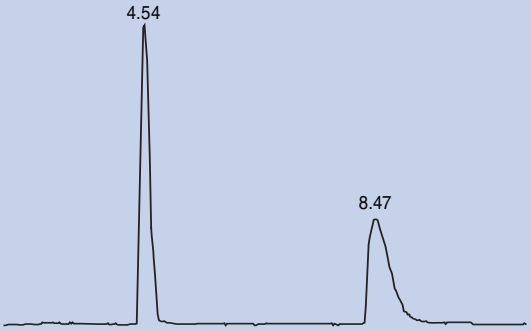


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Figure 12. Sample Solubility Considerations in Preparative

Analytical Scale

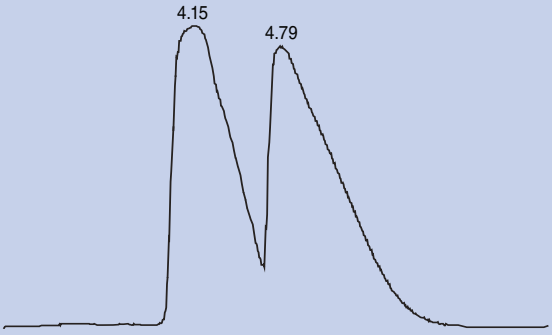
column: CHIROBIOTIC V, 25 cm x 4.6 mm, 5 µm particles (11024AST)
mobile phase: CH_3OH
det.: UV at 293 nm
flow rate: 1 mL/min.
analyte: Thalidomide



G004338

Prep Scale

column: CHIROBIOTIC V, 25 cm x 21.2 mm, 5 µm particles (11044AST)
mobile phase: (80:20) CH_3OH:dioxane
det.: UV at 313 nm
flow rate: 20 mL/min.
load: 70 mg in 12 mL
analyte: Thalidomide



G004339



CHIROBIOTIC V and V2

Bonded Macrocylic Glycopeptide:	Vancomycin
Chiral Centers:	18
Sugar Moieties:	2
Inclusion Cavities:	3

Separates a wide variety of secondary and tertiary amines in the polar ionic mode. Have many of the separation characteristics of protein-based stationary phases but with exceptional stability and much higher sample capacity. CHIROBIOTIC V2 and V differ in the chemistry used to bond the glycopeptide to the silica, which gives them differences in selectivity.

CHIROBIOTIC T and T2

Bonded Macrocylic Glycopeptide:	Teicoplanin
Chiral Centers:	23
Sugar Moieties:	3
Inclusion Cavities:	4

These CSPs have resolved all of the known beta-blockers and dihydrocoumarins and many other compound classes. Generally reproduces chiral crown ether or ligand-exchange for amino acid separations. CHIROBIOTIC T2 and T differ in the chemistry used to bond the glycopeptide to the silica, which gives them differences in selectivity.

CHIROBIOTIC TAG

Bonded Macrocylic Glycopeptide:	Teicoplanin Aglycone
Chiral Centers:	8
Sugar Moieties:	0
Inclusion Cavities:	4

The removal of the three sugar moieties enhances resolution of many of the amino acids (alpha, beta, gamma and cyclic). CHIROBIOTIC TAG has shown remarkable selectivity for sulfur-containing molecules, such as sulfoxides and the amino acids methionine, histidine and cysteine. Neutral molecules, like oxazolidinones, hydantoins and diazepines, have shown enhanced resolution and, more remarkably, in single-solvent systems like methanol, ethanol and acetonitrile. Some acidic molecules have also shown increased selectivity.

CHIROBIOTIC R

Bonded Macrocylic Glycopeptide:	Ristocetin A
Chiral Centers:	38
Sugar Moieties:	6
Inclusion Cavities:	4

The presence of amines in the ristocetin structure makes it a good choice when screening acidic compounds.

CHIROBIOTIC Product Listing

For more information and to review our complete offering of CHIROBIOTIC columns, please visit *sigma-aldrich.com/chiral*

Method Development Kits

ID (mm)	Length (cm)	Cat. No.	
4.6	10	**10300AST**	- One each of CHIROBIOTIC V2, T, TAG and R
4.6	25	**10305AST**	- One each of CHIROBIOTIC V2, T, TAG and R

CHIROBIOTIC Columns*		V	V2	T	T2	TAG	R
ID (mm)	**Length (cm)**	**Cat. No.**	**Cat. No.**	**Cat. No.**	**Cat. No.**	**Cat. No.**	**Cat. No.**
5 µm							
2.1	15	11019AST	15019AST	12019AST	16019AST	14019AST	13019AST
2.1	25	11020AST	15020AST	12020AST	16020AST	14020AST	13020AST
4.6	5	11021AST	15021AST	12021AST	16021AST	14021AST	13021AST
4.6	10	11022AST	15022AST	12022AST	16022AST	14022AST	13022AST
4.6	15	11023AST	15023AST	12023AST	16023AST	14023AST	13023AST
4.6	25	11024AST	15024AST	12024AST	16024AST	14024AST	13024AST
10	25	11034AST	15034AST	12034AST	16034AST	14034AST	13034AST
10	50	11036AST	15036AST	12036AST	16036AST	14036AST	13036AST
21.2	25	11044AST	15044AST	12044AST	16044AST	14044AST	13044AST
10 µm							
4.6	25	11124AST	15124AST	12124AST	16124AST	14124AST	13124AST

*Other column dimensions, including guard columns and preparative dimensions are available on our website or by inquiring to ***techservice@sial.com.***

Chiral Services: Column Screening and Small-Scale Purification

Consult Supelco to obtain a quotation for our expert services for chiral column screening (HPLC and GC), method development and optimization, as well as isolation of up to 10 grams of purified enantiomer.

The complete listing of our chiral HPLC and GC columns can be found at *sigma-aldrich.com/chiral*, our corporate chiral web portal, where you can view our other products for chiral chemistry, like chiral catalysts, building blocks, mobile phase additives, derivatization reagents and more.

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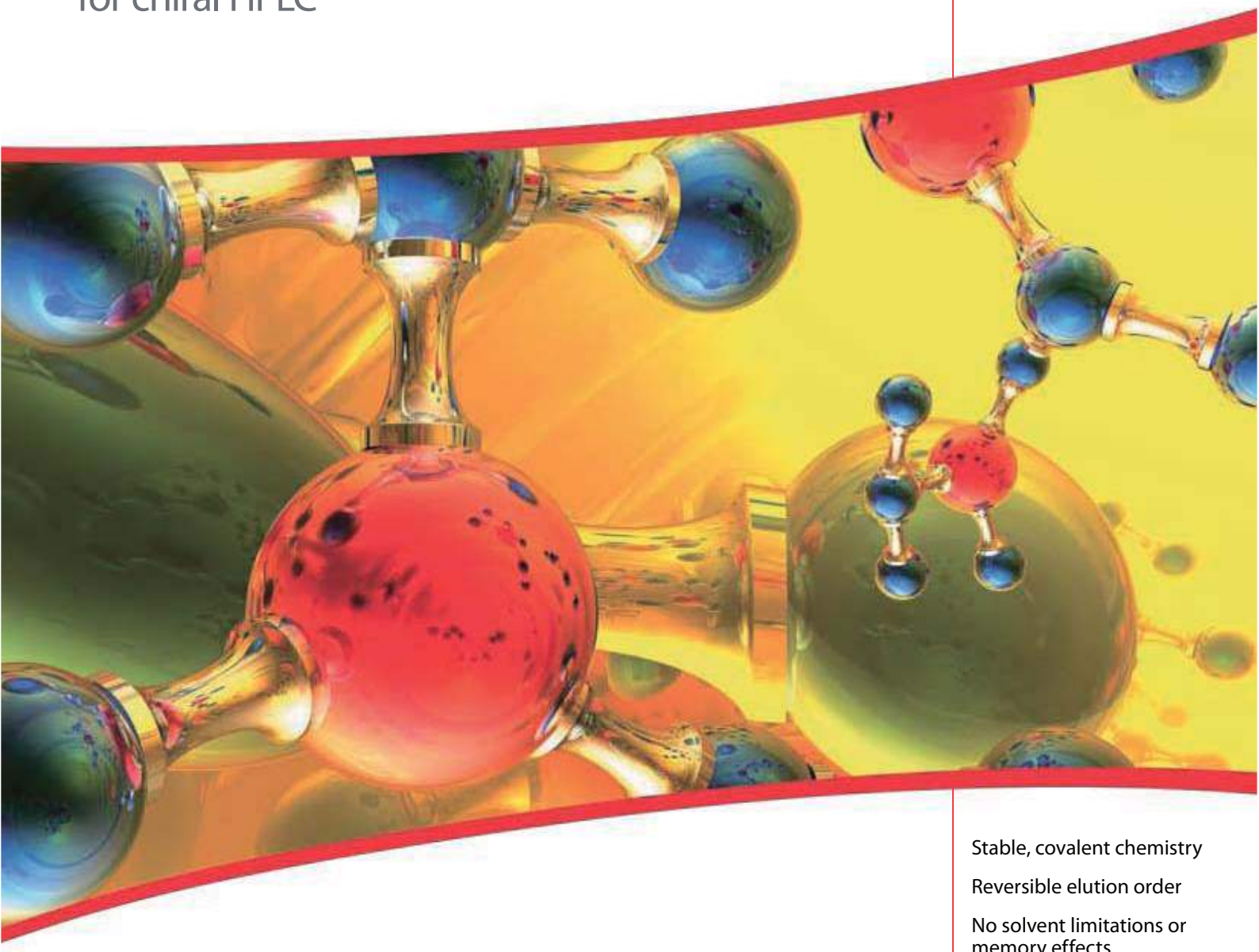
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Astec P-CAP™ and P-CAP™-DP

Polycyclic amine polymer stationary phases for chiral HPLC

SUPELCO® Analytical



- Stable, covalent chemistry
- Reversible elution order
- No solvent limitations or memory effects
- High capacity for preparative applications
- MS and SFC-compatible

Chiral HPLC for Chemists: Ultimate Solvent Choice with High Capacity Using Astec's P-CAP and P-CAP-DP

Useful for chiral HPLC and SFC separations, Astec P-CAP and P-CAP-DP polymeric chiral stationary phases (CSPs) have a thin, ordered layer of chiral polymer covalently bonded to the silica surface. They offer high stability, high sample loadability, easy scale-up, and no memory effect.

Today's chiral HPLC columns too often give excellent enantioselectivity at the expense of solvent choice. Sample solubility and its link to preparative separations can mean that a compromise has to be reached between selectivity and solvent choice. Astec P-CAP and P-CAP-DP chiral HPLC columns have no solvent restrictions, so the user can select a solvent that provides optimum enantioselectivity and analyte solubility.

Astec P-CAP

– **Bonded phase: Poly(trans-1,2-cyclohexanediyl-bis-acrylamide)**

– **Invented by Prof. Francesco Gasparrini (1), P-CAP is made from a diacryloyl -trans-1,2-diphenylethylenediamine polymerization, and utilizes hydrogen bonding and steric effects as enantiomer separation mechanisms.**

Astec P-CAP-DP

– **Bonded phase: Poly(diphenylethylenediamine-bis-acryloyl) or Poly-DPEDA**

– **Invented by Prof. Daniel Armstrong (2), Astec P-CAP-DP introduces phenyl rings to add π-π interactions, giving it one additional type of interaction compared to P-CAP. P-CAP-DP is less polar than P-CAP.**

Solvent Choice and Reversal of Elution Order

The P-CAP and P-CAP-DP polyamide CSPs feature a thin, ordered polymer layer chemically bonded to 5 µm or 3.5 µm spherical silica using a patented radical polymerization. This gives the phases high permeability across the surface and, because they are synthetic, they can be identically manufactured in both R,R and S,S forms. This provides a predictable reversal of elution order in the same mobile phase (Figure 1).

The P-CAP phases have no solvent or additive memory effects, so the same column can be used in a number of different mobile phases without any detrimental effects. These phases form a new generation bridge between the traditional 'brush' type CSPs and the conventional polymeric phases.

Chiral method development is typically carried out either in normal phase (heptane/IPA or hexane/ethanol) or polar organic (acetonitrile/methanol) modes. For method optimization, a wide range of organic solvents can be used, from acetone to dichloromethane to dioxane, and many others. For acids and bases, the addition of 0.1% TFA often

Figure 1. Predictable Elution Order Reversal

columns: 25 cm x 4.6 mm I.D., 5 µm
mobile phase: 95:5, methylene chloride:methanol
flow rate: 1 mL/min.

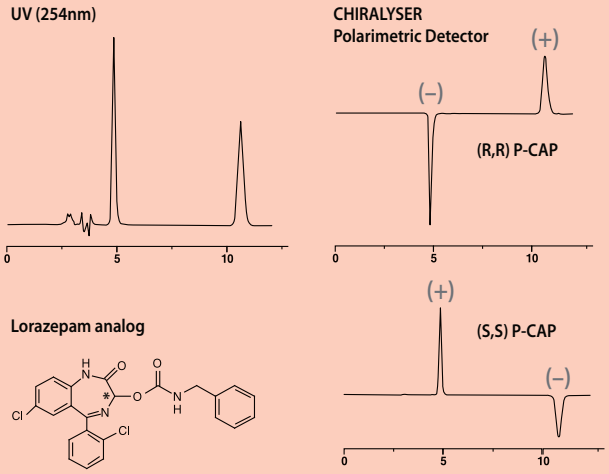
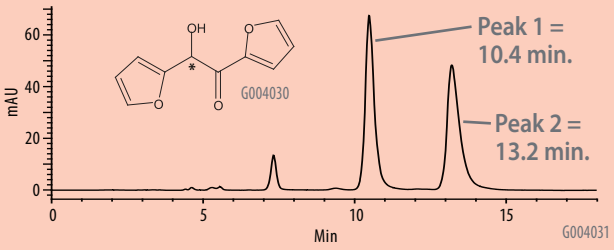


Figure 2. High-capacity Separations

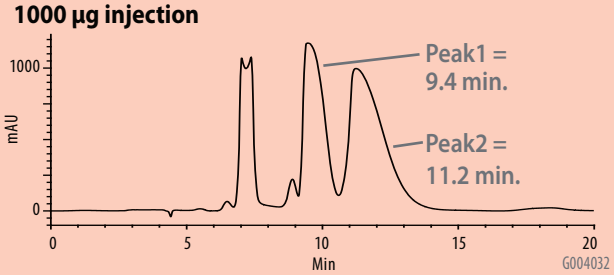
Analyte: furoin

column: (R,R) P-CAP-DP, 25 cm x 4.6 mm I.D., 5 µm particles (25024AST)
mobile phase: 80:20, hexane:ethanol
flow rate: 1.0 mL/min.
temp.: 23 °C
det.: UV at 235 nm
injection: (a) 2 µL at 4 mg/mL (8 µg total)
(b) 50 µL at 20 mg/mL (1000 µg total)

8 µg injection



1000 µg injection



increases resolution and efficiency and decreases retention times. There are no known limitations on the kind of solvents that can be used with these phases. For MS detection, volatile acids and buffers such as ammonium acetate can be added to enhance peak efficiency or to enhance ionization when needed.

High Capacity for Preparative HPLC

Solvent flexibility and high loading capacity make P-CAP and P-CAP-DP CSPs ideal for analytical, preparative and process scale separations. The separation of furoin enantiomers is shown in Figure 2 using an analytical 25 cm x 4.6 mm Astec (R,R) P-CAP-DP column and mobile phase of 80:20 hexane:ethanol. Excellent separation is demonstrated with an injection of 8 µg of the furoin racemate. Increasing the load to 1 mg on this analytical column demonstrates the phase's high loading capacity.

MS-Compatible Operation

Astec P-CAP and P-CAP-DP operate in mobile phases that are amenable to MS-detection. Salt and/or acetic acid can be added to improve efficiency or enhance ionization and detection (Figure 3).

Applications

Astec P-CAP CSPs have been used for a wide variety of molecular types and are ideal for medium to high polarity compounds. The mechanism of separation is either through hydrogen bonding for P-CAP, or through both hydrogen bonding (donor and acceptor) with additional π-π interaction for the P-CAP-DP. Both also use dipole-dipole and steric interactions. Examples of the separations completed to date are shown in Table 1.

Table 1. Examples of P-CAP and P-CAP-DP Application Areas

Hydroxycarboxylic acids	**Benzene sulfonamides**
Alcohols	**Binaphthols**
Sulfoxides	**Benzodiazepines**
Esters	**Phosphonic acids**
Amides	**Bis-Sulfones**
N-blocked amino acids	**Chromemones**

Complementary to Other Astec CSPs

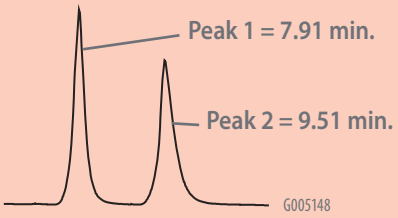
Astec P-CAP and P-CAP-DP are complementary to Astec CHIROBIOTIC, CYCLOBOND and the polysaccharide-based CSPs. We suggest you incorporate them into your chiral column screening protocol.

Figure 3. Improved Analytical Separation with MS-Compatible Mobile Phases

column: (R,R) P-CAP, 25 cm x 4.6 mm I.D., 5 µm particles (31024AST)
flow rate: 1.0 mL/min.
temp.: 25 °C
det.: UV @ 254 nm

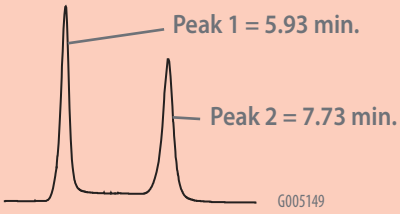
Separation of 1,1′-Bi-2-naphthol

mobile phase: 95:5:10 mM ammonium acetate:methanol:acetate



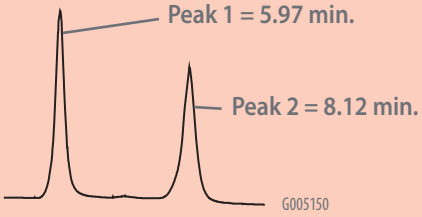
Oxazepam

mobile phase: 70:30:20 mM ammonium acetate:methanol:acetate



Lorazepam

mobile phase: 70:30:20 mM ammonium acetate:methanol:acetate



Summary

Astec P-CAP and P-CAP-DP are rugged chiral HPLC phases, experience no memory effects, and can be run in a wide variety of solvents with speed and high efficiencies. For preparative applications, a combination of wide solvent choice and high capacity make them ideal for large-scale purification.

References

1) New hybrid polymeric liquid chromatography chiral stationary phase prepared by surface initiated polymerization. Gasparrini, F.; Misiti, D.; Rompietti, R.; Villani, C. J Chromatogr, A. (2005), 1064(1), 25-38.

2) Chromatographic evaluation of poly(trans-1,2-cyclohexanediyl-bisacrylamide) as a chiral stationary phase for HPLC. Zhong, Qiqing; Han, Xinxin; He, Lingfeng; Beesley, Thomas E.; Trahanovsky, Walter S.; Armstrong, Daniel W. Department of Chemistry, Iowa State University, Ames, IA, USA. Journal of Chromatography, A (2005), 1066(1-2), 55-70.

Ordering Information

Particle Size (µm)	Length (cm)	I.D. (mm)	Cat. No.
Astec (R,R) P-CAP			
3.5	5	4.6	**30021AST**
3.5	10	4.6	**30022AST**
3.5	15	4.6	**30023AST**
5	5	4.6	**31021AST**
5	10	2.1	**31018AST**
5	10	4.6	**31022AST**
5	15	2.1	**31019AST**
5	15	4.6	**31023AST**
5	25	2.1	**31020AST**
5	25	4.6	**31024AST**
5	25	10	**31034AST**
5	25	21.2	**31044AST**
10	25	4.6	**31124AST**
Guards*			
5	2	1	**31101AST**
5	2	4	**31100AST**
Astec (S,S) P-CAP			
3.5	5	4.6	**32021AST**
3.5	10	4.6	**32022AST**
3.5	15	4.6	**32023AST**
5	5	4.6	**33021AST**
5	10	2.1	**33018AST**
5	10	4.6	**33022AST**
5	15	2.1	**33019AST**
5	15	4.6	**33023AST**
5	25	2.1	**33020AST**
5	25	4.6	**33024AST**
5	25	10	**33034AST**
5	25	21.2	**33044AST**
10	25	4.6	**33124AST**
Guards*			
5	2	1	**33101AST**
5	2	4	**33100AST**

Particle Size (µm)	Length (cm)	I.D. (mm)	Cat. No.
Astec (R,R) P-CAP-DP			
3.5	15	4.6	**34023AST**
5	15	2.1	**35019AST**
5	15	4.6	**35023AST**
5	25	4.6	**35024AST**
5	25	10	**35034AST**
5	25	21.2	**35044AST**
Guards*			
5	2	4	**35100AST**
Astec (S,S) P-CAP-DP			
3.5	15	4.6	**36023AST**
5	15	2.1	**37019AST**
5	15	4.6	**37023AST**
5	25	4.6	**37024AST**
5	25	10	**37034AST**
5	25	21.2	**37044AST**
Guards*			
5	2	4	**37100AST**

***Guard Column Holders**	
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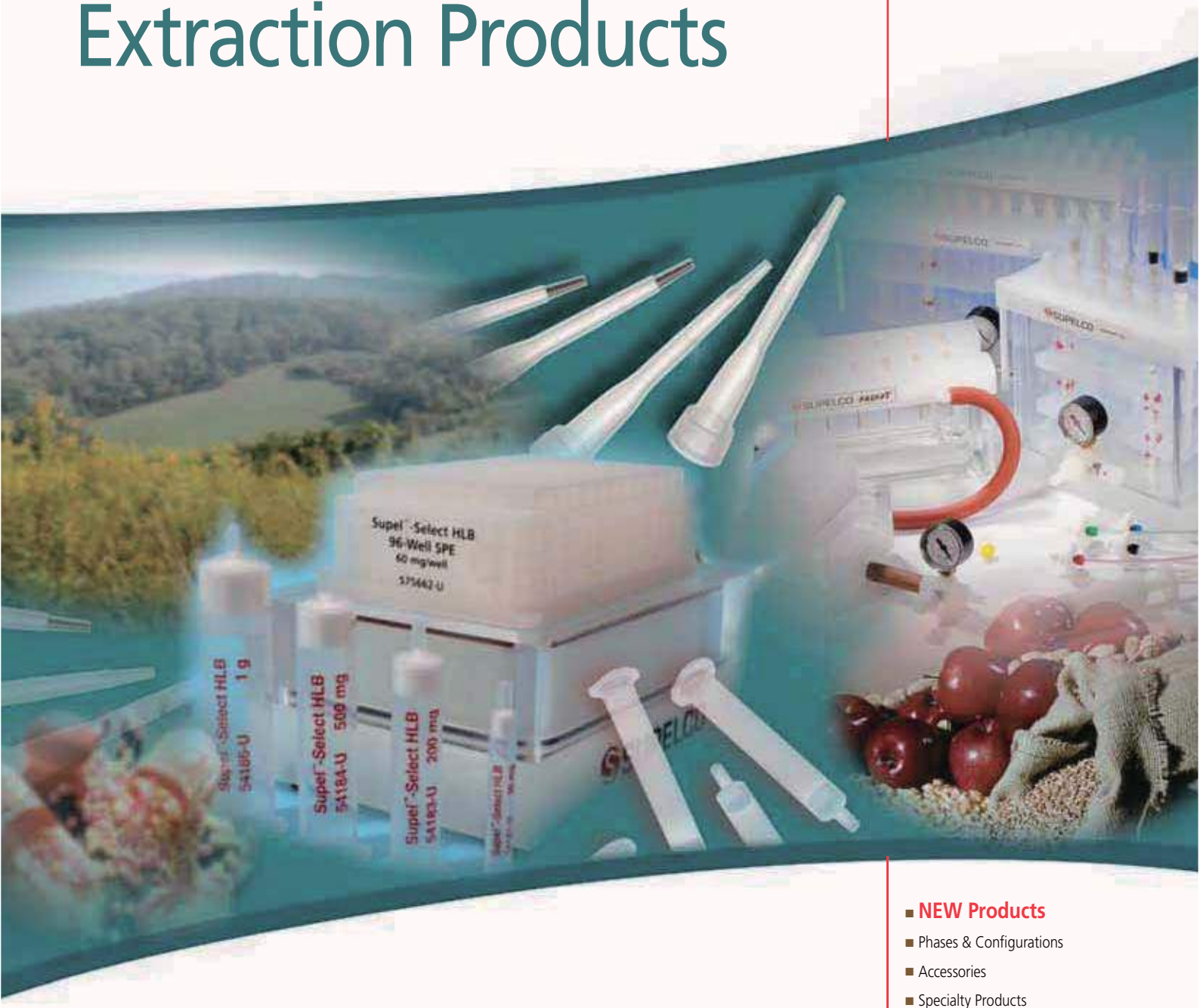
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A Brief History of Supelco Solid Phase Extraction (SPE)

Supelco, the Analytical & Chromatography Division of Sigma-Aldrich, first introduced SPE technology in 1985 under the Supelclean™ brand name. Shortly thereafter, we introduced our Visiprep™ Vacuum Manifold system.

In 1992, with the focus on environmental, food/agrochemical, and industrial analyses, we improved and extended the line further to include Supelclean ENVI™- SPE products. In 1998, we introduced the Discovery® SPE line for pharmaceutical analysis.

Beginning 2007, the emphasis for Supelco Sample Prep R&D has been innovation. For example, MIP Technologies AB collaborated with Supelco to introduce SupelMIP™ SPE - Molecularly Imprinted Polymer Technology. HybridSPE™ -Precipitation was developed for phospholipid and protein removal.

In addition, Supelco was among the first to introduce a dispersive SPE (QuEChERS) product line for multi-residue pesticide analysis.



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Supelclean & Supelclean ENVI

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Discovery SPE

- Developed, tested, and quality controlled for pharmaceutical and clinical applications
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- Supelclean Sulfoxide SPE for PCB analysis
- Dispersive SPE for multi-residue pesticide analysis
- Supel™-Select HLB SPE – our newest line of hydrophilic polymer SPE phases
- … and more!

Supelclean Specifications:

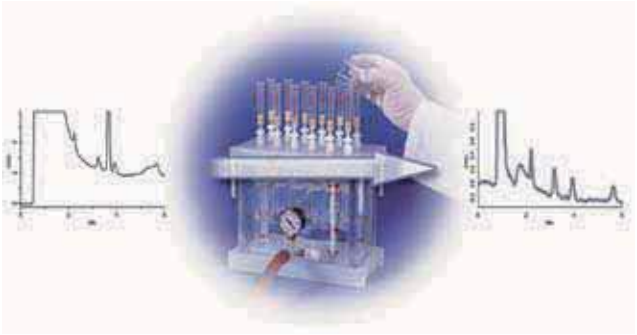
Base Silica:	Irregular shape, acid washed for Supelclean ENVI
Mean Particle Size:	45 µm
Mean Pore Diam.:	60 Å
Tot. Pore Vol.:	0.8 cm^3/g
Specific Surf. Area:	475 m^2/g
Endcapped:	Yes (unless otherwise noted)
Frit:	Polyethylene (PE), 20 µm porosity (unless otherwise noted)

Discovery Specifications:

Base Silica:	Irregular shape, acid washed
Mean Particle Size:	50 µm
Mean Pore Diam.:	70 Å
Tot. Pore Vol.:	0.9 cm^3/g
Specific Surf. Area:	480 m^2/g
Endcapped:	Yes (unless otherwise noted)
Frit:	Polyethylene (PE), 20 µm porosity (unless otherwise noted)

The Importance of SPE

Solid phase extraction is a form of digital (step-wise) chromatography designed to extract, partition, and/or adsorb one or more components from a liquid phase (sample) onto stationary phase (sorbent or resin). Over the last twenty years, SPE has become the most powerful technique available for rapid and selective sample preparation (prep) prior to analytical chromatography. SPE extends a chromatographic system's lifetime, improves qualitative and quantitative analysis, and by changing an analyte of interest's original matrix environment to a simpler matrix more suitable for subsequent analysis, the demand placed on an analytical instrument is considerably lessened.



Use SPE for Samples that:

- Contain particulate matter causing system clogging and high back-pressure
- Contain components that cause high background, misleading peaks, and/or poor sensitivity
- Require cleanup, trace enrichment/concentration, or purification
- Require sample matrix or solvent exchange

Benefits of SPE:

- Switch sample matrices to a form more compatible with chromatographic analyses
- Concentrate analytes for increased sensitivity
- Remove interferences to simplify chromatography and improve quantitation
- Protect the analytical column from contaminants

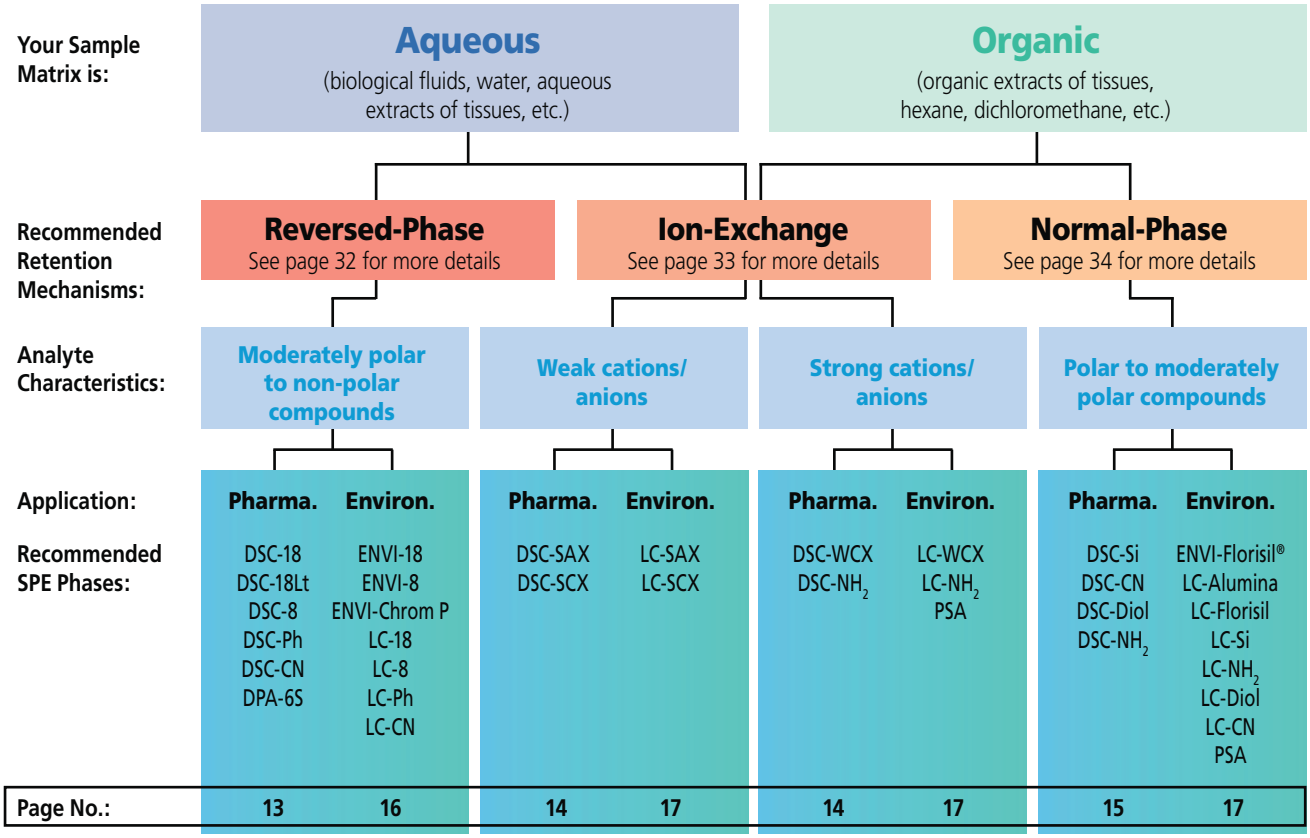
Common SPE Applications:

- Pharmaceutical compounds and metabolites in biological fluids
- Drugs of abuse in biological fluids
- Environmental pollutants in drinking and wastewater
- Pesticides and antibiotics in food/agricultural matrices
- Desalting of proteins and peptides
- Fractionation of lipids
- Water and fat soluble vitamins
- For more applications and application details, please visit our web site, *sigma-aldrich.com/spe* or refer to the current Supelco catalog.

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	NEW! *Supel™-Select HLB*
	NEW! *Empore® SPE*
	NEW! *SupelMIP®*
	Discovery®
	Supelclean™/Supelclean ENVI
19	Specialty Products
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	Environmental
	Pesticide Analysis
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SPE Phase Selection Quick Look-Up Guide



Supelco SPE Specialty Phases:

Phase Description	Field/Applic.	Page	Description
HybridSPE-Precipitation	Ph	8	Combines the simplicity of protein precipitation with the selectivity of SPE for the targeted removal of proteins andphospholipids in biological samples
Supel-Select HLB	Ph, G, F	9	Hydrophilic modified styrene based polymer for the broad range extraction of diverse analytes from aqueous samples
Empore SPE	Ph, E, G	10	SPE particles enmeshed in a PTFE membrane. Allows for faster flow-rates, smaller solvent consumption, and reduced elution volumes.
SupelMIP SPE	Ph, F, E	12	Molecularly imprinted polymers for the highly selective extraction of trace analytes in difficult sample matrices
Discovery DSC-MCAX	Ph, G	14	Mixed-mode cation exchange for superior selectivity/sample cleanup when extracting basic compounds (most pharmaceuticals) from biological fluids (e.g., plasma, urine, etc.)
Discovery DPA-6S	G, E, Ph	13	Polyamide resin that adsorbs polar compounds containing multi –OH and –COOH groups. Useful for extracting polyphenolics and other natural compounds (e.g., flavanoids, chlorophyll, humic acid, etc.) from plant extracts.
Polymer SAX Rezorian™ Cartridge / Polymer SCX Reversible Tube	G	21	Strong cation and anion exchanger on a styrene base particle. Offers much higher ion-exchange capacity than silica based ion-exchangers.
Supelclean ENVI-18 and –8 DSK SPE Disks	E	16	Provides fast flow rates for processing large volumes of water samples (≥0.5 L). Used in EPA 500 series methods – Drinking Water.
Dual Layer Florisil/Na_2SO_4	E	17	For total petroleum hydrocarbon index according to European Method EN9377-2
Supelclean Coconut Charcoal	E	22	Configured for EPA Method 521 – Nitrosamines in Water
Supelclean ENVI-Carb Plus	E	22	Spherical carbon particles packed in a reversible tube for the extraction of highly polar compounds from water
Supelclean Sulfoxide	E	22	Developed for the highly selective extraction of PCBs from transformer and waste oil
EPA 8290 SPE Tubes	E	22	Multi-layer SPE tubes configured for EPA Method 8290 - PCDDs and PCDFs by HRGC/HRMS
Discovery Ag-Ion	F	24	Silver Ion SPE for the fractionation of cis-trans isomers and other FAMEs
Supelclean ENVI-Carb	F	23	Extreme affinity for polar compound in aqueous samples and water miscible organic extracts.Commonly used in pesticide analysis of food samples.
Multi-layer Supelclean SPE Products	F	23	Developed to provide superior cleanup when conducting multi-residue pesticide analysis in food/agricultural (ENVI-Carb, SAX, PSA, NH_2) matrices
Supelclean LC-4 (wide pore)	B	16	Used for desalting proteins/peptides and other macromolecules

Key: Ph = Pharmaceutical/Drugs; F = Food / ; E = Enviromental; B = Biological macromolecules; G = General

SPE Bed Weight Quick Look-Up Guide

Choosing the Right Bed Weight and Tube Size

General guidelines for choosing the appropriate SPE tube size and bed weight configuration are listed in this table. Optimal method parameters and hardware/ bed weight dimensions should be determined during method optimization and troubleshooting.

Bed Weight	Tube Volume	Minimum Elution Vol.	Bed Capacity*
50-100 mg	1 mL	100-200 µL	2.5-10 mg
500 mg	3 mL	1-3 mL	25-100 mg
0.5-1 g	6 mL	2-6 mL	25-100 mg
2 g 5 g 10 g	12 mL 20 mL 60 mL	10-20 mL 20-40 mL 40-100 mL	0.1-0.2 g 1.25-2.5 g 0.5-1 g

* This value depends on the analyte and sample matrix. As a rule of thumb, the bed capacity can be estimated with ~5% of the bed weight.

- Smaller tube dimensions (1 mL) contain smaller bed weights. Smaller bed weights allow for reduced elution volumes which can be beneficial for sensitive analyses, and when further processing is required (e.g., evaporation).
- 3 mL SPE tubes are the most common size dimension.
- 6 mL SPE tubes should be used when one or more steps in the SPE process require volumes greater than 3 mL. 6 mL tubes also contain larger bed weights (up to 1g) which offers greater capacity, and can be beneficial when extracting difficult to retain compounds.
- 12, 20, and 60 mL tubes contain larger bed weights and head space volume which offer greater capacity. This allows researchers to use SPE as a purification or modified LPLC/Flash technique.
- The 10 mL LRC (large reservoir cartridges) are ideal for preparing larger sample volumes with smaller bed weights (25-100 mg). The packed section has the same diameter like a 1 mL tube.

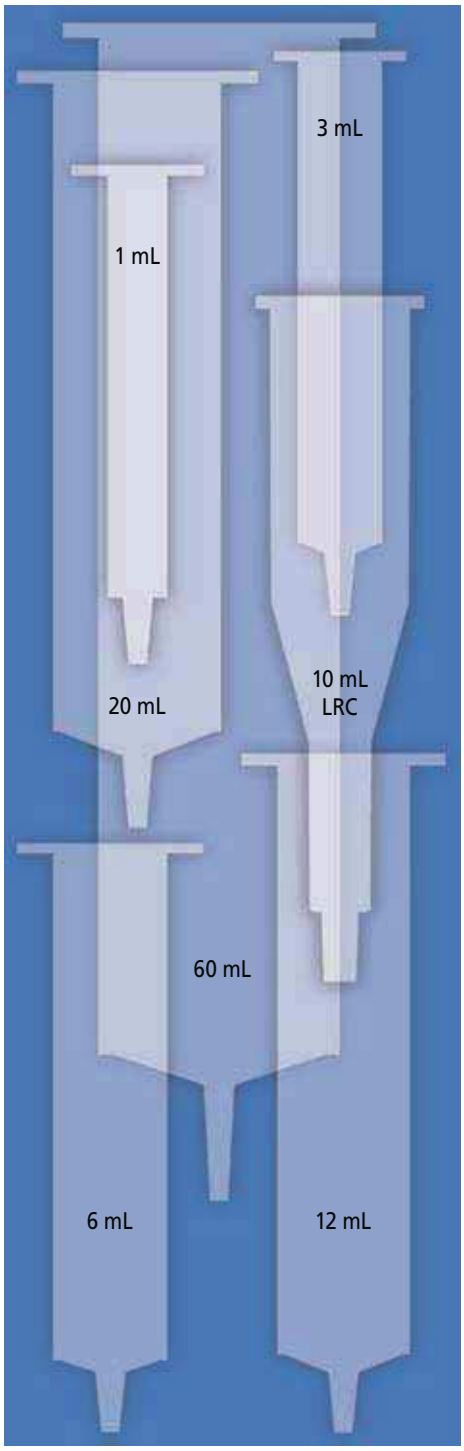
FREE SPE MultiPaks for Method Development

SPE MultiPaks consist of an assortment of SPE phase chemistries and tube dimensions ideally suited for method development. The mix of phase chemistries available in these MultiPaks allows you to screen for optimal retention and selectivity required to achieve your sample prep objectives.

Available SPE MultiPaks

- HybridSPE-PPT
- Supel-Select HLB
- Supel-Tips
- SupelMIP
- Dispersive SPE (dSPE)
- Discovery Reversed-Phase
- Discovery Normal-Phase
- Discovery Ion-Exchange
- Discovery DSC-MCAX (Mixed-Mode Cation Exchange)
- Discovery DPA-6S (Polyamide)
- Supelclean ENVI-Carb (Graphitized Carbon)
- Discovery Ag-Ion
- Supelclean Dual Layer (for multi-residual pesticide analysis)
- Supelclean PSA

Most common SPE hardware:
Polypropylene SPE tubes with PE Frit



Actual size of SPE tubes

To learn more about SPE MultiPaks, or to request a FREE SPE MultiPak sample, please visit sigma-aldrich.com/spe or contact Technical Service at 800-359-3041/814-359-3041.

SPE Tubes and Specialty Hardware Quick Look-Up Guide

Additional Tubes & Cartridges

Glass SPE Tubes with PTFE & SS Frits (pg. 25 and 26)



Common in environmental analysis to reduce leachables from PP hardware and PE frits

VersaPure® PrePacked Büchner Funnels (21 and 26)



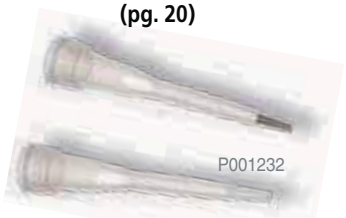
Used for large scale purification (medicinal chemistry purification)

Reversible SPE Tubes (pg. 21, 22, and 26)



Reverse SPE tubes prior to elution to minimize elution volume for strongly retained compounds

Supel-Tips SPE (pg. 20)



Ideal for the micro-extraction of small & biological macromolecules

Rezorian Cartridges (pg. 21 and 26)



Luer-Lock® cartridges for positive pressure applications. Can also be used with vacuum manifold with proper luer connectors.

Discovery SPE 96-Well Plates (pg. 19 and 20)



For high throughput sample preparation

Dispersive SPE (pg. 24)



Custom pre-washed salt sorbent vials for dispersive SPE

Custom Capabilities

Supelco offers custom manufacturing services so you can optimize your sample processing procedure to the parameters dictated by your sample prep objectives. If there is a certain permutation of phase chemistry, bed weight and hardware configuration you require that is not listed within our standard product line, please inquire.

To request a price quote or inquire on the feasibility of Supelco manufacturing a custom SPE product, please contact our Order Processing & Technical Service representatives:

Flangeless SPE Tubes (custom - inquire)



Accommodate robotic liquid vials handling systems (e.g. Gilson SPE 215™ System)

Order Processing:	Phone: 800-247-6628/814-359-3441	Fax: 800-447-3044/814-359-5459	email: supelco@sial.com
Technical Service:	Phone: 800-359-3041/814-359-3041	Fax: 800-359-3044/814-359-5468	email: techservice@sial.com

For US only. All other countries, please contact your local Sigma-Aldrich office or distributor.

TRADEMARKS

AutoTrace - **Caliper Technologies Corp.**, Celite - **Celite Corp.**; Discovery, ENVI, ENVI-Carb, ENVI-Disk, Hisep, HybridSPE, Preppy, Rezorian, Sigma-Aldrich, Supelclean, Supelco, SupelMIP, VersaFlash, VersaPure, Visi-1, Visidry, Visiprep - **Sigma-Aldrich Biote;chnology LP;** DOWEX - **Dow Chemical Co.**, Empore - **3M;** Florisil - **U.S. Silica Company;** Gilson SPE 215 - **Gilson;** Laboport - **KNF Neuberger GmbH;** Luer-Lock - **Becton-Dickinson & Co.;** Multi-Probe - **Hewlett-Packard Corp.;** Quadra 96 - **TomTec, Inc.**

SPE Accessories Quick Look-Up Guide

Visiprep™ DL & Standard Vacuum Manifold (pg. 27)



Uses disposable liners that prevent cross-contamination

Visiprep 5-Port Flask Manifold (pg. 27)



Collects the SPE eluate in round flasks for easy rotary evaporation

Preppy™ Vacuum Manifold (pg. 28)



Most economical

PlatePrep Vacuum Manifold (pg. 30)



For 96-well SPE
Useful for stacking SPE tubes,

ENVI-Disk™ Holder (pg. 31)



Used with 47 mm SPE disks
Simple racks for using SPE

Visi-1™ Single SPE Tube Processor (pg. 25)



For processing very few SPE samples

Visiprep Large Volume Sampler (pg. 28)



For processing larger sample volumes

Visidry™ Drying Attachment& (pg. 28)



For drying SPE tubes or evaporating SPE eluate

Large Volume Reservoirs & Tube Adapters (pg. 25)



Useful for stacking SPE tubes, increasing headspace volume, or processing SPE tubes via luer syringe

SPE Elution Rack (pg. 28)



Simple racks for using SPE under gravity flow

KNF Laboport® Vacuum Pumps (inquire)



Provides vacuum source for vacuum manifolds

Trap Kit and Vacuum Gauge Bleed Valve (pg. 29)



Additional vacuum accessories

NEW! HybridSPE - Precipitation Technology

Winner of the SelectScience.net Scientists' Choice Award for Best New Separations Product in 2008

HybridSPE-Precipitation (HybridSPE-PPT) combines the simplicity of protein precipitation with the selectivity of solid phase extraction (SPE) for the targeted removal of phospholipids in biological plasma/serum (Figure 1). The technology utilizes a zirconia-coated particle, and exhibits selective affinity towards phospholipids while remaining non-selective towards a range of basic, acidic, and neutral compounds. The phospholipid retention mechanism is based on a highly selective Lewis acid-base interaction between the proprietary zirconia ions (functionally bonded to the HybridSPE stationary phase) and the phosphate moiety consistent with all phospholipids (Figure 2).



Features & Benefits:

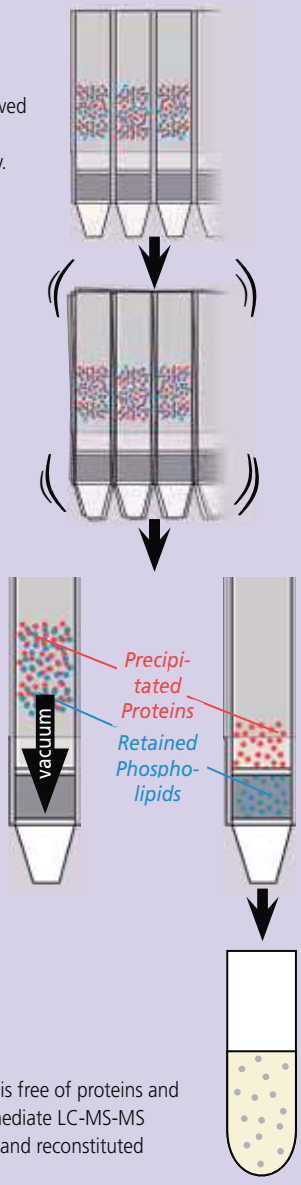
- Merges both protein precipitation & SPE
  - Offers the simplicity and generic nature of protein precipitation
  - Selectivity approaches SPE via the targeted removal of phospholipids
- 2-3 step generic procedure
- 100% removal of phospholipids and precipitated proteins
- Minimal to no method development required
- Available in 96-well and 1 mL cartridge dimensions

Figure 1. HybridSPE-PPT "In-well" Method

1) **Precipitate Proteins** by adding 100 µL plasma or serum to the HybridSPE-PPT plate followed by 300 µL 1% formic acid in acetonitrile. Add I.S. as necessary.

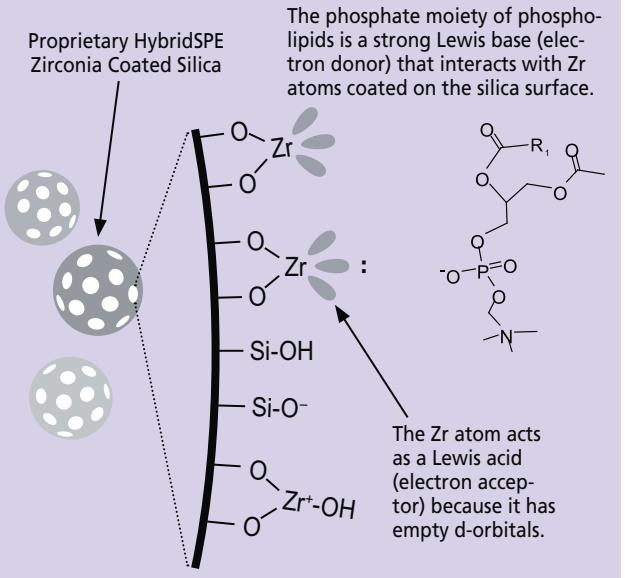
2) **Mix** by vortexing/shaking HybridSPE-PPT plate or by aspirating/dispensing with 0.5-1 mL pipette tip (e.g., TOMTEC Quadra liquid handler)

3) **Apply vacuum.** The packed-bed filter/frit assembly acts as a depth filter for the concurrent physical removal of precipitated proteins and chemical removal phospholipids. Small molecules (e.g., pharma compounds and metabolites) pass through unretained.



4) **Resulting filtrate/eluate** is free of proteins and phospholipids and ready for immediate LC-MS-MS analysis; or it can be evaporated and reconstituted as necessary prior to analysis

Figure 2. Lewis Acid-Base Interactions Between HybridSPE Zirconia Ions and Phospholipids



Description	Qty.	Cat. No.
HybridSPE-PPT Products		
96-well Plate, 50 mg/well	1	575656-U
1 mL Cartridge, 30 mg/well	100	55261-U
Related Products		
96-well Protein Precipitation Filter Plate	1	55263-U
Supelco PlatePrep Vacuum Manifold	1	57192-U
96 Square/Deep Well Collection Plate, 0.35 mL, PP	50	575651-U
96 Square/Deep Well Collection Plate, 0.5 mL, PP	50	575652-U
96 Square/Deep Well Collection Plate, 2 mL, PP	50	575653-U
96 Square Well Pierceable Cap Mats	25	575656-U

sigma-aldrich.com/hybridspe-ppt

NEW! Supel-Select HLB SPE

Sample Prep Performance at the Price you Desire

Supelco Supel-Select HLB SPE is a hydrophilic modified styrene-based polymer developed for the solid phase extraction of a highly broad range of compounds from aqueous samples. The retention mechanism is predominately based on reversed-phase interaction. However, because the phase is hydrophilic modified, the phase is also selective for more polar compounds (HLB: Hydrophilic Lipohilic Balance). Examples of more polar compounds that are retained and recovered on Supel-Select HLB include (but not limited to): pyridoxine (logPo/w -0.56), riboflavin (logPo/w -2.02), biotin (logPo/w 0.11).

Features & Benefits:

- Extract and recover a highly broad range of compounds from aqueous samples
- Reduce ion-suppression
- Amenable to generic methodology
- Resistant to overdrying for greater reproducibility
- Low UV and MS extractables
- Stringent production and QC guidelines
- Greater capacity for smaller elution volumes



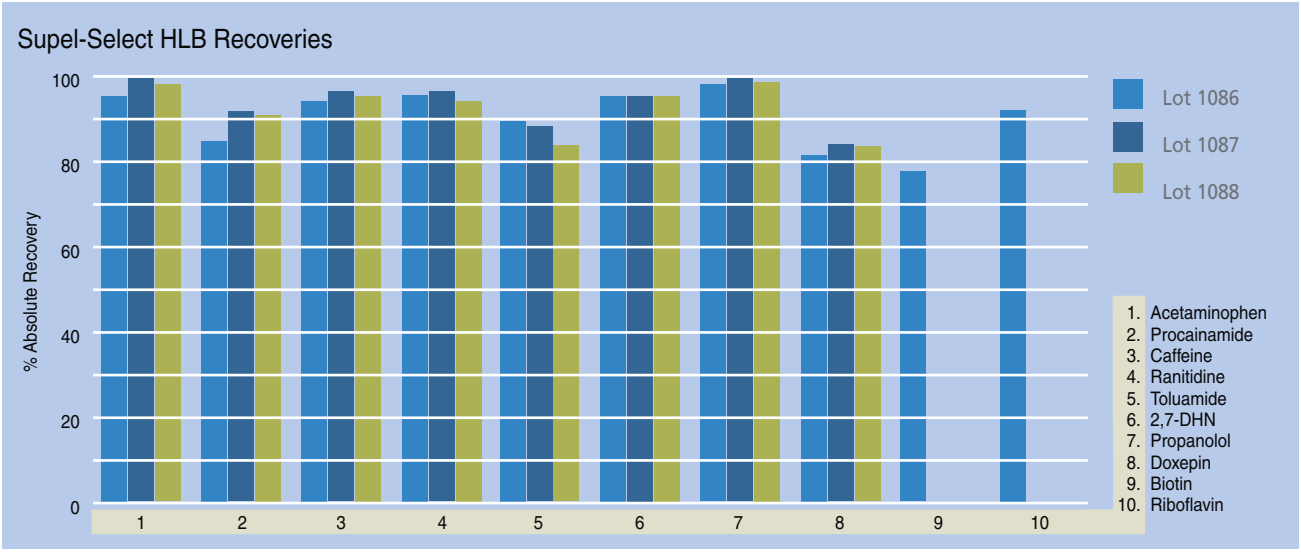
P001336

Phase Chemistry:	Hydrophilic modified styrene polymer
pH Compatibility:	0-14
Particle Size:	55-60 µm
MS Suitable:	Yes
Surface Area:	400-410 m^2/g
Pore Volume:	0.88 mL/g
Pore Size:	87 Å

High & Reproducible Recoveries

Supel-Select HLB SPE allows users to extract a broad range of compounds using a single sorbent and generic methodology.

Analyte recovery was high across all the compounds tested, and results were highly reproducible across three production lots.

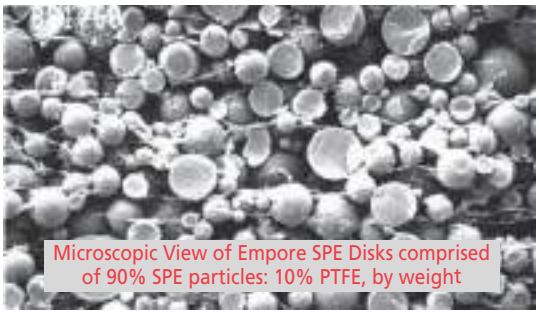


Description	Qty/Pk.	Cat. No.
Supel-Select HLB SPE		
30 mg/1 mL	100	54181-U
60 mg/3 mL	50	54182-U
200 mg/6 mL	30	54183-U
500 mg/12 mL	20	54184-U
1 g/20 mL	20	54186-U
Supel-Select HLB 96-well SPE		
10 mg/ well	1	Inquire
30 mg /well	1	575661-U
60 mg/ well	1	575662-U

sigma-aldrich.com/supel-select

NEW! Empore Solid Phase Extraction (SPE) Products

Empore membrane SPE technology comprises of SPE particles tightly enmeshed within a network of inert PTFE fibrils. The SPE-membrane fabrication process results in a highly dense and uniform extraction medium that offers distinct advantages over traditional sorbent/packed-bed SPE products. Empore SPE technology provides a denser, more uniform extraction bed than traditional packed bed products allowing for smaller bed weights, shorter analyte to pore diffusion paths, and more efficient extractions.



Microscopic View of Empore SPE Disks comprised of 90% SPE particles: 10% PTFE, by weight

E001071

Save Time & Money with Empore SPE

Reduced SPE bed mass = Reduced SPE solvent & elution volumes

- Minimizes SPE eluate evaporation time
- Potentially allows for direct injection of the SPE eluate

Dense & uniform extraction medium = NO SPE channeling/voiding

- Efficient mass-transfer kinetics allow for faster flow rates
- Eliminate SPE fines improving column and instrument life

Cartridge Dimension	Bed Vol.	Conditioning[1]	Elution[2]
Empore 7 mm (12 mg)/3 mL cartridge	50 µL	200-250 µL	100-150 µL
Traditional 500 mg/6 mL packed bed	60 µL	2400-3000 µL	1200-1800 µL
Traditional 100 mg/1 mL packed bed	120 µL	480-600 µL	240-360 µL

[1] Conditioning typically requires 4-5 x bed volumes.
[2] Elution typically requires 2-3 x bed volumes

Available Formats:

The Empore 96-well line is ideal for high throughput SPE allowing users to process up to 96 samples in parallel. The unique Empore technology comprises of a series of polypropylene (PP) pre-filters that are layered on top of the SPE disk. The PP pre-filter acts as a depth filter that provides faster flow rates and reduces the risk of clogging.



E001070

- Reduced elution volume (< 100 µL) allows for direct injection or reduced eluate evaporation
- Faster flow rates without risk of recovery and reproducibility loss
- Proprietary pre-filter reduces risk of clogging
- Luer tip collar eliminates potential cross-contamination

The Empore SPE disk line comprises of the most complete line of SPE disks for extracting large volumes of aqueous samples. The product line ranges from time-tested C18 to unique phase chemistries such as carbon and the oil & grease disk. The disks are ideal for environmental analysis where 1 L sample volumes are not uncommon and provide an efficient alternative to liquid-liquid extraction (LLE).



E001068

- Amenable to dozens of EPA and related environmental methods
- Developed for the highly efficient extraction of pollutants in large volume water samples

The Empore SPE cartridge line is packed with a PTFE membrane enmeshed with SPE particles. Layered above the SPE membrane is a polypropylene pre-filter to prevent particulates from reaching the underlying membrane. The dense particle packing and uniform distribution within the Empore membrane offers outstanding extraction efficiency and reproducibility.

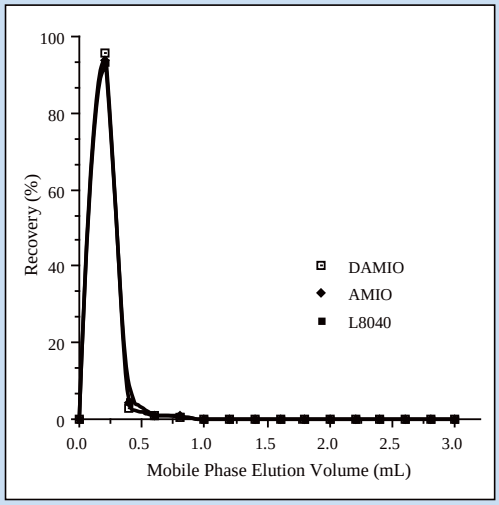


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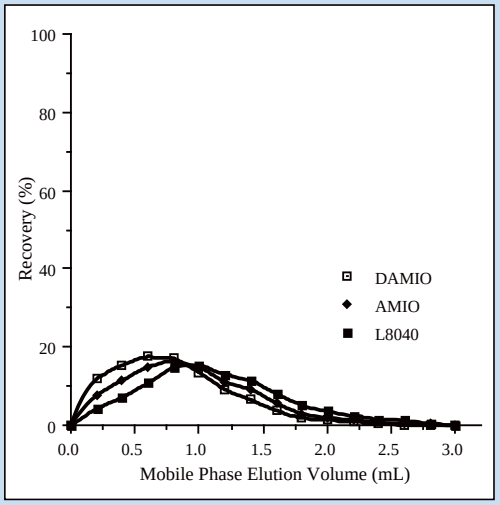
Recovery, Precision, & Elution Volume Profile of Empore SPE

Antiarrhythmic drug amiodarone (AMIO) and its metabolite, desethyl-amiodarone (DAMIO), were extracted from 250 µL serum using reversed-phase SPE. Elution volume profiles for both the Empore and traditional packed SPE approaches are compared below. Only 0.5 mL of mobile phase elution volume was required for complete analyte elution using Empore SPE. In contrast, the traditional SPE packed column required over 2 mL to recover the analytes of interest.

SPE Empore Membrane (4 mm/1 mL)



SPE Packed Column (100 mg/1 mL)



	Precision (between-run, n = 15)						Recovery (at 300 µg/mL)	Sensitivity (lowest limit of quantitation)
	Mean µg/mL	SD µg/mL	CV %	Mean µg/mL	SD µg/mL	CV %		
AMIO	0.415	0.015	3.7	3.06	0.094	3.1	92-95%	0.05 µg/mL
DAMIO	0.412	0.013	3.3	3.06	0.096	3.2	90-93%	0.05 µg/mL

SD = standard deviation
CV = coefficient of variation

Empore Solid Phase Microextraction Products

Description	Dimension	Qty./Pk	Cat. No.
Cartridges			
Empore C18-SD (Standard Density)	4 mm/1 mL	100	66871-U
Empore C18-SD (Standard Density)	7 mm/3 mL	50	66872-U
Empore C18-SD (Standard Density)	10 mm/6 mL	30	66873-U
Empore UR-SD (Universal Resin)	7 mm/3 mL	50	66874-U
96-well			
Empore C18	5.5 mm/1.2 mL well	1	66875-U
Empore UR (Universal Resin)	5.5 mm/1.2 mL well	1	66877-U
Empore MPC (Mixed Phase Cation)	5.5 mm/1.2 mL well	1	66876-U
Empore Filter Plate	5.5 mm/1.2 mL well	1	66878-U
Disks			
Empore C18 Octadecyl	47 mm	20	66883-U
Empore C8 Octyl	47 mm	20	66882-U
Empore Oil and Grease	47 mm	20	66887-U
Empore Oil and Grease	90 mm	10	66898-U
Empore Styrene Divinyl Benzene (SDB-RPS)	47 mm	20	66886-U
Empore Styrene Divinyl Benzene (SDB-XC)	47 mm	20	66884-U
Empore Cation	47 mm	20	66889-U
Empore Anion-SR	47 mm	20	66888-U
Empore Chelating	47 mm	20	66894-U
Empore Carbon	47 mm	20	66896-U
Accessories			
Empore 96-well Vacuum Manifold		1	66879-U
Empore Filter Aid 400		1	66897-U
Empore Sealing Tape for 96-well		10 pads (25 sheets/pad)	66881-U

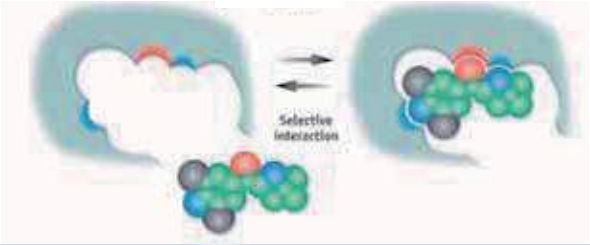
sigma-aldrich.com/empore

NEW! SupelMIP SPE – Molecularly Imprinted Polymers

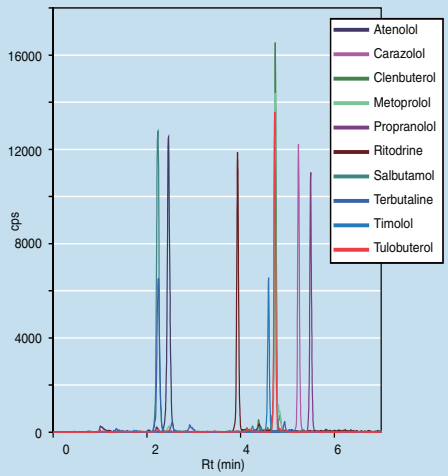
SupelMIP SPE phases were developed by MIP Technologies AB, which is one of the leading authorities and commercial pioneers of molecularly imprinted polymers for process scale separations, analytical chromatography, and sample preparation.

The SupelMIP SPE line consists of highly cross-linked polymers that are engineered to extract a single analyte of interest or a class of structurally related analytes with an extremely high degree of selectivity. This is possible because selectivity is introduced during MIP synthesis in which a template molecule, designed to mimic the analyte, guides the formation of specific cavities or imprints that are sterically and chemically complementary to the analyte(s) of interest.

By careful design of the imprinting site, either by molecular modeling, experimental design, or screening methods, the binding cavities can be engineered to offer multiple interaction points (ion-exchange, reversed-phase with polymer backbone, and hydrogen bonding) with the analyte(s) of interest. MIP binding site is both chemically and sterically complementary to the analyte(s) of interest. This leads to a stronger interaction between the solid phase and the analyte(s). As a consequence, harsher wash conditions can be tolerated during SPE methodology resulting in cleaner extracts. Because extraction selectivity is significantly improved, lower background is observed allowing analysts to achieve lower limits of detection.



ß-agonists and ß-blockers (1 ng/mL spike) in Urine and Wastewater using SupelMIP SPE (53223-U)



Note: Clenbuterol and Tulobuterol were spiked at the levels of 0.1 ng/mL.

Key Features & Benefits:

- Achieve lower detection limits through superior selectivity
- Reduce ion-suppression
- Save time and reduce cost via robust and rapid methodology
- Minimal to no method development required
- Stable at broad pH ranges and high temperatures
- Stringent quality control conditions

SupelMIP Phases & Methods available for:

- **PAHs** (polyaromatic hydrocarbons) in edible oils
- **Nitroimidazoles** in milk, eggs, and other food matrices
- **Non-steroidal anti-inflammatory drugs** (NSAIDs) in wastewater and other sample matrices
- **Fluoroquinolones** in bovine kidney, honey, and milk
- **Amphetamine** and related compounds in urine
- **Chloramphenicol** in milk, plasma, honey, urine, and shrimp/prawns
- **NNAL** (4-(N-nitrosomethylamino)-1-(3-pyridyl)-1-butanol) in urine
- **TSNAs** (Tobacco Specific Nitrosamines) in urine and tobacco
- **ß-agonists** and **ß-blockers** in tissue, urine, and wastewater
- **Clenbuterol** in urine
- **Triazines** in water
- **Riboflavin** in milk

sigma-aldrich.com/supelmip

Analyte	Lower Limit of Quantitation (ng/mL, ppb, or µg/kg) 1 mL Horse Urine	10 mL Wastewater
Atenolol	0.1	0.01
Carazolol	0.1	0.01
Metoprolol	0.1	0.01
Propranolol	0.1	0.01
Timolol	0.1	0.01
Clenbuterol	0.02	0.002
Ritodrine	0.05	0.005
Salbutamol	0.1	0.01
Terbutaline	0.2	0.02
Tulobuterol	0.005	0.0005

SupelMIP SPE	25 mg/3 mL pk 50	25 mg/10 mL (LRC)▲ pk 50
PAHs	52773-U●	—
Nitroimidazoles	52734-U	—
NSAIDs	52769-U	—
Fluoroquinolones	53269-U	—
Amphetamines	53228-U	—
Clenbuterol	—	53201-U
Beta-agonists (class selective)	53225-U	53202-U
Beta-blockers (class selective)	53213-U	53218-U
Full Beta-receptors (beta-agonists and beta-blockers)	53223-U	53224-U
Chloramphenicol	53209-U	53210-U
NNAL (4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol)	53203-U	53206-U
TSNAs (4 tobacco specific nitrosamines: NNK, NNN, NAB, NAT)	53222-U●	53221-U■
Riboflavin (vitamin B2)	—	53207-U
Triazines (class selective)	—	53208-U

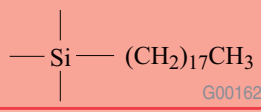
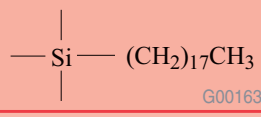
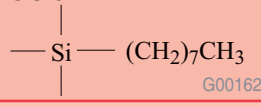
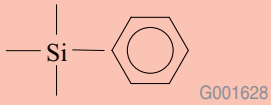
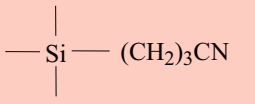
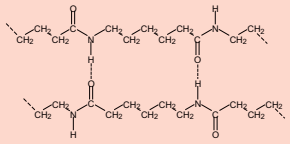
▲ LRC = large reservoir cartridge
● 50 mg/3 mL, pk 50
■ 50 mg/10 mL (LRC), pk 50

Discovery SPE

Reversed-Phase

Discovery reversed-phase SPE products are specifically developed, tested and quality controlled for pharmaceutical and clinical applications. Experience greater and more reproducible recoveries for the quick and effective extraction, isolation, and concentration of pharmaceuticals from biological fluids and other aqueous sample matrices.

For Discovery silica specifications, see pg. 2. For general guidelines on reversed-phase SPE, see pg. 32.

DSC-18  G001625	• Polymerically bonded, octadecyl (18% C), endcapped • Higher 18% C loading for increased binding capacities and higher recoveries • The least selective phase: retains most organic analytes from aqueous matrices • Beneficial for extracting numerous analytes diverse in structure from the same sample
DSC-18Lt  G001633	• Monomerically bonded, octadecyl (11% C), endcapped • Increased retention for moderately polar hydrophobic molecules • Used to elute very large hydrophobic molecules that are too strongly retained on DSC-18. Use this less retentive phase for the rapid release of hydrophobic compounds using weaker organic solvents at lower volumes
DSC-8  G001624	• Monomerically bonded, octyl (9% C), endcapped; lower carbon content than DSC-18Lt • Used to elute very large hydrophobic molecules too strongly retained on DSC-18 or DSC-18Lt • Use this less retentive phase for the rapid release of hydrophobic molecules using weaker organic solvents at lower volumes
DSC-Ph  G001628	• Monomerically bonded, phenyl (7% C), endcapped • Similar in polarity to DSC-8; however, electron dense aromatic ring offers some unique selectivity and retention
DSC-CN  G001626	• Monomerically bonded, cyanopropyl (7% C), endcapped • Can behave as either reversed-phase or normal-phase • Ideal for very hydrophobic analytes that may be irreversibly retained on more hydrophobic sorbents such as DSC-18 • Less retentive than DSC-Si or DSC-Diol when used as normal phase (organic matrices such as hexane or oils) • Allows for the rapid release of very polar molecules irreversibly retained on very polar sorbents
DPA-6S  G001195	• Polyamide Resin: Particle Size: 50-160 µm, Surf pH: 4.5-7.5, Density: 0.2-0.3 cm³/g, Water Content: < 5% • Used to adsorb polar compounds (-OH groups, esp. phenolic compounds) from aqueous or methanolic solutions under the reversed-phase mechanism through strong hydrogen bonding between compound hydroxyl groups and amide groups of the resin • Useful for extracting tannins, chlorophyll, humic acid, pharmacologically active terpenoids, flavanoids, gallic acid, catechol A protocatechuic acid, and phloroglucinol • Also useful for extracting aromatic carboxylic acids, nitroaromatic compounds, and irreversibly retains quinones

Discovery Reversed-Phase SPE Products

Description	Qty./Pk	DSC-18	DSC-18Lt	DSC-8	DSC-Ph	DSC-CN	DPA-6S
Discovery SPE Tubes							
50 mg/1 mL	108	52601-U	52610-U	52703-U	52723-U	52693-U	52624-U
100 mg/1 mL	108	52602-U	52611-U	52707-U	52725-U	52694-U	–
500 mg/3 mL	54	52603-U	52613-U	52713-U	52727-U	52695-U	[4] 52625-U
500 mg/6 mL	30	52604-U	52615-U	52714-U	52728-U	52696-U	[5] 52626-U
1 g/6 mL	30	52606-U	52616-U	52716-U	52731-U	52697-U	[6] 52627-U
2 g/12 mL	20	52607-U	52618-U	52717-U	Custom	52698-U	[7] 52629-U
5 g/20 mL	20	52608-U	52621-U	52718-U	Custom	52699-U	[8] 52631-U
10 g/60 mL	16	52609-U	52622-U	52722-U	Custom	52700-U	[9] 52632-U
Discovery SPE 96-Well Plates							
100 mg/well	1	575603-U	575606-U	575627-U	575630-U	575624-U	Custom
50 mg/well	1	575602-U	575605-U	575628-U	575631-U	575625-U	Custom
25 mg/well	1	575601-U	575604-U	575629-U	575632-U	575626-U	Custom
Bulk packing	100 g	52600-U	52623-U	57223-U	57227-U	57222-U	[10] 52633-U

[4] 250 mg/3 mL, [5] 250 mg/6 mL, [6] 500 mg/6 mL, [7] 1 g/12 mL, [8] 2 g/20 mL, [9] 5 g/60 mL, [10] 50 g

Discovery SPE

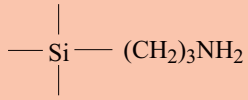
Ion-Exchange & Mixed-Mode

Discovery ion-exchange SPE products are specifically developed, tested and quality controlled for pharmaceutical and clinical applications. The Discovery ion-exchange product line offers excellent selectivity towards charged molecular species enabling the user to extract, isolate, purify, and concentrate charged ionizable pharmaceuticals (basic or acidic) from both polar and non-polar sample matrices.

Use mixed-mode SPE (e.g., Discovery DSC-MCAX) for superior cleanup and selectivity when extracting basic pharmaceutical compounds from biological matrices such as plasma and urine.

For Discovery silica specifications, see pg. 2. For general guidelines on ion-exchange & mixed-mode SPE, see pg. 33.

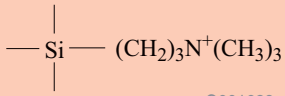
DSC-NH$_2$



G001631

- Polymerically bonded, aminopropyl phase that is very polar in nature (hydrogen bonding) allowing for both normal-phase and ion-exchange applications
- A weak anion exchanger with a pKa of 9.8. At pH 7.8 or below, the functional groups are positively charged
- Allows the rapid release of very strong anions such as sulfonic acids that may be retained irreversibly on SAX (a quarternary amine sorbent that is always positively charged)
- Can be used in some reversed-phase applications (due to ethyl spacer); however, it is predominately used as an ion-exchanger or normal-phase sorbent due to its polar nature

DSC-SAX



G001629

- A polymerically bonded quarternary amine that remains charged at all pH levels
- Commonly used when extracting weaker cations (e.g., carboxylic acids) that may not bind strongly enough to weaker anion-exchangers
- Selectivity can be modified by changing the counter ion with the appropriate buffer during conditionin
- Counter ion Cl^-

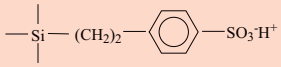
DSC-WCX



G001632

- A polymerically bonded carboxy propyl phase with a K^+ counter ion and a pKa of 4.8
- Its weak cation exchange properties carries a negative charge at pH 6.8 or above
- A pH of 2.8 or below neutralizes this phase for easier elution of strong cationic analytes that are neutralized only at extreme basic conditions
- Typically used when dealing with very strong cationic (high pKa) compounds that may be irreversibly retained on strong cation exchangers

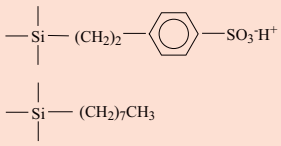
DSC-SCX



G001630

- A polymerically bonded, benzene sulfonic acid functional group with a H^+ counter ion that is a strong cation exchanger due to its very low pKa (<1.0)
- Silica support allows for use with very organic solvents (no shrinking/swelling)
- Excellent capacity (0.8 meq/g) for cleaning up solution phase combinatorial chemistry reactions (removing target molecules from reaction by-products and excess reagents)
- The presence of the benzene ring offers some mixed-mode capabilities (hydrophobic interactions) that should be considered when extracting cations from aqueous matrices

DSC-MCAX



G001630, G001624

- Packed bed contains both octyl (C8) and benzene sulfonic acid (SCX) bondings. (H^+ as counterion)
- Developed for superior selectivity/sample cleanup when isolating basic compounds from biological fluids
- Dual retention mechanisms broadens retention for a range of neutral, basic, acidic and zwitterionic compounds
- Greater ion-exchange capacity for isolating polar basic and zwitterionic compounds
- Can be used to fractionate basic/zwitterionic compounds from acidic and neutral compounds

Discovery Ion-Exchange SPE Products

Description	Qty./Pk	DSC-NH$_2$	DSC-SAX	DSC-WCX	DSC-SCX	DSC-MCAX
Discovery SPE Tubes						
50 mg/1 mL	108	52635-U	52661-U	52737-U	52684-U	52781-U
100 mg/1 mL	108	52636-U	52662-U	52739-U	52685-U	52782-U
500 mg/3 mL	54	52637-U	52664-U	52741-U	52686-U	52783-U
500 mg/6 mL	30	52638-U	52665-U	52742-U	52688-U	52784-U
1 g/6 mL	30	52640-U	52666-U	52743-U	52689-U	52786-U
2 g/12 mL	20	52641-U	52667-U	52744-U	52690-U	52788-U
5 g/20 mL	20	52642-U	52668-U	52745-U	52691-U	–
10 g/60 mL	16	52644-U	52669-U	52746-U	52692-U	–
Discovery SPE 96-Well Plates						
100 mg/well	1	575615-U	575618-U	575633-U	575621-U	575641-U
50 mg/well	1	575616-U	575619-U	575634-U	575622-U	575640-U
25 mg/well	1	575617-U	575620-U	575635-U	575623-U	575639-U
Bulk packing	100 g	57212-U	57214-U	57228-U	57221-U	–

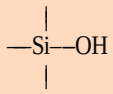
Discovery SPE

Normal-Phase

Discovery normal-phase SPE products are specifically developed, tested and quality controlled for normal phase pharmaceutical applications and other modified flash techniques. The Discovery normal phase product line enables you to quickly and effectively extract, isolate, purify, and concentrate polar compounds from non-polar solutions. Its highly selective properties allow the user to separate or remove structurally similar molecules through successive wash/elutions with increasingly polar solutions.

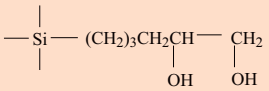
For Discovery silica specifications, see pg. 2. For general guidelines on normal-phase SPE, see pg. 34.

DSC-Si



- Unbonded acid washed silica sorbent ideal for normal-phase SPE and other modified flash techniques
- Considered the most polar normal-phase sorbent available
- Excellent capacity for purifying solution phase CombiChem reactions when removing target molecules from reaction by-products and excess reagents
- Available in Büchner Funnel configurations for easy scalability

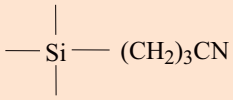
DSC-Diol



G001627

- Polymerically bonded, 2,3-Dihydroxypropoxypropyl (7% C)
- Polar sorbent most commonly used for normal-phase applications (polar extractions from non-polar matrices)
- The sorbent's dihydroxy groups facilitate strong hydrogen bonding
- Excellent selectivity when extracting structurally similar molecules

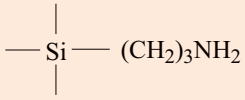
DSC-CN



G001626

- Monomerically bonded, cyanopropyl (7% C), endcapped
- Can behave as either reversed-phase or normal-phase
- Ideal for very hydrophobic analytes that may be irreversibly retained on more hydrophobic sorbents such as DSC-18
- Less retentive than DSC-Si or DSC-Diol when used as normal-phase (organic matrices such as hexane or oils)
- Allows for the rapid release of very polar molecules irreversibly retained on very polar sorbents

DSC-NH$_2$



G001631

- Polymerically bonded, aminopropyl phase that is very polar in nature (hydrogen bonding) allowing for both normal-phase and ion-exchange applications
- A weak anion exchanger with a pKa of 9.8. At pH 7.8 or below, the functional groups are positively charged
- Allows the rapid release of very strong anions such as sulfonic acids that may be retained irreversibly on SAX (a quarternary amine sorbent that is always positively charged)
- Can be used in some reversed-phase applications (due to ethyl spacer); however, it is predominately used as an ion-exchanger or normal-phase sorbent due to its polar nature

Discovery Normal-Phase SPE Products

Description	Qty./Pk	DSC-CN	DSC-Si	DSC-Diol	DSC-NH$_2$
Discovery SPE Tubes					
50 mg/1 mL	108	52652-U	52652-U	52747-U	52635-U
100 mg/1 mL	108	52653-U	52653-U	52748-U	52636-U
500 mg/3 mL	54	52654-U	52654-U	52751-U	52637-U
500 mg/6 mL	30	52655-U	52655-U	52752-U	52638-U
1 g/6 mL	30	52656-U	52656-U	52753-U	52640-U
2 g/12 mL	20	52657-U	52657-U	Custom	52641-U
5 g/20 mL	20	52658-U	52658-U	Custom	52642-U
10 g/60 mL	16	52659-U	52659-U	Custom	52644-U
Discovery SPE 96-Well Plates					
100 mg/well	1	575609-U	575609-U	575636-U	575615-U
50 mg/well	1	575608-U	575608-U	575637-U	575616-U
25 mg/well	1	575607-U	575607-U	575638-U	575617-U
Discovery Büchner Funnels					
12.5 g, 55 mm ID x 30 mm H	6	Custom	52591-U	Custom	Custom
25 g , 70 mm ID x 40 mm H	6	Custom	52592-U	Custom	Custom
50 g , 90 mm ID x 48 mm H	6	Custom	52593-U	Custom	Custom
100 g, 110 mm ID x 66 mm H	6	Custom	52594-U	Custom	Custom
Bulk packing	100 g	52651-U	52651-U	57229-U	57212-U

For a complete list of available Büchner funnels, see page 21.

Supelclean & Supelclean ENVI

Reversed-Phase

The Supelclean SPE line represents one of our original brands and is referenced in hundreds of journal publications, and validated in methods such as EPA 500 series (drinking water) and SW-846 methods (solid waste).

For Supelclean silica specifications, see pg. 2. For general guidelines on reversed-phase SPE, see pg. 32.

ENVI-18	• Polymerically bonded, octadecyl (17% C), endcapped • Excellent for cleaning, extracting & concentrating pollutants from aqueous environmental samples • Higher 17% C loading for increased binding capacities and higher recoveries • Higher carbon loading also offers greater resistance to extreme pH conditions • Typical applications include herbicides, fungicides, pesticides and other aqueous hazardous waste materials • Ideal for EPA 500 series including 525.1 and 508.1
ENVI-18 & ENVI-8 DSK SPE Disks	• The SPE membrane equivalents of ENVI-18 and ENVI-8 packed bed SPE sorbents • Porous glass fiber membranes embedded with C18 or C8 silica particles • Provides faster flow rates and exhibits less clogging than PTFE discs for the extraction of organic contaminants from drinking water • Typical applications include PAHs, PCBs, phthalates, semivolatile organics, paraquat and diquat, pesticides and herbicides • Ideal for EPA 500 series including 525.1 and 508.1
LC-18	• Monomerically bonded, octadecyl (10% C), endcapped • For reversed-phase extraction of nonpolar to moderately polar compounds.
ENVI-8	• Available in glass tubes with PTFE frits • High 14% C loading for increased binding capacities and higher recoveries • Higher carbon loading also offers greater resistance to extreme pH conditions • Excellent for cleaning, extracting & concentrating pollutants from aqueous environmental samples
LC-8	• Monomerically bonded, octyl (7% C), endcapped
ENVI-Chrom P *(polystyrene divinylbenzene)*	• Styrene/divinylbenzene co-polymer resin: Particle Size: 80-160 µm; Spherical Shape; Pore Size: 110-175 Å; Surface Area: 900 m^2/g • Highly crosslinked, neutral, specially cleaned styrene-divinylbenzene resin used to retain hydrophobic compounds with some hydrophilic functionality under the reversed-phase mechanism • Highly resistant to extreme pH conditions • Typical applications include aromatic and phenolic compounds from aqueous sample matrices • Used for priority pollutant phenols from aqueous samples
ENVI-Carb & ENVI-Carb II *(graphitized carbon black)*	• Surface Area: 100 m^2/g, Particle Size: 100/400 mesh (ENVI-Carb-II: 100/140 mesh) • Extreme affinity for organic polar and non-polar compounds from both non-polar and polar matrices when used under reversed-phase conditions • Carbon surface comprised of hexagonal ring structures, interconnected and layered into graphitic sheets • Non-porous nature of the carbon phase allows for rapid processing, adsorption does not require analyte dispersion into solid phase pores • Independent investigators have found ENVI-Carb extremely useful for the rapid sample preparation of over 200 pesticides from various matrices including ground water, fruits, and vegetables (publication T196900)
LC-4 (Wide Pore)	• Butyldimethyl, wide pore (500 Å), endcapped • Larger pore size to accommodate larger macromolecules (e.g., proteins and peptides) • Commonly used for desalting proteins and peptides in aqueous samples
Hisep™	• Hydrophobic sites shielded by a hydrophilic surface for protein exclusion during sample load • Hydrophobicity similar to C8
LC-Ph	• Monomerically bonded, phenyl (5.5% C), endcapped
LC-CN	• Monomerically bonded, cyanopropyl (7.5% C), endcapped

For available configurations & part numbers, please see page 18.

Supelclean & Supelclean ENVI

Ion-Exchange & Normal-Phase

The Supelclean SPE line represents one of the original brands to be introduced into the market place. It is referenced in hundreds of journal publications, and validated in a variety of methods spanning environmental applications to the food & beverage industry. The Supelclean ENVI reversed-phase line was developed and optimized for numerous environmental methods including EPA 500 series (drinking water methods), and a number of SW-846 methods (solid waste).

For Supelclean silica specifications, please see pg. 2. For general guidelines on ion-exchange & normal-phase SPE, see pgs. 33 & 34.

LC-SAX	• A strong anion exchanger with pKa of 10.1 and 10.9 • Quarternary amine, Cl^- counter-ion
LC-SCX	• Aliphatic sulfonic acid, Na^+ counter-ion, endcapped
LC-WCX	• Carboxylic acid, Na^+ counter-ion
LC-NH_2	• Monomerically bonded, aminopropyl (5% C)
PSA	• Polymerically bonded, ethylenediamine-N-propyl phase that contains both primary and secondary amines
ENVI-Florisil	• Magnesium silicate, mesh: 100/200, available with PTFE or stainless steel frits • Tested for US Environmental Protection Agency (EPA) Contract Laboratory Program (CLP) statement of work for pesticides • Highly polar material that strongly adsorbs polar compounds from non-polar matrices under normal-phase conditions • Typical applications include alcohols, aldehydes, amines, herbicides, pesticides, PCBs, ketones, nitro compounds, organic acids, and phenols
Dual Layer Florisil/Na_2SO_4	• Dual layer glass SPE tube that contains Na_2SO_4 (upper layer) and Florisil (magnesium silicate; lower layer) separated and packed with PTFE frits • Florisil, activated, size- 60/100 mesh (150-200 mm), Na_2SO_4 Purity- 99.99 %, Density- 2.68 g/mL • Excellent for removing/isolating polar compounds from organic matrices • Na_2SO_4 layer aids in removing aqueous sample residues that may hinder Florisil performance and/or subsequent GC analysis • Suitable for the determination of the hydrocarbon oil index in water (surface, waste, and sewage treatment plants) by GC-FID analysis according to European Standard EN ISO 9377-2:2000 (enclosed in the Extraction Kit for EN ISO 9377-2 Cat.No. 68172) • Glass SPE hardware allows user to reactivate Florisil through heating at 140 °C, 16 hours • Use in conjunction with Visiprep Large Volume Sampler (Cat.No.57275, only suitable for PP SPE tubes) and Visiprep SPE Vacuum Manifolds for processing larger volume samples
LC-Florisil	• Magnesium silicate, mesh: 100/120
LC-Alumina A, N, & B	• Alumina-A for acidic pH (~5) • Alumina-N for neutral pH (~6.5) • Alumina-B for basic pH (~8.5) • Brockman Activation I for all Alumina SPE products, mesh: 60/325
LC-CN	• Monomerically bonded, cyanopropyl (7% C), endcapped
LC-Si	• Silica gel
LC-Diol	• Monomerically bonded, Diol (7% C), endcapped

For available configurations & part numbers, please see page 18.

Supelclean & Supelclean ENVI SPE

All SPE tubes listed consist of polypropylene hardware and PE frits unless noted otherwise. Color coded footnotes denote differences in hardware, package size, or bed weight from the standard configuration.

	Description	0.1 g/1 mL pk 108	0.5 g/3 mL pk 54	0.5 g/6 mL pk 30	1 g/6 mL pk 30	2 g/12 mL pk 20	5 g/20 mL pk 20	10 g/60 mL pk 16	100 g bulk
Reversed-Phase	ENVI-18	57062	57063	57064 54331-U[1]	505706	57114	57137	57138	57219
	ENVI-18 DSK SPE Disks			57171[12]	57170-U[13]				
	ENVI-8 DSK SPE Disks			57172[12]					
	LC-18	504270	57012	57054	505471	57117	57135-U	57136	57202
	ENVI-8	57230-U	57231 57106[1]	57232 57107[1]	57233 57108[1]		57139	57140-U	
	LC-8	504157	505145	57052					57201
	ENVI-Chrom P	57143	57224[5]	57226 57225-U[7]					57217[11]
	ENVI-Carb	57109-U	57088[5]	57094 57092[7]		57128 57127-U[10]	57129	57130	57210-U[11]
	ENVI-Carb C, mesh 80/100					57149[10]			
	LC-4 (Wide Pore)		57089						
	Hisep		57076-U						
	LC-Ph	504599	505269						
Normal-Phase	LC-CN	504386	57013	57056			57141	57142	
	LC-Diol	504718	57016						
	ENVI-Florisil		57058[2]	57046[3]	57053[3] 54095[1]				
	Dual Layer Florisil/ Na_2SO_4				52582-U[1,9] 54116-U[2,9]				
	LC-Florisil			54333-U[1]	57057 54334-U[1]	57115	57131	57132	57209
	LC-Alumina A		57082-U[6]		57083-U[8]				57026
	LC-Alumina B		57084[6]		57085[8]				57207
	LC-Alumina N		57086[6]		57087[8]				57028
	LC-Si	504041	505048	505374	57051 54335-U[1]	57116	57133	57134	57200
Ion Exch.	$LC-NH_2$	504483	57014	54059-U					57205
	PSA		52578-U[4]	52579-U					52738-U
	LC-SAX	504815	57017						57203
	LC-SCX	504920	57018						57204
	LC-WCX	505595	57061						

Footnotes/Color Codes

[1] glass SPE tubes, PTFE frits
[2] PP SPE tubes, PTFE frits
[3] PP SPE tubes, stainless steel frits
[4] 0.2 g/3 mL, pk 54
[5] 0.25 g/3 mL, pk 54
[6] 1 g/3 mL, pk 54
[7] 0.25 g/6 mL
[8] 2 g/6 mL, pk 30
[9] 2 g/2 g/6 mL, pk 48
[10] 1 g/12 mL, pk 20
[11] 50 g bulk
[12] 47 mm diam. disks, pk 24
[13] 90 mm diam. disks, pk 12

For a list of method development kits containing various phases, see next page.

Multi-Layer SPE

Developed to provide superior cleanup when conducting multi-residue pesticide analysis in food/agricultural matrices.

Description	Cat. No.
ENVI-Carb-II/PSA	
0.3 g/0.5 g/6 mL, pk 30	54058-U
0.5 g/0.5 g/6 mL, pk 30	54067-U
0.5 g/0.3 g/6 mL, pk 30	55119-U
0.5 g/0.5 g/20 mL, pk 20	54217-U
ENVI-Carb-II/SAX/PSA	
0.5 g/0.5 g/0.5 g/12 mL, pk 20	52574-U
SAX/PSA	
0.25 g/0.25 g/6 mL, pk 30	52576-U
0.5 g/0.5 g/6 mL, pk 30	52577-U

Description	Cat. No.
ENVI-Carb/$LC-NH_2$	
0.5 g/0.5 g/3 mL, pk 20	54332-U
0.5 g/0.5 g/20 mL, pk 20	54216-U
0.5 g/0.5 g/20 mL, pk 300	54024-U
0.5 g/0.5 g/6 mL, pk 30	54035-U
ENVI-Carb/NH_2/Silica	
0.5 g/0.4 g/0.6 g/12 mL, pk 20	54034-U
0.5 g/0.4 g/0.6 g/20 mL, pk 20	54036-U
Dual Layer Florisil/Na_2SO_4	
Glass tubes, PTFE frits, 2 g/2 g/6 mL, pk 48	52582-U
2 g/2 g/6 mL, PP, pk 48	54116-U

SPE Method Development Kits

Supelclean SPE Method Development Kits

Supelclean SPE Method Development Kits consist of an assortment of SPE phase chemistries and cartridge configurations ideal for SPE method development. The range of phase chemistries available for each kit allows the user to profile for compound retention, elution and sample matrix selectivity.



Supelclean SPE Method Development Kits

SPE Method Development Kit	Kit A	Kit B	Kit C	Kit NP-3	Kit IX-3
Supelclean Packing			**Sorbent Qty./Tube Size**		
LC-Si	500 mg/3 mL	100 mg/1 mL	500 mg/6 mL 1 g/6 mL	500 mg/3 mL –	– –
LC-8	500 mg/3 mL	100 mg/1 mL	500 mg/6 mL	–	–
LC-18	500 mg/3 mL	100 mg/1 mL	500 mg/6 mL	–	–
LC-CN	500 mg/3 mL	100 mg/1 mL	500 mg/6 mL	–	500 mg/3 mL
LC-Diol	500 mg/3 mL	100 mg/1 mL	–	500 mg/3 mL	–
LC-NH_2	500 mg/3 mL	100 mg/1 mL	–	500 mg/3 mL	500 mg/3 mL
LC-Ph	500 mg/3 mL	100 mg/1 mL	–	–	–
LC-SAX	500 mg/3 mL	100 mg/1 mL	–	–	500 mg/3 mL
LC-SCX	500 mg/3 mL	100 mg/1 mL	–	–	500 mg/3 mL
LC-WCX	500 mg/3 mL	100 mg/1 mL	–	–	500 mg/3 mL
LC-Alumina-A	–	–	2 g/6 mL	1 g/3 mL	–
LC-Alumina-B	–	–	2 g/6 mL	1 g/3 mL	–
LC-Alumina-N	–	–	2 g/6 mL	1 g/3 mL	–
LC-Florisil	–	–	1 g/6 mL	–	–
Qty. Ea. Tube	**6**	**12**	**3**	**6**	**12**
Cat. No.	**57019**	**57009-U**	**57075-U**	**57074-U**	**57073**

For more information about FREE SPE SAMPLES, see pg. 5.

96-Well SPE Method Development Plate

Supelco 96-Well SPE method development plates contain an assortment of SPE phase chemistries ideally suited for method development. The mix of phase chemistries contained within this 96-well SPE plate allows researchers to screen for analyte retention, recovery, and selectivity when achieving one's sample prep objectives.



Description	Qty.	Cat. No.
96-well SPE Method Development Plate		
BAN, 25 mg/well (configured for extracting basic, acidic and neutral compounds)	1	577522-U

	1	2	3	4	5	6	7	8	9	10	11	12
A	Discovery DSC-PS/DVB (polystyrene divinyl benzene)[1]											
B	Discovery DSC-18 (tC18)[1]											
C	Discovery DSC-8 (C8)[1]											
D	Discovery DSC-CN (cyanopropyl)[1]											
E	Discovery DSC-MCAX (mixed-mode cation exchange)[1,2]											
F	Discovery DSC-WCX (weak cation exchange)[2]											
G	Discovery DSC-SAX (strong anion exchange)[3]											
H	Discovery DSC-NH_2 (aminopropyl weak anion exchange)[3]											

[1] Reversed-phase; [2] Cation-exchange; [3] Anion-exchange

Specialty Products for Pharmaceutical Analysis

Supelco SPE 96-well Plates



Supelco SPE 96-well plates answer the challenge of high throughput sample prep for pharmaceutical bioanalysis. These plates are packed with our high quality Discovery SPE line, Supel-Select HLB phase (see pg. 9), and our new and innovative HybridSPE-Precipitation technology (see pg. 8). The uniform flow dynamics inherent with well plate technology offers a high level of reproducibility and throughput while maintaining excellent recoveries for increased sensitivity.

96-Well Plate Specifications:

- One-piece polypropylene square well design
- 2 mL sample volume
- Polyethylene frit, 20 µm porosity (Discovery and Supel-Select HLB only)
- Compatible with TomTec Quadra 96®, Microlab STAR®, Packard Multi-Probe®, and most other 96-well automated SPE systems.

Supelco SPE 96-well Plates

Phase	25 mg/well	50 mg/well	100 mg/well
HybridSPE-PPT	–	575656-U	–
Supel-Select HLB	–	575661-U◆	575662-U▼
Discovery DSC-18	575601-U	575602-U	575603-U
Discovery DSC-18Lt	575604-U	575605-U	575606-U
Discovery DSC-MCAX	575639-U	575640-U	575641-U
Discovery DSC-8	–	575628-U	575627-U
Discovery DSC-Ph	575632-U	575631-U	575630-U
Discovery DSC-CN	575626-U	575625-U	575624-U
Discovery DSC-PS/DVB	575610-U	575611-U	–
Discovery DSC-Si	575607-U	575608-U	575642-U▲ 575609-U
Discovery DSC-Diol	575638-U	575637-U	575636-U
Discovery DSC-NH_2	575617-U	575616-U	575615-U
Discovery DSC-SAX	575620-U	575619-U	575618-U
Discovery DSC-WCX	575635-U	575634-U	575633-U
Discovery DSC-SCX	575623-U	575622-U	575621-U

▲PE bottom frit (5 µm porosity)
◆Actual bed weight = 30 mg/well
▼Actual bed weight = 60 mg/well

Supel-Tips SPE – Microscale Extraction

The Supel-Tips SPE product line is designed for the microscale extraction, concentration, and recovery of small molecules and biological macromolecules. These 10 µL pipette tips containing a sorbent bed bonded at the working end of the tip using an inert high-purity adhesive. The bed acts as a solid phase extraction medium to adsorb molecules of interest from the sample matrix. Subsequently, the concentrated and desalted analytes are eluted for downstream analysis.

Supel-Tips Offer:

- Superior recovery
- Exceptional binding capacity and enhanced affinity
- Excellent sorbent bed stability for cleaner samples
- Fast and effective analyte retention/elution



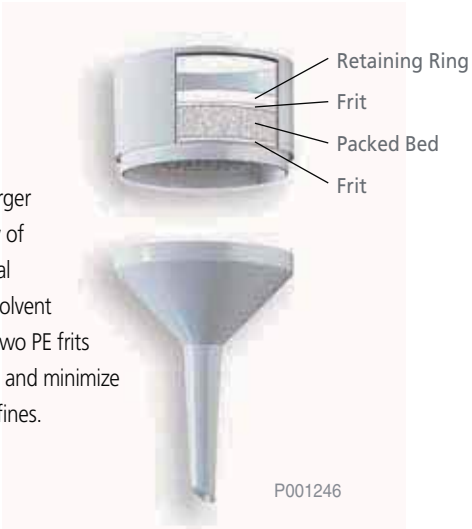
sigma-aldrich.com/pipette-tips

Supel-Tips

Description	Supel-Tip C18	Supel-Tip Carbon	Supel-Tip Zr	Supel-Tip Ti
Pipette Tip	10 µL, PP	10 µL, PP	10 µL, PP	10 µL, PP
Application	peptides and proteins	Oligosaccharides and other sugar containing **macromolecules**	Phosphopeptides and other phosphate **containing molecules**	Phosphopeptides and other **phosphate containing molecules**
Adsorbent	C18	Carbon	Zirconia-silica composite	Titania-silica composite
Particle Size	50-60 µm	50-60 µm	50-60 µm	50-60 µm
Pore Size	200 Å	175 Å	300 Å	300 Å
Capacity (per tip)	Insulin, Chain B, Oxidized – 17 µg; ß-amyloid – 17 µg; Bradykinin, Fragment 1-7 – 7.6 µg	Maltohexose – 10.2 µg; Glycopeptide (mol. wt. 1300-3500) - > 10 µg	MPP1- 1 µg	MPP1- 1 µg
Cat. No. (pk. 96)	TPSC18	54227-U	54266-U	54263-U

Specialty Products for Purification

VersaPure Prepacked, Disposable Büchner Funnels



VersaPure Büchner funnels offer the convenience and capacity necessary to purify and/or filter larger scale samples and reaction mixtures. Researchers have used VersaPure Büchner Funnels for a variety of applications including: the purification of organic synthesis reactions, isolation of actives from natural products, filtration, removal of residual moisture from solvents, and more. The funnel consists of a solvent resistant two-piece semi-translucent polypropylene body. The packed bed is sandwiched between two PE frits (20 µm porosity) that are compressed in place by a heat riveted retaining ring to eliminate loose frits and minimize channeling. A 0.7 µm glass fiber membrane is placed below the bottom frit to capture any residual fines.

VersaPure Büchner Funnel

Description	I.D. x H:	12.5 g (45 mL) - pk 6 55 mm x 30 mm	25 g (90 mL) - pk 6 70 mm x 40 mm	50 g (174 mL) - pk 3 90 mm x 48 mm	100 g (410 mL) - pk 3 110 mm x 66 mm
Discovery DSC-Si		52591-U	52592-U	52593-U	52594-U
Merck-Si		2026-U	2027-U	2028-U	2029-U
Charcoal		2031-U	2032-U	2033-U	2034-U
Magnesium Sulfate		2037-U	2041-U	2043-U	2044-U
Celite®		2047-U	2048-U	2049-U	2064-U
Florisil		2074-U	2076-U	2077-U	2078-U
Alumina-A		2084-U	2087-U	2088-U	2089-U
Alumina-N		2091-U	2092-U	2093-U	2094-U
Alumina-B		2096-U	2097-U	2098-U	2099-U
Discovery DPA-6S		2079-U	2081-U	2082-U	2083-U (pk. 1) 52634-U
Empty Büchner Funnel		2141-U	2142-U	2143-U	2144-U

Polymer SAX Rezorian Cartridge



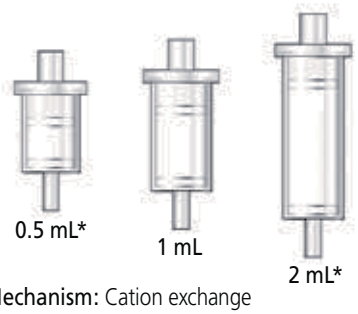
Retention Mechanism: Anion exchange

Sample Matrix Compatibility: Organic or aqueous samples

- A quarternary amine functional group bonded to styrene gel, 200/400 mesh (Dowex 1x8)
- Offers high capacity (3.5 meq/g) for extracting acidic compounds
- OH^- counter ion; 8% cross linking; ~42% moisture; max temp. 99 °C
- Excellent resistance to extreme pH conditions

Description	Qty.	Cat. No.
Polymer SAX Rezorian Cartridge		
Bed wt. 6 g, vol. 5 mL	10	2832-U
Bed wt. 14.4 g, vol. 13 mL	10	2833-U

Polymer SCX Reversible SPE Tube



Retention Mechanism: Cation exchange

Sample Matrix Compatibility: Organic or aqueous solutions

- A sulfonic acid functional group bonded to styrene gel, 200/400 mesh (DOWEX® 50Wx8)
- Offers high capacity (4.8 meq/g) for extracting basic compounds
- H^+ counter ion; 8% cross linking; ~54% moisture; max temp. 150 °C
- Excellent resistance to extreme pH conditions (1-14)

Description	Qty.	Cat. No.
Polymer SCX Reversible SPE Tube		
Bed wt. 700 mg, vol. 1 mL	10	54037-U

*Available as custom only.

Specialty Products for Environmental Analysis

Supelclean Coconut Charcoal SPE Tube



9940374

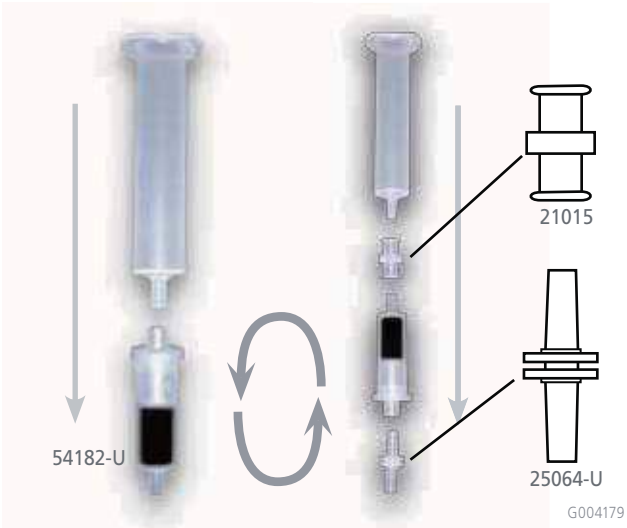
- Developed specifically for EPA Method 521 – Nitrosamines in Drinking Water
- Activated coconut charcoal stationary phase – particle size: 80/120 mesh
- Quality controlled for low fines and nitrosamine recovery

Description	Qty.	Cat. No.
Supelclean Coconut Charcoal SPE Tube, 2 g/6 mL	30	57144-U
Female Luer Coupler	20	2105
Male Luer Coupler	20	25064-U

Supelclean ENVI-Carb Plus Reversible SPE

- Spherical carbon particles (carbon mol sieve) developed for the SPE of highly polar compounds from aqueous samples as drinking or ground water
- Offers extreme affinity to organic polar and non-polar compounds from both non-polar and polar matrices when used under reversed-phase conditions.
- Strong high surface spherical particles which are less friable (fines) than traditional graphitized carbon blacks
- Examples of highly polar compounds recovered:
  - Acephate (LogPo/w: -0.85)
  - Phenol (LogPo/w: 1.51)
  - 1,4-dioxane (LogPo/w: -0.27)
  - Oxamyl (LogPo/w: -1.2)
- When used in conjunction with an SPE vacuum manifold, a male luer coupler (25064-U), female luer coupler (21015) and empty SPE tube(s) are required but not included.

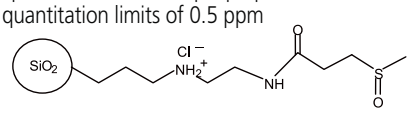
Description	Qty.	Cat. No.
Supelclean ENVI-Carb Plus Reversible SPE Tube, 0.4 g/1 mL	30	54182-U
Female Luer Coupler	20	21015
Male Luer Coupler	20	25064-U



G004179

Supelclean Sulfoxide SPE

- Developed for the extraction of polychlorinated biphenyls (PCBs) from transformer, waste and mineral oil
- Proprietary silica-bonded sulfoxide (-SO) phase
- PCB retention facilitated by interaction between the SPE phase's electrophilic sulfur atom and the pi-electron cloud formed from aromatic rings inherent with PCBs
- Simple and efficient sample prep method for identifying PCBs at quantitation limits of 0.5 ppm



G004219

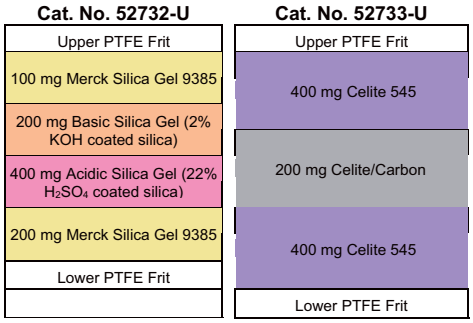


P001240

Description	Qty.	Cat. No.
Supelclean Sulfoxide Glass SPE Tube, 6 g/20 mL	5	55252-U
Supelclean Sulfoxide SPE, 3 g/6 mL	30	55253-U
Supelclean Sulfoxide, Bulk	100 g	55254-U
Empty Glass SPE Tube (17 mm I.D. x 137 mm L) with PE frit, 20 mL, with PE frit, luer cap, and screw-top cap	5	55255-U
Frit Insertion Tool for 20 mL Glass SPE tube	1	55257-U
Disposable PTFE liners	100	57059
Large volume reservoir (25 mL) for 6 mL SPE tubes, PP	30	54258-U
Large volume reservoir (25 mL) for 6 mL SPE tubes, PTFE	3	54259-U

Multi-Layer SPE Tubes for EPA Method 8290

Configured for EPA Method 8290 – PCDDs and PCDFs by HRGC/HRMS



The sample cleanup employed in EPA Method 8290 requires a series of hand-packed glass chromatography steps involving:

1. A multi-layer silica gel glass column
2. A sodium sulfate/alumina glass column
3. A multi-layer celite 545-activated carbon glass column

Cat. No. 52732-U can be used in place of the required multi-layer silica gel glass column, and Cat. No. 52733-U can be used in place of the required multi-layer celite 545-activated carbon glass column.

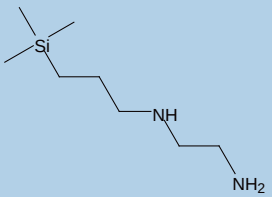
Note: The bed weights packed into these SPE tubes are smaller than what is described in EPA Method 8290. Therefore, to use these SPE tubes, sample volumes need to be scaled down accordingly.

Description	Qty.	Cat. No.
Multi-layer Silica Gel SPE Tube, glass, 6 mL	30	52732-U
Multi-layer Celite/Activated Carbon SPE Tube, glass, 6 mL	30	52733-U

Specialty Products for Pesticide Analysis

The Supelclean ENVI-Carb-II/PSA SPE product line consists of multi-layer SPE cartridges that were developed for superior cleanup when conducting multi-residue pesticide analysis in agricultural products (fruits, vegetables, meat, shellfish, grains, and dairy products). The technology acts as a chemical filter in which each layer plays a specific role for removing key interferences.

Note that dual layer ENVI-Carb/NH_2 SPE products are also available. Please see pg. 18 for a listing.

ENVI-Carb-II/PSA  G002462	• Dual layer SPE tube that contains both Supelclean ENVI-Carb-II (upper layer) and PSA (lower layer) SPE sorbents (separated by PE frit) • Developed to offer superior cleanup when conducting multi-residue pesticide analysis in food (e.g., fruits, vegetables, etc.) • ENVI-Carb-II a graphitized non-porous carbon (100/140 mesh, surface area 100 m^2/g) that has a strong affinity towards planar molecules, and has been quality controlled specifically for the isolation/removal of pigments (e.g., chlorophyll and carotinoids) and sterols commonly present in fruits, vegetables, and other natural products • Supelclean PSA is a polymerically bonded, ethylenediamine-N-propyl phase that contains both primary and secondary amines • Supelclean PSA has a strong affinity and high capacity for fatty acids, organic acids, and some polar pigments and sugars • Tested for superior cleanliness using GC-FID and GC-MS
ENVI-Carb-II/ SAX/PSA	• Tri-layer SPE tube that contains Supelclean ENVI-Carb-II (upper layer), SAX (middle layer) and PSA (lower layer) SPE sorbents (separated by PE frit) • Developed to offer superior cleanup when conducting multi-residue pesticide analysis in food (e.g., fruits, vegetables, etc.) • ENVI-Carb-II is a graphitized non-porous carbon (100/140 mesh, surface area 100 m^2/g) that has a strong affinity towards planar molecules, and has been quality controlled specifically for the isolation/removal of pigments (e.g., chlorophyll and carotinoids) and sterols commonly present in fruits, vegetables and other natural products • Supelclean PSA has a strong affinity and high capacity for fatty acids, organic acids, and some polar pigments and sugars • Supelclean SAX offers additional ion-exchange capacity for removing matrix components that may induce ion-suppression or enhancement during GC analysis
SAX/PSA	• Dual layer SPE tube that contains both Supelclean SAX (upper layer) and PSA (lower layer) SPE sorbents (separated by PE frit) • Supelclean SAX is a quarternary amine, Cl^- counter-ion • Supelclean PSA is a polymerically bonded, ethylenediamine-N-propyl phase that contains both primary and secondary amines • Ideal for removing matrix components (fatty acids, organic acids, polar pigments, and some sugars) when conducting multi-residue pesticide analysis in foods • In compliance with Luke and Luke II methods that use SPE to reduce matrix induced ion-suppression and enhancement when conducting GC analysis of pesticides in food
ENVI-Carb	• Surface Area: 100 m^2/g, Particle Size:100/400 mesh • Extreme affinity for organic polar and non-polar compounds from both non-polar and polar matrices when used under reversed-phase conditions • Carbon surface comprised of hexagonal ring structures, interconnected and layered into graphitic sheets • Non-porous nature of the carbon phase allows for rapid processing, adsorption does not require analyte dispersion into solid phase pores • Independent investigators have found ENVI-Carb extremely useful for the rapid sample preparation of over 200 pesticides from various matrices including ground water, fruits, and vegetables
PSA  G002460	• Polymerically bonded, ethylenediamine-N-propyl phase that contains both primary and secondary amines • A weak anion exchanger with a pKa of 10.1 and 10.9 • Similar to aminopropyl SPE phases (NH_2) in terms of selectivity, but has a much higher capacity due to presence of secondary amine (0.98-1.05 meq/g) • Strong affinity and high capacity for removing fatty acids, organic acids, and some polar pigments and sugars when conducting multi-residue pesticide analysis in foods • Has been shown to significantly reduce matrix-enhancement effects encountered during the GC analysis of food products • Bidendate nature of ligands allow for chelation

For available configurations & part numbers, please see page 18.

Specialty Products for Pesticide & FAME Analysis

Dispersive SPE (dSPE)

Dispersive SPE (dSPE), often referred to as the "QuEChERS" method (Quick, Easy, Cheap, Effective, Rugged, and Safe), is an emerging sample prep technique that is becoming increasingly popular in the area of multi-residue pesticide analysis in food and agricultural products.

In dSPE, food/agricultural samples are first extracted with an aqueous miscible solvent (e.g., acetonitrile) in the presence of high amounts of salts (e.g., sodium chloride and magnesium sulfate) and/or buffering agents (e.g. citrate) to induce liquid phase separation and stabilize acid and base labile pesticides, respectively. Upon shaking and centrifugation, an aliquot of the organic phase is subjected to further cleanup using SPE. Unlike traditional methods using SPE tubes, in dispersive SPE, cleanup is facilitated by mixing bulk amounts of SPE (e.g., Supelclean PSA, ENVI-Carb, and/or Discovery DSC-18) with the extract. After sample cleanup, the mixture is centrifuged and the resulting supernatant can either be analyzed directly or can be subjected to minor further treatment before analysis.



Supelco now offers a Comprehensive Dispersive SPE Customization Service. To learn more visit sigma-aldrich.com/quechers

Dispersive SPE Products now Available for:

- *50 mL centrifuge tubes*
- *2 mL microcentrifuge tubes*
- *Glass vials*
- *A wide range for Sigma-Aldrich/Supelco salts, buffering agents, and SPE phases*

Supelco now carries a line of vials and centrifuge tubes containing pre-determined amounts of salts and SPE sorbents to support the most common method configurations used today.

Dispersive SPE (dSPE) Products

Description	Qty.	Cat. No.
Packed in 12 mL Greiner Centrifuge Tube (Greiner Cat. No. 163270)		
Citrate Extraction Tube	50	55227-U
4 g magnesium sulfate **(Cat. No. 63135)**		
1 g sodium chloride **(Cat. No. 71379)**		
0.5 g sodium citrate dibasic sesquihydrate **(Cat. No. 71635)**		
1 g sodium citrate tribasic dihydrate **(Cat. No. 32320)**		
Mg_2SO_4 Extraction Tube	50	55234-U
6 g magnesium sulfate **(Cat. No. 63135)**		
1.5 g sodium acetate **(Cat. No. 24,124-5)**		
PSA SPE Cleanup Tube 1	50	55228-U
900 mg magnesium sulfate **(Cat. No. 63135)**		
150 mg Supelclean PSA **(Cat. No. 52738-U)**		
PSA/C18 SPE Cleanup Tube 1	50	55229-U
900 mg magnesium sulfate **(Cat. No. 63135)**		
150 mg Supelclean PSA **(Cat. No. 52738-U)**		
150 mg Discovery DSC-18 **(Cat. No. 52600-U)**		
PSA/ENVI-Carb SPE Cleanup Tube 1	50	55230-U
900 mg magnesium sulfate **(Cat. No. 63135)**		
150 mg Supelclean PSA **(Cat. No. 52738-U)**		
15 mg Supelclean ENVI-Carb **(Cat. No. 57210-U)**		
PSA/ENVI-Carb SPE Cleanup Tube 2	50	55233-U
900 mg magnesium sulfate **(Cat. No. 63135)**		
150 mg Supelclean PSA **(Cat. No. 52738-U)**		
45 mg Supelclean ENVI-Carb **(Cat. No. 57210-U)**		

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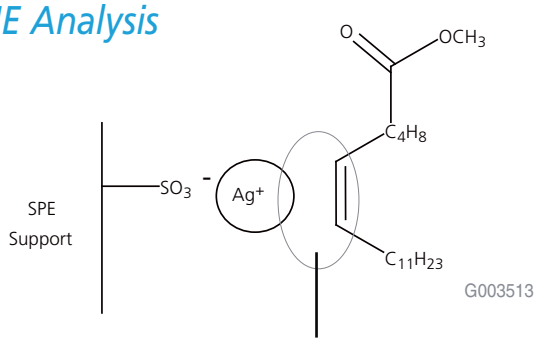
Discovery Ag-Ion SPE Tubes for cis/trans FAME Analysis

Retention Mechanism: Normal-phase

Sample Matrix Compatibility: Organic solvents, oils, and lipids

- Developed for the fractionation of FAMEs based on degree of unsaturation, and for the resolution of cis/trans isomers.
- Silver counter-ions are anchored onto a SCX support using a proprietary procedure to offer optimal resolution, performance, and capacity.
- Each lot is tested and quality controlled for cis/trans FAME resolution

Description	Qty.	Cat. No.
750 mg/6 mL	30	54225-U
750 mg/1 mL reversible cartridge	10	54226-U



Charge-transfer complex between Ag^+ and unsaturated bond

Miscellaneous Specialty Products & SPE Accessories

Glass SPE Tubes with PTFE Frits

A select line of our Supelclean SPE phase chemistries is also available in inert glass and PTFE hardware configurations.



Features & Benefits:

- Resistant to harsh chemicals and aggressive solvents
- Absence of leachables such as pthalates and plasticizers
- Hygroscopic adsorbents (e.g. Florisil) can be easily heat treated/ activated (e.g., 105-120 °C oven, overnight) prior to use.

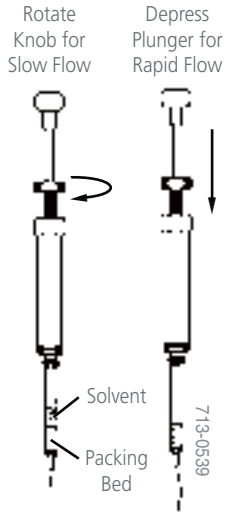
Description	Qty.	Cat. No.
Supelclean ENVI-18 SPE Tube		
glass hardware, PTFE frit, bed wt. 500 mg, vol. 6 mL	30	54331-U
Supelclean ENVI-8 SPE Tube		
glass hardware, PTFE frit, bed wt. 500 mg, vol. 3 mL	27	57106
glass hardware, PTFE frit, bed wt. 500 mg, vol. 6 mL	20	57107
Supelclean LC-Florisil SPE Tube		
glass hardware, PTFE frit, bed wt. 500 mg, vol. 6 mL	30	54333-U
glass hardware, PTFE frit, bed wt. 1 g, vol. 6 mL	30	54334-U
Supelclean LC-Si SPE Tube		
glass hardware, PTFE frit, bed wt. 1 g, vol. 6 mL	30	54335-U
Dual Layer Florisil/Na_2SO_4 SPE Tube		
bed A 2 g (Na_2SO_4), bed B 2 g (Florisil), vol. 6 mL	48	52582-U

Single SPE Tube Processor

Visi-1 processor - two rates of flow control

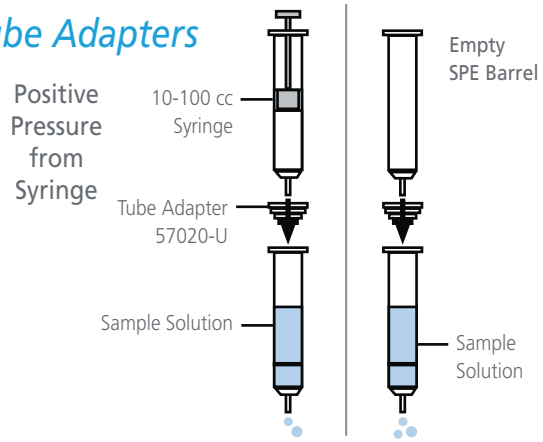
Our Visi-1 Single SPE Tube Processor provides precise flow control through a single 1 mL, 3 mL, or 6 mL SPE tube. There is no faster, more convenient, or more reliable method for processing one or a few samples.

Simply fill the SPE tube with the appropriate solution, and attach it to the Visi-1 processor. Remove the tube from the processor, introduce the next solution, and repeat the process.



Description	Cat. No.
Visi-1 Single SPE Tube Processor	57080-U

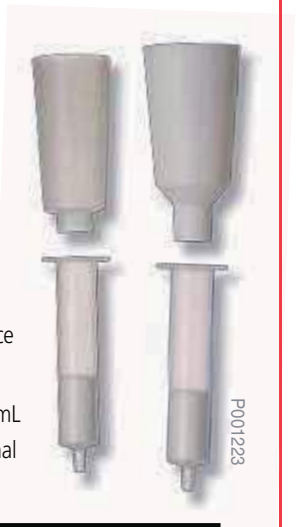
Tube Adapters



Tube adapters serve many purposes. They can be used to stack one SPE tube on top of another to provide different selectivities. A larger empty syringe barrel can be stacked on top of a smaller SPE tube to act as a larger load reservoir. Or, they can serve as an adapter for positive pressure methods (e.g. from a syringe or air/N_2 line).

Description	Qty.	Cat. No.
SPE Tube Adapters for Polypropylene Tubes		
For 1, 3, 6 mL Tubes	12	57020-U
For 12, 20, 60 mL Tubes	6	57267
AutoTrace SPE Tube Adapters*		
For 3 mL Tubes	6	57123
For 6 mL Tubes	6	57126
* Allows SPE tubes to be used with AutoTrace® Automated Systems		
SPE Tube Adapter for Glass Tubes		
PTFE, for use with 6 mL glass SPE Tube	24	504335

Large Volume SPE Reservoirs



Large volume SPE reservoirs are designed to increase the headspace volume of standard polypropylene SPE tubes. Because these reservoirs are designed to connect directly to the mouth of the SPE tube, they are ideal for gravity applications where increased headspace volume is required.

The reservoirs are designed for use with 6 mL polypropylene SPE tubes, and add an additional headspace volume of 25 mL.

Description	Qty.	Cat. No.
Large Volume SPE Reservoir		
Polypropylene	30	54258-U
PTFE	3	54259-U

SPE Accessories

Empty SPE Hardware & Components





SPE Tube Components

Description		1 mL	3 mL	6 mL	12 mL	20 mL	60 mL
Empty SPE Tubes with and without Frits	**Qty.:**	**108**	**54**	**30**	**20**	**20**	**16**
Empty PP SPE Tube with PE Frits, 20 µm porosity		57023	57024	57026	57176	57177	57178
Empty PP SPE Tube with PE Frits, 20 µm porosity – pre-fritted with bottom frit		54220-U (pk 100)	54221-U (pk 100)	54222-U (pk 100)	54223-U (pk 100)	57118-U	57119-U
Empty PP SPE Tube (no frits)		57240-U	57241	57242	57179	57021 (Qty. 12)	57022 (Qty. 12)
Empty Glass SPE Tubes with PTFE Frits, 20 µm porosity		–	–	504394*	–	–	–
SPE Tube Caps (encloses top of SPE tubes)	**Qty.:**	**108**	**54**	**30**	**20**	**20**	**20**
PP cap for PP SPE tubes		52171-U	52172-U	52173-U	52174-U	52175-U	52176-U
PTFE cap for glass SPE tube		–	–	504343*	–	–	–
Frits for use with SPE tubes	**Qty.:**	**216**	**108**	**60**	**40**	**40**	**32**
PE Frits for PP SPE tubes, 20 µm porosity		57244	57180-U	57181	57182-U	57183	57184
PTFE Frits for PP SPE tubes, 20 µm porosity		57185	57186	57187	57188	57189	57190-U
PTFE Frits for glass SPE tubes, 20 µm porosity		–	–	504327	–	–	–
SS Frit for PP SPE tubes, 20 µm porosity		–	–	57246-U	–	–	–
SPE Frit Insertion Tool							
SPE Frit Insertion Tool, pk 1		55217-U	55218-U	55219-U	55221-U	55224-U	55224-U
SPE Frit Insertion Tool Kit (includes all 5 tools for 1, 3, 6, 12 & 20/60 mL tubes)		–	–	–	–	55226-U	–

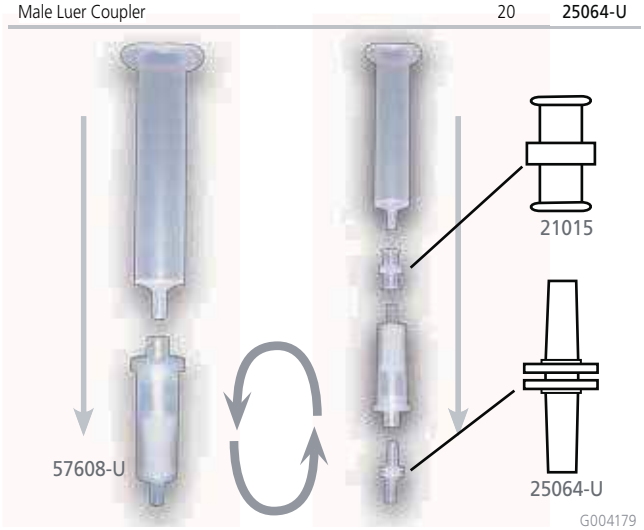
PP = Polypropylene; PTFE = Polytetrafluoroethylene; SS = Stainless steel; PE = Polyethylene

* Qty. of 24

Miscellaneous SPE Hardware & Accessories

Description	Qty.	Cat. No.
Empty Reversible SPE Tube, non-flourous PP, w/PE frits		
0.5 mL	50	57602-U
1.0 mL	50	57607-U
2.0 mL	50	57608-U
Empty Flangeless PP SPE Tubes w/PE Frits, 20 µm porosity		
1 mL	108	Inquire
3 mL	54	Inquire
6 mL	30	Inquire
Empty PP Rezorian Tube Kit w/PE Frits, luer plugs and caps		
1.0 mL	50	57609-U
5.0 mL	50	57613-U
Empty 96-well SPE Plates		
2 mL deep square well, w/PE frits	1	Inquire
1.25 mL round well, w/PE frits	1	Inquire
Empty PP Disposable Büchner Funnels w/PE Frits		
55 mm I.D. x 30 mm H, 75 mL	6	2141-U
70 mm I.D. x 40 mm H, 165 mL	6	2142-U
90 mm I.D. x 48 mm H, 315 mL	6	2143-U
110 mm I.D. x 66 mm H, 875 mL	3	2144-U

Description	Qty.	Cat. No.
Luer Caps, Plugs, and Couplers		
Female Luer Cap, PP (caps SPE luer tips)	12	57098
Male Luer Plug, PP (plugs female luer fitting)	12	504351
Female Luer Coupler	20	21015
Male Luer Coupler	20	25064-U



SPE Accessories - Vacuum Manifolds

Visiprep & Visiprep DL SPE Vacuum Manifolds

Visiprep SPE Vacuum Manifolds allow you to process up to 12 or up to 24 SPE tubes simultaneously. Both DL (disposable liner) and standard models are available.

The Visiprep DL Vacuum Manifold eliminates the possibility of cross contamination when processing a new sample on the same port. The liner consists of a PP luer hub that attaches to the SPE tube, and thin walled PTFE tubing that is threaded through the SPE port. This ensures that all SPE port/valve surfaces coming in contact with the sample can be replaced following each extraction.



12-Port Visiprep DL Vacuum Manifold (57044)

Features & Benefits for both DL and standard models:

- Screw-type valves for SPE port for precise flow control
- Glass basin will not dissolve, fog, or discolor when exposed to solvents
- Legs on stand-alone cover allows user to easily rest cover on work surface when removed from vacuum manifold
- Screw type solvent resistant vacuum bleed gauge and valve offer better sealing and vacuum control. Valve takes ¼" vacuum tubing.
- PP collection vessel rack accommodates autosampler vials, small scintillation vials, 10 and 16 mm test tubes, and 1, 2, 5, and 10 mL volumetric flasks. An optional plate for 20 mL scintillation vials is available for 24-port models.

Description	Cat. No.
Visiprep DL Solid Phase Extraction Manifold	
12-Port Model	57044
24-Port Model	57265
Disposable valve liners, PTFE, (pk. of 100)	57059
Visiprep Solid Phase Extraction Manifold	
12-Port Model	57030-U
24-Port Model	57250-U



24-Port Visiprep Vacuum Manifold (57250-U)

Visiprep 5-Port Flask Manifold

The Visiprep 5-Port Flask Vacuum Manifold enables analysts using Supelco solid phase extraction tubes to simultaneously prepare up to 5 samples.

Unlike conventional vacuum manifolds, the Visiprep 5-Port Flask Manifold allows users to collect their SPE eluate directly into 50 mL round or flat bottom flasks for direct Rotovap evaporation. The manifold consists of a chemical resistant 5-port cover (DL or standard available), gasket, base, a glass basin, vacuum gauge and bleed valve, 5 flow control valves, 5 replaceable solvent guide needles, and a base plate that supports up to five 50 mL round or flat bottom flasks. Each port on both the standard and DL Visiprep models are equipped with flow control valves.

Recommended Flasks: Aldrich single-neck flask, 50 mL, joint: ST/NS 24/40

- Round Bottom (Cat. No. Z414484)
- Flat Bottom (Cat. No. Z418773)

Description	Cat. No.
Visiprep 5-Port Flask Vacuum Manifold	
DL (Disposable Liner)	57101-U
Standard	57103-U
Visiprep 5-Port Vacuum Manifold Conversion Kit	
For converting 24-port model into DL 5- port flask model, includes DL 5-port lid and flask base plate	57104-U
For converting 24-port model into standard 5-port flask model, includes standard 5-port lid and flask base plate	57105-U





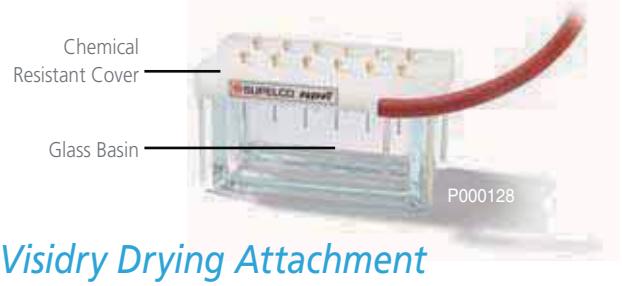
SPE Processing Accessories

Supelco Preppy Vacuum Manifold

Simultaneously prepare up to 12 samples with our simplest and most economical manifold. The Preppy consists of a chemical-resistant cover and gasket, glass basin, vacuum release vent, 12 individual control valves with knurled tops, and stainless steel solvent guide needles.

Two optional collection racks are available; one for 2 and 4 mL autosampler vials, and the other for 15 (w/21 mm O.D.) or 40 (w/28 mm O.D.) mL vials. An optional vacuum gauge/bleed valve assembly can be installed to allow precise control of the vacuum.

Description	Cat. No.
Preppy Vacuum Manifold	
12-Port Model	57160-U
Preppy Replacement Parts	
Cover with flow control valves and solvent needle guides	57158-U
Collection Vessel Racks	
For 2 or 4 mL vials	57159-U
For 15 or 40 mL vials	57162-U
Accessories	
Vacuum Gauge/Bleed Valve Assembly	57161-U



Visidry Drying Attachment

Designed for our Visiprep Vacuum Manifold, the Visidry Drying Attachment (57100-U) also fits our economical Preppy manifold. The Visidry unit installs in minutes, dries up to 12 or up to 24 SPE tubes at one time, and can be used with any inert gas supply. It is also useful for evaporating and concentrating recovered samples. Gas flow to each port can be independently adjusted.



57030-U
12-Port Model
Order Separately

E00772

NOTE: The Visidry drying attachment cannot be used to dry 12 mL, 20 mL, or 60 mL SPE tubes.

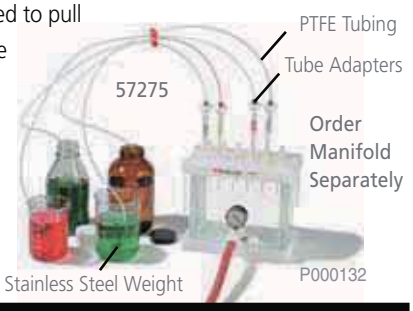
Description	Qty.	Cat. No.
Visidry Drying Attachment		
12-Port Model	1	57100-U
24-Port Model	1	57124
Replacement Parts for Visidry Drying Attachment		
Control Knobs	2	57095
Retaining "C" Clips	2	57096
Female Luer Plugs	12	57098

Replacement SPE Tube Adapters (57020-U) listed on p. 20.

VisiPrep Large Volume Samplers

Allows for easy "hands-off" transfer of large volumes of low viscosity liquid samples directly from any sample container to conventional SPE tubes (not suitable for glass tubes).

The samplers consist of 1/8" PTFE tubing with a stainless steel weight at one end and a screw-fitted SPE tube adapter on the other end. To use the sampler, the weighted end is placed in the sample container, and the tube adapter is inserted into a pre-conditioned SPE tube. Vacuum pressure delivered from the vacuum manifold is used to pull the sample through the PTFE tubing into the SPE tube where analytes of interest are concentrated on the SPE tubes prior to elution.



Description	Qty.	Cat. No.
Visiprep Large Volume Sampler		
for 12 mL, 20 mL, or 60 mL SPE Tubes (3 adapters)[1]	1	57272
for 3 mL or 6 mL SPE Tubes (4 adapters)	1	57275
Replacement Parts		
1/8" PTFE Tubes, color-coded	4	57276
Nuts and Ferrules, color-coded	4	57277
Stainless Steel Weights	4	57278
Tube Adapters, 1/4-28 threads		
For 3 mL or 6 mL Tubes	4	57273-U
For 12 mL, 20 mL, or 60 mL Tubes	3	57274-U

[1]Also, you must equip alternate manifold valves with long stem flow control knobs to accommodate 12 mL, 20 mL, or 60 mL SPE tubes.

SPE Elution Rack for Gravity Feed Elution



This versatile stand-alone elution rack can be used with a variety of SPE tubes and receiving vessels, for simultaneous gravity feed extraction of up to 12 tubes. By assembling the plates in appropriate combinations, you can configure the rack to accept the following:

- 1 mL, 3 mL, or 6 mL syringe barrel-type tubes
- Closed cartridge (reversible) tubes
- 5 mL or 10 mL volumetric flasks
- 2 mL or 4 mL vials
- Test tubes up to 15 mm I.D. x 10 cm

Description	Cat. No.
SPE Elution Rack	21043-U

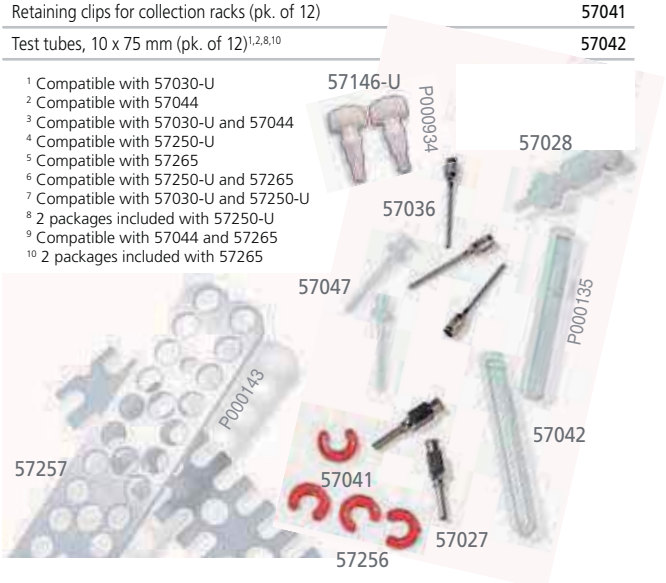
SPE Accessories

Vacuum Manifold Replacement Parts & Accessories

Replacement Parts and Optional Components for Visiprep Manifolds

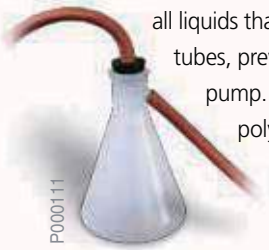
Description	Cat. No.
For 12-Port Manifold	
Cover, 12 flow control valves, gasket[1]	57031-U
Cover, 12 DL flow control valves, gasket[2]	57029
Gaskets (pk. of 2)	57033
Glass basin	57049
Glass basin, vacuum gauge and bleed valve[3]	57034
Collection rack (base, 3 support rods, center plate, 10 mm test tube plate, 12 retaining clips)[3]	57037
Plate for 16 mm test tubes[3]	57039
Plate for 2 mL autosampler vials[3]	57040-U
Plate for 20 mL scintillation vials	57043
Splash guard	57045-U
For 24-Port Manifold	
Cover, 24 flow control valves, gasket[4]	57251
Cover, 24 DL flow control valves, gasket[5]	57266
Gaskets (pk. of 2)	57254
Glass basin	57253
Glass basin, vacuum gauge and bleed valve[6]	57252
Collection rack (base, 2 support rods, center plate, 10 mm test tube plate, 8 retaining clips)[6]	57255
Plate for 16 mm test tubes[6]	57257
Plate for 2 mL autosampler vials[6]	57258
For 12-Port or 24-Port Manifold	
Valve Stem for Visiprep DL Vacuum Manifold (pk. of 24)	57146-U
Valve Stem for Visiprep/Preppy Vacuum Manifold (pk. of 24)	57147-U
Flow control valves (pk. of 2)[7]	57032
Solvent guide needles, PTFE (pk. of 12)[1,8]	57047
Solvent guide needles, stainless steel (pk. of 12)[7]	57036
Disposable liner flow control valves (pk. of 2)[9]	57028
Liner guide needles, stainless steel (pk. of 12)[2,10]	57027
Disposable valve liners, PTFE (pk. of 100)[2,5]	57059
Vacuum gauge and bleed valve	57035-U
Retaining clips for collection racks (pk. of 12)	57041
Test tubes, 10 x 75 mm (pk. of 12)[1,2,8,10]	57042

[1] Compatible with 57030-U
[2] Compatible with 57044
[3] Compatible with 57030-U and 57044
[4] Compatible with 57250-U
[5] Compatible with 57265
[6] Compatible with 57250-U and 57265
[7] Compatible with 57030-U and 57250-U
[8] 2 packages included with 57250-U
[9] Compatible with 57044 and 57265
[10] 2 packages included with 57265



Trap Kit for SPE Vacuum Manifolds

When installed between a Visiprep SPE vacuum manifold and the vacuum source, a Supelco SPE Vacuum Pump Trap collects all liquids that are aspirated through the SPE tubes, preventing contamination of the vacuum pump. The easily assembled kit contains a polypropylene filtering flask, a one-hole rubber stopper, 4" (10 cm) of polypropylene tubing and 5' (1.5 m) of red rubber vacuum hose.



Description	Cat. No.
SPE Vacuum Pump Trap Kit	57120-U

Vacuum Gauge / Bleed Valve Assembly

Install in-line for control of vacuum.

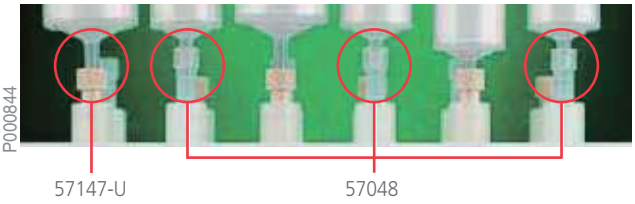


Description	Cat. No.
Vacuum Gauge / Bleed Valve Assembly	57161-U

Long Stem Flow Control Valves for Visiprep Manifolds

Equip alternate valves in your 12-port or 24-port Visiprep vacuum manifold with these long stem flow control valves if you intend to use all ports of the manifold with 12 mL, 20 mL, or 60 mL tubes.

Not for use with DL manifolds.



Description	Qty.	Cat. No.
Long Stem Flow Control Valves	6	57048

Long Stem Flow Control Knobs

If you have equipped your Visiprep Vacuum Manifold with long stem flow control valves, these control knobs will enable you to attach the Visidry Drying Attachment without removing the long stem valves.

NOTE: Not to be used w/24-port manifold to process 12 mL, 20 mL, or 60 mL tubes.

Description	Qty.	Cat. No.
Long Stem Flow Control Knobs	6	57093

SPE Accessories

96-Well Vacuum Manifolds

PlatePrep Vacuum Manifold

The PlatePrep vacuum manifold consists of a clear acrylic top allowing for easier inspection of flow rates during SPE 96-well plate processing. The polypropylene base offers excellent chemical resistance while a single remote vacuum gauge/bleed valve controls flow through all the wells.

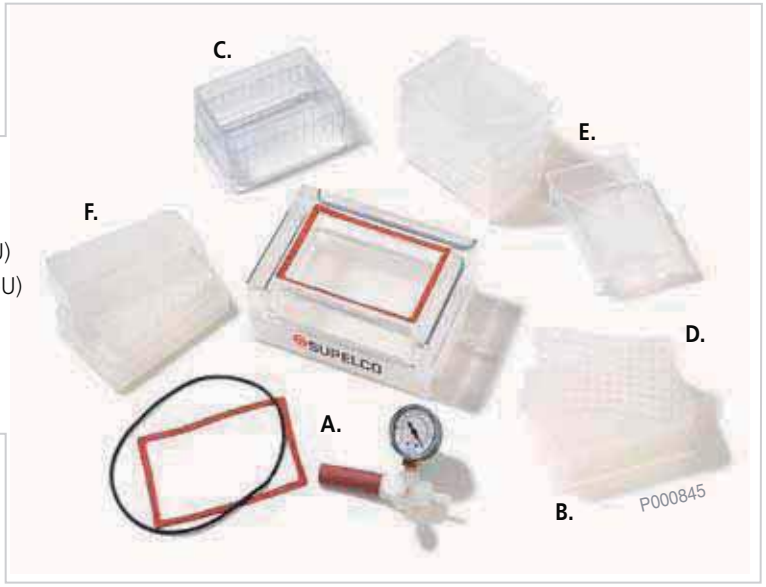
Use this compact vacuum manifold in conjunction with a Discovery SPE 96-well plate to process up to 96 samples concurrently. The single valve control, parallel processing capabilities, and uniform flow dynamics allow for easier method development, reduces clutter, and allow for greater reproducibility. Unused wells can be covered and used at a later date.



Note: The PlatePrep Vacuum Manifold is not compatible with the Empore 96-well plate

Starter Kit Includes:

A. 1 PlatePrep Vacuum Manifold (57192-U)
B. 1 96 Sq. Well Collection Plate, 2 mL, PP (575653-U)
C. 2 Disposable Reservoir/Waste Trays, PVC (575654-U)
D. 1 96 Sq. Well Piercable Cap Mat (575655-U)
E. 5 Reagent Reservoirs (R9259-100EA)
F. 1 Cluster Tube Rack (CLS4410-960EA)





Description	Qty.	Cat. No.
Supelco PlatePrep Vacuum Manifold	1	57192-U
96-Well Plate Starter Kit with PlatePrep Manifold	1	575650-U
PlatePrep Vacuum Manifold Replacement Parts		
Acrylic Clear Top	1	57193-U
Polypropylene Base	1	57194-U
Gasket/Connector Replacement Kit	1	57195-U
Remote Vacuum Gauge/Bleed Valve Assembly	1	57161-U
96-Well SPE Accessory Items		
96 Sq. Well Collection Plates, 0.35 mL, PP	50	575651-U
96 Sq. Well Collection Plates, 1 mL, PP	50	575652-U
96 Sq. Well Collection Plates, 2 mL, PP	50	575653-U
Disposable Reservoir/Waste Tray, PVC	25	575654-U
96 Sq. Well Piercable Cap Mats	50	575655-U
Reagent Reservoirs	100	R9259-100EA
Cluster Tube Rack	1	CLS4410-960EA

SPE Accessories

ENVI-Disk Accessories

ENVI-Disk Holder

Use the ENVI-Disk Holder with 47 mm ENVI-DSK SPE disks. The unique design of the holder allows each disk to be installed and held firmly in place without wrinkling or tearing. A screw clamp provides uniform pressure on the disk and the sealing surfaces to prevent troublesome leaks – spring-loaded clamps cannot offer the sealing integrity of the ENVI-Disk Holder.



P000116

The unit consists of a 1-liter sample funnel, a threaded screw clamp, a PTFE disk support, and a PTFE filter base/adapter with a vacuum attachment fitting. The filter base fits onto any standard 1-liter flask that has a 40/35 tapered ground glass neck. Use 25 x 250 mm test tubes to collect disk eluates. The flask and collection tubes are not included with the holder, but can be purchased separately.

Description	Cat. No.
ENVI-Disk Holder	57173
Flask, 1-liter, 40/35 fitting[1]	Z290610-1EA
Collection Tube, 25 x 250 mm[1]	57175

[1] Order separately – not included with holder.

ENVI-Disk Holder Manifold

The ENVI-Disk Holder Manifold holds one to six ENVI-Disk Holders with flasks, allowing you to simultaneously extract up to six 1-liter samples. Each of the six stations is controlled through an independent flow control valve. These valves are designed to vent the flask to the atmosphere when moved from the open to the closed position. The flow rate is controlled by the needle valve on the manifold.


P000115

The unit includes a sturdy polymer base with six stations, six flow control valves, a needle valve, a vacuum gauge, and vacuum tubing. A 1-liter glass bottle in the manifold acts as a trap, to protect the vacuum source in the event of an overflow from one of the sample flasks.

Description	Cat. No.
ENVI-Disk Holder Manifold	57174

ENVI-Disk Clamp

- Eliminates leaks
- Attaches to any 34/45 tapered flask


P000101

When used with a standard 47 mm glass filtration apparatus, the ENVI-Disk Clamp creates a better seal, eliminating leaks with SPE extraction disks or when filtering HPLC mobile phase solvents.

Use only with a filtration glassware funnel base that has a removable filtration stage, such as Supelco Mobile Phase Filtration Apparatus 1 (58061) or 2 (58062-U), or with a funnel base (58064 or 58068). It cannot be used with a permanent fritted glass filtration stage or stainless steel holder screen.

Description	Cat. No.
ENVI-Disk Clamp, 47 mm assembly	57260-U
Replacement PTFE stage	57261

SPE Methodology & Useful Tips

Reversed-Phase SPE

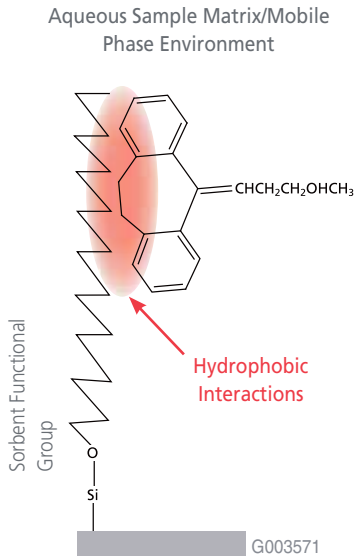
Retention Mechanism: **Non-polar or hydrophobic interactions**
- Van der Waals or dispersion forces

Sample Matrix: **Aqueous samples**
- Biological fluids (serum, plasma, urine)
- Aqueous extracts of tissues
- Environmental water samples
- Wine, beer and other aqueous samples

Analyte Characteristics: **Analytes exhibiting non-polar functionalities**
- Most organic analytes
- Alkyl, aromatic, alicyclic functional groups

Elution Scheme: **Disrupt reversed-phase interaction with solvent or solvent mixtures of adequate non-polar character**
- Methanol, acetonitrile, dichloromethane
- Buffer/solvent mixtures

Common Applications:
- Drugs and metabolites in biological fluids
- Environmental pollutants in water
- Aqueous extracts of tissues and solids



Reversed-phase SPE is considered the least selective retention mechanism when compared to normal-phase or ion-exchange SPE. In other words, it may be difficult for a reversed-phase method or bonded-chemistry to differentiate between molecules that are structurally similar. However, because reversed-phase will retain most molecules with any hydrophobic character, it is very useful for extracting analytes that are very diverse in structure within the same sample.

Basic Steps

1. Sample Pre-treatment

For interference laden samples (e.g., biological fluids), dilute samples 1:1 with buffer. pH manipulation may be important when dealing with ionizable compounds. A compound's ionization state can drastically change its retention and elution characteristics on a given SPE sorbent.

When an analyte is in its neutral form, it becomes more hydrophobic and retention strengthens under reversed-phase conditions. Adjusting the sample pH to 2 pH units above or below the compound's pKa (depending on the functional group) will effectively neutralize the compound. When dealing with tissues and other solids, conduct a solid-liquid extraction or homogenization using a buffer. Solvents of non-polar character (including methanol and isopropanol) disrupt interaction between the compound and sorbent functional groups.

To avoid clogging, it may be necessary to centrifuge, dilute, and/or pre-filter the sample prior to introducing it to the SPE phase.

2. Condition/Equilibration

Conditioning wets or activates the bonded phases to ensure consistent interaction between the analyte and the sorbent functional groups. Reversed-phase sorbents are often conditioned with 1-2 tube volumes of a water miscible solvent such as methanol or acetonitrile.

Equilibration introduces a solution similar to the sample load in terms of solvent strength and pH in order to maximize retention. 1-2 tube volumes of buffer (used in sample pre-treatment) or water are good choices for reversed-phase equilibration.

3. Sample Load

Apply sample (from step 1) at a consistent and reduced flow rate of ~1-2 drops/second to ensure optimal retention.

4. Wash

Sample interferences are often co-retained with compounds of interest during sample load. A wash step is necessary to elute interferences without prematurely eluting compounds of interest. 5-20% methanol in water or sample pre-treatment buffer is typical for wash solvents.

5. Elution

Disrupt hydrophobic interactions between the analyte and sorbent functional groups with an organic solvent or solvent combination of sufficient non-polar character. Example elution solvents are 1-2 volumes of methanol or acetonitrile.

pH manipulation during elution can often improve recovery when dealing with ionizable compounds. In their ionic form, basic and acidic compounds become more polar, weakening reversed-phase interaction, possibly allowing for weaker elution solvents and/or reduced elution volumes.

6. Eluate Post-treatment

It is often necessary to evaporate and reconstitute the SPE eluate in mobile phase prior to LC analysis. GC analysis often requires further SPE eluate concentration and/or possible matrix exchange with a more volatile solvent.

SPE Tips:

1. Drug-protein binding should be disrupted during sample pre-treatment.

Strategies include:
- 40 µL 2% disodium EDTA per 100 µL mouse plasma
- 40 µL 2% formic acid per 100 µL mouse plasma
- Other possible reagents (per 100 µL matrix): 40 µL 2% TCA, 40 µL 2% acetic acid, 40 µL 2% TFA, 40 µL 2% phosphoric acid, or 200 µL MeCN (protein ppt.).

2. If the SPE eluate needs to be evaporated prior to analysis, pass vacuum air through the SPE tube for~10 minutes prior to elution. This will remove residual moisture that may prolong evaporation.

3. Consistent and slow flow rate (1-2 drops per second) during sample load and elution will improve recovery and reproducibility.

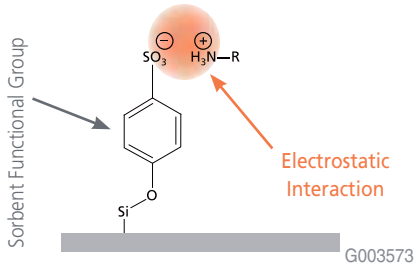
4. Reduce bed weight to minimize elution volume.

5. Increase bed weight to retain more polar compounds

6. Concern for sorbent over drying is only critical during methanol conditioning.

7. A pre-conditioning solvent such as dichloromethane (or solvent used for elution) can be used before conditioning to remove any impurities on the SPE tube that can interfere with subsequent analysis.

SPE Methodology & Useful Tips



In order for electrostatic retention to occur, both analyte and sorbent functional groups must be in their ionized form. This is done through strict pH control of the sample matrix. For basic analytes, the pH should be adjusted to at least 2 pH units below the molecule's pKa. For acidic analytes, the pH should be adjusted to at least 2 pH units above the molecule's pKa.

To elute, the opposite is true. By adjusting the pH of the eluant to at least two pH units above or below the analytes' and/or sorbent's pKa, one can effectively neutralize one or both functional groups disrupting the electrostatic interaction allowing for elution to occur.

Note: Because the kinetic exchange processes between sample and sorbent functional groups are considerably slower for ion-exchange than for normal- and reversed-phase, flow rates should be drop wise (~1 drop/second). One may also need to increase elution and wash volumes allowing for sufficient residence time for the mobile phase and stationary phase to interact.

Counter Ion Selectivity & Ion Exchange:

Counter ion selectivity is defined as the degree to which a counter ion is capable of competing with other counter ions for the functional group of an ion exchanger sorbent. Retention is facilitated by having a sorbent and/or sample matrix pre-equilibrated with a counter-ion that is less selective than the analyte functional group (minimum competition). Analyte elution is facilitated by using buffers with counter-ions more selective than analyte functional group.

For Cation Exchangers:

- $Ca^{2+} > Mg^{2}+ > K^{+} > Mn^{2+} > RNH_3^{2+} > NH_4^{+} > Na^{+} > H^{+} > Li^{+}$

For Anion Exchangers:

- Benzene Sulphonate > Citrate > HSO_4- > NO_3^- > HSO_3^- > NO_2^- > Cl^- > HCO_3^- > HPO_4^- > Formate > Acetate > Propionate > F^- > OH^-

To change to a higher selective ion, pass 2-5 bed volumes of 1N solution of the new counter ion through sorbent. To change to a lower selective ion, pass 5-65 bed volumes of 1N solution of the new counter ion through sorbent.

Note: Number of bed volumes dependent of how much less selective the new counter ion is than the present one on the sorbent.

Ion-Exchange & Mixed-Mode SPE

Retention Mechanism: Electrostatic attraction of charged functional groups of the analyte(s) to oppositely charged functional groups on the sorbent. Combination of reversed-phase and ion-exchange for mixed-mode

Sample Matrix: Aqueous or organic samples of low salt concentration (< 0.1M)

- Biological fluids
- Solution phase synthesis reactions

Analyte Characteristics:

- Use cation-exchange for isolating basic compounds: primary, secondary, tertiary, and quarternary amines
- Use anion-exchange for isolating acidic compounds: carboxylic acids, sulphonic acids, and phosphates

Elution Scheme: Electrostatic interactions disrupted via:

- pH modification to neutralize compound and/or sorbent functional groups
- Increase salt concentration (> 1M); or use a more selective counter-ion to compete for ion-exchange binding sites

Common Applications:

- Drugs of abuse and pharmaceutical compounds in biological fluids
- Fatty acids removal in food/agricultural samples
- Cleanup of synthetic reactions
- Organic acids from urine
- Herbicides in soil

Basic Steps

1. Sample Pre-treatment

Salt concentration should be less than 0.1M. Dilute sample 1:1 with buffer of appropriate pH to ensure analyte functional groups are ionized.

Examples:

- Basic compounds: dilute with 10-25 mM buffer (e.g., potassium phosphate or ammonium acetate), pH 3-6
- Acidic compounds: dilute with 10-50 mM buffer (e.g., acetate buffer), pH 7-9

For interference laden samples (e.g., biological fluids) containing varying levels of salt concentration, use mixed-mode SPE technology.

2. Condition/Equilibration

If samples are in a non-polar solvent, the same solvent should be used to condition the SPE device. For aqueous samples, condition with 1-2 tube volumes of methanol or acetonitrile. Equilibrate with buffer similar/identical in pH and salt concentration to buffer used sample pre-treatment.

3. Sample Load

Apply sample (from step 1) at a consistent and reduced flow rate of ~1-2 drops/second to ensure optimal retention. Mass transfer kinetics of ion-exchange SPE are slower than reversed-phase and normal-phase. Reduced flow rate is critical for consistent recovery.

4. Wash

Adequate control of pH and ionic strength should be maintained to prevent premature elution of the analytes of interest. Use buffer of appropriate pH (e.g. buffer used in sample pre-treatment) to remove polar interferences. More hydrophobic interferences can be removed using up to 100% methanol diluted in sample pre-treatment buffer.

5. Elution

Elute at a consistent and reduced flow rate of ~1-2 drops/second to ensure optimal compound desorption. The most common elution strategy is by pH manipulation. Also, most ion-exchangers exhibit some mixed-mode behavior. Addition of organic modifier is necessary to disrupt secondary reversed-phase interactions.

Examples:

- Basic compounds: elute with 2-5% ammonium hydroxide in 50-100% methanol
- Acidic compounds: elute with 2-5% acetic acid in 50-100% methanol.

Other elution strategies:

- Use an SPE eluate of higher salt concentration (> 1M)
- Use a more selective counter-ion to compete for ion-exchange binding sites

6. Eluate Post-treatment

A number of elution strategies are available. Various elution strategies should be tested and optimized to minimize eluate post-treatment.

SPE Methodology & Useful Tips

Normal-Phase SPE

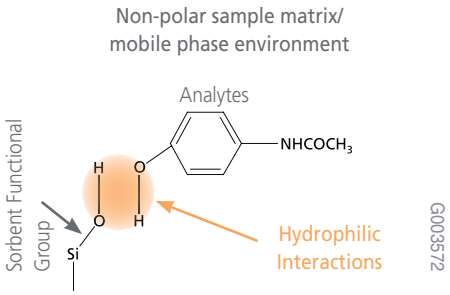
Retention Mechanism: **Polar Interactions**
- Hydrogen bonding, pi-pi, dipole-dipole, and induced dipole-dipole

Sample Matrix: **Non-polar samples**
- Organic extracts of solids
- Very non-polar solvents
- Fatty oils, hydrocarbons

Analyte Characteristics: **Analytes exhibiting polar functionalities**
- Hydroxyl groups, carbonyls, amines, double bonds
- Hetero atoms (O, N, S, P)
- Functional groups with resonance properties

Elution Scheme: **Polar interactions disrupted with a more polar solvent or solution**
- Acetonitrile, methanol, isopropanol
- Combinations of buffer/solvent or solvent/solvent mixtures

Common Applications:
- Cleanup of organic extracts of soils and sludge
- Fractionation of petroleum hydrocarbons
- PCBs in transformer oil
- Isolation of compounds in cosmetics



In order for polar retention to occur between the sorbent and the sample, the analyte must be introduced to the SPE device in a non-polar sample or mobile phase environment. Therefore, typical sample matrices that can be employed in normal-phase SPE include hydrocarbon or fatty oils diluted in an organic solvent, hexane, isooctane, chlorinated solvents, THF, diethyl ether, and ethyl acetate.

Most organic analytes exhibit some polar functionalities that can be exploited for normal-phase separation. Because many molecules exhibit polar functionality, each interaction can provide different levels of selectivity offering highly selective separations of compounds very similar in structure.

Basic Steps

1. Sample Pre-treatment

Liquid samples should be initially extracted or diluted with a non-polar solvent such as hexane or a chlorinated solvent. Soil, sediment, and other solid samples are initially extracted (soxhlet or sonication) with a non-polar solvent, and concentrated prior to SPE cleanup. Aqueous residues in the sample can reduce normal-phase retention. It may be necessary to further dry the organic extract with sodium sulfate or magnesium sulfate prior to SPE.

2. Condition/Equilibration

Condition and equilibriate with 2-3 tube volumes of a non-polar solvent similar or identical to sample matrix resulting from sample pre-treatment.

3. Sample Load

Apply sample (from step 1) at a consistent and reduced flow rate of ~1-2 drops/second to ensure optimal retention. The compounds should be a non-polar solvent (e.g., hexane) for optimal retention. Note that methanol and acetonitrile are often used as elution solvents in normal-phase SPE, and will often not promote compound retention during sample load.

4. Wash

Sample interferences are often co-retained with compounds of interest during sample load. A wash step is necessary to elute interferences without prematurely eluting compounds of interest. In normal-phase SPE, 1-2 tube volumes of solvent used in sample pre-treatment and conditioning can be used during wash.

5. Elution

Disrupt polar interactions with a solvent or solvent/buffer mixture more polar than both the sample and wash solutions. Typical elution solvents include water miscible organic solvents such as acetone, acetonitrile, methanol, and isopropanol. Eluting with increasingly polar solvents or solvent mixtures in succession can also fractionate multiple compound classes. See "Common Normal-Phase Solvents" table for assistance.

6. Eluate Post-treatment

Normal-phase SPE is often followed by GC analysis, and therefore requires a volatile sample matrix prior to injection. Use sodium sulfate or magnesium sample to remove residual moisture. Further SPE eluate concentration may also be necessary prior to analysis.

Common Normal-Phase Solvents

Solvent	Elutropic (e°) or elution strength on silica	
Hexane	0.00	Promotes Normal-Phase Retention
Isooctane	0.00	
Carbon tetrachloride	0.14	
Toluene	0.22	
Benzene	0.27	
Tert-butyl methyl ether	0.29	
Chloroform	0.31	
Methylene chloride (dichloromethane)	0.32	
Diethyl ether	0.29	
Ethyl acetate	0.43	
Tetrahydrofuran	0.35	
Acetone	0.45	
Acetonitrile	0.50	
40% methanol in acetonitrile	0.67	
20% methanol in diethyl ether	0.65	
20% methanol in methylene chloride	0.63	
Isopropanol	0.63	
Methanol	0.73	
Water	>0.73	Promotes Normal-Phase Elution
Acetic acid	>0.73	

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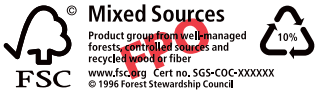
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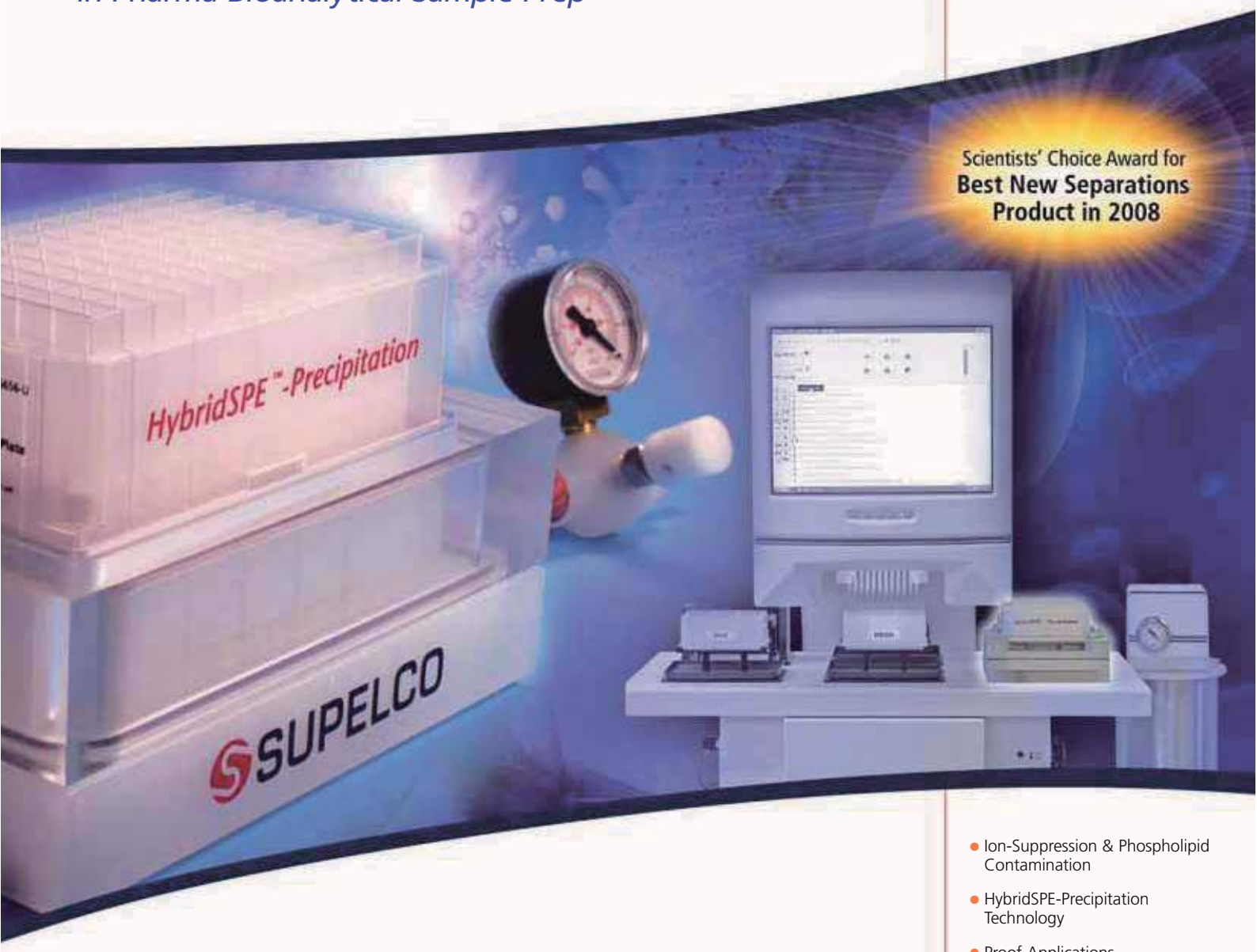
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Ion-Suppression & Phospholipid Contamination

In pharmaceutical bioanalysis, researchers develop and run various assays to quantitate drugs, pharmaceutical candidates, and their metabolites in biological fluids such as serum or plasma. The data resulting from these assays are used to help determine the pharmacodynamic and pharmacokinetic properties as well as the toxic and therapeutic concentrations of existing and emerging pharmaceutical compounds. Although advances in LC-MS technology have reaped overwhelming benefits in terms of increased throughput and sensitivity, good sample preparation continues to be a critical component of bioanalysis.

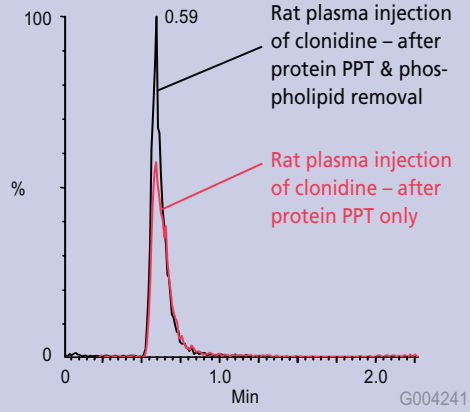
Phospholipids & Ion-Suppression

Excessive background from endogenous matrix components has always been a greater concern in bioanalysis, and has become paramount with decreasing analytical run times. In bioanalytical mass spectrometry, the issue of excessive background contributes to the growing problem of ion-suppression.

Ion-suppression is caused by one or more interfering components or species that co-elute with analyte(s) of interest during LC-MS analysis and manifests itself as a loss of analyte response. These co-eluting species can affect droplet formation or ionize concurrently resulting in an erroneous decrease (suppression) or increase (enhancement) in signal-response. The end result is poor assay reproducibility, accuracy, and sensitivity. Such deleterious effects are often most notable at the lower limits of quantiation (LLOQ).

One of the major causes of ion-suppression in bioanalysis is the presence of phospholipids during LC-MS analysis in the positive ion electrospray mode (+ESI). Phospholipids are prevalent in extremely high concentrations in blood based biological fluids (~1 mg/mL); and represent the second largest lipid component in biological matrices after triglycerides. Figure 1 compares the LC-MS chromatograms of two clonidine spiked rat plasma samples processed by standard protein precipitation alone and protein precipitation followed by phospholipid removal. When standard protein precipitation was employed, severe signal suppression of clonidine was evident. In contrast, by removing phospholipid interferences prior to analysis, response for clonidine was nearly doubled.

Figure 1. Phospholipid Effect on Ionization of Clonidine



Why are Phospholipids Difficult to Remove During Sample Prep?

When processing plasma/serum samples for LC-MS, the three most common sample prep techniques are protein precipitation (protein ppt), liquid-liquid extraction (LLE), and solid phase extraction (SPE). Each technique offers unique advantages that are considered during the method development process. For example, protein ppt methods are simple (2-3 steps), fast, and often require no method development. However, the technique offers minimal selectivity as it only removes gross levels of protein from the sample prior to analysis. In contrast, SPE offers significant benefits in terms of selectivity/sample cleanup, but the technique requires moderate to extensive levels of expertise and time for adequate method development. In addition, SPE often requires multiple steps (5-8) resulting in increased assay time.

Due to the nature of phospholipids, none of the mainstream sample prep techniques (protein ppt, LLE, and SPE) offer the proper selectivity to distinguish phospholipids from analytes of interest. Figure 2 describes this phenomenon.

Figure 2. Phospholipids Co-Extract with Analytes of Interest when Using Traditional Sample Prep Techniques

Protein PPT – No phospholipid removal

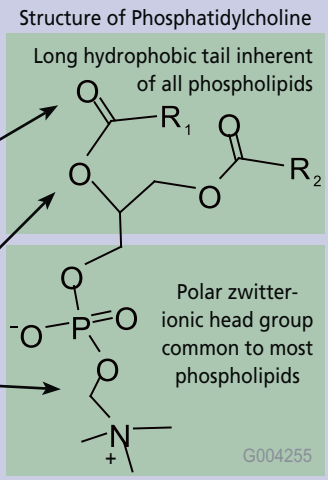
- Will only remove gross levels of proteins

LLE – No phospholipid removal

- Phospholipids will co-extract with analytes due to hydrophobic tail

SPE – Nominal phospholipid removal

- Reversed-phase – phospholipids will co-extract with analytes due to hydrophobic tail
- Mixed-mode/ion-exchange – phospholipids will co-extract with analytes due to zwitterionic polar head group





HybridSPE-Precipitation Technology

How does HybridSPE-PPT Work?

HybridSPE-PPT technology is a simple and generic sample prep platform designed for the gross level removal of endogenous protein and phospholipid interferences from biological plasma and serum prior to LC-MS or LC-MS-MS analysis. Biological plasma or serum is first subjected to protein precipitation in which biological plasma/serum is first added to the 96-well plate followed by acidified acetonitrile (precipitation agent). An upper PTFE frit impedes premature flow of the sample before vacuum application. After a brief mixing/vortexing step to facilitate protein ppt, vacuum is applied to the 96-well plate. The 96-well version contains a series of low porosity hydrophobic filters/frits. The packed-bed filter/frit assembly acts as a depth filter facilitating the concurrent removal of both phospholipids and precipitated proteins during the extraction process. After the protein-precipitated sample passes through the HybridSPE-PPT device, the resulting eluent is ready for immediate LC-MS or LC-MS-MS analysis, see Figure 3 for the recommended method.

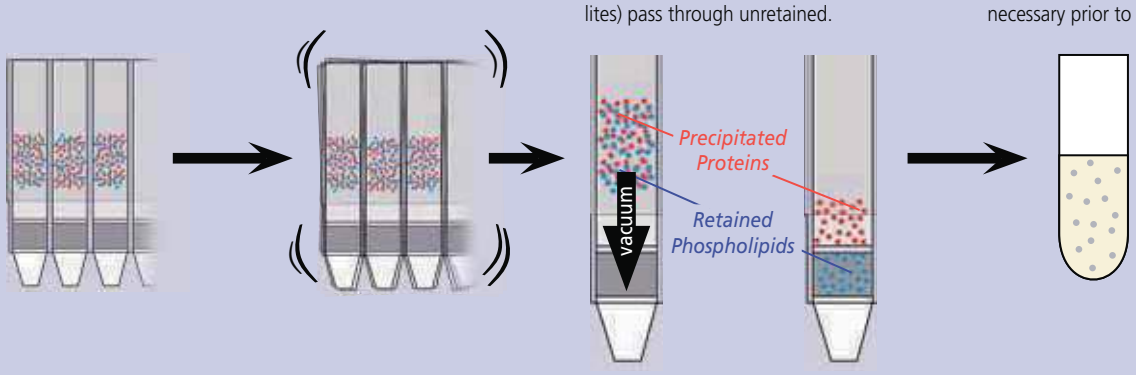
Figure 3. "In-well" Precipitation Procedure using HybridSPE-PPT 96-well Format

1) Precipitate Proteins by adding 100 µL plasma or serum to the HybridSPE-PPT plate followed by 300 µL 1% formic acid in acetonitrile. Add I.S. as necessary.

2) Mix by vortexing/shaking HybridSPE-PPT plate or by aspirating/dispensing with 0.5-1 mL pipette tip (e.g., TOMTEC Quadra liquid handler)

3) Apply vacuum. The packed-bed filter/frit assembly acts as a depth filter for the concurrent physical removal of precipitated proteins and chemical removal phospholipids. Small molecules (e.g., pharma compounds and metabolites) pass through unretained.

4) Resulting filtrate/eluate is free of proteins and phospholipids and ready for immediate LC-MS-MS analysis; or it can be evaporated and reconstituted as necessary prior to analysis.



Note: The 1 mL HybridSPE-PPT cartridge version does not contain the necessary filters to remove precipitated proteins. As a result, protein precipitation must be conducted outside the cartridge followed by a centrifugation or filtration step prior to HybridSPE processing. The resulting supernatant/filtrate is then loaded onto HybridSPE-PPT cartridge for phospholipid removal.

HybridSPE-PPT Feature	HybridSPE-PPT Benefit
2-3 Step Procedure (like standard protein ppt)	Save Time & Increase Throughput
Generic Methodology	Save Time & Headache during Method Development
100% Phospholipid & Precipitated Protein Removal	Reduce Ion-Suppression& Improve Assay Sensitivity
Fast Flow Rates	Robust Methodology & Faster Sample Prep
Available in Cartridge & 96-well Dimensions	Amenable to Automation
Patent Pending Technology	New and Unique Approach to Sample Prep
Low Price (less expensive than traditional SPE)	Save Money While Improving Data Quality

Abbreviation Glossary:
I.S. - Internal Standard; **LLE** - Liquid Liquid Extraction; **LLOQ** - Lower Limit of Quantitation; **PPT** - Precipitation; **SPE** - Solid Phase Extraction

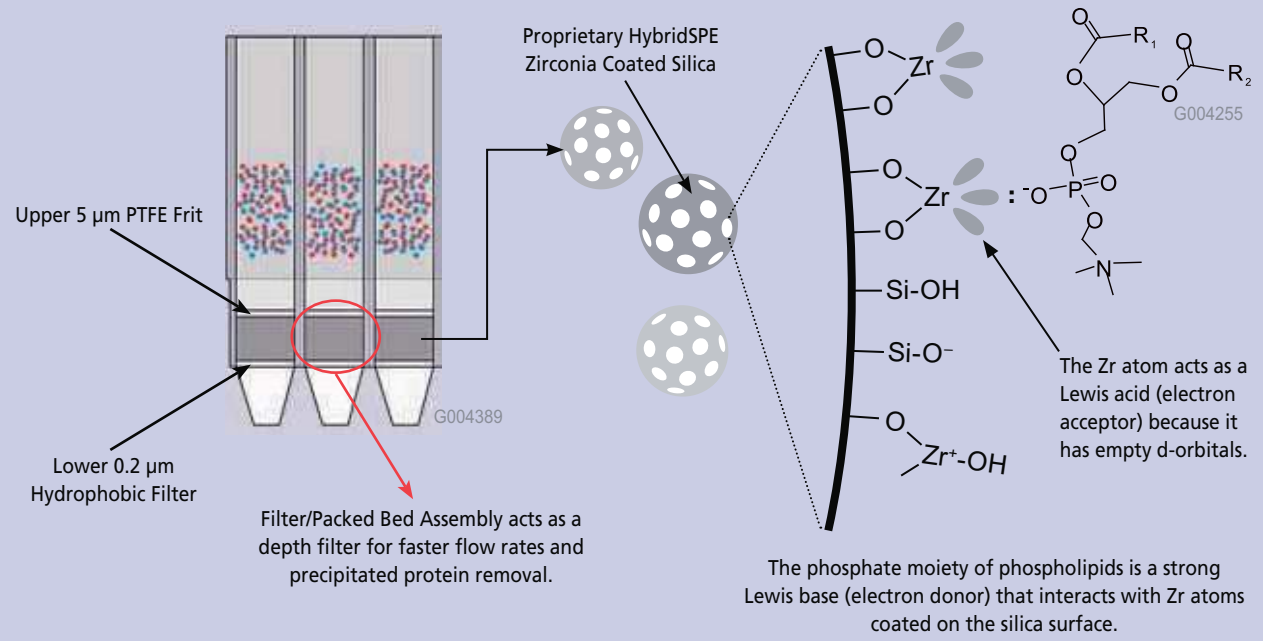
TRADEMARKS:
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How are Phospholipids Removed?

Once the plasma/serum sample is subjected to protein precipitation via the addition of acetonitrile (containing 1% formic acid), it is passed through the HybridSPE-PPT packed bed. The packed bed consists of proprietary zirconia coated silica particles. The zirconia sites exhibit Lewis acid (electron acceptor) properties that will interact strongly with Lewis bases (electron donor). Phospholipids structurally consist of a polar head group (zwitterionic phosphonate moiety) and a large hydrophobic tail (two fatty acyl groups that are hydrophobic). The phosphate group inherent with all phospholipids acts as a very strong Lewis base that will interact strongly with zirconia atoms functionalized on the particle surface (Figure 4). Formic acid is a critical modifier used in the precipitation agent to improve the recovery of many analytes of interest (e.g., acidic compounds). It plays a critical role in preventing analyte retention without affecting phospholipid retention/removal.

Figure 4. HybridSPE-PT 96-well Schematic and Phospholipid Retention Mechanism



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Description	Qty.	Cat. No.
HybridSPE-Precipitation 96-well Plate, 50 mg/well	1	575656-U
HybridSPE-Precipitation 96-well Plate for Small Volume Samples, 15 mg/well	1	52794-U
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96 Square Well Pierceable Cap Mats	25	**575655-U**



Comparison of Sample Prep Techniques

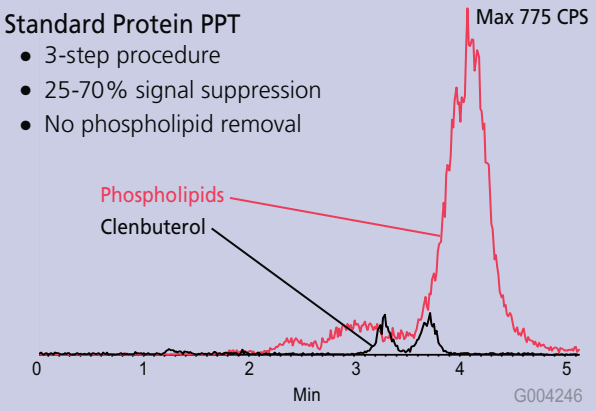
HybridSPE-PPT combines the simplicity of protein precipitation with the selectivity of SPE targeting the specific removal of both phospholipids and precipitated proteins from biological plasma. Both phospholipids and protein represent the two largest contributors of ion-suppression in pharmaceutical bioanalysis. If adequately removed prior to LC-MS, analysts can more easily and quickly achieve targeted LLOQ for most applications. Figure 5 compares standard protein PPT, SPE, and HybridSPE-PPT for the extraction of clenbuterol from plasma.

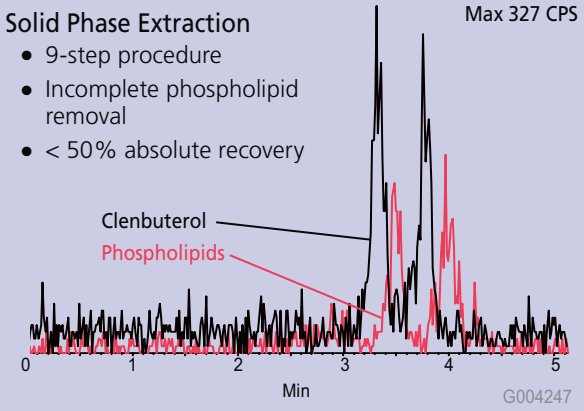
	Std. Protein PPT	HybridSPE-PPT	Solid Phase Extraction
Number of Steps	2-3	2-3	5-8
Time Required	< 10 min.	<10 min.	30-45 min.
Method Development	Generic/Minimal	Generic/Minimal	Moderate/Extensive
Sample Cleanup & Reduction of Ion-Suppression	Minimal	Moderate to High	Moderate to High
Phospholipid Removal	NONE	High	Moderate
Recovery	High	Moderate to High	Moderate to High

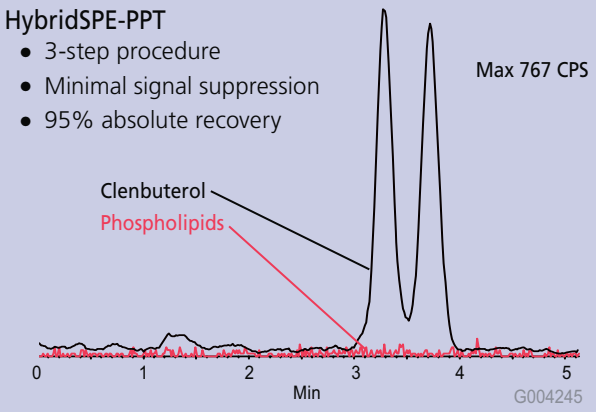
Green = Advantage Red = Disadvantage

Figure 5. Comparative Extraction of 10 ng/mL Clenbuterol (R(-) and S(+) enantiomers) in Rat Plasma

column: CHIROBIOTIC T, 10 cm x 2.1 mm, 5 µm particles
mobile phase: 10 mM ammonium formate:methanol
flow: 300 µL/min.
temp.: 30°C
detector: MS-MRM







Did you know...?

HybridSPE-PPT won the SelectScience.net Scientists' Choice Award for Best New Separations Product in 2008. The award was based on an independent poll of over 25,000 scientists within the SelectScience.net community. The award was announced at PITTCON® 2009 held in Chicago, IL.

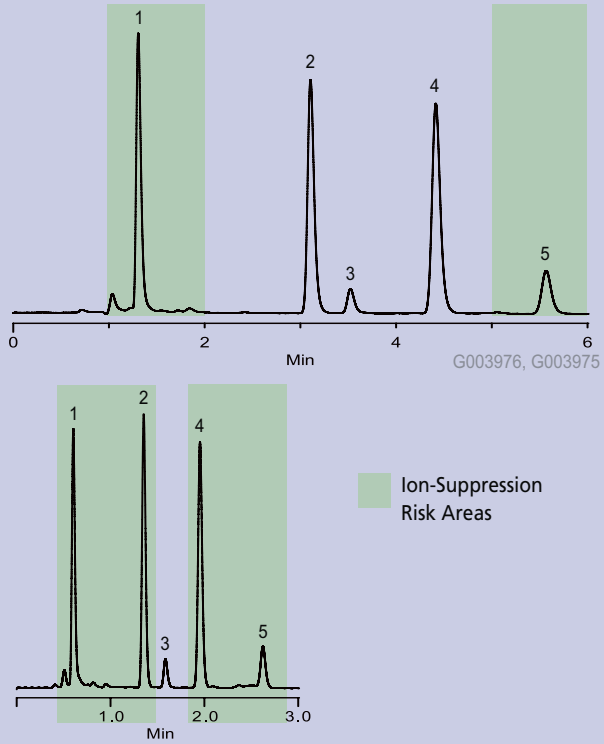




Improve LC-MS Run Time/Performance & Reduce Risk of Ion-Suppression

When analyzing biological samples via reversed-phase LC-MS, ion-suppression often occurs in the early (e.g., salts) and late regions (e.g., phospholipids) of a chromatogram. However, as analysts strive for faster run times (≤ 3 min.), resolving analytes of interest from interfering matrix components becomes a greater challenge (Figure 6).

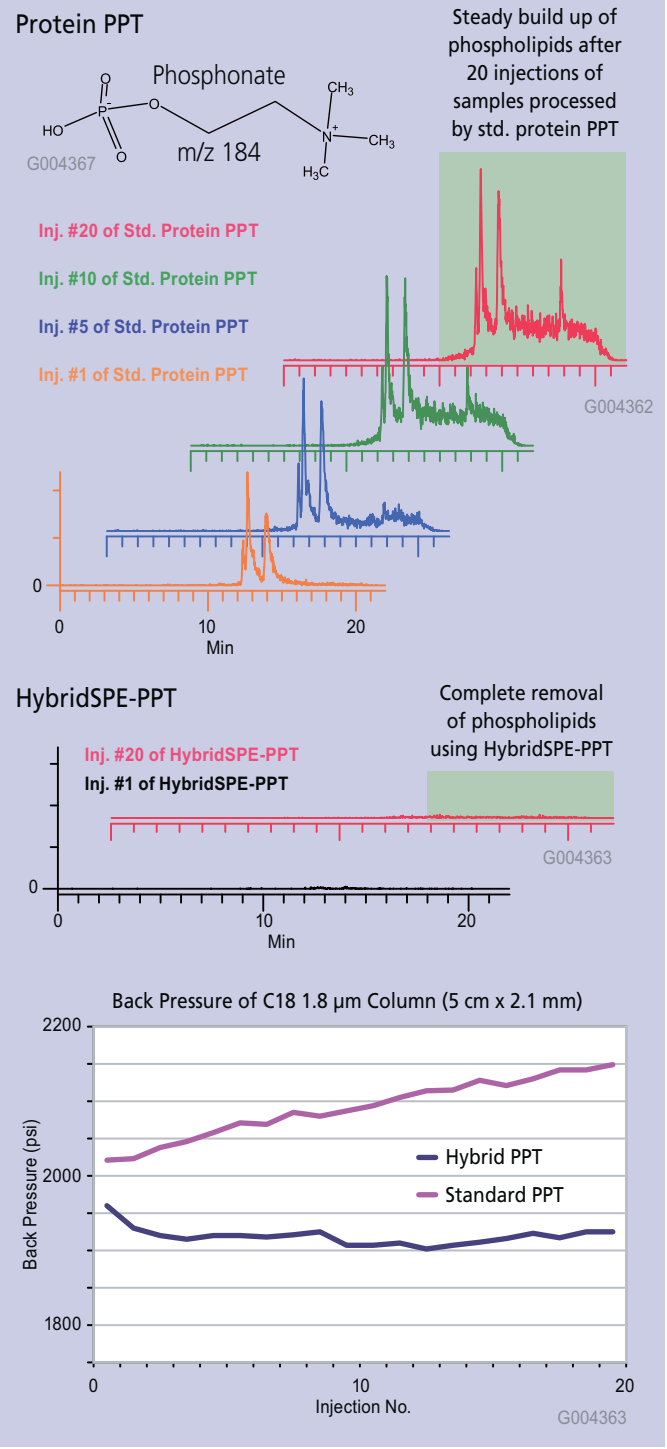
Figure 6. Decreasing LC Run Time Increases Risk of Ion-Suppression



LC Accumulation of Phospholipids

With advances in LC-MS technology, many analysts are decreasing LC run time by incorporating ballistic gradients and sub-2 µm HPLC column particles. When coupled with standard protein ppt (e.g., plasma:acetonitrile, 1:3 v/v), ballistic gradients are often inadequate at purging the column of phospholipids. As a result, phospholipids can build on the column, potentially change LC retention selectivity, and elute uncontrollably downstream in an injection run sequence causing unpredictable ion-suppression effects and poor reproducibility. Figure 7 compares a series of reversed-phase gradient LC-MS injections after standard protein ppt with HybridSPE-PPT in which m/z 184 (phosphonate moiety of phospholipids) is monitored. In addition, sub-2 µm HPLC columns are more prone to clogging than larger particle size columns (2.7-5.0 µm). Unlike traditional protein ppt techniques that use centrifugation to remove precipitated proteins, HybridSPE-PPT 96-well plates contain a series of filters that allows users to concurrently remove proteins and phospholipids reducing LC column backpressure (Figure 7).

Figure 7. Gradient RP LC-MS of Blank Plasma Samples Prepared by Standard Protein PPT vs. HybridSPE-PPT





Reduce Analytical Run Time Using HybridSPE-PPT

When processing plasma samples using standard protein ppt, contaminating phospholipids are strongly retained and do not elute off the column after 10 min. Therefore, shorter run times (e.g., < 5 min.) pose a great risk to on-column phospholipid accumulation/contamination. Gradient conditions are often required to elute phospholipids in a reasonable time frame (Figure 8). Because HybridSPE-PPT depletes phospholipids from the sample, it is not necessary to run long gradient conditions to "wash-off" contaminating phospholipids. We demonstrate the utility of combining HybridSPE-PPT and Ascentis column technology in Figure 9 in which less than 90 second run time was achieved under isocratic conditions. Because HybridSPE-PPT was employed during sample prep, the risk of phospholipid ion-suppression and on-column accumulation was eliminated.

Figure 8. Phospholipid Contamination from Standard Protein PPT Requires Increased Gradient Run Time (> 10 min.)

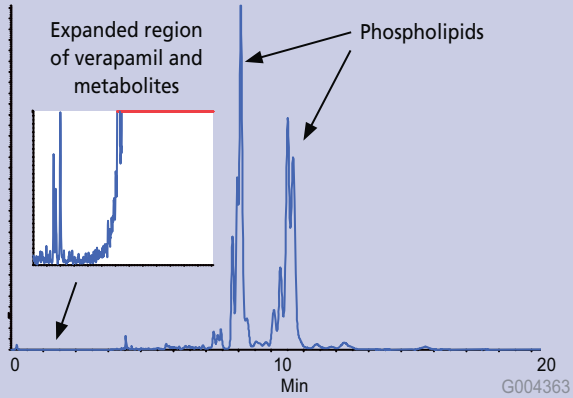
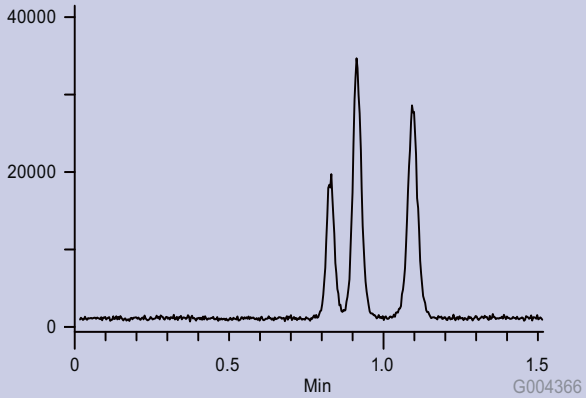


Figure 9. Less than 90 Sec. Run Time Achieved Using Ascentis Express C18 (isocratic) and HybridSPE-PPT for Verapamil and Metabolites in Rat Plasma





From Sample Prep to LC-MS Analysis…

The Perfect Complement of Speed, Selectivity, and Sensitivity for Pharma Bioanalysis

- Increase Sample Prep & LC-MS Speed
- Decrease Sample Prep Method Development Time
- Increase Sensitivity by Reducing Ion-suppression & Increasing LC Efficiency

HybridSPE-PPT Technology

- 2-3 Step generic procedure
- Reduce ion-suppression through phospholipid & protein removal
- Minimal to no method development
- Available in 96-well & 1 mL cartridges

Ascentis® Express HPLC with Fused-Core™ Technology

- Half the back-pressure of sub-2 µm particles
- Twice the efficiency of 3 µm particles
- Increased column ruggedness
- Available in 6 phases for small molecule and peptides



HybridSPE-PPT Method Development: Recovery Optimization

The HybridSPE-PPT stationary phase is comprised of a proprietary patent pending zirconia bonded silica particle. Phospholipids are retained/removed from the sample through a highly selectivity Lewis acid-base interaction between the phosphate group (Lewis base), inherent of all phospholipids, and Zr atoms bonded to the HybridSPE silica surface.

The precipitation agents recommended for HybridSPE-PPT is comprised of two parts:

1) an aqueous miscible organic solvent (e.g., MeCN or MeOH) that denatures protein into a precipitant
2) a modifier (formic acid, ammonium formate, or citric acid) that inhibits analyte(s) of interest from co-retaining with phospholipids on the Zr-Si HybridSPE stationary phase, potentially resulting in low recovery

Relative Retention Strength of Lewis Bases to Zirconia

Lewis Base	Relative Retention Strength on Zirconia
Hydroxide	Strongest
Phosphate	
Fluoride	
Citrate	
Sulfate	
Acetate	
Formate	
Chloride	Weakest

When developing new HybridSPE-PPT methods, there are three precipitation agents that we recommend for researchers to screen when optimizing analyte recovery.

96-well Primary Method (Formic Acid Modifier):

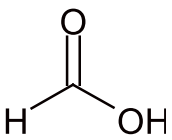
Recommended for most applications (basic, neutral, acidic compounds) – amenable for most (80%) applications

1. To each well, add 100 µL plasma followed by 300 µL **1% formic acid in MeCN**
2. Mix the sample well (e.g., vortex for 1 min.)
3. Apply vacuum and collect the resulting eluent for LC-MS analysis

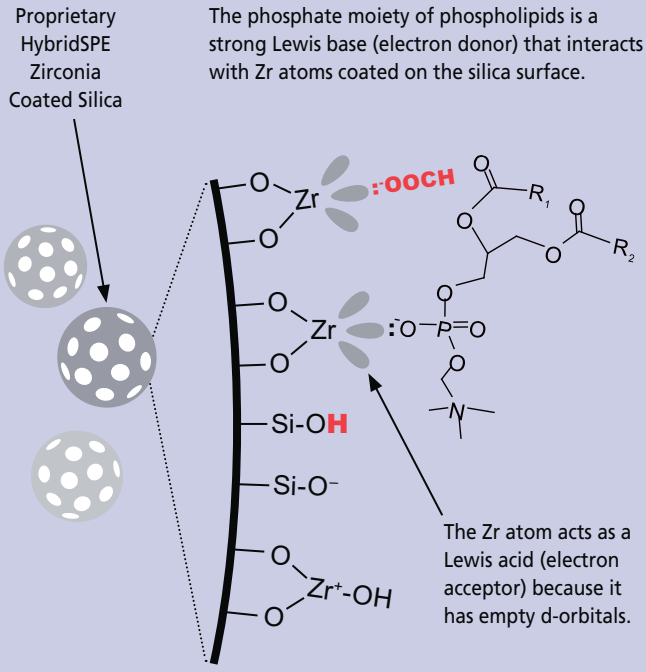
If low recovery is observed, proceed to Secondary Procedures. An alternative option is to screen both the primary and secondary procedures concurrently during initial method development.

- Formate ion (**$HCOO^-$**) is a strong enough Lewis base to inhibit most acidic compounds from interacting with Zr sites, improving recovery of acidic compounds

Fomic Acid



- **H^+** derived from formic acid neutralizes silanol groups (Si-O- => Si-OH), minimizing potential secondary weak cation exchange (WCX) interactions of basic compounds improving analyte





96-well Secondary Method (Basic & Neutral Compounds):

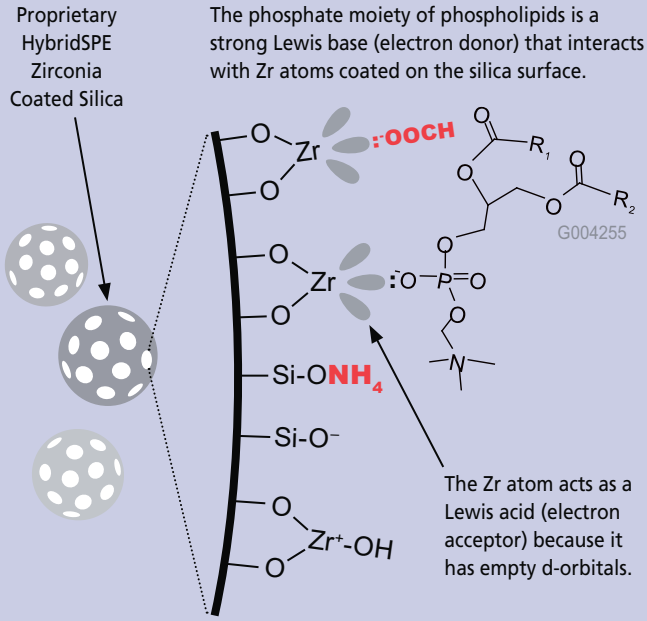
Recommended for low recovery basic & neutral compounds

1. To each well, add 100 µL plasma followed by 300 µL **1% ammonium formate in MeOH**
2. Mix the sample thoroughly (e.g., vortex for 1 min.)
3. Apply vacuum and collect the resulting eluent for LC-MS analysis

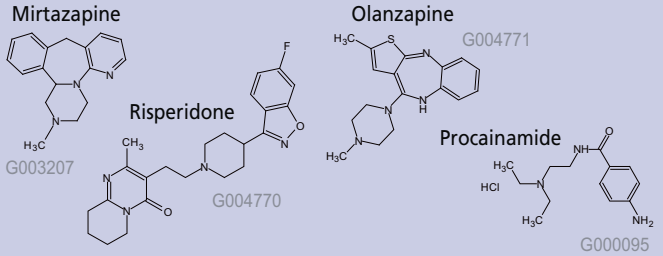
Ammonium Formate

$[NH_4]^+$ $[HCOO]^-$

- Methanol combined with ammonium formate is a powerful protein precipitation agent, providing precipitants similar in consistency to acetonitrile protein precipitation
- Formate ion (**HCOO**$^-$) is a strong enough Lewis base to inhibit most acidic compounds from interacting with Zr sites, improving recovery of acidic compounds
- **NH_4^+** is a stronger counter-ion than H^+, able to inhibit a wider range of basic compounds from interacting with exposed silanol groups



Examples of Basic Compounds that require the Secondary Method (Methanol with 1% Ammonium Formate):

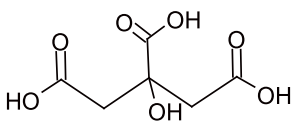


96-well Secondary Method (Chelator & Acidic Chelator Compounds):

Recommended for low recovery chelator & acidic chelator compounds

1. Condition each well with 400 µL **0.5% citric acid in acetonitrile**
2. To each well, add 100 µL plasma followed by 300 µL **0.5% citric acid in acetonitrile**
3. Apply vacuum and collect the resulting eluent for LC-MS analysis

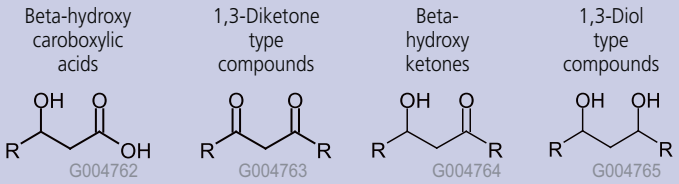
Citric Acid



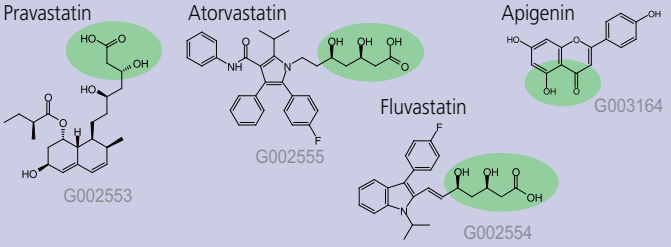
- **Citrate ion** (citric acid) is a stronger Lewis base than formate, inhibiting most chelator compounds from interacting with Zr ions on the HybridSPE stationary phase
- Note that citrate is not strong enough to disrupt phosphate (phospholipid) binding

Low Recovery Chelation Functional Groups with Example Compounds

Chelation functional groups that can lead to low HybridSPE-PPT recovery and may require citric acid secondary procedure:

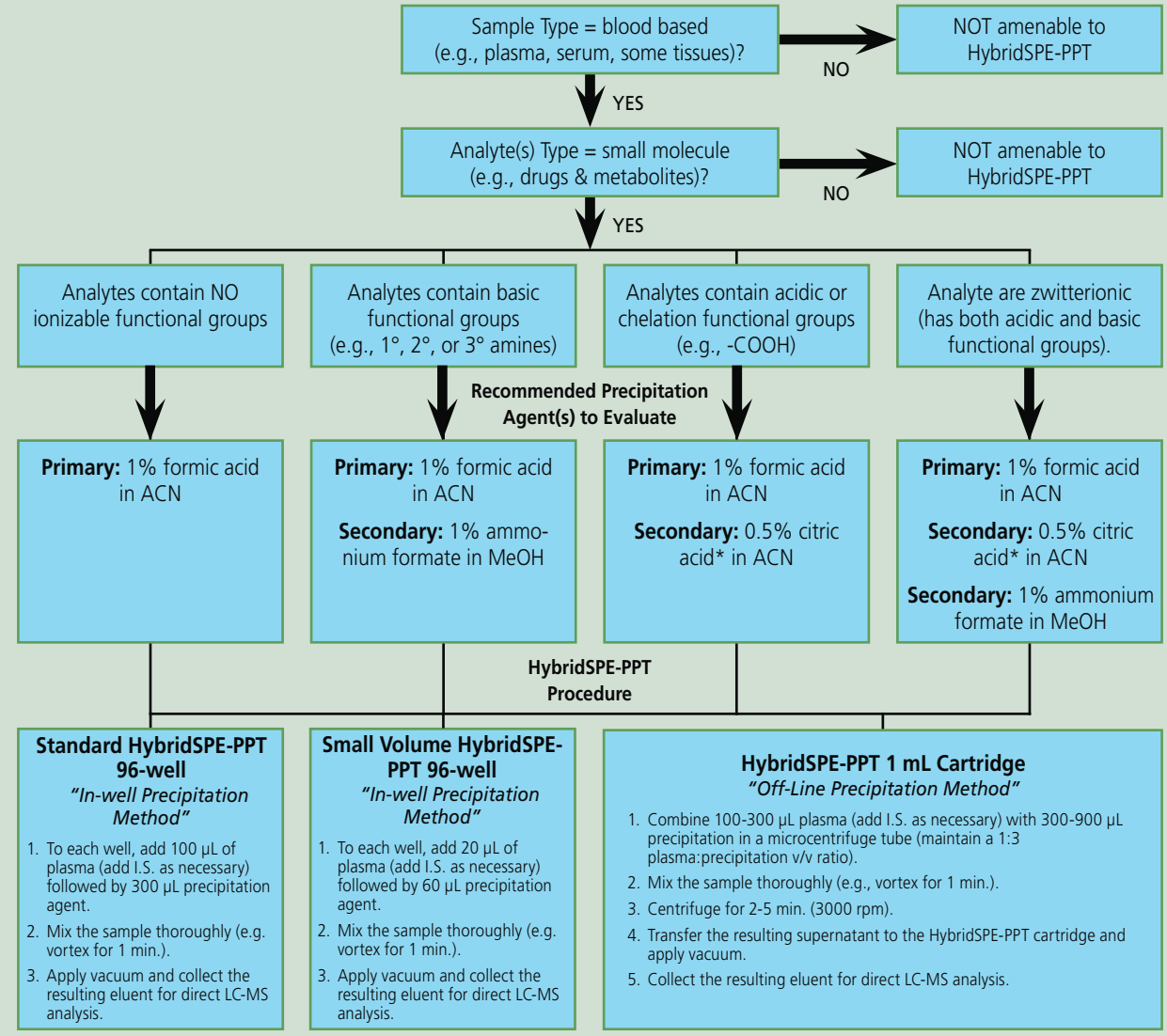


Example compounds with chelation functional groups:





HybridSPE-PPT Method Development (Recovery Optimization) Flow Chart



* Note: When 0.5% citric acid in ACN is employed as the precipitation agent, the HybridSPE-PPT phase (96-well or 1 mL cartridge) should be conditioned with 400 µL 0.5% citric acid in ACN prior to sample addition.

Troubleshooting & Frequently Asked Questions

Can I use HybridSPE-PPT with smaller plasma volumes (e.g., 20-40 µL plasma)?

Yes. The HybridSPE-PPT Small Volume plate (52794-U) is designed for processing plasma/serum volumes between 20-40 µL. Larger sample volumes of 100-300 µL should be processed on the standard HybridSPE-PPT plate (575656-U).

Why is acetonitrile and formic acid used as a precipitating agent in the HybridSPE-PPT method?

Acetonitrile is a commonly used protein precipitation agent when prepping plasma samples for LC-MS analysis. The resulting precipitated protein is easily filtered using the "In-well Precipitation" method and forms protein pellets easily removed when centrifugation ("Off-Line Precipitation" method – required for HybridSPE-PPT 1 mL cartridge format) is preferred.

The addition of 1-2% formic acid to the acetonitrile precipitating agent is critical because: 1) formic acid is a stronger Lewis base than most carboxyl (-COOH) groups found in acidic pharmaceutical compounds (inhibiting analyte retention on the HybridSPE phase) but not



as strong a Lewis base as the phosphate moiety found in phospholipids; and 2) the low pH environment neutralizes residual silanol activity on the silica surface, thereby eliminating secondary cation-exchange interaction with basic compounds of interest.

What if my analyte(s) of interest are not soluble in acetonitrile?

Although some analytes may not be soluble in acetonitrile, after protein precipitation, the HybridSPE eluent will consist of 75% acetonitrile (w/ formic acid) and 25% aqueous (from the biological sample). The aqueous content of the sample should provide adequate solubility prior to LC-MS analysis.

Alternatively, 1% ammonium formate in methanol may be used in place of 1% formic acid in acetonitrile. Ammonium formate in methanol provides increased solubility of polar compounds and precipitates proteins as well as acetonitrile allowing for both "Off-Line" and "In-well" precipitation methods.

Can I increase assay sensitivity by either increasing sample volume and/or concentrating (evaporation and reconstitution) of the HybridSPE eluent?

Biological sample volumes of >300 µL can be applied; however, some phospholipid breakthrough may occur with analytes of interest. 98-100% of biological phospholipids are removed when <300 µL plasma is applied to the HybridSPE phase. When increasing sample volume, be sure to increase the volume of the precipitating agent accordingly. A 1:3 (v/v) plasma: precipitating agent ratio is necessary for optimal performance.

Another strategy for increasing sensitivity is through evaporation of the HybridSPE eluent, followed by reconstitution in a smaller volume of LC-MS mobile phase. The acetonitrile portion of the HybridSPE eluent greatly aids the evaporation process. On average it takes less than 10 minutes to evaporate 300-400 µL of HybridSPE eluent under nitrogen at 37 °C.

Why can ion-suppression still be evident during LC-MS analysis after HybridSPE-PPT?

HybridSPE technology will only remove phospholipids and gross levels of precipitated protein from biological samples. Other chemical entities common to biological samples can lead to ion-suppression if not removed prior to LC-MS-MS analysis. It is important to identify the ion-suppression causing component to facilitate troubleshooting. It may be necessary to adjust chromatographic conditions to separate analytes of interest from interfering matrix components.

Examples of non-phospholipid chemicals that can lead to ion-suppression include:

- sodium citrate which is an anti-coagulant used to prepare plasma from blood
- phthalates, plasticizers and other mold release agents found in plastic ware
- polyethylene glycol which is a common dosing vehicle for many drugs
- extractables from o-rings, plastic ware, and seals used to store biological samples

Why is the resulting HybridSPE-PPT eluent lower in volume than what was applied to the HybridSPE packed bed? What are the effects of conditioning the phase?

The dead volume for the HybridSPE packed bed is ~80 µL. Also, there is an evaporation effect on the eluent when using a vacuum manifold. When applying -15 in Hg vacuum to the HybridSPE plate for 3 min. (time taken to pass the sample through the well plate), 10-20 µL of the volume of the SPE eluent can be lost due to evaporation during processing. Therefore, when processing a 400 µL precipitated sample (100 µL plasma + 300 µL precipitating agent) through the unconditioned HybridSPE phase, the resulting eluent will be a volume of ~300 µL. Although the volume is reduced during SPE processing, the final analyte concentration of the eluent does not appear to be affected. Nevertheless, addition of an I.S. is recommended prior to HybridSPE processing (which is standard for most sample prep techniques). If the analyst chooses to condition the HybridSPE phase with >80 µL of solution prior to sample addition, there could be a dilution effect. The final eluent volume will be ~80 µL greater than it should be. As a result, absolute recovery will appear lower than it actually is. If an increase in signal response is necessary during LC-MS analysis, we recommend evaporating the eluent and reconstituting in a smaller known volume of LC mobile phase prior to LC-MS analysis.

Why am I experiencing absolute recovery values > 100%?

The resulting HybridSPE eluate contains acetonitrile (volatile solvent). After the precipitated sample completely passes through the HybridSPE packed bed, the vacuum should be disengaged immediately. Further vacuum application can evaporate the eluate, thereby erroneously giving misleadingly high analyte responses during subsequent LC-MS analysis.

To learn more, visit ***sigma-aldrich.com/hybridspe-ppt***

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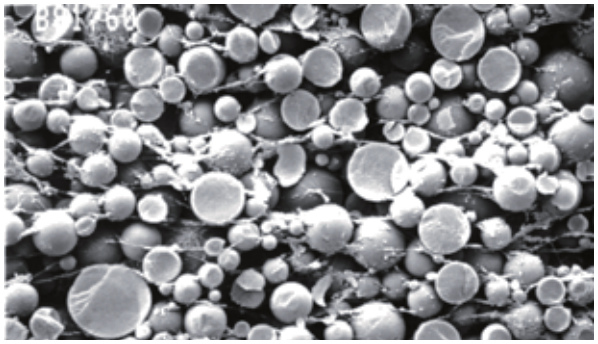
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SUPELCO Analytical

Empore® Solid Phase Extraction (SPE) Products

Empore membrane SPE technology comprises of SPE particles tightly enmeshed within a network of inert PTFE fibrils. The SPE-membrane fabrication process results in a highly dense and uniform extraction medium that offers distinct advantages over traditional sorbent/packed-bed SPE products. Empore SPE technology provides a denser, more uniform extraction bed than traditional packed bed products allowing for smaller bed weights, shorter analyte to pore diffusion paths, and more efficient extractions.



E001071

Microscopic View of Empore SPE Disks comprised of 90% SPE particles: 10% PTFE, by weight

Save Time & Money with Empore SPE

Reduced SPE bed mass = Reduced SPE solvent & elution volumes

- Minimizes SPE eluate evaporation time
- Potentially allows for direct injection of the SPE eluate

Dense & uniform extraction medium = NO SPE channeling/voiding

- Efficient mass-transfer kinetics allow for faster flow rates
- Eliminate SPE fines improving column and instrument life

Cartridge Dimension	Bed Vol.	Conditioning[1]	Elution[2]
Empore 7 mm (12 mg)/3 mL cartiridge	50 µL	200-250 µL	100-150 µL
Traditional 500 mg/6 mL packed bed	60 µL	2400-3000 µL	1200-1800 µL
Traditional 100 mg/1 mL packed bed	120 µL	480-600 µL	240-360 µL

[1] Conditioning typically requires 4-5 x bed volumes.

[2] Elution typically requires 2-3 x bed volumes

Available Formats:



E001070



E001069



E001068

The Empore 96-well line is ideal for high throughput SPE allowing users to process up to 96 samples in parallel. The unique Empore technology comprises of a series of polypropylene (PP) pre-filters that are layered on top of the SPE disk. The PP pre-filter acts as a depth filter that provides faster flow rates and reduces the risk of clogging.

- Reduced elution volume (< 100 µL) allows for direct injection or reduced eluate evaporation
- Faster flow rates without risk of recovery and reproducibility loss
- Proprietary pre-filter reduces risk of clogging
- Patented luer tip collar eliminates potential cross-contamination

The Empore SPE disk line comprises of the most complete line of SPE disks for extracting large volumes of aqueous samples. The product line ranges from time-tested C18 to unique phase chemistries such as carbon and the highly polar oil & grease disk. The disks are ideal for environmental analysis where 1 L sample volumes are not uncommon and provide an efficient alternative to liquid-liquid extraction (LLE).

- Amenable to dozens of EPA and related environmental methods
- Developed for the highly efficient extraction of pollutants in large volume water samples

The Empore SPE cartridge line is packed with a PTFE membrane enmeshed with SPE particles. Layered above the SPE membrane is a polypropylene pre-filter to prevent particulates from reaching the underlying membrane. The dense particle packing and uniform distribution within the Empore membane offers outstanding extraction efficiency and reproducibility.



SUPELCO® Analytical

Ordering Information:

Description	Dimension	Pkg. Qty.	Cat. No.
Cartridges			
Empore C18-SD (Standard Density)	4 mm/1 mL	100	**66871-U**
Empore C18-SD (Standard Density)	7 mm/3 mL	50	**66872-U**
Empore C18-SD (Standard Density)	10 mm/6 mL	30	**66873-U**
Empore UR-SD (Universal Resin)	7 mm/3 mL	50	**66874-U**
96-well			
Empore C18	5.5 mm/1.2 mL well	1	**66875-U**
Empore UR (Universal Resin)	5.5 mm/1.2 mL well	1	**66877-U**
Empore MPC (Mixed Phase Cation)	5.5 mm/1.2 mL well	1	**66876-U**
Empore Filter Plate	5.5 mm/1.2 mL well	1	**66878-U**
Disks			
Empore C18 Octadecyl	47 mm	20	**66883-U**
Empore C8 Octyl	47 mm	20	**66882-U**
Empore Oil and Grease	47 mm	20	**66887-U**
Empore Oil and Grease	90 mm	10	**66898-U**
Empore Styrene Divinyl Benzene (SDB-RPS)	47 mm	20	**66886-U**
Empore Styrene Divinyl Benzene (SDB-XC)	47 mm	20	**66884-U**
Empore Cation	47 mm	20	**66889-U**
Empore Anion-SR	47 mm	20	**66888-U**
Empore Chelating	47 mm	20	**66894-U**
Empore Carbon	47 mm	20	**66896-U**
Accessories			
Empore 96-well Vacuum Manifold		1	**66879-U**
Empore Filter Aid 400		1	**66897-U**
Empore Sealing Tape for 96-well		10 pads (25 sheets/pad)	**66881-U**

For more information, visit ***sigma-aldrich.com/empore***

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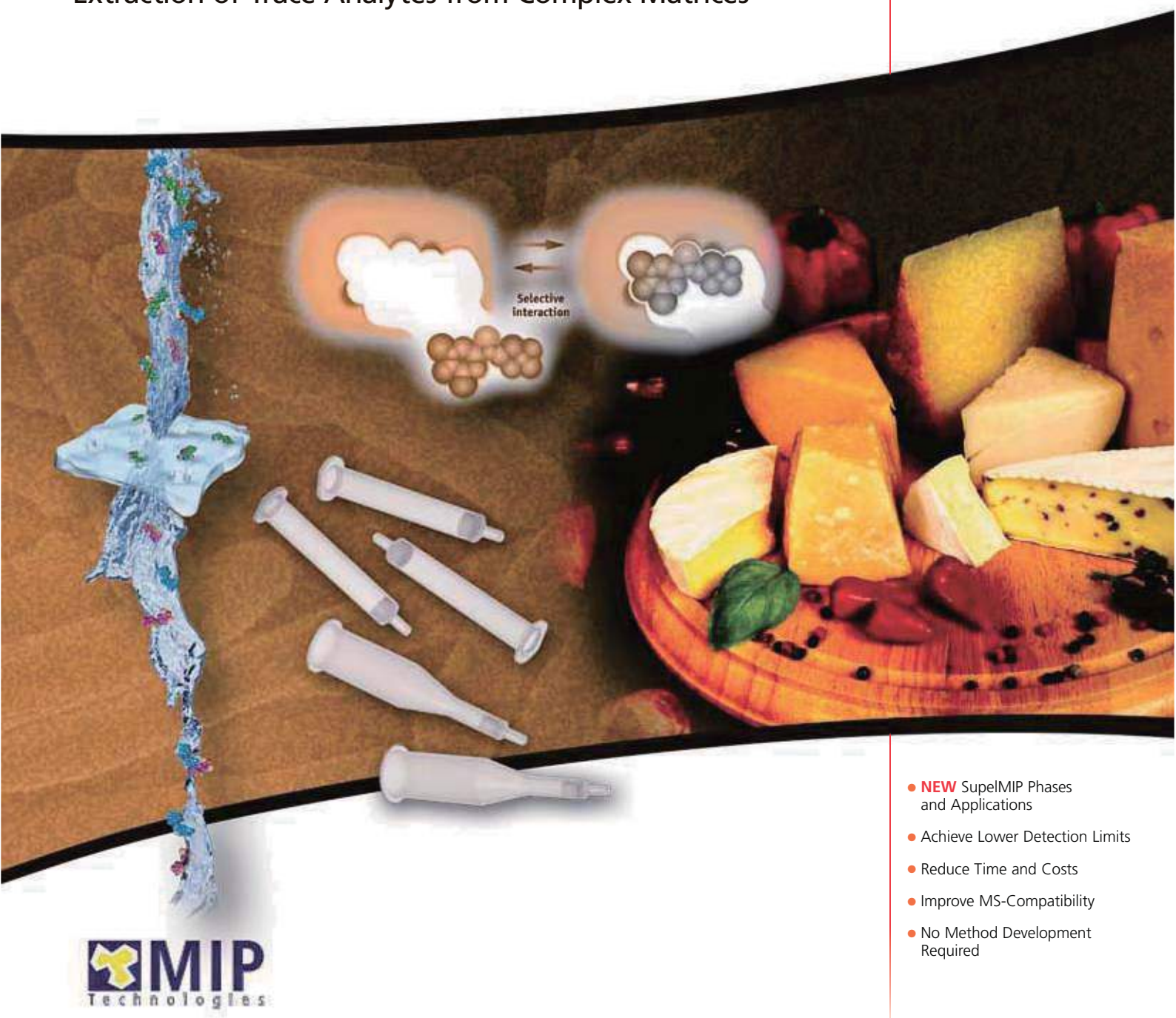
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SUPELCO® Analytical

SupelMIP™ Solid Phase Extraction

Molecularly Imprinted Polymers for the Highly Selective Extraction of Trace Analytes from Complex Matrices



MIP Technologies

- **NEW** SupelMIP Phases and Applications
- Achieve Lower Detection Limits
- Reduce Time and Costs
- Improve MS-Compatibility
- No Method Development Required

Supelco Partners with MIP Technologies AB

MIP Technologies AB, Lund, Sweden, is a world leading company in the development of molecularly imprinted polymers (MIPs). The company is a pioneer in the commercial applications of MIPs, holds important patents, and maintains cutting-edge research activities in the area. The company's mission is to provide innovative products based on molecularly imprinted polymers that serve industry's needs in analytical, preparative and process scale 'selective separations'.

Supelco and MIP Technologies has entered in a collaborative agreement in which, as of December 2006, Supelco has assumed the exclusive global distribution of MIP Technologies' patent protected molecularly imprinted polymers for sample preparation, analytical, and preparative applications. The companies will collaborate on the development of new products while MIP Technologies will continue to separately develop its process scale separations business.



Supelco, Bellefonte, PA, USA MIP Technologies AB, Lund, Sweden

"With molecularly imprinted polymer technology, analysts can reach a level of sample prep extraction selectivity that could not be achieved by conventional means. With the widespread advent of mass spec technology, more and more methods are requiring lower limits of quantitation when analyzing difficult and dirty sample matrices. Improvements in selectivity during sample preparation are absolutely critical," said An Trinh, Product Manager, Supelco.

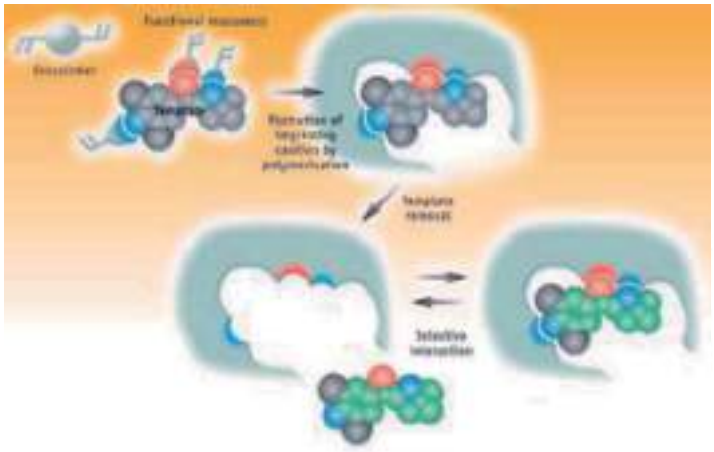
"By merging the strengths of both organizations in this collaborative effort, a new generation of innovative molecularly imprinted polymers and applications will emerge."

What are Molecularly Imprinted Polymers?

Molecularly imprinted polymers (MIPs) are a class of highly cross-linked polymer-based molecular recognition elements engineered to bind one target compound or a class of structurally related target compounds with high selectivity. Selectivity is introduced during MIP synthesis in which a template molecule, designed to mimic the analyte, guide the formation of specific cavities or imprints that are sterically and chemically complementary to the target analyte(s).

As illustrated in Figure 1, MIPs are prepared by first mixing a template molecule that consists of a structural analog of the analyte(s) of interest with one or more functional monomers. The monomers form spontaneous complexes around the template. Upon complex formation, cross-linking monomers are then added with a suitable porogen (solvent that aids in the role in pore formation) to drive polymerization. An extensive wash procedure is used to remove the template from the polymer, leaving imprints or binding sites that are sterically and chemically complementary to the template.

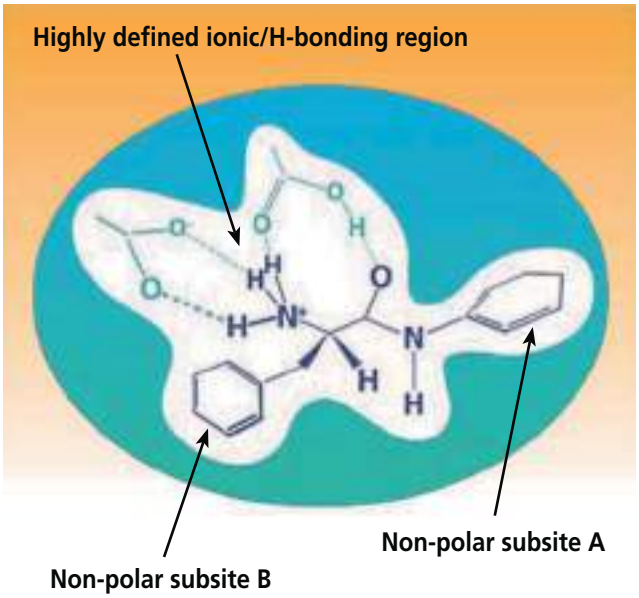
Figure 1. Formation of MIPs



SupelMIP is a trademark of Sigma-Aldrich Biotechnology LP., Inc. SupelMIPs have been developed by MIP Technologies AB.

How is Selectivity Improved Using SupelMIP SPE?

Figure 2. Visual Depiction of a Typical MIP Binding Site

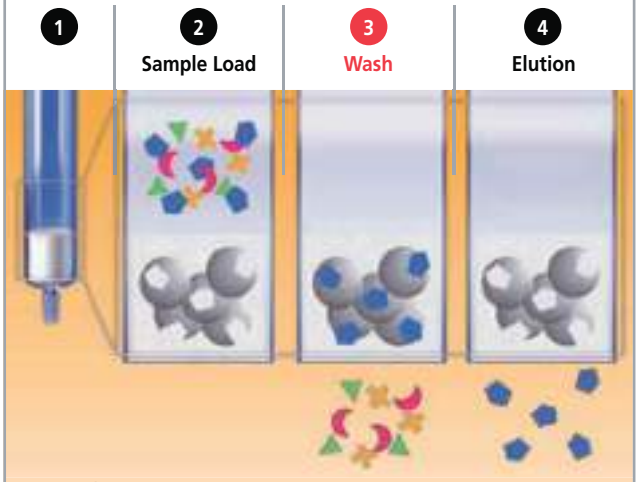


By careful design of the imprinting site, either by molecular modeling, experimental design, or screening methods, the binding cavities can be engineered to offer multiple interactions with the analyte(s) of interest (Figure 2). Multiple non-covalent interaction points (ion-exchange, reversed-phase with polymer backbone, and hydrogen bonding) between the MIP phase and analyte functional groups allow for stronger and more specific analyte retention. Improved selectivity is then introduced through the use of harsher wash conditions during sample prep methodology (Figure 3). Because extraction selectivity is significantly improved, lower background is observed allowing analysts to achieve lower detection limits relative to other less selective sample prep techniques (Table 1).

Did you know?

Did you know that SupelMIP SPE scored perfectly (z-score of 0) for the FAPAS (Food Analysis Perfomance Assessment Scheme) proficiency test for chloramphenicol in prawns? FAPAS is the largest international analytical proficiency testing program since 1990. See the press release at ***sigma-aldrich.com/supelmip*** for more information.

Figure 3. Overview of a Typical SupelMIP SPE Procedure



1. Condition and equilibrate SupelMIP SPE
2. Sample Load
3. Application of a series of vigorous wash steps that will selectively retain analyte(s) of interest but elute interfering components
4. Analyte elution

Table 1. Relative Selectivity of Various Sample Prep Techniques

Non-Selective	**Dirty Extracts**
Protein Precipitation	
Liquid-Liquid Extraction	
Hydrophobic Resin SPE	
Supported LLE	
C18-C2 Silica Based SPE	
Mixed-Mode SPE	
SupelMIP SPE	
Highly Selective	**Clean Extracts (Lower LODs/ LOQs)**

Key Features & Benefits of SupelMIP:

Achieve lower detection limits through superior selectivity	*Reduce ion-suppression*	*Save time and reduce cost via robust and rapid methodology*	*Minimal to no method development required*	*Stable at broad pH ranges and high temperatures*	*Stringent quality control conditions*

Achieving Lower Detection Limits Through Superior Selectivity

Chloramphenicol is a broad spectrum antiobiotic that has recently been determined as a causative agent of aplastic anemia and possible carcinogen in humans. Because of these health concerns, the EU, US and Canada have banned the use of chloramphenicol in food-producing animals and live stock.

In this application, the extraction of 15 ng/mL of chloramphenicol from milk using a SupelMIP SPE – Chloramphenicol cartridge was compared against a published method using a conventional hydrophilic polymer SPE phase (P.A. Guy et al. in J. Chromatogr. A 1054 (2004) 365-371). Note that unlike the SupelMIP SPE – Chloramphenicol protocol (included with the product), the conventional polymer method required a protein precipitation/filtration and three liquid-liquid extraction steps in addition to SPE cleanup. Using the SupelMIP SPE – Chloramphenicol phase, the total sample handling time is significantly reduced.

In Figure 4, we see that LC-MS signal/noise ratio for the hydrophilic polymer SPE method was double that of the SupelMIP ion-chromatograms (320-323 m/z range); and blank milk samples processed using the SupelMIP were free of interfering responses in the elution area of chloramphenicol. In Figure 5, a significantly cleaner mass spectra is observed for the SupelMIP SPE extract relative to the conventional hydrophilic polymer extract.

For additional information regarding this application, please refer to Supelco Reporter 25.1; or European Reporter, Issue 26, May 2007, available at ***sigma-aldrich.com/supelmip***

Figure 4. Chloramphenicol Spiked Milk Samples Extracted on SupelMIP SPE vs. Conventional Hydrophilic Polymer SPE

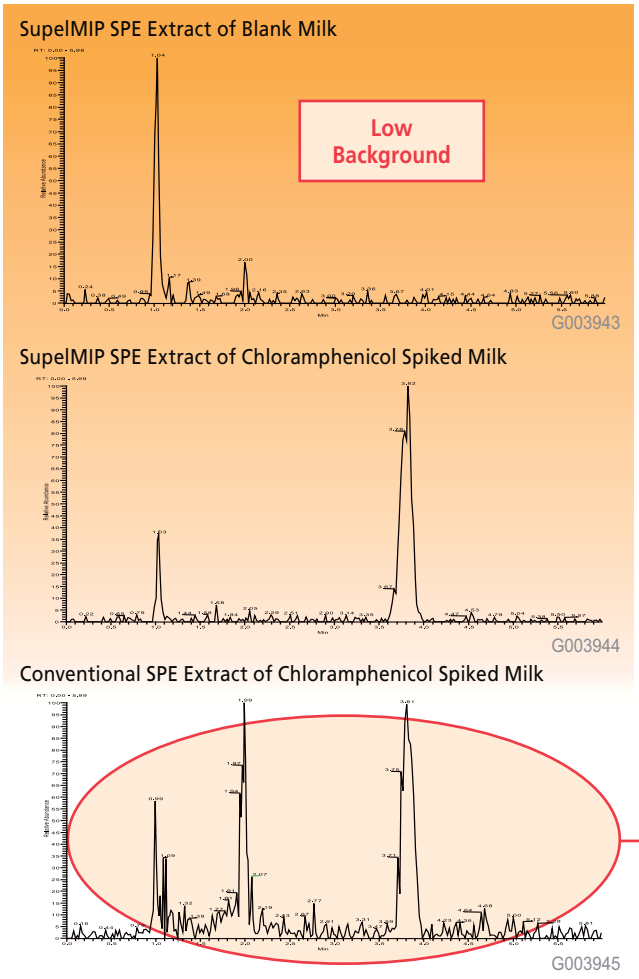
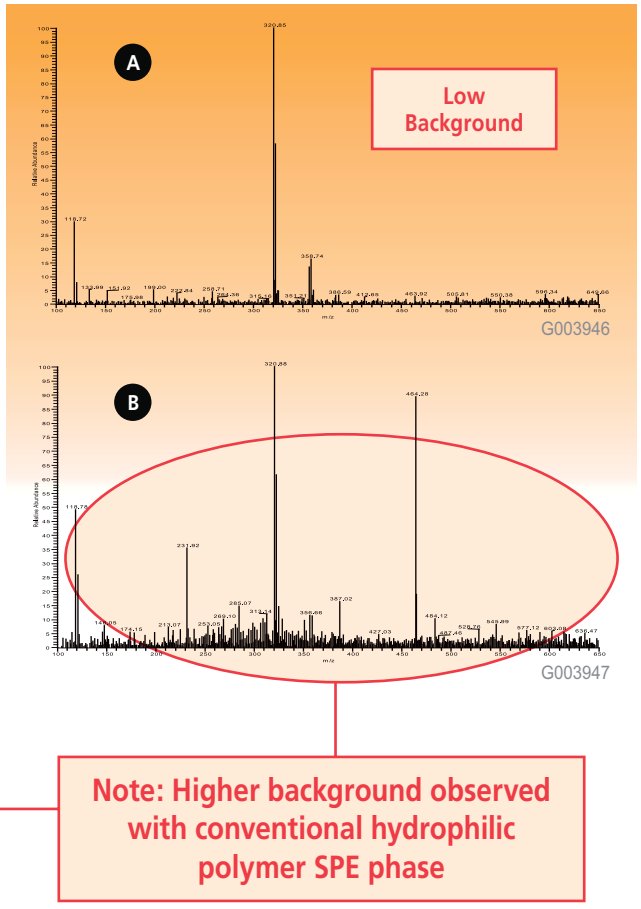


Figure 5. Mass Spectrum of Full Ion-Chromatograms (3.65- 4.00 min.) of the SupelMIP SPE Extract (A) and the Hydrophilic Polymer SPE Extract (B)



Key Features & Benefits of SupelMIP:

- *Achieve lower detection limits through superior selectivity*
- *Reduce ion-suppression*
- *Save time and reduce cost via robust and rapid methodology*
- *Minimal to no method development required*
- *Stable at broad pH ranges and high temperatures*
- *Stringent quality control conditions*

Clenbuterol is a beta-agonist known for its growth-promoting properties in which use of the drug induces significant weight gain by increasing the proportion of muscle mass to fat. Although the US Food and Drug Administration, US Department of Agricultural and European Union have banned the use of clenbuterol for humans and livestock, illegal use of the drug still readily occurs.

In this application, 0.1-1.0 ng/mL clenbuterol was extracted from human urine using a SupelMIP SPE – Clenbuterol cartridge. The SupelMIP method was compared against a published method using a conventional hydrophilic polymer SPE phase (M. Joseffson, et al., J. Chromat. A., 2006, 1120:1-12.). The extracts were analyzed via LC-MS/MS analysis.

In Figure 6, blank urine samples extracted with the SupelMIP protocol offered low background. In contrast, the conventional hydrophilic polymer SPE procedure co-extracted matrix interferences resulting in a high background response within LC elution area of clenbuterol (1-2 min.). This can potentially lead to lower assay reproducibility, accuracy and sensitivity thereby elevating lower limits of quantitation. Table 2 lists recovery values for clenbuterol using both sample prep procedures. Note that at the lowest spike levels tested (0.1 ng/mL), SupelMIP recovery was 99% whereas the hydrophilic polymer phase yielded a recovery of 8%.

For additional information regarding this application, please refer to Supelco Reporter 25.2; or European Reporter, Issue 25, March 2007, available at *sigma-aldrich.com/supelmip*

Figure 6. Clenbuterol Spiked Urine Samples Extracted with SupelMIP SPE vs. Convention Hydrophilic Polymer SPE

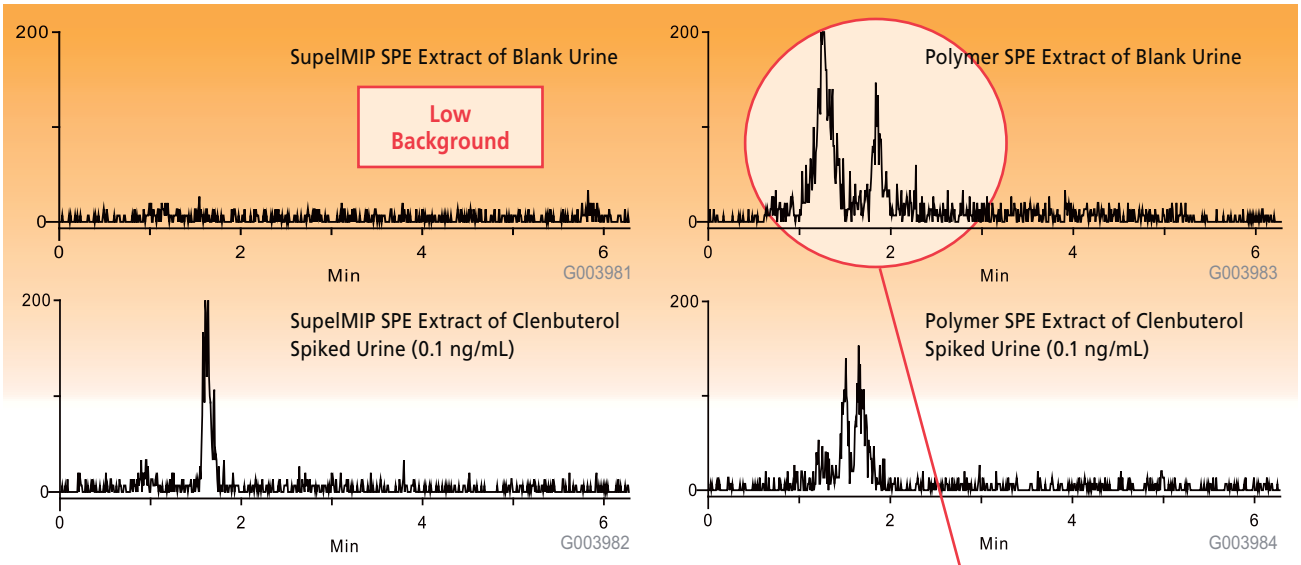


Table 2. Recovery Comparison for Clenbuterol from Urine using SupelMIP SPE and Conventional Hydrophilic Polymer SPE

	% Recovery from Urine	
Spike Level (ng/mL)	SupelMIP SPE - Clenbuterol	Hydrophilic Polymer SPE
0.1	99%	8%
0.5	75%	66%
1.0	75%	69%

Note: Higher background observed with conventional hydrophilic polymer SPE phase resulted in signal suppression at lower detection levels.

Key Features & Benefits of SupelMIP:

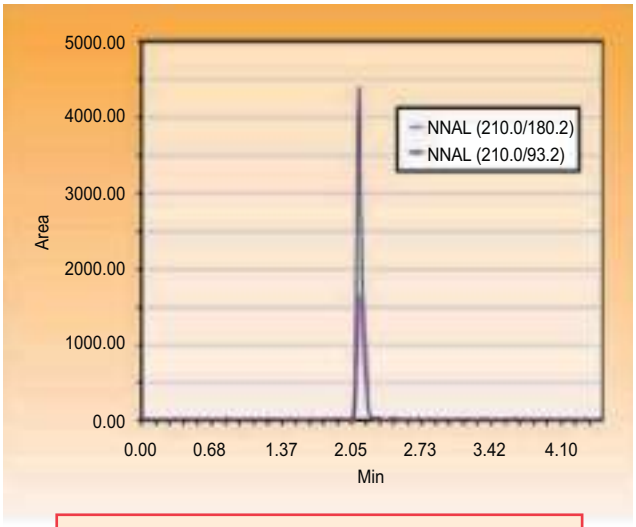
Achieve lower detection limits through superior selectivity	*Reduce ion-suppression*	*Save time and reduce cost via robust and rapid methodology*	*Minimal to no method development required*	*Stable at broad pH ranges and high temperatures*	*Stringent quality control conditions*

Tobacco Specific Nitrosamines (TSNAs) are highly carcinogenic and derived solely from tobacco products. They are generated from the fermentation, curing, and burning of tobacco. For example, NNAL is a valuable biomarker in human urine to determine exposure to second-hand smoke. Because TSNAs are often found in very low concentrations in difficult biological matrixes, a highly selective and sensitive assay is required for sample preparation and analysis.

MIP Technologies AB has developed two phases to address this issue. SupelMIP SPE – NNAL is designed for the extraction of NNAL, and SupelMIP SPE – TSNA is a class selective phase developed for the extraction of four different tobacco specific nitrosamines: NNK, NNN, NAB, and NAT.

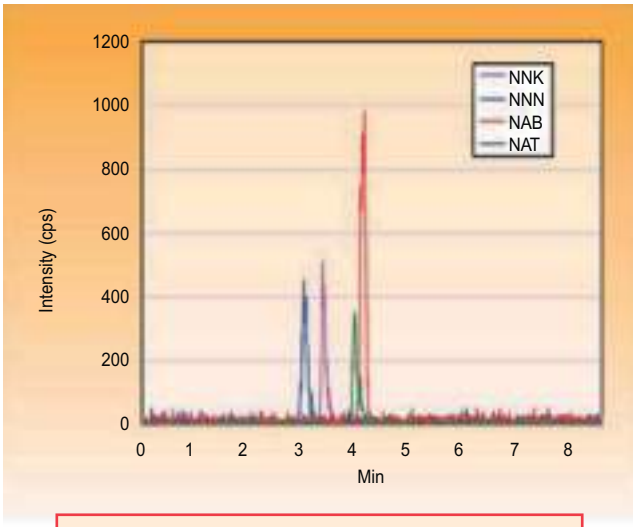
Figures 7 and 8 depict LC-MS-MS chromatograms (MRM) of SupelMIP extracts of human urine spiked with 1 ng/mL NNAL and 25 pg/mL TSNAs, respectively.

Figure 7. Representative LC-MS-MS Chromatogram (MRM) of a SupelMIP SPE – NNAL Extract of Human Urine Spiked with 1 ng/mL NNAL



SupelMIP SPE – NNAL:
- Consistent low background
- Recoveries greater than 90%
- Achieve LODs of 5 pg/mL
- Achieve LOQs of 13 pg/mL

Figure 8. Representative LC-MS-MS Chromatogram (MRM) of a SupelMIP SPE – TSNA Extract of Human Urine Spiked with 25 pg/mL TSNAs



SupelMIP SPE – TSNAs:
- Consistent low background
- Recoveries greater than 90%
- Achieve LODs of 2.5 pg/mL
- Achieve LOQs of 4 pg/mL

NNAL = 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol
NNK = 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone
NNN = N-nitrosonornicotine
NAB = N'-nitrosoanabasine
NAT = N'-nitrosoanatabine

Key Features & Benefits of SupelMIP:

Achieve lower detection limits through superior selectivity	***Reduce ion-suppression***	*Save time and reduce cost via robust and rapid methodology*	*Minimal to no method development required*	*Stable at broad pH ranges and high temperatures*	*Stringent quality control conditions*

Reduce Ion-Suppression

Ion-suppression or ion-enhancement is caused by one or more interfering components/species that co-elute with the analyte(s) of interest during LC-MS analysis. These co-eluting species can affect droplet formation or ionize concurrently resulting in an erroneous decrease (suppression) or increase (enhancement) in signal response. Ion-suppression often leads to poor assay reproducibility, accuracy, and sensitivity, and such deleterious effects are often most notable at the lower limits of quantitation.

In order to achieve adequate lower limits of quantitation when conducting trace analysis of analytes in complex matrices such as biological fluids, it is absolutely critical to procure adequate selectivity during sample preparation. By virtue of molecularly imprinted polymer technology, SupelMIP SPE offers the necessary selectivity and sample cleanup required for achieving ever-decreasing detection limits that are challenging analysts today.

Blank urine samples were extracted with SupelMIP SPE – NNAL and the resulting SPE (post-SPE) eluate was spiked with NNAL and analyzed via LC-MS-MS. The resulting chromatogram response (peak area) levels generated were compared against external standards (prepared in buffer). The results (Figure 9) show that ion-suppression was nominal (< 4% signal suppression) for the SupelMIP SPE – NNAL urine extract (post-SPE spike) relative to the external standard calibration curve.

In another study, blank urine samples were extracted with SupelMIP SPE Beta-agonists and conventional hydrophilic polymer SPE phases and the resulting SPE eluate was spiked (post-SPE) with metaproteronol at the levels of 0.5, 1, and 5 ng/mL, respectively. Figure 10 compares the response levels and linear relation of known spike concentrations vs. calculated concentrations determined from the signal responses obtained from blank urine extracts spiked post-extraction using both the SupelMIP SPE – Beta-agonist method and conventional polymer SPE method. Increased levels of ion-suppression were observed for the polymer SPE protocol relative to the SupelMIP procedure.

Figure 9. Response Comparison of NNAL Calibration Curve Generated from SupelMIP SPE – NNAL Urine Extract (post-SPE spike) vs. External Standards

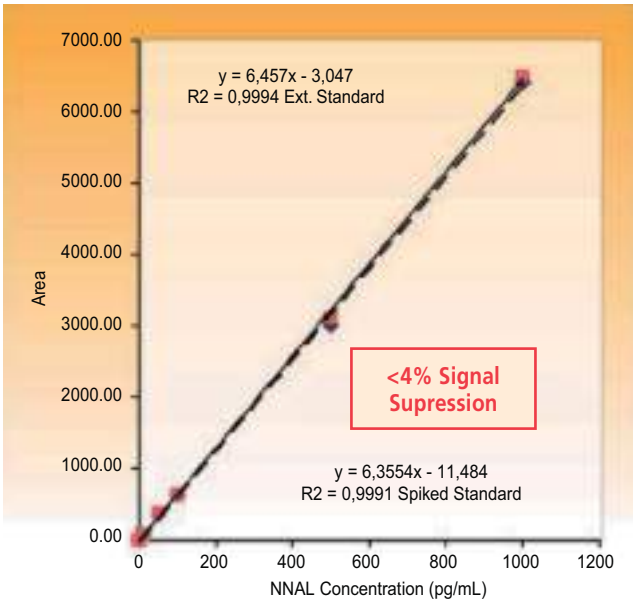
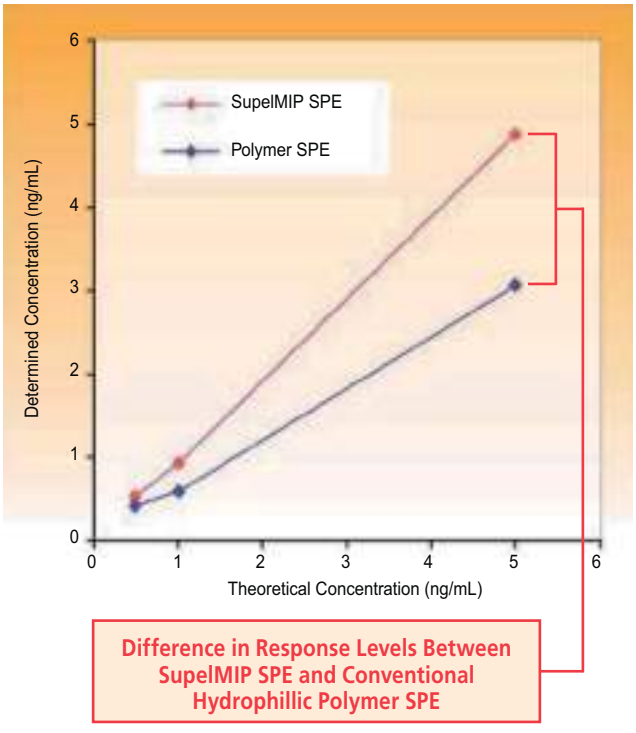


Figure 10. Known Spike Concentration vs. Determined Concentration for SupelMIP SPE Beta agonist and Polymer SPE for Metaproterenol from Urine (Post-Extraction Spike)



Key Features & Benefits of SupelMIP:

Achieve lower detection limits through superior selectivity	*Reduce ion-suppression*	***Save time and reduce cost via robust and rapid methodology***	*Minimal to no method development required*	*Stable at broad pH ranges and high temperatures*	*Stringent quality control conditions*

Save Time and Reduce Cost

Sample preparation is often the rate-limiting step within the analytical process, and can often take up to 10 times as long as the analysis in itself. It is therefore critical for analysts to develop simple, robust, and rapid extraction techniques that are selective enough to achieve sensitivity, precision, and accuracy limits required of the assay.

Table 3 describes the cost difference for the extraction of chloramphenicol using SupelMIP SPE – Chloramphenicol vs. a conventional sample prep method that utilizes a common commercially available hydrophilic polymer SPE phase (1).

Time data depicted in Table 3 courtesy of Dr. Philippe A. Guy, Nestlé Research Center, Nestec Ltd., Lausanne, Switzerland.

Total Cost and Sample Prep/Analysis Time Reduced by 75% using SupelMIP SPE - Chloramphenicol.

Table 3. Comparison of SupelMIP SPE Method and Conventional Method Using a Hydrophilic Polymer SPE Phase

SupelMIP SPE - Chloramphenicol Method Sample

Pre-Treatment:

Whole pasteurized milk (purchased from the local supermarket) was centrifuged for 15 min. at 5k rpm. The aqueous lower layer was spiked with chloramphenicol at the level of 15 ng/mL and 38 ng/mL.

SPE Procedure:

SupelMIP SPE – Chloramphenicol, 25 mg/10mL (LRC) (53210-U)

1. Condition and equilibrate MIP phase with 1 mL methanol followed by 1 mL DI water.
2. Apply 1 mL of the pre-treated milk sample to the cartridge.
3. Elute interferences using the following wash scheme:
   2 x 1 mL MS-grade water
   1 mL 5% acetonitrile in 0.5% acetic acid
   2 x 1 mL MS-grade water
   1 mL 20% acetonitrile in 1% ammonium hydroxide
   Dry SPE tubes for 5 min. under gentle vacuum
   3 x 1 mL dichloromethane
   Dry SPE tubes for 1 min. under gentle vacuum
4. Elute chloramphenicol with 2 x 1 mL methanol:acetic acid:MS-grade water (89:1:10, v/v/v)
5. Evaporate combined eluate to dryness at 50 °C under nitrogen. Reconstitute 150 µL LC mobile phase prior to LC-MS analysis.

SupelMIP SPE - Chloramphenicol
Sample Prep/Analysis Time: 1.5 hrs.
Sample Prep Analysis Cost (140 EUR/hr.) = 195 EUR
Total Cost of Extraction = 202.5 EUR (275 USD)

Published Chloramphenicol Method Using Conventional Hydrophilic Polymer SPE Phase

Sample Pre-Treatment:

5 mL of milk was spiked with 40 ng chloramphenicol. Proteins were precipitated by the addition of 15 mL 10% trichloracetic acid in water. The sample was vortexed and heated for 1 hour at 65 °C. After cooling to room temperature, the mixture was centrifuged for 15 min. at 3K rpm. The supernatant was filtered over glass wool, and the filtered was rinsed with 10 mL DI water. The pH of the filtrate was adjusted to pH 5 with 0.1 M sodium acetate.

SPE Procedure:

Conventional Hydrophilic Polymer SPE, 500 mg/12 mL

1. Condition and equilibrate SPE phase with 3 mL methanol, 4 mL DI water, and 4 mL 10 mM HCl
2. Apply the pre-treated milk extract to the cartridge.
3. Elute interferences using the following wash scheme:
   4 mL MS-grade water
   2 mL 5% methanol
   2 mL 50% methanol
4. Elute chloramphenicol with 2 mL methanol
5. Evaporate combined eluate to dryness at 50 °C under nitrogen. Reconstitute 0.4 mL DI water

Liquid-Liquid Extraction

1. Liquid-liquid extract of reconstituted eluate with 0.6 mL acetonitrile: dichloromethane (4:1, v/v).
2. Centrifuge at 7k rpm for 5 min. Transfer upper organic layer to a fresh tube.
3. Repeat steps 1 & 2 of the LLE procedure two additional times on the lower aqueous layer.
4. Combine all organic layers, evaporate to dryness at 60 °C under nitrogen. Reconstitute with 0.2 mL LC mobile phase and filter through a 0.2 µm nylon filter.

Published Chloramphenicol Method
Sample Prep/Analysis Time: 6.5 hrs.
Sample Prep Analysis Cost (140 EUR/hr.) = 845 EUR
Total Cost of Extraction = 855 EUR (1,161 USD)

Key Features & Benefits of SupelMIP:

Achieve lower detection limits through superior selectivity	*Reduce ion-suppression*	*Save time and reduce cost via robust and rapid methodology*	***Minimal to no method development required***	*Stable at broad pH ranges and high temperatures*	*Stringent quality control conditions*

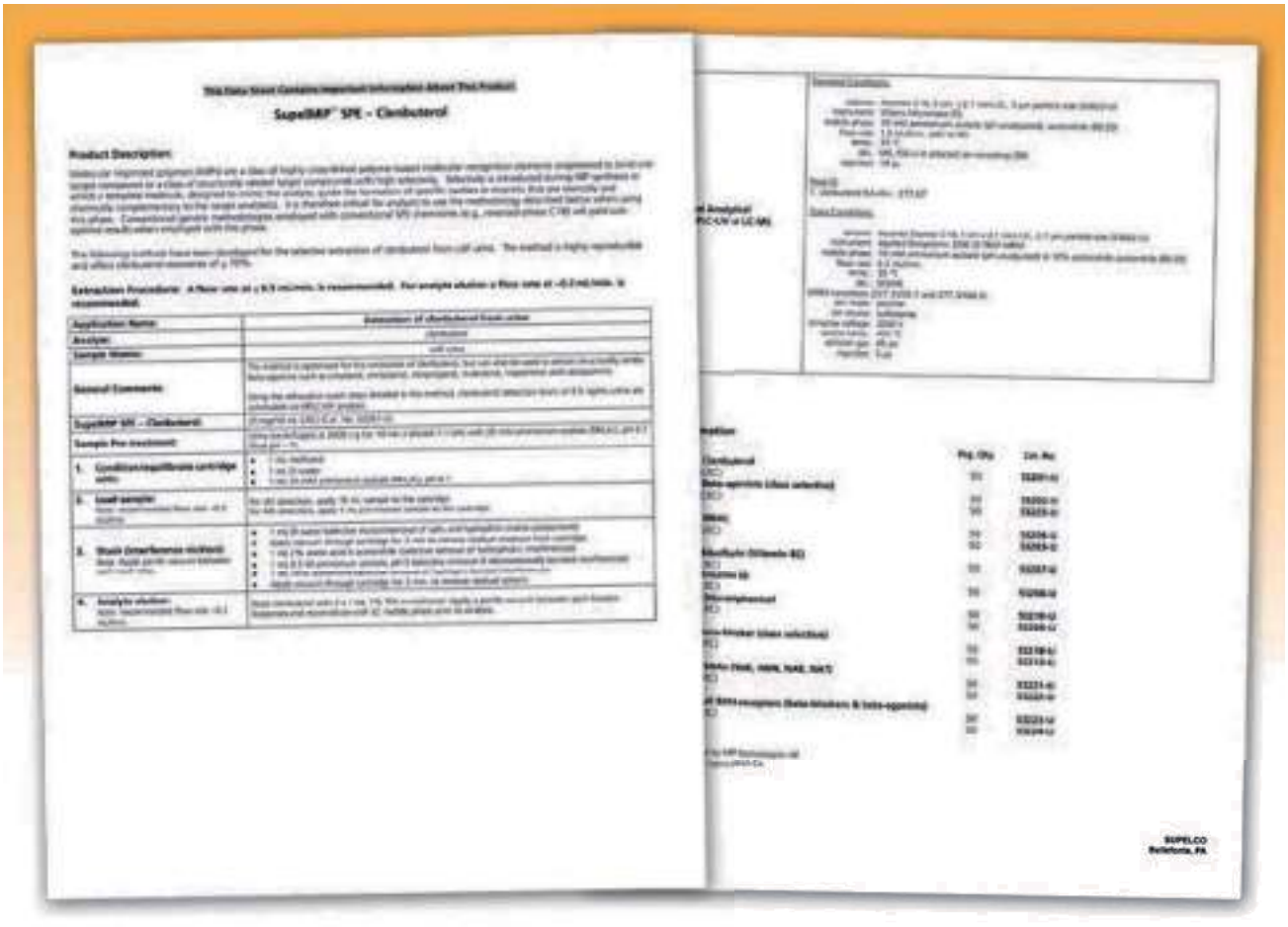
Minimal to No Method Development Required

Sample prep methods are often developed using a variety of schemes such as: referring to published methods of similar/identical applications; implementation of generic methodology; requesting support from a chromatography vendor; screening of techniques, phase chemistries, and method conditions. These approaches are often effective; however, more often than not, a sample prep method can often be frustrating and time consuming.

Unlike many traditional sample prep techniques, SupelMIP is developed and tailored for very specific applications. Therefore, each SupelMIP SPE phase comes with a detailed protocol and analytical technique for its respective application.

Figure 11 depicts a typical data/instruction sheet that is included with each SupelMIP SPE phase.

Figure 11. Example of a Typical Data/Instruction Sheet Included With Each SupelMIP SPE Phase



Key Features & Benefits of SupelMIP:

Achieve lower detection limits through superior selectivity	*Reduce ion-suppression*	*Save time and reduce cost via robust and rapid methodology*	*Minimal to no method development required*	***Stable at broad pH ranges and high temperatures***	***Stringent quality control conditions***

High Stability

SupelMIP SPE consists of highly cross-linked polymers that maintain stability when exposed to a broad range of organic solvents, can withstand high temperatures, and can be used over broad pH ranges, without loss of selectivity. Furthermore, they can be stored at room temperatures for prolonged periods of times. This is extremely advantageous over immunoaffinity based products.

Stringent Quality Control Conditions

SupelMIP SPE phases are manufactured by MIP Technologies AB. Each lot is subjected to stringent QC conditions to ensure low batch-to-batch variation. MIP based SPE technology is currently employed by a number of industrial and regulatory agencies for routine analysis. References from these organizations are available upon request.

Frequently Asked Questions (FAQs):

1. How is sample preparation improved using molecularly imprinted polymer SPE technology?

Because MIPs are tailor-made for individual analytes and analyte classes, analyte retention strength is increased significantly allowing for powerful wash steps within the SPE procedure. This allows for highly selective and simple extractions resulting in lower detection limits and improved MS compatibility (reduced ion-supression). Each SupelMIP phase also comes with a detailed application specific protocol simplifying the method development process which in turn saves time and cost.

2. Are sample packs available?

Yes. Sample packs are available and can be obtained through the SupelMIP website: ***sigma-aldrich.com/supelmip***
Alternatively, you can also request a sample pack by calling or emailing your local Sigma-Aldrich office and connecting with technical service.

3. There is no MIP phase for my application? How do I develop a MIP protocol for my application?

Within the SupelMIP website, ***sigma-aldrich.com/supelmip***, there is a survey where you can describe your application and needs for MIP based SPE product/procedure. Scientists from both Supelco and MIP Technologies AB will evaluate your application through a short feasibility stage. If your application is prioritized to move through feasibility, the next stages will be development and optimization. The latter two stages can often take up to 8 months; however, we are in the process of streamlining how we develop and approach new SupelMIP applications.

4. Are process scale MIP products available through Supelco?

No. Process scale MIP products are not available through Supelco. Please contact MIP Technologies AB directly by visiting *www.miptechnologies.com*

5. Can we use existing or traditional SPE protocols with SupelMIP SPE technology?

No. Existing protocols cannot be used. Every SupelMIP SPE includes a detailed extraction protocol that is analyte and matrix specific. This protocol needs to be used in order to achieve optimal retention during sample load, maximum interference removal during sample wash, and high recoveries during elution.

6. What dimensions are available for SupelMIP SPE?

Currently, our standard product consists of 25 mg bed weights (50 mg for SupelMIP SPE – TSNAs) packed in 3 mL and 10 mL LRC (large reservoir cartridges) SPE tubes. The phases can be custom packed in all other SPE hardware that Supelco offers (other SPE tube dimensions, glass SPE tubes, 96-well plates, etc.)

Ordering Information

SupelMIP SPE Cartridges	Sorbent Mass (mg)	Cartridge Volume (mL)	Cartridges per Box	Cat. No.
PAHs	25	3	50	**52773-U**
Nitroimidazoles	50	3	50	**52734-U**
NSAIDs	25	3	50	**52769-U**
NSAIDs	25	10	50	**52772-U**
Fluoroquinolones	25	3	50	**53269-U**
Amphetamines	25	3	50	**52228-U**
Clenbuterol	25	10	50	**53201-U**
Beta-agonists (class selective)	25	10	50	**53202-U**
Beta-agonists (class selective)	25	3	50	**53225-U**
Beta-blockers (class selective)	25	10	50	**53218-U**
Beta-blockers (class selective)	25	3	50	**53213-U**
Full Beta Receptor (Beta-agonists and Beta-blockers)	25	10	50	**53223-U**
Full Beta Receptor (Beta-agonists and Beta-blockers)	25	3	50	**53224-U**
Chloramphenicol	25	10	50	**53210-U**
Chloramphenicol	25	3	50	**53209-U**
NNAL (4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol)	25	10	50	**53206-U**
NNAL (4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol)	25	3	50	**53203-U**
TSNAs (4 different Tobacco specific Nitrosamines: NNK, NNN, NAB, NAT)	50	10	50	**53221-U**
TSNAs (4 different Tobacco specific Nitrosamines: NNK, NNN, NAB, NAT)	50	3	50	**53222-U**
Riboflavin (vitamin B2)	25	10	50	**53207-U**
Triazines (class selective)	25	10	50	**53208-U**

For a complete SupelMIP product listing, and to request a SupelMIP sample pack, visit ***sigma-aldrich.com/supelmip***

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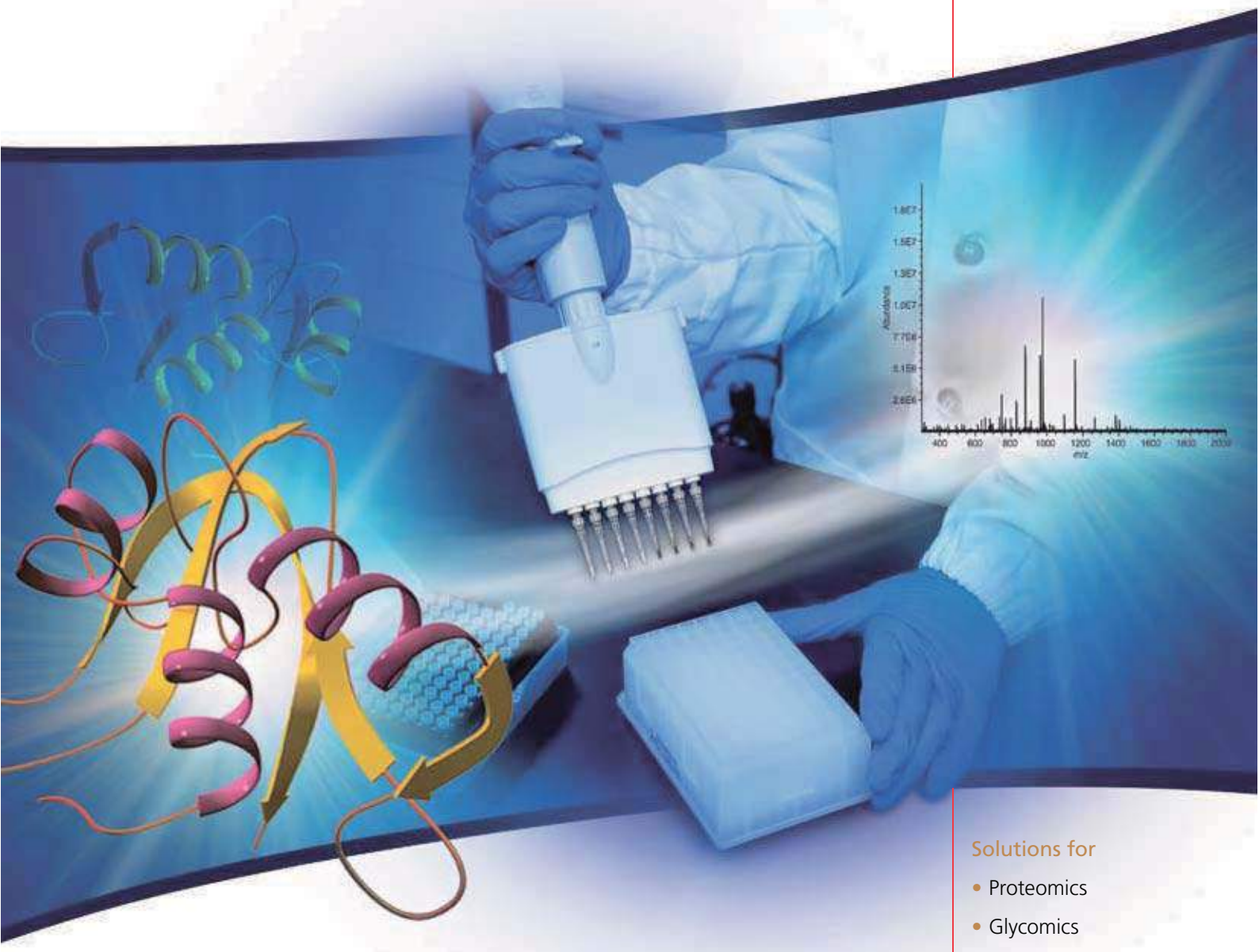
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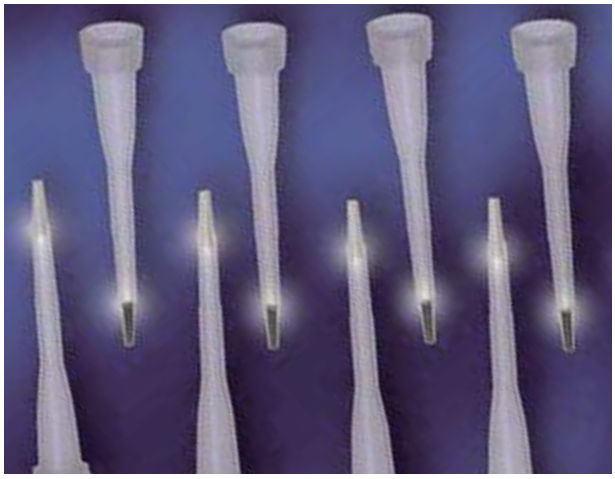
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Pipette tips are convenient and useful tools for extraction, concentration, and/or purification of complex bio-molecules through hydrophobic interactions. Supelco's Supel-Tips are designed to purify and enrich femtomole to picomole quantities of desired samples for subsequent analysis and identification with mass spectrometric and/or chromatographic techniques.

Supel-Tips contain a chromatography sorbent bed bonded at the working end of the tip with a proprietary high purity adhesive. This sorbent bed acts as a solid phase extraction medium that adsorbs molecules of interest from the sample matrix. Subsequently the concentrated, desalted analytes are eluted for down-stream analysis.

Supel-Tips provide the following separation benefits:

- Superior recovery
- Exceptional binding capacity and enhanced affinity
- Excellent sorbent bed stability for cleaner samples
- Fast and effective analyte retention/elution

Applications and Suitable Products for Micro-Purification/Enrichment of:

Phosphopeptides: **Supel-Tips Zr & Supel-Tips Ti**

Proteins & Peptides: **Supel-Tips C18**

Oligosaccharides/
Similar Molecules: **Supel-Tips Carbon**

Supel-Tips C18 Pipette Tips

Cat. No.: TPSC18

Applications: **Sample preparation for proteins and and peptide analysis**

Features:

- 10 µL polypropylene pipette tips
- C18 bonded spherical silica-based sorbent
- Sorbent particle size of 50-60 µm, pore size of 200 Å

Benefits:

- Excellent recovery and reproducibility
- Effective for achieving high capacity for trace-level peptides

Excellent Recovery

Peptide	(M+H)+ Monoisotopic	Recovery by HPLC (%)
Insulin, Chain B, Oxidized	3494	89
β-Amyloid	1446	100
Bradykinin, Fragment 1-7	757	78

Supel-Tips Carbon Pipette Tips

Cat. No.: 54227-U

Applications: **Sample preparation for analysis and identification of oligosaccharides and other macromolecules containing sugar moieties**

Features:

- 10 µL polypropylene pipette tips
- Graphitized carbon adsorbent
- Adsorbent particle size of 50-60 µm, pore size is 175 Å
- Proprietary high purity adhesive

Benefits:

- Higher binding capacity
  1. Maltahexose: 10.2 µg
  2. Glycopeptide (mol. wt.: 1300 – 3500): >10 µg
- Large sample volume of 0.5-10 µL
- Fast and effective analyte transport

NEW Tips for Phosphopeptide Enrichment

Zirconia-Silica and Titania-Silica Composite Pipette Tips

Supel-Tips Zr Pipette Tips (Cat. No.: 54266-U)
Supel-Tips Ti Pipette Tips (Cat. No.: 54263-U)

Applications: **Phosphopeptide purification for analysis and identification**

Features:

- 10 µL polypropylene micropipette tips
- Zirconia-silica or Titania-silica composite adsorbent
- Adsorbent particle size of 50-60 µm
- Adsorbent average pore size is 300 Å
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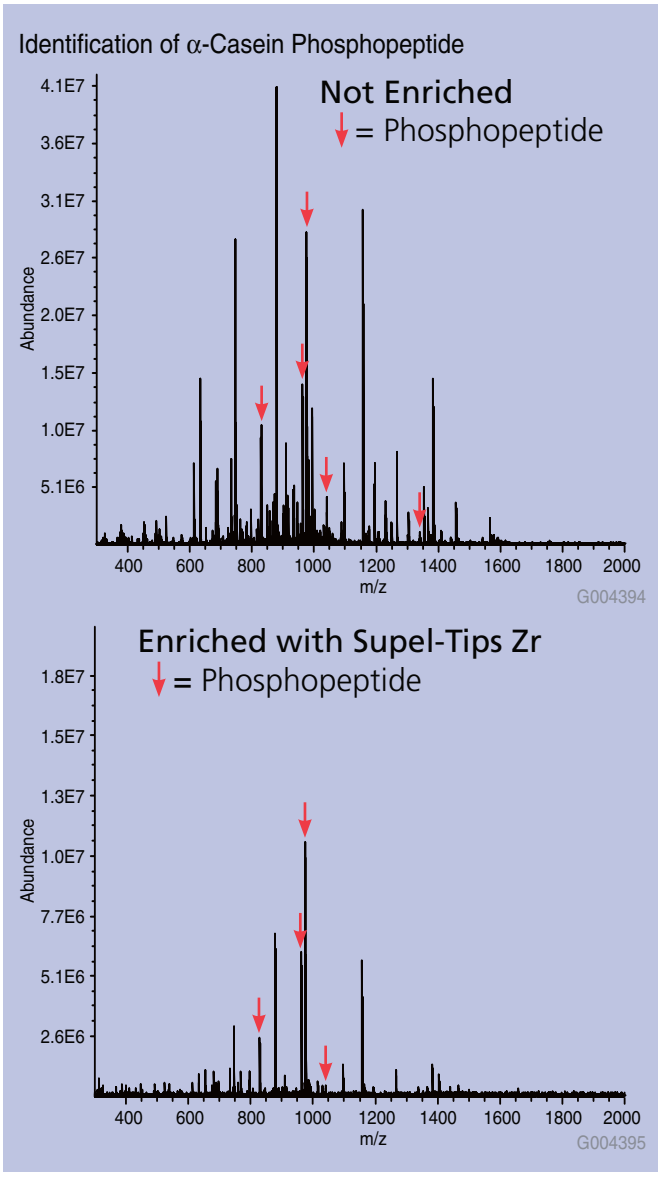
Benefits:

- Excellent recovery and reproducibility
- Effective for achieving high capacity for trace-level peptides

Identification

Phosphopeptide:
Bovine Casein, Monophosphopeptide
[M+H]+ Monoisotopic (2061)

Analysis (by MS+MS/MS)	Confidence Index %
Supel-Tips Zr	100
Supel-Tip Ti	100



Chemical Compatibility:

Supel-Tips are compatible with most organic solvents, buffers and alkaline solutions. They are not compatible with concentrated inorganic acids such as hydrochloric and nitric acids.

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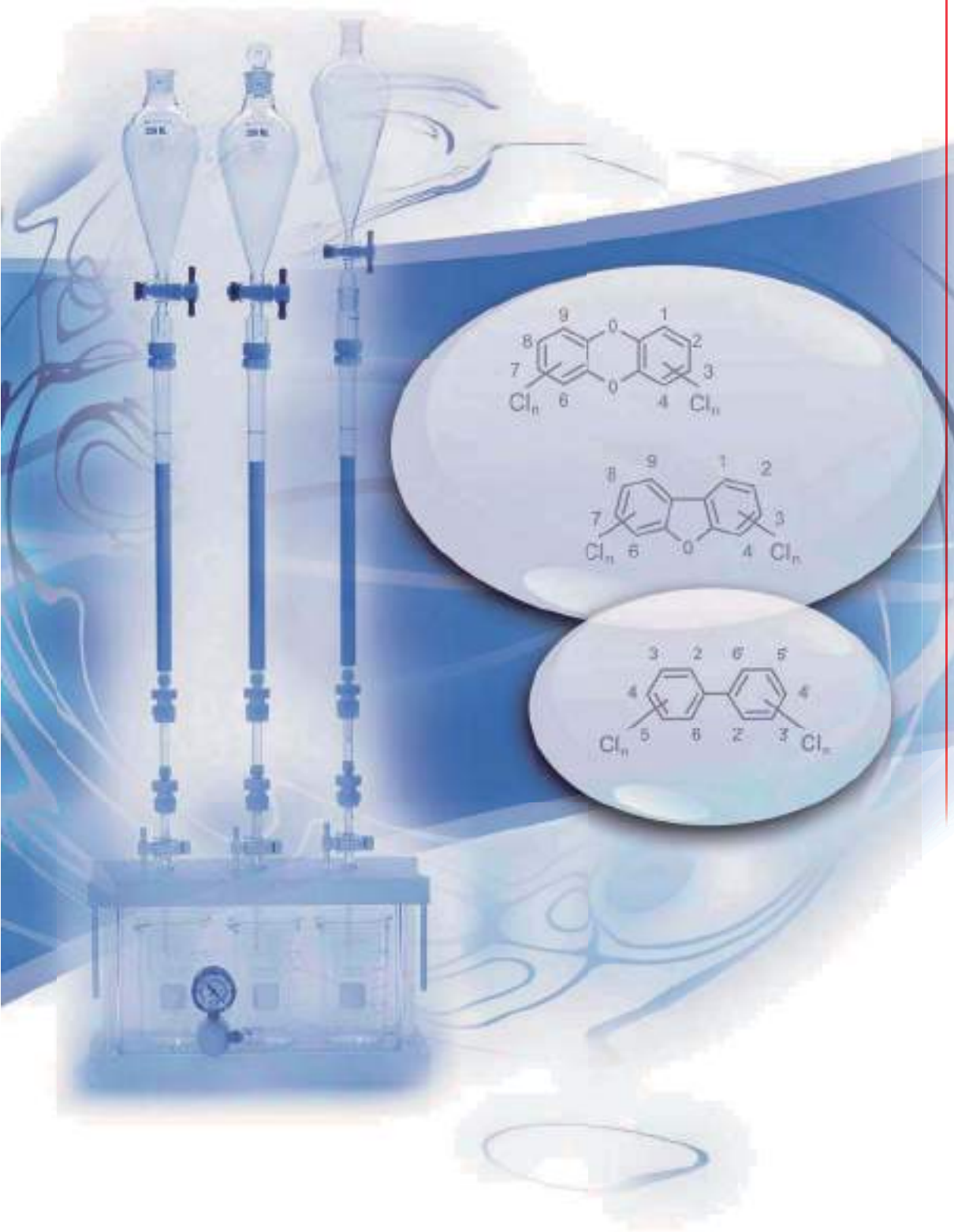
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Introduction

Figure 1. Dioxin / Furan skeletal structure, can be chlorinated at any of the suitable positions on the aromatic ring

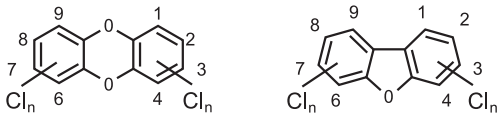
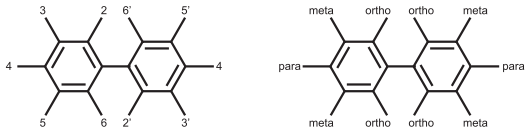


Figure 2. Biphenyl skeletal structure of PCBs



What are Dioxins?

Dioxins and PCBs belong to the group of compounds known as Persistent Organic Pollutants (POPs). They are known to bio accumulate due to their lipophilic nature and, therefore, have health implications. As a result their emission into the environment and food chain is strictly controlled. Samples that are analysed, amongst others, are foodstuffs like fish, fish feed, and stack emissions from waste incineration sites. Limits are published by the World Health Organisation (WHO) and local authorities. As a consequence, low levels of contamination have to be detected, providing a challenge to sample preparation and detection systems.

Compounds of Interest

The term 'Dioxin' covers a wide range of halogenated aromatic compounds, including polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDDs and PCDFs). These compounds are formed as a result of incomplete combustion of hydrocarbons in the presence of chlorine e.g. metal processing, domestic waste incineration, etc. They have high melting points and are stable to acids and bases; these characteristics make them very persistent in the environment. PCDD/Fs can be found in many environmental matrices such as soils, air, and water.

The basic structure of PCDD/Fs comprises two benzene rings joined by either a single (furan) or a double oxygen bridge (dioxin), see Figure 1.

There are 210 possible combinations of chlorine atoms on the skeletal structure of dioxins and furans. However, only a few congeners are considered to have significant risk to human health. The toxicity of these compounds is measured in TEF (Toxic Equivalence Factor), which is an internationally recognised calculation that weighs the toxicity of each individual congener against the most toxic compound in that family, in the case of PCDD/PCDF, this is 2,3,7,8-TCDD. The closer the ratio is to unity, the greater the toxicity of that congener. Calculation of the total toxicity of a sample is achieved by multiplying the concentrations of the individual target compounds by their respective TEFs. These values are known as TEQs (Toxic Equivalents); and the total TEQ of a sample is obtained by summing the individual TEQs.

In addition to PCDF and PCDD, some polychlorinated biphenyls (PCBs) (Figure 2) that are similar in structure and lipophilic properties as the dioxins have been identified as having similar toxic health effects. These are often referred to as non-ortho, coplanar, or dioxin like PCBs, and their TEF is also measured against 2,3,7,8-TCDD. For example, a PCB congener with a TEF of 0.01 is considered to be one hundred times less toxic than 2,3,7,8-TCDD (see Table 1).

Non-ortho PCBs are those which are not chlorinated at the ortho position, and as such are free to rotate around the single carbon carbon bond, resulting in a co-planar ('flat') configuration; PCBs that have a single ortho chlorine are also able to adopt a relatively planar arrangement; the twelve possible congeners that obey these rules are known as the WHO-12 PCBs. These compounds are monitored along with the dioxins (see Table 1).

Table 1.

IUPAC No.	Type	Structure	WHO-TEF
77	Non-ortho	3,3'4,4'-TeCB	0.0001
81		3,4,4',5-TeCB	0.0001
126		3,3',4,4',5-PeCB	0.1
169		3,3',4,4'5,5'-HxCB	0.01
105	Mono-ortho	2,3,4,4'5-PeCB	0.0005
114		2,3,4,4',5-PeCB	0.0005
118		2,3',4,4',5-PeCB	0.0001
123		2',3,4,4',5-PeCB	0.0001
156		2',3,3',4,4',5-HxCB	0.0005
157		2',3,3',4,4',5'-HxCB	0.0005
167		2,3',4,4',5,5'-HxCB	0.00001
189		2,3,3',4,4',5,5'-HpCB	0.0001

Abbreviations	
HRGC	High Resolution Gas Chromatography
HRMS	High Resolution Mass Spectrometry
PCDDs	Polychlorinated Dibenzo-p-dioxins
PCDFs	Polychlorinated Dibenzofurans
PCBs	Polychlorinated Biphenyls
TCDD	Tetrachloro Dibenzo-p-dioxin
TEQs	Toxic Equivalents
TEF	Toxic Equivalent Factor
WHO	World Health Organisation

Table 2. Limits for Environmental Samples (EU)

Sample Matrix	Measured Typical Range	Max. Conc. for Contaminated Sites	Units
Soil	<1 - 100	100.000	ng I-TEQ/kg d.m.
Sediment	<1 - 200	80.000	ng I-TEQ/kg d.m.
Air (ambient)	<1 - 100s	14.800	fg I-TEQ/m³
Air (bulk deposition)	<1 - 100s	14.800	pg I-TEQ/m³
Sewage Sludge	<1 - 200 (average 15 - 40)	1.200	ng I-TEQ/kg d.m.
Spruce/Pine Needles (biomonitors)	0.3 - 1.9	100	ng I-TEQ/kg d.m.

Source: http://ec.europa.eu/environment/dioxin/pdf/task2.pdf
d.m. = dried matter

Table 3. Limits for Foodstuff (EU)

Sample	WHO-PCDD/F-TEQ/g fat or product
Milk and milk products, including butter fat	3 pg/g fat
Hen eggs and egg products	3 pg/g fat
Liver and derived products	6 pg/g fat
Fish oil	2 pg/g fat
Fish (flesh)	4 pg/g fresh weight

Source: http://www.gafta.com/fin/findioxin.html

The limits allowed in various matrices are published by the WHO and other local authorities. Examples for European environmental levels and foodstuff limits (status Feb/2007) are given below (Tables 2. & 3.). The current EU Commission Maximum Levels for dioxins are contained in Commission Regulation 466/2001, amended by Council Regulation 2375/2001. This was implemented in July 2002 and became effective February 2003. These are general guidelines, actual limits and measured concentrations can vary from country to country.

http://ec.europa.eu/environment/dioxin/download.htm

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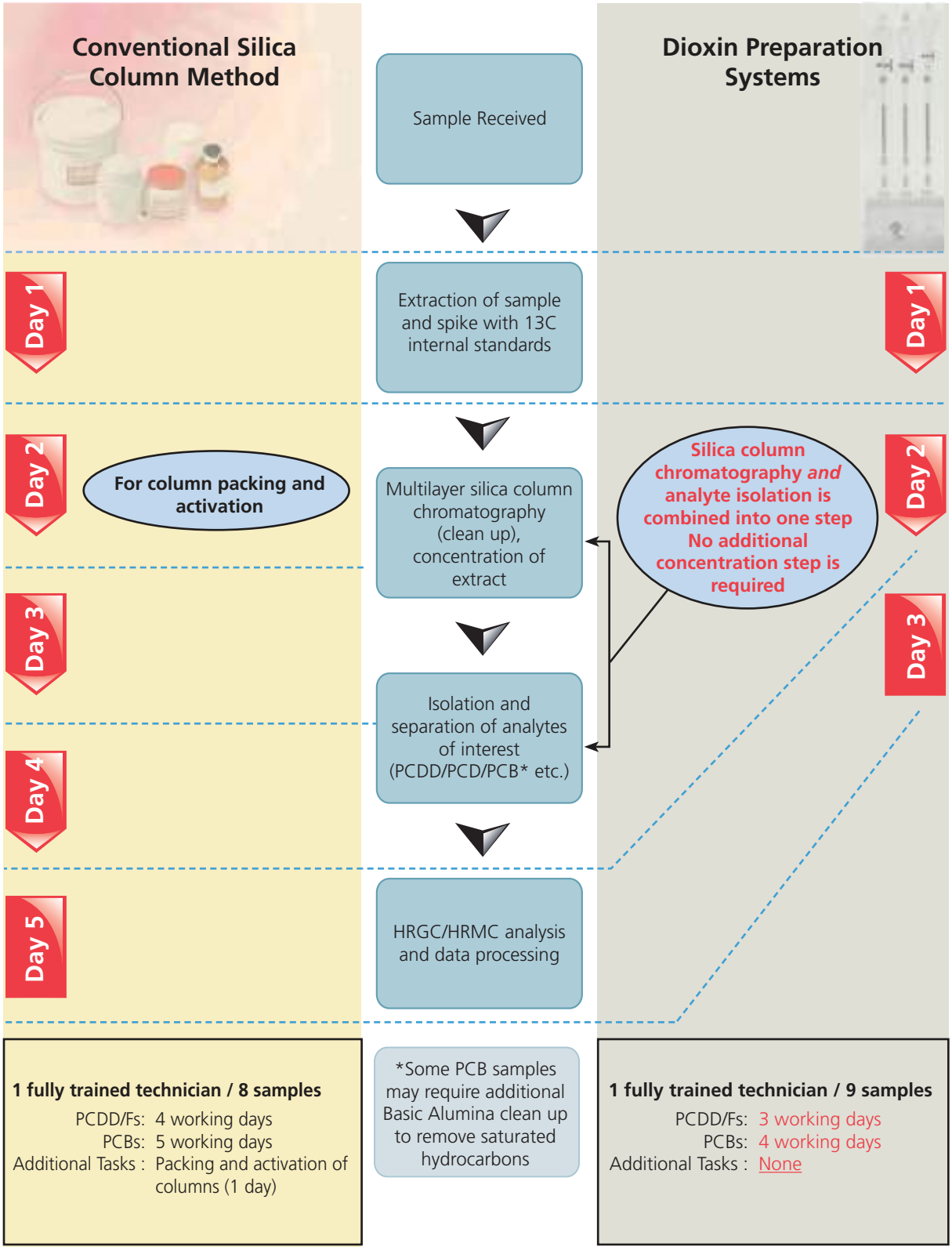
Solvents & Standards 15

Accredited Methods

Several accredited methods for sample collection, clean up and analysis exist. These include (also see p.13):

Accredited Methods		
	EPA Method 1613b	Tetra- through Octa-Chlorinated Dioxins and Furans by Isotope Dilution HRGC/HRMS
	EPA Method 1668	Chlorinated Biphenyl Congeners in Water, Soil, Sediment, and Tissue by HRGC/HRMS
	EPA Method 8290A	Polychlorinated Dibenzodioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) by High-Resolution Gas Chromatograph/High-Resolution Mass Spectrometry (HRGC/HRMS)
	EN 1948-1	Stationary source emissions. Determination of the mass concentration of PCDDs/PCDFs and dioxin-like PCBs. Sampling of PCDDs.PCDFs
	EN 1948-2	Stationary source emissions. Determination of the mass concentration of PCDDs/PCDFs and dioxin-like PCBs. Extraction and clean-up
	EN 1948-3	Stationary source emissions. Determination of the mass concentration of PCDDs/ PCDFs and dioxin-like PCBs. Identification and quantitation, sample collection collection and clean up general information
	JSA JIS K 0311:2005	Method for determination of tetra- through octachlorodibenzo-p-dioxins, tetra- through octachlorodibenzofurans and dioxin-like polychlorinated biphenyls in stationary source emissions
	JSA JIS K 0312	Method for determination of tetra- through octachlorodibenzo-p-dioxins, tetra- through octachlorodibenzofurans and dioxin-like polychlorinated biphenyls in industrial water and waste water limits

Sample Preparation for Dioxin and PCB Analysis: Conventional vs. Supelco System



The Supelco Dioxin Prep System

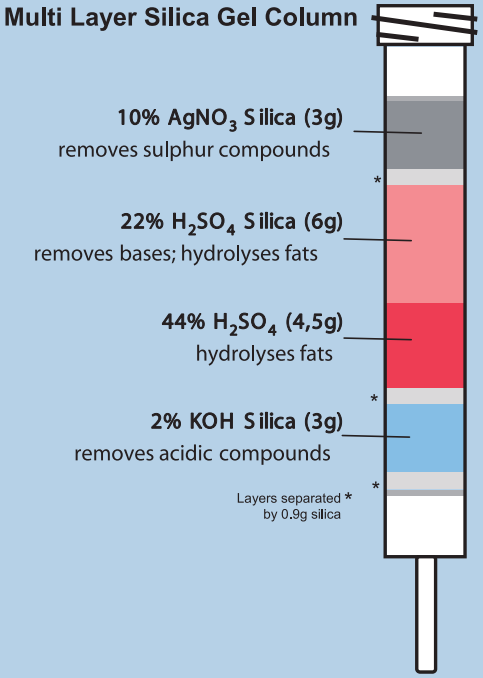


The Supelco Dioxin Prep system provides a highly efficient means of extracting and isolating dioxins, furans, and PCBs from stack gases, wastewater, soil, food, blood, and milk. The prep system design reduces solvent usage, decreases sample preparation time by 1-2 days, and results in extraction recoveries greater than 85%.

The convenient multi-layer silica gel column is key to the extraction process; seven layers of treated silica oxidize, reduce, and separate polar interferences. The modular glassware and hardware design makes it convenient for analysts to select only a few pieces or the entire prep system for their extraction needs. A vacuum adapter and a vacuum manifold provide the option of running a single sample or multiple samples at one time, using vacuum or gravity feed.

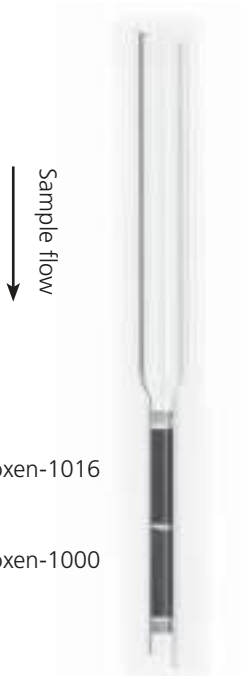
Multi-layer Silica Gel Dioxin Column

Potential chromatographic interferences are removed from the sample as it migrates through the several layers of treated silica gel. The silver nitrate treated layer removes sulphur-containing compounds; whilst two sulphuric acid treated layers oxidise sample lipids and remove any basic analytes. The potassium hydroxide treated layer removes any acidic sample components. Dioxins, furans, and PCBs pass through the silica column unretained. The column design includes an elongated tapered end that slips inside the dual-layer carbon reversible tube or Florisil micro column, preventing leakage of solvent and sample as well as contamination of/by the PTFE fittings. For very dirty samples, bulk treated silica gels and empty glass tubes are available to customise packings to meet individual sample needs.



Dual-layer Carbon Reversible Tube

Originally developed for the Japanese market in accordance with JIS method K-0311 and K-0312, a unique dual-layer carbon reversible tube isolates and concentrates the non-ortho PCBs, dioxins, and furans with a minimum of hexane and toluene. Isolation and separation is based on the two layers of carbon having different affinities for such compounds. Carboxen-1016 provides a low surface area (75 m^2/g), whilst Carboxen-1000 has a high surface area (1200 m^2/g). The combination of the two Carboxen™ layers isolate the dioxins, furans, and non-ortho PCBs. Any aliphatic hydrocarbons and the remaining PCBs present in the sample pass completely through the carbon tube into a waste fraction. The carbon tube is then removed and flushed in reverse direction with toluene to collect the dioxins, furans, and non-ortho PCBs.



Dual-Layer Reversible Carbon Column





**Micro-column & ampoulised Florisil®
(28309-U & 48924-U)
to be packed just before use**

Figure 3. Elution efficiency with hexane followed by toluene for Dual-Layer Reversible Carbon Tube - Recoveries of dioxins, furans and PCBs

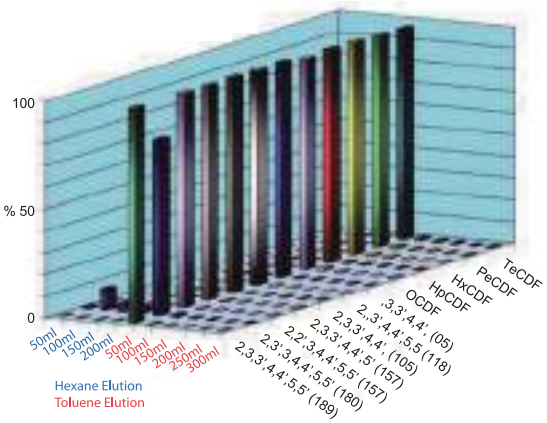
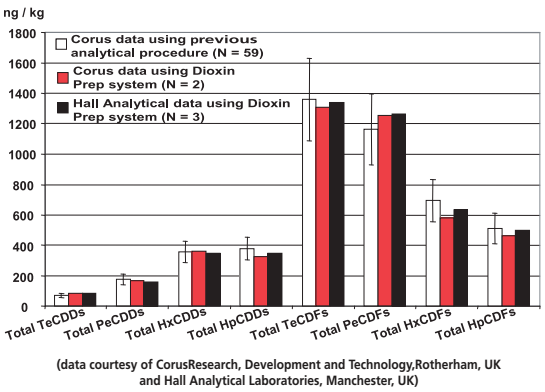


Figure 4. Dioxin extraction from waste ESP# dust using the Dual-Layer Reversible Carbon Tube System and comparison to previously used method (#electrostatic percipitator)



(data courtesy of CorusResearch, Development and Technology,Rotherham, UK and Hall Analytical Laboratories, Manchester, UK)

Dioxin Prep System - Florisil Version

In 1998, the World Health Organization identified 12 polychlorinated biphenyls (PCBs) that exhibit dioxin-like activities. These WHO-12 PCBs are now included as part of the overall dioxin concentration and should be systematically investigated in industrial emissions. The original Dioxin Sample Prep System (Multi-layer Silica Gel Dioxin Column plus Dual-layer Carbon Reversible Tube) is ideal for the rapid cleanup and isolation of polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/Fs). However the extraction of PCBs can prove more challenging requiring multiple fractionation steps. As not all the WHO-12 PCBs are non-ortho, some of these compounds of interest will not be retained. These will pass through the carbon tube directly into the waste fraction, resulting in a split of the PCBs into two fractions. To address this issue a "Dioxin Prep System–Florisil Version" was developed in collaboration with Corus Research, Development and Technology, Rotherham, UK, and Hall Analytical Laboratories, Manchester, UK.

In this new system, the Dual-Layer Carbon Reversible Tube is replaced with a micro-column (reversible tube) packed with Pre-Activated Florisil. As the sample extract passes through the multilayer silica gel column and onto the Florisil micro-column, the relatively weak retention of all the PCBs means they can be easily eluted with n-hexane and/or n-hexane/dichloromethane mixtures. The subsequent PCB fraction contains all PCBs and can be further treated by basic alumina clean-up to remove any saturated hydrocarbons before analyzed by GC/MS. Further elution of the Florisil micro-column with dichloromethane is used to collect the PCDD/F fraction. As a result, the new "Dioxin Prep System–Florisil Version" can rapidly separate PCBs from PCDD/Fs prior to analysis for simpler quantitative determination.

For convenience, ampoulised Pre-Activated Florisil is available for use with the Dioxin Prep System. The Florisil ampoule is snapped open and emptied into an empty micro-column (reversible tube), 6.35/10 mm O.D. before sample clean up is performed.

How does it compare? - Extraction Recoveries

The multi-layer silica gel column in series with the dual-layer carbon reversible tube provides extraction recoveries of 85% or better with less than 200 mL of toluene as illustrated in Figure 3. Recoveries of $^{13}C_{12}$ internal standards ranged from 65% to 95% [n = 3; RSD from 10% to 20%] for the dual layer carbon system. Figure 4 shows how the recoveries compare to previous used method. An overview on recoveries with the Florisil system is shown below.

Challenged with a variety of matrices, the Dioxin Prep System -Florisil Version has demonstrated the ability to clean up sample extracts for dioxin (and PCB) analysis from an array of certified reference materials and inter-calibration samples including sediments WMS-01 and DX-3, fish tissue WMF-01, and intercalibration samples from Orebro University, Sweden (2004 and 2005).

A selection of the results is shown in Figure 5 and Tables 4 & 5*. The Dioxin Prep System showed good recoveries and RSDs for Dioxins and PCBs. Recoveries of $^{13}C_{12}$ internal standards ranged from 80% to 87% [n=4; RSD from 13% to 16%).

For more information or extraction recoveries on additional dioxins, furans, and PCBs, please e-mail the Technical Service department at Europe: EurTechServ@sial.com or USA: techservice@sial.com

Selected Dioxin and PCB concentrations in WMF-01 reference freeze-dried fish tissue and DX-3 certified reference sediments determined using the Supelco Dioxin Prep System-Florisil Version.

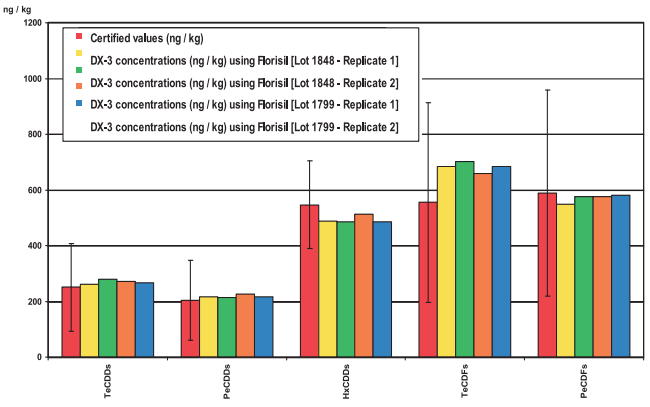
Table 4. Recovery of selected dioxins in reference materials*

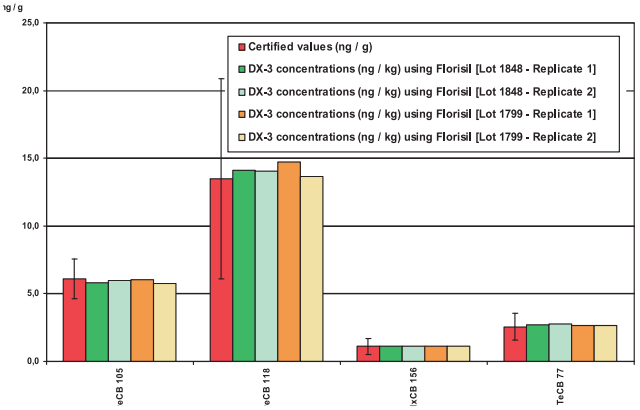
Matrix	DX-3 (Sediment)			WMF-01 (Fish Tissue)		
Dioxin/Furan	Certified value (SD) [ng/kg]	Average for n=4 (SD) [ng/kg]	% Recovery	Certified value (SD) [ng/kg]	Average for n=4 (SD) [ng/kg]	% Recovery
2,3,7,8-TeCDD	121 (43)	120 (4.3)	99,2	13.1 (4.4)	12.1 (0.4)	92,4
1,2,3,7,8-PeCDF	35 (17)	36.8 (1.7)	102,2	1.53 (1.4)	0.89 (0.73)	58,2
1,2,3,6,7,8-HxCDD	60 (18)	51 (1.8)	85,7	0.88 (0.4)	0.72 (0.23)	81,8
1,2,3,4,7,8,9-HpCDF	98 (39)	105 (5.9)	107,2	0.4 (0.4)	1.0 (1.9)	250,0
OCDD	3'067 (888)	3'349 (223)	109,2	5.055 (5.1)	2.01 (0.88)	40,1

Table 5. Extraction results for selected dioxins and PCBs with two Florisil lots*

Matrix	DX-3 (Sediment)			WMF-01 (Fish Tissue)		
PCB	Certified value (SD) [ng/kg]	Average for n=4 (SD) [ng/kg]	% Recovery	Certified value (SD) [ng/kg]	Average for n=4 (SD) [ng/kg]	% Recovery
TeCB 77	2.56 (0.99)	2.69 (0.05)	105,1	2'233 (720)	2'293 (22)	102,7
PeCB 105	6.097 (1.467)	5.88 (0.13)	96,4	49'050 (14200)	54'077 (1829)	110,2
PeCB 118	13.48 (7.4)	14.14 (0.43)	104,9	130'100 (32500)	141'535 (1170)	108,8
HxCB 169	0.01 (0.01)	0.018 (0.01)	128,6	76 (30)	78 (2.6)	103,8
HpCB 189	0.185 (0.13)	0.192 (0.01)	103,8	2'016 (611)	2'155 (44)	06,9

Figure 5. Extraction results for selected dioxins and PCBs with two Florisil lots*





***data provided by Corus Research, Development and Technology, Rotherham, UK**

Acknowledgements:

We wish to thank Koji Takayanaet al. from Kawaju Techno Service Corporation and Masaaki Maeokaet al. from the Japan Quality Assurance Organization (JQA) for their involvement in the development and evaluation of the Dioxin Prep System applying the Dual-Layer Carbon Reversible Tube.

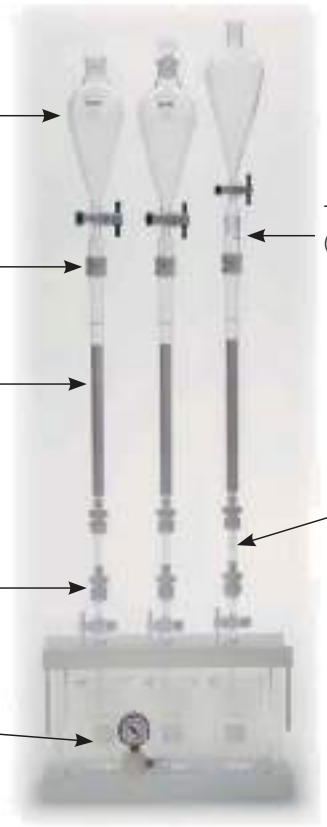
We wish to thank Eric Aries from Corus Research, Development and Technology and Nicholas Ordsmith from Hall Analytical Manchester, UK for their involvement in the development of the Florisil Version of the Dioxin Sample Prep System.

Sample Clean up

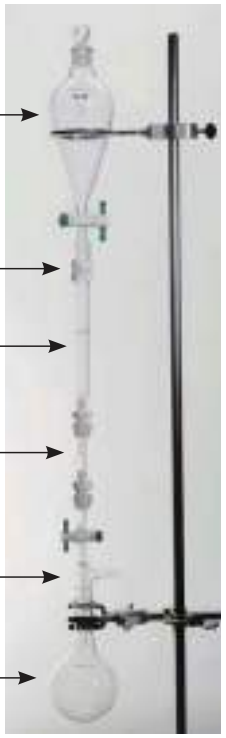
Feature	Advantage	Benefit
Pre packed silica tubes	Reduced additional analysis tasks e.g. silica pre treatment, activation and tube packing	Reduces health & safety implications of small particulate inhalation and exposure to acid and silver treated reagents
Developed in accordance with JIS methods and adapted to EU and EPA methods	Applicable to a wide range of matrices (fat content ~1.5g max per silica column)	Minimise the quantity of lab equipment required to cover a range of samples
Simple and easy to use	Low capital investment and ongoing consumable costs	Excellent option for both start up and established laboratories
Small system footprint	Fume hood space dedicated to laboratory equipment is decreased	Increases the available space for other laboratory and sample preparation tasks
Parallel sample preparation	Sample preparation (including multilayer column preparation) time is reduced by at least two days vs. conventional silica tube method	Increased sample throughput = quicker reporting times
Multiple treated silica layers	Superior clean up of potential interferences	More accurate GC or LC analysis and interpretation

Ordering Information

Vacuum Manifold System



Single Sample Station



Ordering Information

System Components

Dioxin Sample Preparation Kit

Kit includes all glassware and connectors.

Note: Requires, but does not include, Multi-Layer Silica Gel Dioxin Column (28397-U) and Dual-Layer Carbon Reversible Tubes (28399-U) for "Standard Version", and Pre-Activated Florisil (48924-U) and Empty Micro-Column (Reversible Tube) (28309-U) for "Florisil Version"

	1 ea	**28423-U**

Required Consumables for Standard Version

Description	Pkg	Cat. No.
Multi-Layer Silica Gel Dioxin Column O.D. 6.35 mm × length 35 cm	5 ea	**28397-U**
Dual-Layer Carbon Reversible Tube (Micro-Column), O.D. 6.35/10 mm	10 ea	**28399-U**

Required Consumables for Florisil Version

Description	Pkg	Cat. No.
Multi-Layer Silica Gel Dioxin Column O.D. 6.35 mm × length 35 cm	5 ea	**28397-U**
Pre-Activated Florisil®, ampulized, 1 g, particle size 60/100 mesh	10 ea	**48924-U**
Empty Glass Micro-Column (Reversible Tube), O.D. 6.35/10 mm	10 ea	**28309-U**

Replacement Kit Parts

Instruction sheets delivered with the Dioxin Sample Prep System include details and descriptions of the following replacement parts.

Glassware

Description	Pkg	Cat. No.
Dioxin Vacuum Manifold	1 ea	**28403-U**
Vacuum Adapter, I.D. 10 mm	1 ea	**28408-U**
Top Flask with Stopcock, volume 250 mL, neck 24 mm	1 ea	**28449-U**
Empty Dioxin Column, O.D. 6.35 mm × length 35 cm	5 ea	**28404-U**
Syringe Luer Adapter, I.D. 10 mm	3 ea	**28405-U**
Collection Flask/Beaker, flat bottom, volume 300 mL	3 ea	**21269-U**
Long Stem Stopcock, I.D. 10 mm	3 ea	**28425-U**

Connectors

Description.	Pkg	Cat. No
6.35 mm/6.35 mm Union, PTFE	3 ea	**28411-U**
6.35 mm/10 mm Reducing Union, PTFE	3 ea	**28398-U**
10 mm/10 mm Union, PTFE	3 ea	**28412-U**
24 mm/24 mm Polypropylene Viton Connector	6 ea	**28432-U**

Optional components (not included with kit)

Description.	Pkg	Cat. No
Clear Seal Top Flask Adapter, neck 24 mm	3 ea	**21002-U**
Short Stem Stop Cock, I.D. 10 mm	3 ea	**28402-U**
Empty Dioxin Column, I.D. 6.35/10 mm × length 20 cm, to be used with 6.35/ 10mm Reducing Union (Cat. No.28398-U)	5 ea	**28409-U**

Bulk Media (Silica Gels/Sodium Sulfate/Alumina)

The same treated silica gels found in the pre packed multi-layer silica gel columns are available in bulk packages. These materials are useful for customizing your own columns to more efficiently clean very dirty samples, or to prepare shorter columns when samples are relatively clean, e.g. drinking water.

Description.	Pkg	Cat. No
10% $AgNO_3$ Coated Silica Gel	100 g	**21319-U**
44% H_2SO_4 Coated Silica Gel	100 g	**21334-U**
22% H_2SO_4 Coated Silica Gel	100 g	**21341-U**
2% KOH Coated Silica Gel	100 g	**21318-U**
Washed Silica Gel	250 g	**21342-U**
Sodium sulfate, ACS reagent, anhydrous, ≥99.0%, granular	500 g & 2.5 kg	**17876**
Alumina, Basic Type WB-5	250 g & 1 kg	**A1647**

For solvents specifically developed for this analysis see p.15

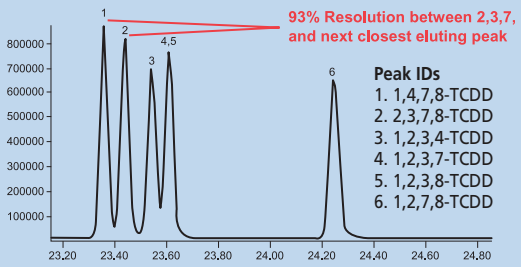


Related Information

Custom Tubes

If you have a **special multi-layer column** need, or require other packing materials in micro columns, please contact our technical service for support and further assistance.

GC Columns suitable for Dioxin and PCB analysis



column: SP-2331, 60 m x 0.25 mm I.D., 0.20 µm (24104-U)
oven: 170 °C (1 min.), 8 °C/min. to 265 °C
inj.: 250 °C
MSD interface: 265 °C
scan range: SIM
carrier gas: helium, 37 cm/sec constant
injection: 1 µL, splitless (1 min.)
liner: 4 mm I.D., single taper
sample: 1.5 µg/mL TCDD standard in dodecane

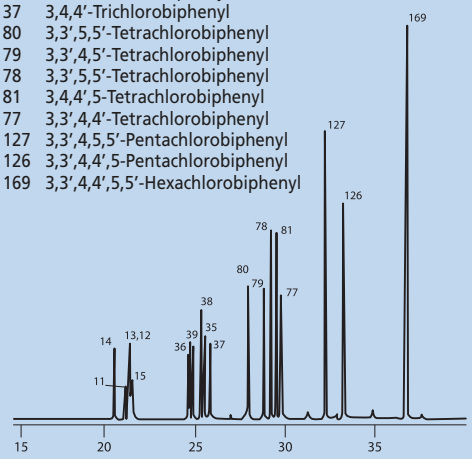
SP™-2331

A highly polar cyanosilicone stationary phase, specially tested for analyses of TCDD isomers. The phase is stabilized, providing a maximum temperature slightly higher than nonbonded cyanosilicone phases, such as SP-2330.

Temp. Limits: subambient to 275°C
Phase: Propriatary, stabilised

I.D. (mm)	Length (m)	d_f (µm)	Beta Value	Cat. No.
0.25	30	0.20	313	**24257**
	60	0.20	313	**24104-U**
0.32	60	0.20	400	**24105-U**

PCB IUPAC No.
14 3,5-Dichlorobiphenyl
11 3,3′-Dichlorobiphenyl
13 3,4′-Dichlorobiphenyl
12 3,4-Dichlorobiphenyl
15 4,4′-Dichlorobiphenyl
36 3,3′,5-Trichlorobiphenyl
39 3,4′,5-Trichlorobiphenyl
38 3, 4,5-Trichlorobiphenyl
35 3,3′,4-Trichlorobiphenyl
37 3,4,4′-Trichlorobiphenyl
80 3,3′,5,5′-Tetrachlorobiphenyl
79 3,3′,4,5′-Tetrachlorobiphenyl
78 3,3′,5,5′-Tetrachlorobiphenyl
81 3,4,4′,5-Tetrachlorobiphenyl
77 3,3′,4,4′-Tetrachlorobiphenyl
127 3,3′,4,5,5′-Pentachlorobiphenyl
126 3,3′,4,4′,5-Pentachlorobiphenyl
169 3,3′,4,4′,5,5′-Hexachlorobiphenyl



column: SPB-Octyl, 60 m x 0.25 mm I.D., 0.25 µm (24219-U)
oven: 150 °C (4 min.), 6 °C/min. to 320 °C (16 min.)
inj: 250 °C
det.: ECD, 340 °C
carrier gas: helium, 20 cm/sec at 200 °C
injection: 1 µL, splitless (45 sec)
sample: PCB mixture in isooctane, each analyte at 50-200 ng/mL

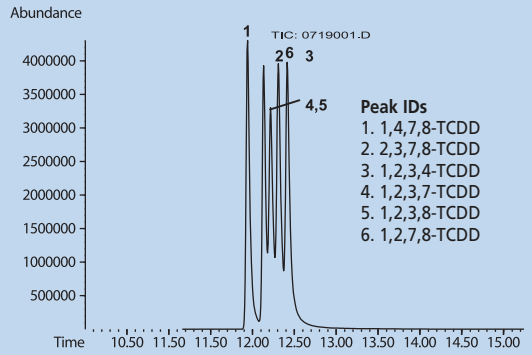
SPB™-Octyl

The polarity of SPB-Octyl approaches that of squalane and is substantially less polar than that of the widely used nonpolar methyl silicone phase. Because this column offers unique selectivity compared to nonpolar and intermediate polarity columns, we recommend SPB-Octyl columns for conformational analyses of PCB-containing samples. Operating Conditions: Chemically compatible with water and other injection solvents. Sensitive to strong inorganic acids and bases. Columns can be rinsed.

Temp. Limits: -60°C to 280°C (isothermal)
McReynolds Nos.: x′y′z′u′s′= 3 14 11 12 11
Phase: bonded; poly (50% n-octyl/50% methylsiloxane)

I.D. (mm)	Length (m)	d_f (µm)	Beta Value	Cat. No.
0.25	30	0.25	250	**24218-U**
	60	0.25	250	**24219-U**
	30	1.00	63	**24232**
	60	1.00	63	**24233-U**
0.53	60	3.00	44	**25398**

TCDD Isomers



column: SLB-5ms, 30 m x 0.25 mm I.D., 0.25 µm (28471-U)
oven: 170 °C (1 min.), 8 °C/min to 270 °C (10 min.)
inj: 250 °C
MSD interface: 270 °C
scan range: SIM, m/z=320, 322, 324
carrier gas: helium, 37 cm/sec., constant
injection: 1 µL, splitless (1 min.)
liner: 4 mm I.D., single taper
sample: TCDD standard, 1500 ppb in n-dodecane

SLB™-5MS

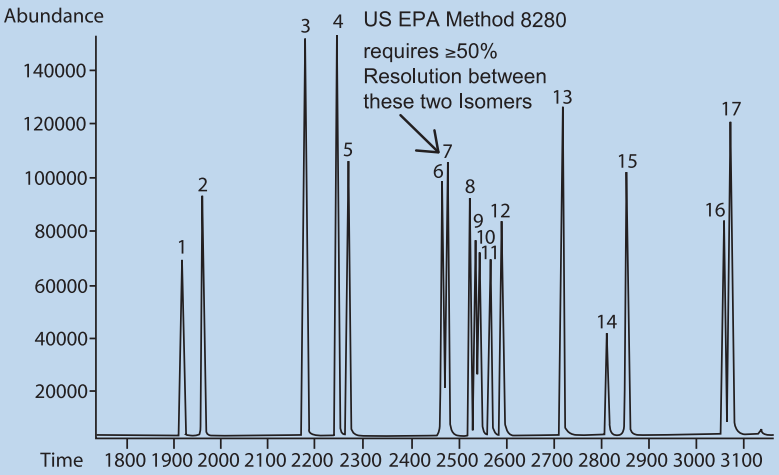
Supelco Low Bleed-5ms columns are designed for GC-MS and GC analysts who require a low bleed, inert, durable, and consistent capillary column for routine and trace analyses. SLB-5ms provides consistently lower bleed, lower detection limits, shorter analysis times, easier mass spectral identification, and less instrument downtime. The low phenyl content provides a boiling point elution order with a slight increase in selectivity, especially for aromatic compounds. The low bleed characteristics, inertness, and durable nature of the SLB™-5ms make it the column of choice for US EPA Methodologies such as environmental semivolatiles by GC-MS and pesticides/PCBs by GC-ECD as well as for dioxins/furans with HRGC/HRMS.

This column meets USP G27 and G36 requirements.
Operating Conditions: Chemically compatible with water and other injection solvents. Sensitive to strong inorganic acids and bases. Columns can be rinsed.

Temp. Limits: 0.10 -0.32 mm I.D.: -60 °C to 340 °C (isothermal)
0.10 -0.32 mm I.D.: -60 °C to 360 °C (programmable)
0.53 mm I.D.: -60 °C to 330 °C (isothermal)
0.53 mm I.D.: -60 °C to 340 °C (programmable)

Phase: bonded and highly crosslinked; silphenylene polymer virtually equivalent in polarity to 5% phenyl polymethylsiloxane

2,3,7,8-substituted PCDDs (Isomers)



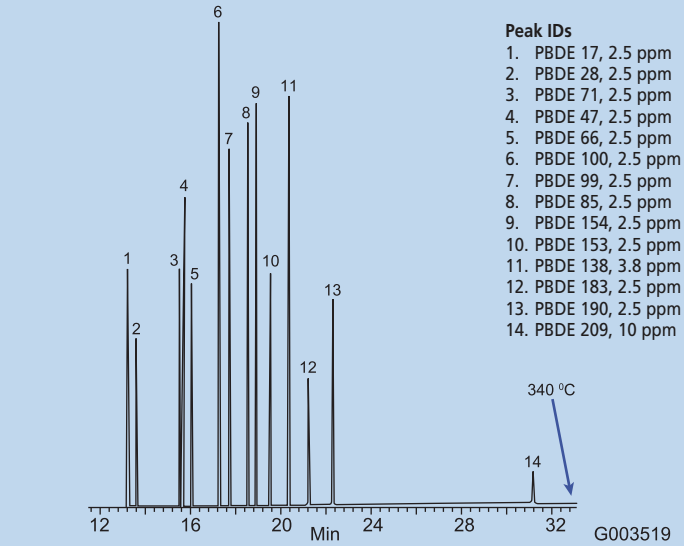
Peak IDs
1. 2,3,7,8-TCDF, 100ppb
2. 2,3,7,8-TCDD, 100ppb
3. 1,2,3,7,8-PCDF, 250ppb
4. 2,3,4,7,8-PCDF, 250ppb
5. 1,2,3,7,8-PCDD, 250ppb
6. 1,2,3,4,7,8-HxCDF, 500ppb
7. 1,2,3,6,7,8-HxCDF, 500ppb
8. 2,3,4,6,7,8-HxCDF, 250ppb
9. 1,2,3,4,7,8-HxCDD, 500ppb
10. 1,2,3,6,7,8-HxCDD, 500ppb
11. 1,2,3,7,8,9-HxCDD, 250ppb
12. 1,2,3,7,8,9-HxCDF, 250ppb
13. 1,2,3,4,6,7,8-HpCDF, 250ppb
14. 1,2,3,4,6,7,8-HpCDD, 250ppb
15. 1,2,3,4,7,8,9-HpCDF, 250ppb
16. OCDD, 500ppb
17. OCDF, 500ppb

column: SLB-5ms, 30 m x 0.25 mm I.D., 0.25 µm (28471-U)
oven: 150 °C (1 min.), 5 °C/min. to 325 °C (2 min.)
inj.: 250 °C
MSD interface: 325 °C
scan range: SIM
carrier gas: helium, 37 cm/sec constant
injection: 1 µL, splitless (1 min.)
liner: 4 mm I.D., single taper
sample: 17 component 2,3,7,8-substituted dioxin standard, 100-500 ppb in n-nonane

SLB-5ms (cont.)

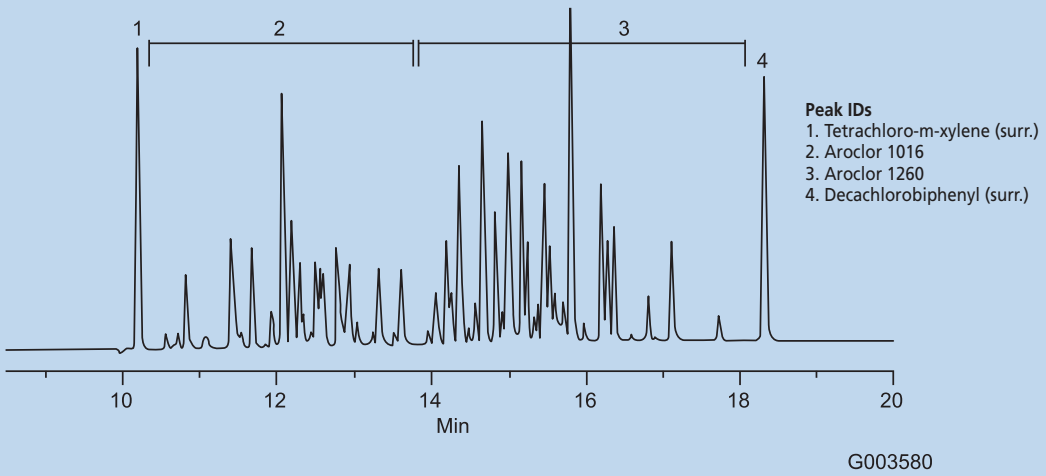
Length (m)	d_f (µm)	Beta	Cat. No.
0.10 mm ID Fused Silica			
10	0.10	250	**28465-U**
15	0.10	250	**28466-U**
0.18 mm ID Fused Silica			
20	0.18	250	**28564-U**
12	0.30	150	**28566-U**
30	0.30	150	**28575-U**
20	0.36	125	**28576-U**
0.20 mm ID Fused Silica			
30	0.20	250	**28513-U**
0.25 mm ID Fused Silica			
30	0.10	625	**28467-U**
15	0.25	250	**28469-U**
30	0.25	250	**28471-U**
60	0.25	250	**28472-U**
15	0.50	125	**28577-U**
30	0.50	125	**28473-U**
60	0.50	125	**28474-U**
30	1.0	63	**28476-U**
0.32 mm ID Fused Silica			
15	0.25	320	**28557-U**
30	0.25	320	**28482-U**
30	0.32	250	**28532-U**
15	0.50	160	**28597-U**
30	0.50	160	**28484-U**
30	1.0	80	**28487-U**
0.53 mm ID Fused Silica			
15	0.50	265	**28542-U**
30	0.50	265	**28541-U**
30	1.0	132	**28559-U**

Polybrominated diphenylethers (PBDEs) by GC-MS



column: SLB-5ms, 30 m x 0.25 mm I.D., 0.25 µm (28471-U)
oven: 125 °C (1 min.), 10 °C/min. to 340 °C (15 min.)
inj.: 300 °C
MSD interface: 340 °C
scan range: SIM
carrier gas: helium, 1.5 mL/min., constant
injection: 1 µL, pulsed splitless (30 psi until 0.2 min.)
liner: 4 mm I.D., single taper
sample: 14 component PBDE standard, 2.5-10 µg/mL in n-nonane

PCB/Aroclor's



column: SLB-5ms, 30 m x 0.25 mm I.D., 0.25 µm (28471-U)
oven: 100 °C (2 min.), 15 °C/min to 330 °C (3 min.)
inj.: 250 °C
det.: ECD, 330 °C
carrier gas: helium, 25 cm/sec, constant
injection: 2 µL, splitless (0.75 min.)
liner: 4 mm I.D., single taper
sample: Aroclor standard mix 1 (46846-U) diluted to 500 ppb / 50 ppb (Aroclors / surrogates) in n-hexane

Air Monitoring

Methods on air sampling of Dioxins/Furans & PCBs (*sampling media reference*)

European Method

EN1948-1 – Stationary source emissions. Determination of the mass concentration of PCDDs/PCDFs and dioxin-like PCBs -Sampling (*Orbo-1000, Orbo-2000, XAD-2 / Supelpak-2*)

US Methods

EPA TO-9A – Polychlorinated, Polybrominated and Brominated Chlorinated Dibenzo-p-Dioxins and Dibenzofurans in Ambient Air (*ORBO-2000*)

EPA 0023A – PCDD / PCDF emissions from stationary sources (*Supelpak-2*)

CARB 428 – PCDD / PCDF and PCBs emissions from stationary sources (*Supelpak-2*)

NIOSH 5503 – PCBs (*ORBO-60*)

EPA TO-10A – Pesticides/PCBs In Ambient Air Using Low Volume PUF Sampling (*ORBO-1000*)

EPA TO-4A – Pesticides / PCBs in Ambient Air Using High Volume PUF Sampling (*ORBO-2000*)

ASTM D4861-05 – Pesticides and PCBs in Air (*ORBO-1000*)

Dioxins /Furans and PCB are also sampled in ambient and indoor air as well as in emissions of industrial sites and waste incinerations. Supelco offers a range of purified sampling media and samplers suitable for this type of analysis. Common adsorbent materials are polyurethane foam (PUF) and Amberlite® XAD-2 (see below for details).

Samplers packed with PUF allow due to the low back pressure created by the foam for high flow rates (up to 5 L/min e.g. ORBO™-1000). For the ORBO-1000 PUF sampler, a filter cartridge assembly with a quartz filter is also available. This enables the simultaneous sampling of both the gas and particulate fractions. The ORBO-1500 and –2500 also have purified XAD-2 as an adsorbent (between two PUF plugs).





ORBO-1000 with installed filter cartridge
(Cat.Nos. 20557 & 21031)

Ordering Information

Description	Dimension O.D. x L	Pkg	Cat.No.
PUF sampler (product selection*)			
ORBO-1000	Assembled Cartridge - 22 mm x 7.8 cm PUF plug in glass	3 ea	20557
ORBO-1000	22 mm x 7.8 cm precleaned PUF plugs	3 ea	20600-U
ORBO-1500	Assembled Cartridge - 22 mm x 30 mm PUF, 1.5 g XAD-2, 22 mm x 30 mm PUF in glass holder	3 ea	22133-U
Filter cartridge for ORBO-1000		1 ea	21031
Replacement Quartz filter for ORBO-1000		10 ea	21038
ORBO-2000	Assembled Cartridge - 6 cm x 7.6 cm PUF in Glassholder	1 ea	20037
ORBO-2000	6 cm x 7.6 cm precleaned PUF replacement plugs	1 ea	20038
ORBO-2500	Assembled Cartridge - 6 cm x 5 cm PUF, 10 g XAD-2, 6 cm x 5 cm PUF	3 ea	21235-U
Other air sampling tubes & filter*			
ORBO-60 6 mm x 70 mm, Florisil (30/45) 100/50 mg		50 ea	20351
Boro silicate Glass Fiber Filter (Binder free) 13 mm OD, 1 µm pores		500 ea	23376
Empty Filter cassette 13 mm, 2-piece, with washer (Swinney Filter Holder)		5 ea	23367

* For more details on the above products or on other air monitoring media and equipment please refer to the Supelco catalogue or the Sigma-Aldrich web site.

Resins



Amberlite® XAD-2 & purified versions

Amberlite® XAD-2 is a polyaromatic (styrene-divinylbenzene) adsorbent resin commonly used for adsorbing hydrophobic compounds up to MW 20,000: phenols, organic removal, surfactants, aroma compounds, antibiotic recovery. It is one of the most used adsorbents for dioxin/furan sampling. The nonionic macroreticular resin that adsorbs and releases analytes through hydrophobic and polar interactions is usually used under isocratic conditions.

For cleaned US EPA versions, see Supelpak-2, Supelpak-2B and Supelpak-2SV below.

Specifications of Amberlite XAD-2:

- surface area ~300 m2/g
- density 1.02 g/mL, 25 °C (true wet)
- density 1.08 g/mL, 25 °C (skeletal)
- particle size 20-60 mesh
- pore volume ~0.65 mL/g
- mean pore size 90 Å
- max. temp. 200 °C

Ordering Information

Description	Pkg	Cat. No.
Amberlite XAD-2	100 g	**20275**
	500 g	**10357**
	5 kg	**SU853005**
	10 kg	**52672-U**
	25 kg	**3025-U**
Purified Amberlite XAD-2		
Supelpak-2	100 g	**20279**
	1 kg	**21130-U**
Supelpak-2B	100 g	**13670**
Supelpak-2SV	100 g	**13673-U**
	250 g	**13682-U**
	1 kg	**13674-U**

For more details on the above products or other air monitoring media and equipment please refer to the Supelco catalogue or the Sigma-Aldrich web site under sample preparation.

Purified Amberlite® XAD-2

The purified versions of Amberlite XAD-2 from Supelco are the Supelpak™-2 Materials. These have been treated in reference to official methods or special requirements:

Supelpak™-2 – Purified Amberlite® XAD-2 that has been cleaned to meet and exceed US EPA-recommended criteria for purity, as outlined in Level I Environmental Assessment Procedures Manual. It is the best resin to use for standard air sampling methods requiring resin tested for background TCO (total chromatographic organics) level. Packaged in glass containers.

Supelpak™-2B – It has been cleaned to meet and exceed US EPA requirements for determining PCBs in water according to the Great Lakes National Program Office (GLNPO). Packaged in glass containers.

Supelpak™-2SV – Purified Amberlite® XAD-2 that has been specially cleaned and tested for optimal performance in the capturing and extraction of semivolatile organics. Packaged in glass containers.

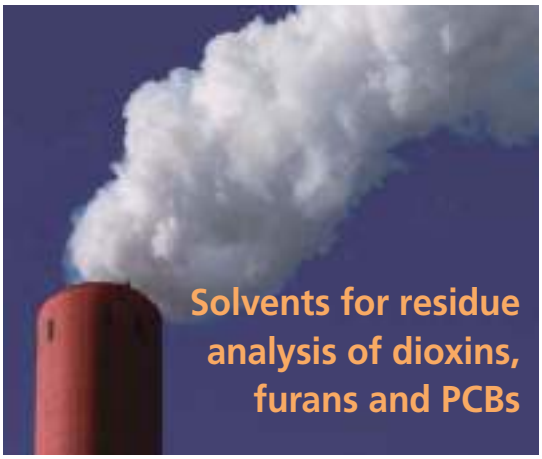


Related Information

Custom capabilities

Often analysts are confronted with analytical needs that are deviating from what is commercially available. Therefore Sigma-Aldrich offers the possibility to custom manufacture e.g. multi-layer silica tubes, standards and special treated bulk packing and adsorbent materials like alumina, silica or certain resins like Amberlite® XAD-2. If you have a special need please contact your local Sigma-Aldrich office/Technical Service for more details on the custom capabilities for these products.

Solvents & Standards



Ordering Information

Description	Pkg	Cat.No.
ENVISOLV		
Acetone	2.5L & 7L	**34410**
Dichloromethane	2.5L & 7L	**34411**
Hexane	2.5L & 7L	**34412**
Toluene	2.5L & 7L	**34413**

For the availability of the pack sizes please check with your local Sigma-Aldrich office or our website **sigma-aldrich.com**

ENVISOLV® Solvents for Dibenzo-p-dioxin/ -furan & PCB analysis

To achieve a good and reliable sample clean up results largely depends also on the used solvents that should not contribute to significant increase in the background of an analysis.

ENVISOLV® solvents are specified especially for the use in dibenzodioxin/furan analysis. They are GC-MS tested and contain less than 5 pg/l (5 ppq) of the 17 relevant dibenzodioxins and dibenzofurans listed in Table 6. Further specifications of this solvents are listed in Table 7.

Table 6. Tested dioxins & furans

Dibenzodioxins
2,3,7,8-tetra-CDD
1,2,3,7,8-penta-CDD
1,2,3,4,7,8-hexa-CDD
1,2,3,6,7,8-hexa-CDD
1,2,3,7,8,9-hexa-CDD
1,2,3,4,6,7,8-hepta-CDD
Octa-CDD

Dibenzofurans
2,3,7,8-tetra-CDF
2,3,4,7,8-penta-CDF
1,2,3,7,8/1,2,3,4,8-penta-CDF
1,2,3,4,7,8/1,2,3,4,7,9-hexa-CDF
1,2,3,6,7,8-hexa-CDF
1,2,3,7,8,9-hexa-CDF
2,3,4,6,7,8-hexa-CDF
1,2,3,4,6,7,8-hepta-CDF
1,2,3,4,7,8,9-hepta-CDF
Octa-CDF

Table 7. Specifications of the ENVISOLV product range

	Acetone	Dichloromethane	Hexane	Toluene
Assay (GC)	min. 99.8 %	min. 99.8 %	min. 95 %	min. 99.7 %
Non-volatile matter	max. 5ppm	max. 5ppm	max. 5ppm	max. 5ppm
Water content (Karl Fischer)	max. 0.2 %	max. 0.02 %	max. 0.01 %	max. 0.02 %
Suitability for GC-MS of dioxins, furanes, PCBs	complying	complying	complying	complying



Sigma-Adrich offers a wide range of standards, reference materials and calibration solutions. Please refer to our standards catalogue & CD, or visit us on our website: www.sigma-aldrich.com/standards



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- Whole Air Sampling
- Pumps and Accessories
- Chemical Standards

What's New in Air Monitoring



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Mercury Emissions Sampling Tubes.....page 17

Introduction

Supelco is proud to offer this comprehensive catalog featuring our air monitoring product line with new innovative products. We have more than 30 years expertise in adsorbent technology, which enables us to provide innovative solutions to meet a wide range of air monitoring needs for industrial hygiene, ambient air, and industrial source emissions applications.



Our sampling media are designed to meet sampling and analysis criteria according to NIOSH, OSHA, EPA, and ASTM methods. Our proprietary adsorbents, such as Carbopack™ graphitized carbon blacks and Carboxen™ carbon molecular sieves, exhibit unique and superior performance characteristics for a wide range of applications. Because we manufacture these materials on-site, we can assure both their quality and availability. We are an ISO 9001 company. Our highly qualified staff is dedicated to offering reliable products and customized solutions to meet your unique needs. This quality is also trusted by the National Aeronautics and Space Administration (NASA) who used Supelco materials for their space mission Cassini-Huygens to the Saturn moon, Titan and Galileo mission to Jupiter (To learn more, see page 9).

We are your one-stop supplier for your air monitoring needs and offer the complete solution from sample collection to analysis and quantification. We offer sampling pumps, sampling devices, chemical standards, vials, syringes, and chromatography columns. The convenience of a single, trusted source for all of your laboratory and air monitoring needs is unsurpassed. For a complete listing of complementary products, request a copy of our general products catalog or visit us online at *sigma-aldrich.com/supelco*



Types of Air Sampling

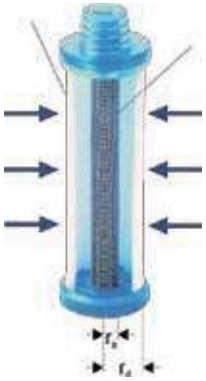
Active Sampling



Active

In active sampling, the air/gas sample is actively pumped or drawn into or through a sampling media. Media can be filters, adsorbent tubes, wash bottles, or gas sampling containers. In addition to capturing analytes of interest from the air, the active sampling device must ensure minimal background interference, exhibit sufficient capacity or breakthrough volume for the application for which it is intended, and provide an acceptable pressure drop during sampling.

Passive Sampling



P001114

Passive/diffusive sampling relies on the unassisted molecular diffusion of gaseous agents (analytes) through a diffusive surface onto an adsorbent. Unlike active sampling, passive samplers require no pumps, have no moving parts, are simple to use, and offer results comparable to active samplers.

Whole Air Sampling



E000995

A whole air sample is collected when the air is drawn into some sort of containment vessel such as a Tedlar™ bag or glass bulb. The method of collection is easy and the compounds of interest are recovered directly from the vessel. Recovery is a function of several factors which include, the surface area of the vessel, the chemistry and vapor pressure of the contaminants, the influence of various matrix effects, and the ability to begin with a vessel free of contamination. Supelco offers Tedlar Gas Sampling Bags and Bulbs to meet your whole air sampling needs.

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Adsorbents for Air Monitoring

Carbon Adsorbent Materials

The commitment to carbon adsorbent technology at Supelco has been ongoing for more than two decades. This effort has been critical to the advancement of chromatography products like GC columns and sample preparation products. Today, Supelco has over 87 different carbons ranging in particle size from 1–1000 µm and surface areas from 1–1500 m^2/g. Our efforts have been broad in scope, and have ranged from purification process development to research focusing on the thermodynamic and kinetic properties of adsorbents. Understanding the performance characteristics of adsorbents has been our primary goal.

The unique and valuable characteristics of the Supelco carbons warranted their inclusion in NASA experiments on the 1995 Galileo Mission to Jupiter; the 2005 Cassini-Huygens Mission to Titan-the largest moon of Saturn; and the 2008 Phoenix Mission to Mars. If you do not see a specialty carbon adsorbent that meets your needs, contact our Technical Service group at ***techservice@sial.com*** to inquire about custom materials. In addition to our specialty carbon adsorbents, we also offer popular adsorbents, such as activated charcoal, polymer materials, and silica gel.

Graphitized Carbon Black (GCB)

Unlike activated charcoals, which are porous, graphitized carbon blacks (GCBs) are generally non-porous, highly hydrophobic. Consequently, the entire surface of these materials is available for interactions that depend solely on dispersion (London) forces. Because we prepare our GCBs at temperatures >2500 °C, the high purity nature of the resulting carbon material ensures effective release/desorption of the analyte of interest. Carbotrap™ signifies material that is 20/40-mesh size, whereas Carbopack signifies material that is smaller than this mesh/particle size.

Products containing Carbotrap B, Carbotrap C, and Carbotrap F graphitized carbon blacks trap a wide range of airborne organic compounds, from C4-C5 hydrocarbons to polychlorinated biphenyls and other large molecules. Carbotrap (formerly called Carbotrap B)adsorbent has a surface area of 100 m^2/g and can be used for monitoring many airborne C5-C12 compounds. The smaller surface areas of Carbotrap C and Carbotrap F adsorbents, 10 m^2/g and 5 m^2/g, respectively, make these materials useful for trapping and efficiently releasing larger molecules in the C9-C30 range.

Unlike most GCBs, Carbopack X is porous. Its surface area of 240 m^2/g provides greater adsorption strength than other GCBs; hence it is a unique bridge between GCBs and carbon molecular sieves. Carbopack Y, with a surface area of 24 m^2/g, bridges the characteristics of Carbopack B and Carbopack C.

These adsorbents offer excellent thermal stability, which ensures minimal bleed at thermal desorption temperatures, and their coarse 20/40 and 40/60 mesh particle size prevents high pressure drop across the tube. Hydrophobic properties minimize sample displacement by water, enabling you to obtain accurate samples despite high humidity. Trapped compounds can be desorbed by solvent or thermal desorption, at virtually 100% desorption efficiency.

Carbopack B, Carbopack C, and Carbopack F GCBs are essentially the same adsorbents as Carbotrap, Carbotrap C, and Carbotrap F, respectively, but in a 60/80 mesh size. These materials often are used in narrow bore tubes (1-2 mm I.D.) for sample refocusing or very low flow sampling (e.g., <20 mL/min).

Graphitized Carbon Blacks

Description	Pkg.	Cat. No.
Carbotrap		
20/40 mesh	10 g	**20287**
Carbopack B		
60/80 mesh	10 g	**20273**
Carbotrap C		
20/40 mesh	10 g	**20309**
20/40 mesh	500 g	**11047-U**
Carbopack C		
60/80 mesh	10 g	**10257**
Carbotrap X		
20/40 mesh	10 g	**10435-U**
Carbopack X		
40/60 mesh	10 g	**10436**
60/80 mesh	10 g	**10437-U**
Carbotrap Y		
20/40 mesh	10 g	**10460-U**
Carbopack Y		
40/60 mesh	10 g	**10461-U**
60/80 mesh	10 g	**10462**
Carbopack Z		
60/80 mesh	10 g	**11051-U**



Carbon Molecular Sieve (CMS)

Carbosieve

A carbon molecular sieve (CMS) particle is the carbon skeletal framework remaining after the pyrolysis of a polymeric precursor. These materials are primarily used for collecting very small molecular-sized compounds (C2, C5). The size and shape of the analyte molecule and the size and shape of the pores in the CMS particle determine how well the analyte is adsorbed and desorbed. Because our CMSs are prepared from high purity polymers, the resulting material is a high purity carbon, effective in the release/desorption of adsorbed analytes for quantification. Carbosieve S-III and our Carboxen carbon molecular sieves have upper temperature limits of at least 400 °C.

- **Carbosieve S-III** is a large surface area (approximately 820 m^2/g) and 15-40 Å pores make this spherical carbon molecular sieve excellent for trapping small airborne molecules, such as chloromethane. Although hydrophobic, it retains slightly more water during sampling than does Carboxen-569. The pure carbon framework permits thermal desorption of analyte molecules without loss.
- **Carbosieve S-II** (mostly used in GC columns) is recommended for analyzing mixtures of permanent gases (H_2, O_2, Ar, CO and CO_2) and C1-C2 hydrocarbons (methane, ethane, ethylene, acetylene). Maximum temperature 225 °C with oxygen-free carrier gas.
- **Carbosieve G** (mostly used in GC columns) is recommended for analyzing C1-C3 hydrocarbons. Maximum Temperature <200 °C with oxygen free carrier gas.

Carbon Molecular Sieves

Description	Pkg.	Cat. No.
Carbosieve S-II		
60/80 mesh	10 g	**10189**
Carbosieve S-III		
60/80 mesh	10 g	**10184**
Carbosieve G		
40/60 mesh	5 g	**10197**
60/80 mesh	5 g	**10198**

Carboxen

Carboxen carbon molecular sieves are hydrophobic, ensuring accurate sampling at high humidities. Carboxen-563 and Carboxen-564 are our preferred versions of Ambersorb® XE-340 and Ambersorb XE-347 adsorbents – the carboxen adsorbents have higher capacity (breakthrough volume) for many volatile organic compounds (VOCs). Carboxen-563 is used for analyzing water quality or airborne compounds. Its range for airborne compounds is similar to that of Carboxen-564, but with a somewhat lower capacity.

Carboxen-564 is effective for monitoring many C2-C5 VOCs.

Carboxen-569 is a 20/45-mesh material with no Ambersorb equivalent. High hydrophobicity makes it useful for sampling in high humidity (use a 4 mm I.D. or larger tube). Relative to Carboxen-563 and Carboxen-564, Carboxen-569 has greater capacity for organic molecules and less capacity for water.

NEW! **Carboxen-572** is a CMS possessing a tapered pore structure with open, throughput micropores. It is a highly efficient CMS and compares directly to the Carboxen-1000 (one of our most efficient CMS carbons used for purge-trap, and air sampling applications). The primary difference between the Carboxen-572 and the Carboxen-1000 is the particle size distribution (Carboxen-572 = 20/45 mesh and Carboxen-1000 = 60/80 mesh).

Carboxen-1000 is for low volume sampling of very volatile compounds, such as vinyl chloride. Its large surface area and optimized microporosity enable it to effectively and efficiently adsorb and desorb smaller molecular size compounds, providing excellent chromatography without a need for cryogenic cooling. This 60/80-mesh adsorbent is used primarily in narrow bore tubes that are desorbed directly into the chromatographic column.

Carboxen-1001 is a 60/80 mesh material used to trap and retain small compounds. It can be used as the final bed in multi-bed adsorbent tubes, to minimize breakthrough. It is similar to Carboxen-569 in strength and hydrophobicity.

Carboxen-1003 is a carbon molecular sieve with a large surface area and hydrophobic surface characteristics, which provide a combination of efficient adsorption/desorption and good hydrophobicity.



Carboxen (Contd.)

Carboxen-1012 is a highly-activated, inert carbon molecular sieve (CMS) possessing large micropores. It has been used effectively for aqueous phase adsorption of organic compounds, or for air sampling of C4-C6 compounds.

Carboxen-1018 is a microporous CMS possessing a large percentage of narrow (~6-7 angstroms) micropores for adsorption/desorption of small analytes such as ethane, acetylene, ethylene and the C3 hydrocarbons. This CMS is a hydrophobic, inert, strong adsorbing porous carbon, as is the Carboxen-1021. Both are used in **breath sampling tubes** developed for ethane, acetaldehyde and other small molecules present in exhaled breath samples.

Carboxen-1021 is a highly-microporous carbon molecular sieve designed for air sampling of small molecules. It is similar to Carboxen-1018, with a large percentage of small micropores (5-6 angstroms; smaller than the Carboxen-1018), and is more hydrophobic than the Carboxen-1018.

Carboxen

Description	Pkg.	Cat. No.
Carboxen-563		
20/45 mesh	10 g	**10263**
Carboxen-564		
20/45 mesh	10 g	**10264**
Carboxen-569		
20/45 mesh	10 g	**10269**
20/45 mesh	500 g	**11048-U**
NEW! Carboxen-572		
20/45 mesh	10 g	**11072-U**
Carboxen-1000		
40/60 mesh	50 g	**10477-U**
60/80 mesh	10 g	**10478-U**
Carboxen-1003		
40/60 mesh	10 g	**10471**
Carboxen-1016		
60/80 mesh	10 g	**11021-U**

Choosing Carbon Adsorbents

For multi-bed tubes, use the weaker adsorbent in front of the stronger adsorbent. For example, use Carbopack C in front of Carbopack B.

Relative Analyte Size▲	Recommended Materials (listed weakest to strongest)
>C20	Carbotrap F, Carbopack F
C12-C20	Carbotrap C, Carbopack C, Carbotrap Y, Carbopack Y
C5-C12	Carbotrap B, Carbopack B
C3-C9	Carboxen 1016, Carbotrap X, Carbopack X, Carbopack Z
C2-C5	Carboxen 569, Carbosieve G, Carboxen 1000, Carbosieve S-III, Carboxen 1021, Carboxen 1018, Carboxen 1003, Carboxen 1012

▲ Analyte size relative to n-Alkanes. Consider all atoms, not just Carbon. For example, even though 1,2-Dichloroethane is a C2, the two Chlorine atoms give it a relative size between C4 and C5.

NEW!
Carbon Adsorbent Sampler Kits



E000926

Often choosing the right adsorbent or combination of adsorbents can be difficult. The goal in selecting the proper adsorbent is to choose one or more that can retain a specific analyte, or group of analytes, for a specific sample volume. However, equally important is that the adsorbent(s) must also be able to release the analyte(s) during the desorption process.

By using one of the Supelco Carbon Adsorbent Sampler Kits, the method developer obtains a cost-effective way to evaluate several carbon adsorbents when designing adsorbent-based applications and products. Once the appropriate material has been identified, Supelco is ready to work with you to produce larger quantities to your specifications.

Carbon Adsorbent Sampler Kits

Description	Cat. No.
Graphitized Carbon Black Kit 20/40 Mesh	
5 g each of Carbotrap F, Carbotrap C, Carbotrap Y, Carbotrap B, Carbotrap X	**13027-U**
Graphitized Carbon Black Kit 60/80 Mesh	
5 g each of Carbopack F, Carbopack C, Carbopack Y, Carbopack B, Carbopack X, Carbopack Z	**13026-U**
Carbon Molecular Sieve Kit	
5 g each of Carboxen-569, Carboxen-1000, Carboxen-1003, Carboxen-1012, Carboxen-1016, Carboxen-1018, Carboxen-1021, Carbosieve G, Carbosieve S-III	**13028-U**

Physical Characteristics of Supelco Carbon Adsorbents

Adsorbent	BET Surface Area● (m^2/g)	Density (g/mL)	Porosity (mL/g) micro-	Porosity (mL/g) meso-	Porosity (mL/g) macro-	Micropore Diameter (Å)
Carbotrap Kit (20/40 mesh graphitized carbon black)						
Carbotrap F	5	0.69	-	-	-	-
Carbotrap C	10	0.68	-	-	-	-
Carbotrap Y	24	0.45	-	-	-	-
Carbotrap B	100	0.37	-	-	-	-
Carbotrap X	240	0.43	-	0.62	-	100
Carbopack Kit (60/80 mesh graphitized carbon black)						
Carbopack F	5	0.64	-	-	-	-
Carbopack C	10	0.68	-	-	-	-
Carbopack Y	24	0.42	-	-	-	-
Carbopack B	100	0.35	-	-	-	-
Carbopack Z	220	0.18	-	1.73	-	255
Carbopack X	240	0.41	-	0.62	-	100
Carbon Molecular Sieve Kit						
Carboxen-1016	75	0.40	-	0.34	-	-
Carboxen-569	485	0.58	0.20	0.14	0.10	5 - 8
Carboxen-1021▼	600	0.62	0.30	-	-	5 - 8
Carboxen-1018▼	675	0.60	0.35	-	-	6 - 8
Carbosieve S-III◆	975	0.61	0.35	0.04	-	4 - 11
Carboxen-1003	1000	0.46	0.38	0.26	0.28	5 - 8
Carbosieve G	1160	-	0.49	0.02	-	6 - 15
Carboxen-1000	1200	0.48	0.44	0.16	0.25	10 - 12
Carboxen-1012	1500	0.50	-	0.66	-	19 - 21

● Brunauer, Emmett, Teller (BET) surface area calculations

▼ microporous, monoporous carbon sieve

◆ closed pore structure



Polymeric Adsorbents

Supelpak™ Adsorbents

Supelpak-2 is a purified form of Amberlite® XAD®-2 resin, designed for minimal background interference when monitoring semivolatile contaminants. It has been cleaned to meet and exceed US EPA-recommended criteria for purity, as outlined in the EPA's Level 1 Environmental Assessment Procedures Manual. Supelpak-2 is used in the following US EPA methodologies: SW-846 Method 0010, Modified Method 5 Sampling Train for Principal Organic Hazardous Compounds (POHCs); TO-13 - PAHs in ambient air; and IP-7 - PAHs in indoor air. It is the best resin to use for standard air sampling methods requiring resin tested for background TCO (Total Chromatographic Organics) level.

Supelpak-2

Matrix:	styrene-divinylbenzene
Surface Area:	~300 m^2/g
Density:	1.02 g/mL, 25 °C (true wet) 1.07 g/mL, 25 °C (skeletal)
Particle Size:	20/60 mesh
Pore Volume:	~0.65 mL/g
Mean Pore Size:	90 Å
Max Temp.:	200 °C

Supelpak-2B is a form of Amberlite XAD-2 resin specially cleaned to USEPA specifications for the Great Lakes National Program Office (GLNPO) program, for sampling and analysis of PCBs from large volumes of water.

Supelpak-2SV is a form of purified Amberlite XAD-2 that has been specifically cleaned and tested for optimal performance in capturing and extraction of semivolatile organics.

Supelpak Adsorbents

Description	Pkg.	Cat. No.
Supelpak-2		
20/60 mesh	100 g	**20279**
20/60 mesh	1 kg	**21130-U**
Supelpak-2B		
20/60 mesh	100 g	**13670**
NEW! Supelpak-2SV		
20/60 mesh	100 g	**13673-U**
20/60 mesh	250 g	**13682-U**
20/60 mesh	1 kg	**13674-U**

Porous Polymers

- **Tenax® TA** is a porous material based on 2,6-diphenylene oxide polymer. It is used to trap volatile and semivolatile compounds with an upper temperature limit of 350 °C. It has a low affinity for water and methanol. When sampling for very volatile analytes with Tenax TA, a carbon molecular sieve typically is used as a backup.
- **Supelpak-TA** is a refined (screened) Tenax TA.
- **Tenax GR** is a composite material containing 30% graphite carbon and 70% Tenax TA. Compared to Tenax TA, it has a higher retention volume for most compounds and is twice as dense. Like Tenax TA, it has a low affinity for water or methanol and has an upper temperature limit of 350 °C.
- **Chromosorb® 106** is a styrenedivinylbenzene polymer used to trap small molecules. It has a surface area of 750 m^2/g and an upper temperature limit of 250 °C.
- **Porapak™ N** is a divinylbenzene-ethyleneglycol dimethacrylate polymer.

Porous Polymers, Bulk

Description	Pkg.	Cat. No.
Tenax TA		
60/80 mesh	10 g	**11982**
Supelpak TA		
60/80 mesh	100 g	**12168-U**
Tenax GR		
20/35 mesh	500 g	**11049-U**
Chromosorb 106		
60/80 mesh	50 g	**20225**
Porapak N		
50/80 mesh	75 cc	**20324**

General Purpose Adsorbents

Activated Coconut Charcoal

Activated coconut charcoal has been used extensively as a general purpose adsorbent due to its ability to adsorb/desorb a wide range of volatile analytes.

Description	Pkg.	Cat. No.
Activated Charcoal		
20/40 mesh	10 g	**10275**

Silica Gel

Silica gel has been used extensively as a general purpose adsorbent due to its ability to adsorb/desorb a wide range of volatile analytes, in particular, those that are polar. Care must be taken when sampling in humid environments due to its affinity for water.

Description	Pkg.	Cat. No.
Davison Silica Gel, Grade 12		
60/80 mesh	100 g	**20290-U**

Adsorbents for Air Monitoring

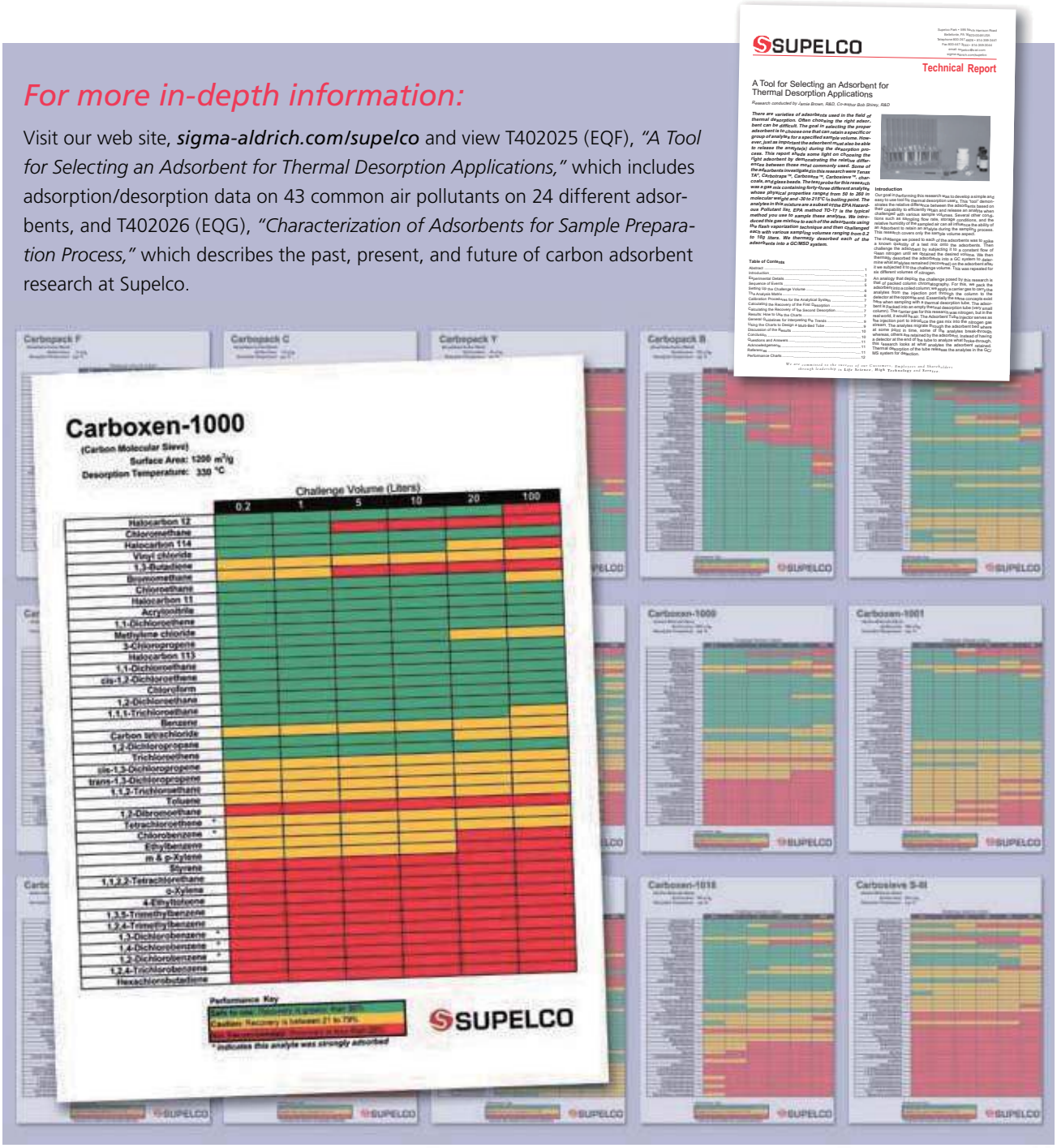
Adsorbent Cross Reference

Adsorbent	Supelco Equivalent or Substitute
Ambersorb 347	Carboxen 564
Anasorb CMS	Carboxen-564, Carboxen-1000, Carbosieve S-III
Anasorb CSC	Coconut charcoal
Anasorb GCB1	Carbopack B, Carbotrap B
Anasorb GCB2	Carbopack C, Carbotrap C
Anasorb 708	Chromosorb 108
Anasorb 727	XAD-4
Anasorb 747	Carboxen-564, Carboxen-1000, Carbosieve S-III

Adsorbent	Supelco Equivalent or Substitute
Carbograph 1	Carbopack B, Carbotrap B
Carbograph 2	Carbopack C, Carbotrap C
Carbosphere	Carboxen-1000
Graphpac-GC	Carbopack B, Carbotrap B,
Carbopack C	Carbotrap C
Purosieve	Carboxen-1000
Spherocarb	Carboxen-1000
Tenax GC	Tenax TA

For more in-depth information:

Visit our web site, ***sigma-aldrich.com/supelco*** and view T402025 (EQF), *"A Tool for Selecting an Adsorbent for Thermal Desorption Applications,"* which includes adsorption/desorption data on 43 common air pollutants on 24 different adsorbents, and T402026 (EQG), *"Characterization of Adsorbents for Sample Preparation Process,"* which describes the past, present, and future of carbon adsorbent research at Supelco.



Did you know..

Space, the Final Frontier.

The National Aeronautics and Space Administration (NASA) has been studying planets in our solar system for several decades. The missions attempt to obtain a breadth of knowledge by gathering data on the electromagnetic spectrum, magnetic fields, particle analyses, and atmosphere constituents of these planets. Some information may lead to determining the birth of the solar system and origins of life on Earth. To assist in these studies, Supelco designed unique carbon adsorbents for analyzing atmospheric constituents under the arduous constraints of space exploration.

The Galileo Probe, which arrived at Jupiter in 1995, employed a column packed with a Carbosieve carbon molecular sieve adsorbent, as part of a mass spectrometer experiment. This adsorbent was developed to separate and quantify the gases in Jupiter's atmosphere — methane, water, argon, neon, hydrogen sulfide, krypton, xenon, ammonia, and isotopes of helium and hydrogen. The adsorption / desorption properties of the adsorbent allowed concentration of these gases of interest, and their subsequent desorption to a mass spectrometer sensor for analysis.

NASA's project, the Cassini-Huygens Mission to Saturn, is a journey to the ringed planet that will last approximately seven years. Exploration will continue for four years. A total of 27 experiments will be performed, with the involvement of a number of international space agencies, academic institutions, and industrial partners. Supelco participated in composing the atmosphere sampling experiments. The Cassini spacecraft consists of two parts — the Saturn orbiter will collect data, communicate with Earth, and power the spacecraft; the Huygens probe will separate from the orbiter and travel to Titan, Saturn's largest moon. A gas chromatograph/mass spectrometer (GC-MS) in the Huygens probe will analyze the organic components of Titan's atmosphere. Light hydrocarbons will be concentrated using a new, porous graphitized carbon developed at Supelco specifically for this application. This carbon will trap the C2 to C8 hydrocarbon fraction — an important indicator of the presence of life.

Supelco scientists graphitized a carbon molecular sieve to optimize the analysis of light hydrocarbons and efficiently release the trapped analytes under conditions specific to a totally new GC-MS flow design. The carbon molecular sieve base withstands the vibrations of the launch and entry into Titan's atmosphere. Also onboard the Huygens probe is another carbon molecular sieve, Carboxen-1004. As the atmosphere of Titan is believed to be similar to that of ancient Earth, Supelco provided an adsorbent that will trap permanent gases. Scientists working at the University of Paris, packed a microcolumn with Carboxen-1004, for in situ GC-MS analysis.

Supelco's carbon laboratory is one of the finest in the world. In addition to developing new carbon molecular sieves and making recent developments with porous graphitized carbon, we also produce a variety of graphitized carbon blacks (GCBs).

We can prepare carbons in sub-micron particle sizes (for capillary GC applications) to 1.0 mm sizes (for sample preparation applications where pressure drop considerations are required). Some carbons are available in larger sizes. The temperature capability of our furnace reaches 3000 °C, and its capacity extends from bench- to pilot-scale. We pride ourselves on being able to tailor carbon adsorbents to specific applications. The graphitized carbon molecular sieve designed specifically for NASA is just one example. Supelco carbon adsorbents are available in bulk, packed in columns, sampling tubes, or gas purifiers. Custom requests are welcome, even if your demands are earthbound.



Active Sampling

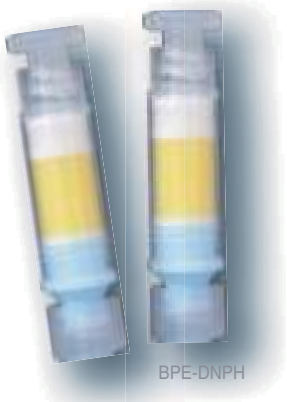
LpDNPH (Low Pressure) Products

LpDNPH cartridges are air-sampling devices designated for sampling carbonyls (e.g. formaldehyde) in ambient, indoor, and industrial atmospheres. Carbonyls are trapped on a high purity silica adsorbent coated with 2,4-dinitrophenylhydrazine (DNPH), where they are converted to hydrazone derivatives. The derivatives are eluted from the cartridge with acetonitrile and analyzed by HPLC.

LpDNPH cartridge benefits:

- High purity adsorbent for better accuracy and trace analysis.
- High sensitivity, low background.
- Low pressure drop, enables use at high sampling rates (1.5-2 L/min), or long pump performance
- New packaging, for maximum sample integrity
- Manufactured in controlled environment
- Meets EPA, OSHA, NIOSH and ASTM specifications

NEW! *BPE-DNPH* Cartridge*



This innovative product is dual-layered and designed to enable the end-user to simultaneously analyze ozone and aldehydes in their sample; or for use as an inline ozone scrubber and aldehyde analysis in one tube. It incorporates a bed of 1,2-bis(4-pyridyl) ethylene (BPE) coated silica and a bed of DNPH coated silica. This product is also not affected by high humidity. Two uses, your choice.

Description	Pkg.	Cat. No.
BPE-DNPH, 90/260 mg Rezorian	10	54269-U
BPE-DNPH, 90/260 mg Rezorian	50	54270-U

Reference: Uchiyama,S.Anal. Chem. 2008, 80, 3285-3290
**Patent Pending*

DNPH Rezorian™ Cartridge



Rezorian cartridges are made of polypropylene with polyethylene frits. The end-fittings are luer lock syringe connections that can be used to connect a pump tubing or two cartridges in a series (piggybacked) to monitor breakthrough or to increase capacity.

Description	Pkg.	Cat. No.
DNPH, 350 mg, Rezorian	10	54074-U
DNPH, 350 mg, Rezorian	50	54075-U

S10 Cartridge

The design of the S10 cartridge makes it easy to use in the field and the laboratory. Reusable adapters are available for connecting the cartridge to the sampling pump. The built-in reservoir eliminates the need to attach a syringe for sample extraction/elution.



Description	Pkg.	Cat. No.
LpDNPH S10, 3 mL/350 mg	50	21014
LpDNPH S10, 3 mL/350 mg	10	21026-U
LpDNPH S10, 3 mL/350 mg (1 per nylon bag)	50	54072-U
LpDNPH S10 Starter Kit	10	21024-U
Kit includes one tube adapter and ten 1/8" male luer fittings		

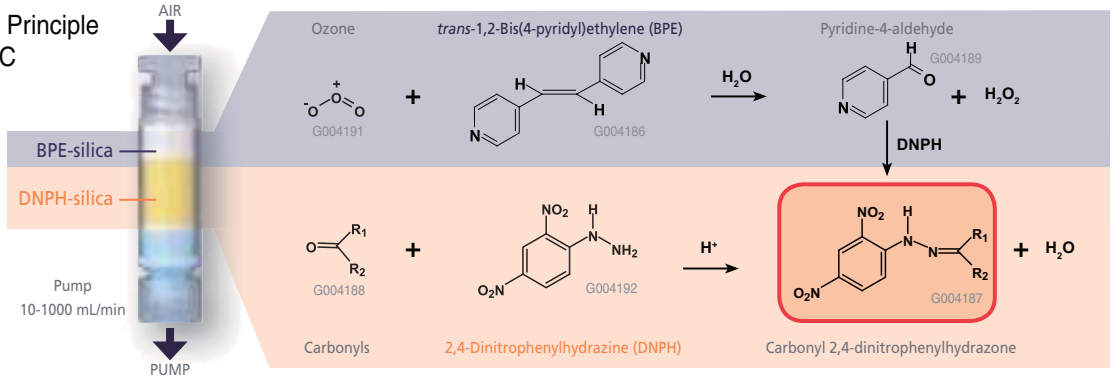
S10x Cartridge

The S10x cartridge is shorter than the S10 cartridge and designed to fit automated systems.



Description	Pkg.	Cat. No.
LpDNPH S10x, 350 mg	10	505293

Reaction Principle and HPLC





S10L Cartridge

The S10L cartridge offers a reversible design and is for analysts who prefer shorter dimensions and does not need an adaptor for sampling. The cartridge is eluted by connecting to a syringe barrel (empty SPE tube) that acts as a reservoir for gravity-fed elution solvent. Meets EPA TO-11A requirements.



Description	Pkg.	Cat. No.
LpDNPH S10L, 350 mg Reversible	10	505358
LpDNPH S10L, 350 mg Reversible	50	505361-U

H Series Cartridges



The H series of LpDNPH cartridges contain higher loadings of 2,4-DNPH and/or larger bed weights compared to the S10 cartridges. This provides a higher capacity for carbonyls making the H series cartridges the preferred choice for use in high concentration environments. The H series is available in H10 (350 mg), H30 (1 g) and H300 (10 g) cartridges.

Description	Pkg.	Cat. No.
LpDNPH H10, 3 mL/350 mg	10	**505315**
LpDNPH H10, 3 mL/350 mg	50	**505320-U**
LpDNPH H30, 6 mL/1 g	10	**505323**
LpDNPH H300, 20 mL/10 g	10	**505331**

ORBO-DNPH Tube



The ORBO-DNPH tube contains 120 mg of 2,4-DNPH packed into a glass tube with break seal at both ends, each measuring 6 mm O.D. x 90 mm long.

Description	Pkg.	Cat. No.
ORBO-DNPH, 120 mg/6 mm O.D. x 90 mm L	10	**20081-U**

Ozone Scrubber

This cartridge offers a reversible design, like the S10L cartridge and contains 1.5 g of high purity potassium iodide. KI traps the ozone, which causes a negative formaldehyde interference in DNPH-coated devices. Luer endfittings enable you to connect this cartridge directly to the inlet of any DNPH cartridge with a luer tip. Testing (200 ppb ozone, 50% RH, 25C) has shown the scrubber to have an ozone capacity of 100,000 ppb/hr. The ozone scrubber is also available in the Rezorian hardware.



Description	Pkg.	Cat. No.
Ozone Scrubber, 1.5 g, Reversible	10	**505285**
Ozone Scrubber, 1.5 g, Rezorian	10	**54078-U**

LpDNPH Cartridge Specifications

Adsorbent:	Chromatographic grade, high purity silica gel coated with: DNPH: 2,4-dinitrophenylhydrazine BPE: trans-1,2-bis(4-pyridyl)ethylene	
Particle Size:	150-250 µm (60/100 mesh)	
DNPH Loading:	0.29% (1 mg/cartridge) 0.38% (1 mg/cartridge, BPE-DNPH) 0.86% (3 mg/cartridge, H series) 0.21% (0.25 mg/cartridge, ORBO-DNPH)	
Capacity (total carbonyls):	75 µg (S10 series, BPE-DNPH) 225 µg (H10) 643 µg (H30) 6.4 mg (H300) 18.8 µg (ORBO-DNPH) 26 µg ozone capacity (BPE-DNPH)	
Cartridge Length:	7.4 cm (S10) 3.8 cm (S10x) 4.0 cm (S10L) 4.0 cm (Rezorian, BPE-DNPH) 9.0 cm (ORBO-DNPH)	
Background:	**SPE Style Cartridges** <0.06 µg formaldehyde <0.10 µg acetaldehyde <0.30 µg acetone	**ORBO-DNPH** <0.025 µg formaldehyde <0.035 µg acetaldehyde <0.120 µg acetone
Pressure Drop:	<7 KPA at 1.5L/min (S10) (<28 inches water/<2.1 inches mercury)	<20 inches water at 167 mL/min
Storage:	Refrigerate (4 °C), protect from light	
Shelf Life:	12 months	

HPLC Column Reference

For HPLC columns suitable for carbonyl-DNPH analysis, see page 12.



Adapters and Fittings

We offer a selection of reusable adapters and fittings for connecting our cartridges to a sampling pump and other devices.

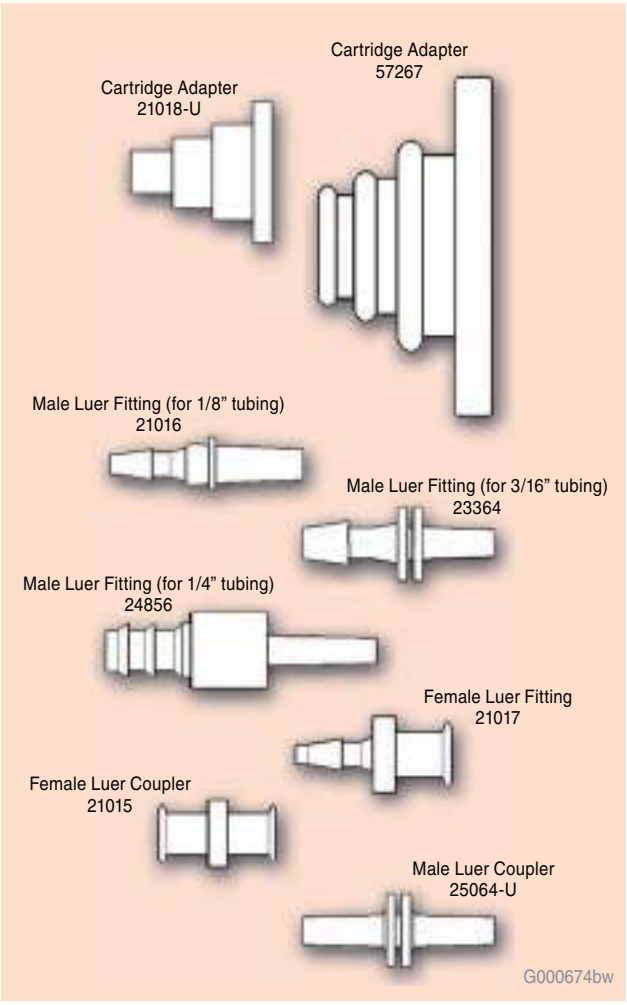


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Accessories

Description	Pkg.	Cat. No.
Connectors		
Cartridge Adapters for S10, H10, H30	10	21018-U
Cartridge Adapters for H300	6	57267
Male Luer Fittings for 1/8" Tubing	20	21016
Male Luer Fittings for 3/16" Tubing	20	23364
Male Luer Fittings for 1/4" Tubing	10	24856
Female Luer Fittings	20	21017
Female Luer Couplers	20	21015
Male Luer Couplers	20	25064-U
Male Luer Plugs	12	504351
Lapel Clips	6	21019-U
Syringe Barrels, 6 mL	30	57242
Glass Reservoirs, 5 mL	5	20015-U
Universal Elution Rack	1	21043-U
Analytical Columns Suitable for Carbonyl-DNPH Analysis		
Ascentis C18, 15 cm x 4.6 mm I.D., 3 µm	1	581322-U
Ascentis C18, 25 cm x 4.6 mm I.D., 5 µm	1	581325-U
Ascentis RP-Amide, 15 cm x 4.6 mm I.D., 3 µm	1	565322-U
Ascentis RP-Amide, 25 cm x 4.6 mm I.D., 5 µm	1	565325-U

Visit our website for detailed analysis and description.



Universal Elution Rack

Fast and convenient sample preparation without the use of a vacuum

Our versatile elution rack can be used with a variety of air monitoring tubes and receiving vessels, including our LpDNPH cartridges, for simultaneous gravity feed extraction up to 12 samples. By using the assembly plates in various combinations, you can configure the unit to accept:



P000131

- Closed cartridges (S10L)
- 1,3, or 6 mL syringe style cartridges
- 5 or 10 mL flasks
- 2 or 4 mL vials
- Test tubes up to 15 mm I.D. x 10 cm

For more in-depth information:

Aldehyde Method Applications

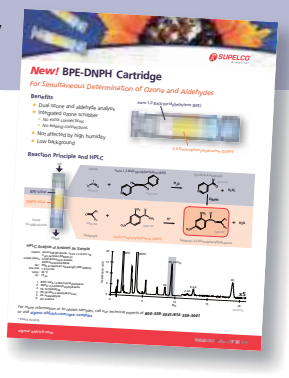
US EPA TO11A – Method for Determination of Formaldehyde in Ambient Air Using Adsorbent Cartridge Followed by High Performance Liquid Chromatography (HPLC)

US EPA IP-6A – Determination of Formaldehyde and Other Aldehydes in Indoor Air Using a Solid Sorbent Cartridge

US EPA Technical Assistance Document – Sampling and Analysis of Ozone Precursors

ASTM D5197 – Standard Test Method for Determination of Formaldehyde and Other Carbonyl Compounds in Air Active Sampler Methodology

Visit ***sigma-aldrich.com/air_monitoring*** to request the NEW **BPE-DNPH Flyer**, T408066 (KJB)





ORBO Solvent Desorption Tubes

ORBO Solvent Desorption Tubes are packed in glass with sealed ends. ORBO Tubes are mostly dual-layered and contain one larger bed of adsorbent followed by a smaller back-up bed to capture any sample break-through. The beds contain separators typically of glass wool or foam to secure the beds in place.



G000211

ORBO No.	Matrix	Bed Wt. A/B (mg)	O.D. x Length (mm)	SKC Equivalent	Pkg.	Cat. No.
ORBO Charcoal						
ORBO 32 Large	Activated Coconut Charcoal (20/40)	400/200	8 x 100	226-09	50	**20228**
ORBO 32 Small	Activated Coconut Charcoal (20/40)	100/50	6 x 75	226-01	50	**20267-U**
ORBO 33	Activated Petroleum Charcoal (20/40)	700/390	8 x 150	226-35	50	**20259**
ORBO 34	Activated Coconut Charcoal (special)	400/200	8 x 105	-	25	**20211**
ORBO 303	Petroleum Charcoal (20/40)	100/50	6 x 75	226-38		**custom order**
ORBO 304	Charcoal (low Ni) (20/40)	120/60	6 x 80	-	50	**20041**
ORBO 306	Petroleum Charcoal (20/40)	400/200	8 x 105	-	50	**20073-U**
ORBO 351	4-tert-butyl catechol on charcoal	100/50	6 x 75	226-73	50	**20042**
ORBO 353	HBr on Petroleum Charcoal	100/50	6 x 75	226-38-03	25	**20044**
ORBO 354	Charcoal (AVL Barneby Cheney, 580-19)	100/50	6 x 75	226-67	50	**20045**
ORBO 356	4-tert-butyl catechol on charcoal	400/200	8 x 110	-	50	**20047**
Silica Gel						
ORBO 52 Small	Activated Silica Gel(20/40)	150/75	6 x 75	226-10	50	**20229**
ORBO 52 Large	Activated Silica Gel (45/60)	150/150	8 x 75	226-48	50	**20263**
ORBO 53	Activated Silica Gel (20/40) with glass fiber filter	400/200	7 x 100	226-10-03	50	**20265**
ORBO 502	Activated Silica Gel (20/45)	100/50	6 x 75	226-51	50	**20030-U**
ORBO 506	Activated Silica Gel (45/60)	300/150	8 x 75	226-10-04	50	**20032**
ORBO 507	Silica Gel (20/40)	520/260	8 x 110	226-15	50	**20870-U**
ORBO-DNPH	2,4-DNPH coated Silica Gel	120	6 x 90	-	10	**20081-U**
Florisil						
ORBO 60	Florisil Magnesium Silicate (30/45)	100/50	6 x 75	226-39	50	**20351**
ORBO Carbon						
ORBO 76 (3 bed)	TEA-Coated Molesieve with Oxidizer	400/800/400	7 x 125	226-40	25	**20826-U**
ORBO 77	H_2SO_4-Treated Carbon Bead (20/30)	500/100	8 x 150	226-29	50	**20036**
ORBO 78	Carboxen-564	400/200	6 x 100	-	25	**20355**
ORBO 90	Carboxen-564 (for group MEK)	160/80	6 x 75	226-81	25	**20358**
ORBO 91	Carbosieve S-III	130/65	6 x 75	226-121	25	**20360**
ORBO 91T (3 bed)	Carbotrap B/Carbosieve S-III x 2	100/200/100	7 x 150	-	25	**20366-U**
ORBO 92	Carboxen-564 (for group vinyl acetate)	160/80	6 x 75	226-81	25	**20362**
ORBO 100	HBr on Carbotrap (20/40)	350/175	7 x 110	-	25	**20255-U**
ORBO 101	Carbotrap (20/40)	100/50	6 x 70	-	25	**20254-U**
ORBO Porous Polymers						
ORBO 23	2-(Hydroxymethyl) piperidine on Supelpak-20 (20/40)	120/60	6 x 85	226-118	25	**20257-U**
ORBO 24	2-(Hydroxymethyl) piperidine on Supelpak-20 (20/40)	150/75	6 x 105	226-117	25	**20231**
ORBO 25	2-(Hydroxymethyl)piperidine on Supelpak-20 (20/40)	450/225	8 x 115	226-27	25	**20357**
ORBO 42 Small	Supelpak-20E (20/40)	66/33	6 x 75	-	50	**20262**
ORBO 42 Large	Supelpak-20P (20/40)	100/50	10 x 100	-	50	**20264-U**
ORBO 43	Supelpak-20U (20/40)	100/50	8 x 100	226-30-04	50	**20258**
ORBO 44	Supelpak-20E (20/40)	100/50	8 x 100	226-30-04	50	**20260-U**
ORBO 47	Supelpak-70	100/50	6 x 90	226-95	50	**20349**
ORBO 49P	Supelpak-20P (20/40) with glass fiber filter	270/140	OVS-2 Tube	226-30-16	10	**20350**
ORBO 65M	XAD-4 (w/MCE filter)	160/80	OVS-2 Tube	-	10	**20028-U**
ORBO 65P	XAD-4 (w/Glass Fiber Filter)	160/80	OVS-2 Tube	-	10	**20029-U**
ORBO 70	5% Na_2CO_3 on Chromosorb P (30/60)	355/165	8 x 100	-	50	**20256-U**
ORBO 402	Tenax TA (35/60)	100/50	8 x 100	226-35-03	50	**20832-U**
ORBO 403	Tenax TA (60/80), acetone/methanol treated	100/50	6 x 85	-	50	**20034**
ORBO 601	XAD-8 (16/50), single bed	100	6 x 75	226-30-08	50	**20048**
ORBO 605	XAD-2 (20/50)	100/50	6 x 100	-	50	**20049**
ORBO 608	XAD-2 (20/50)	150/75	8 x 110	226-30-05	50	**20050-U**
ORBO 609	XAD-2 (20/50)	400/200	8 x 110	226-30-06	50	**20051**
ORBO 613	XAD-4	80/40	6 x 75	226-93	50	**20052**
ORBO 615	XAD-7 (15/50)	100/50	6 x 75	226-94	50	**20053**
ORBO 655	XAD-7 (20/60), Phosphoric Acid Treated	80/40	6 x 75	226-98	50	**20054**
ORBO 657	XAD-7 (20/60),1-(2-pyridyl) piperazine coated)	80/40	6 x 90	-	50	**20055**
ORBO 706	Chromosorb 102 (20/40)	100/50	8 x 100	226-107	50	**20057**
ORBO 711	Chromosorb 106 (60/80)	600/300	10 x 115	226-111	50	**20059**
ORBO 1102	Poropak P (50/80)	100/50	6 x 75	226-114	50	**20062**
ORBO 1103	Poropak Q (50/80)	150/75	6 x 100	226-115	50	**20063**
ORBO Accessories						
Puller/Inserter Tool					2	**22406**
ORBO Tube Cutter					1	**20596**
Tube Cutter Replacement Blade					1	**20575**



ORBO PUF Cartridges

Polyurethane foam (PUF) cartridges exhibit a low-pressure drop across the cartridge that facilitates high volume sampling. Several US EPA and ASTM methods require a PUF adsorbent cartridge for monitoring semivolatiles in stack, ambient, indoor, and workplace atmospheres. Refer to the tables below for descriptions of our PUF cartridges. The PUF plugs for these cartridges are thoroughly cleaned and tested to ensure absence of contamination.



P000745

Specifications for Small PUF Plug (Low Volume)

	ORBO 1000 Small PUF	ORBO 1500 PUF/XAD-2/PUF
Sampling Rate:	1-5 L/min	1-5 L/min
PUF Density:	0.022 g/cm³	0.022 g/cm³
Dimensions: (O.D. x L)	22 mm x 7.6 cm	22 mm x 30 mm/ 1.5 g XAD-2/22 mm x 30 mm
Applications:	ASTM D4861 Pesticides/ PCBs	Pesticides/PCBs
	ASTM D4947 Chlordane/ Heptachlor	
	EPA IP-8 Pesticides/PCBs	
	EPA TO-10A Pesticides/PCBs	

Specifications for Large PUF Plug (High Volume)

	ORBO 2000 Large PUF	ORBO 2500 PUF/XAD-2/PUF
Sampling Rate:	20-225 L/min	20-225 L/min
PUF Density:	0.022 g/cm³	0.022 g/cm³
Dimensions: (O.D. x L)	6 cm x 7.6 cm	6 cm x 30 mm/10 g XAD-2/6 cm x 30 mm
Applications:	ASTM D6209 PAHs	Pesticides/PCBs
	EPA IP-7 PAHs	PAHs
	EPA TO-4A Pesticides/PCBs	Dioxins
	EPA TO-9A	Dioxins
	EPA TO-13	PAHs

Small PUF Cartridges

Description	Pkg.	Cat. No.
ORBO 1000 PUF Cartridge, Assembly	3	20557
ORBO 1500 PUF Cartridge PUF/ XAD-2/PUF	3	21233-U
Glass Holder for Small PUF	1	20556
Cleaned Small PUF Plug	3	20600-U

Large PUF Cartridges

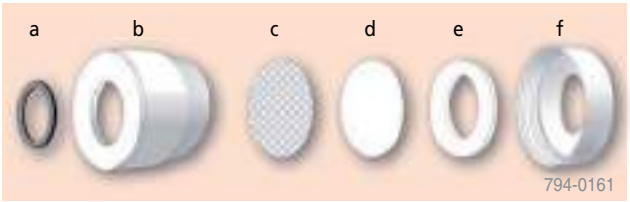
Description	Pkg.	Cat. No.
ORBO 2000 PUF Cartridge, Assembly	1	20037
ORBO 2500 PUF Cartridge, PUF/XAD-2/PUF	1	21235-U
Cleaned Large PUF Plug, 7.6 cm	1	20038
Glass Holder & Screen for Large PUF	1	20563
Stainless Steel Screen	2	21008-U

Filter Cartridge

An optional filter cartridge can be attached to the inlet of an ORBO 1000 or 1500 cartridge to trap aerosol and particulate forms of semi-volatiles. The filter cartridge contains a replaceable 32 mm diameter quartz microfiber filter with a stainless steel support screen.

Filter Cartridge Assembly includes 1 o-ring (a), 1 filter cartridge body (b), 1 stainless steel screen (c), 1 quartz filter (d), 1 filter ring (e), 1 cartridge screw cap (f), and 2 end caps.

Filter Cartridge consists of 1 o-ring (a), 1 filter cartridge body (b), 1 filter ring (e), and 1 cartridge screw cap (f).



794-0161

Note: b and c only available when purchased as the complete assembly.

Filter Cartridge

Description	Pkg.	Cat. No.
Filter Cartridge Assembly	1	21031
Filter Cartridge	1	21033
Replacement Parts		
Quartz Filter, 32 mm diameter (d)	10	21038
O-ring for Filter Cartridge (a)	2	21037
Filter Ring (e)	1	21035
Filter Cartridge End Caps	2	21041-U
Filter Cartridge Body (f)	1	21035



Filters and Cassettes

We have carefully selected these cassettes, filters and accessories to best meet your air sampling needs. These products, cited in numerous US Occupational Health and Safety Administration (OSHA) and National Institute of Occupational Safety and Health (NIOSH) methods, are universally respected for quality and reliability.

Coated Filters

ORBO 80 Coated 1,2-PP Filter is a 1-(2-pyridyl) piperazine coated glass fiber filter used for sampling diisocyanates in air (OSHA Methods 42 and 47).

Description	Pkg.	Cat. No.
ORBO 80 Coated Filter	25	20811
ORBO 80 Coated Filter w/Cassettes, unassembled	25	20812-U

Analytical Column for Isocyanate Derivative Analysis

Description	Pkg.	Cat. No.
SUPELCOSIL™ LC-CN HPLC Column		
25 cm x 4.6 mm I.D., 5 µm	1	58231

Related Chemical Standards

Isocyanate Derivative Standards – 1-(2-Pyridyl)piperazine derivatives. Each solution contains 1000 µg/mL in 1 mL dimethyl sulfoxide

Description	Cat. No.
2,6-TDI Derivative	
2,6-bis(4-(2-Pyridyl)-1-piperazinylcarbamyl) toluene	48144
2,4-TDI Derivative	
2,4-bis(4-(2-Pyridyl)-1-piperazinylcarbamyl) toluene	48145
1,6-HDI Derivative	
1,6-bis (4-(2-Pyridyl)-1-piperazinylcarbamyl) hexane	48146
4-4′-MDI Derivative	
4,4-bis (4-(2-Pyridyl)-1-piperazinylcarbamyl) diphenyl methane	48147

For more in-depth information:

Methods and Applications

OSHA Method 42 – Diisocyanates

OSHA Method 47 – Methylene Bisphenyl Isocyanate (MDI)

Application Note 31 – Monitor Airborne Diisocyanates Using ORBO 80 Coated Filters. Request T394031 at *sigma-aldrich.com/air_monitoring*

Membrane Filters and Cassettes for Air Monitoring of Fibers, Asbestos and Metals

Membrane Filter: Mixed Cellulose Ester (MCE) GN-4 Metricel®



P000662

We offer preassembled 3-piece design cassette which includes a GN-4 Metricel membrane and support pad. Banded cassettes are available for critical applications. The banded cassettes assure an air-tight seal, are leak-proof and tamper-resistant.

- 0.8 mm GN-4 Metricel (mixed cellulose esters) membrane filters have a low fiber background count.
- Accepted for air monitoring of fibers, asbestos fibers, and airborne metals such as lead (NIOSH Methods 7400 and 7402).
- Can be used to monitor respirable particulates such as silica, metal and dusts.

Description	Pkg.	Cat. No.
25 mm, pore 0.8 mm		
Three-piece unit w/GN-4 Metricel membrane and Support Pad	50	23371
Three-piece unit w/GN-4 Metricel membrane and Support Pad (banded)	50	23374
GN-4 Metricel Membrane Filter, 25 mm, plain	100	23380-U
37 mm, pore 0.8 mm		
Three-piece unit w/GN-4 Metricel membrane and Support Pad	50	23368
GN-4 Metricel Membrane Filter, 37 mm, plain	100	23381
GN-6 Metricel (0.45 mm) Membrane Filter, 37 mm, plain	100	23379



PTFE Membrane Filters

Zefluor™ Membrane Filters are suitable for monitoring acid rain, polynuclear aromatic hydrocarbons (PAHs) and particulates. Meets NIOSH specifications. Zefluor membrane filters feature a low-chemical background for highly sensitive determinations.

Zylon™ Membrane Filters are recommended for monitoring dyes, benzidine, o-tolidine, o-dianisidine (NIOSH Method 5013) and feature a low-chemical background for highly sensitive determinations.

TF-1000 (PTFE) Membrane Filters are recommended for general sampling of airborne particulate matter.

Description	Pkg.	Cat. No.
25 mm PTFE Membrane Filters		
Zefluor Membrane Filter, 25 mm, pore 0.5 mm	100	23395
37 mm PTFE Membrane Filters		
Zefluor Membrane Filter, 37 mm, pore 1 mm	50	23391
Zefluor Membrane Filter, 37 mm, pore 2 mm	50	23390-U
Zylon Membrane Filter, 37 mm, pore 5 mm	50	23389
TF-1000 Membrane Filter, 37 mm, pore 1 mm	50	23383

Additional Filters

Borosilicate Glass Fiber Filters are binding agent free and are recommended by the US EPA for high volume air sampling to collect atmospheric particles and aerosols.

GLA-5000 Polyvinyl chloride (PVC) Membrane filters feature low ash and moisture pick-up, light tare weight, and are gravimetrically stable. Suitable for multiple NIOSH analytical methods including silica monitoring.

Description	Pkg.	Cat. No.
Borosilicate Glass Fiber Filters		
A/E Glass Fiber Filter, 13 mm, pore 1 mm	500	23376
A/E Glass Fiber Filter, 25 mm, pore 1 mm	500	23377
A/E Glass Fiber Filter, 37 mm, pore 1 mm	500	23378
PVC Membrane Filters		
GLA-5000 PVC Membrane Filter, 37 mm, pore 5 mm	100	23387

Cassettes and Filter Accessories



Description	Pkg.	Cat. No.
Cassettes		
Empty 13 mm cassette – 2 piece, with washer	5	23367
Empty 25 mm cassette – 3 piece, unassembled	50	23372
Empty 37 mm cassette – 2 piece, unassembled	100	23380-U
Empty 37 mm cassette – 3 piece, unassembled (includes space ring)	100	23370-U
Support Pad (for 37 mm O.D Cassettes)		
Filter Support Pad, 37 mm	100	23385
Filter Support Pad, 37 mm	500	23382
Accessories		
PTFE Washer for 13 mm Cassette	1	23388
Sealing Band for 25 mm Cassette	100	23365
Sealing Band for 37 mm Cassette	100	23366



NEW! Mercury Emissions Sampling Tubes

Experience and Proven Track Record of Performance



P001177

Mercury Sampling Traps are designed for short-term and continuous sampling of total mercury emissions in combustion flue gas streams according to 40 CFR Part 75 Appendix K. Compared to competing technologies, our mercury sampling traps have revolutionized mercury vapor monitoring in two important ways.

- Generates accurate and precise multi-point mercury measurements
- Permits practical, economical long-term continuous mercury monitoring solutions

Supelco has a long-standing partnership (15 years) with Frontier GeoSciences (FGS), respected leaders in the mercury and trace metals characterization industry. Together our experience provides you with Mercury Sampling Traps that are proven and tested in the industry.

- Supelco and Frontier GeoSciences – 15 years of technical collaboration
- FGS/Supelco Traps – principle traps used to validate EPA Method 30B and Appendix K

And feature:

- FSTM Sorbent – Iodinated charcoal developed by Frontier GeoSciences, only available from FGS and Supelco.
- Low mercury background
- High-capacity mercury loading
- Reliability and proven track record of performance

Looking for **spiked traps, mercury analysis and RATA certification**? In the US, contact Frontier GeoSciences at 206-622-6960 or visit their website at *frontiergeosciences.com*. Frontier provides a guarantee with every spiked trap. Frontier's analytical mercury analysis method is based on compliance Method EPA 1631 Revision E (co-authored by EPA and FGS) using cold vapor atomic fluorescence spectroscopy (CVAS) detection. Frontier is NELAC accredited for sorbent trap analysis.

Did you know?

Frontier GeoSciences Inc. is an advanced research and analytical laboratory specializing in the determination and characterization of mercury and other trace metals in the environment.

EPA Method 30B (RATA) Traps (unspiked):

Monitoring: 1-2 hours
Sorbent: FSTM Iodinated Charcoal
Measurement Dimensions: 6 mm OD x 200 mm L
Sorbent Beds: 2 bed, 3 bed
Tube Ends: Glass open

Description	Pkg.	Cat. No.
Method 30B (RATA), 6 mm, 2 bed	25	2270-U
Method 30B (RATA), 6 mm, 3 bed	25	2274-U

Appendix K Traps (unspiked):

Monitoring: 1-10 days
Sorbent: FSTM Iodinated Charcoal
Measurement Dimensions: 10 mm O.D. x 240 mm L
Sorbent Beds: 2 bed, 3 bed
Tube ends: One glass open, one tapered end

Description	Pkg.	Cat. No.
Appendix K, 10 mm, 2 bed	25	2272-U
Appendix K, 10 mm, 3 bed	25	2273-U

For Indoor/Ambient Total Mercury Monitoring

Description	Pk	Cat. No.
10 mm, 300 mg/300 mg FSTM adsorbent	25	2271-U

For more in-depth information

EPA Method 30B RATA* (Draft) is a reference method for measuring total vapor phase mercury (Hg) emissions from coal-fired combustion sources using sorbent trap sampling and an extractive or thermal analytical technique. *RATA = Initial Relative Accuracy Test Audit. ***http://www.epa.gov/mercury*** (Controlling Power Plant Emissions)

40 CFR Part 75 Appendix K (formerly US EPA Method 324) is the EPA Clean Air Mercury Rule (CAMR). It was issued to reduce and cap mercury emissions from coal-fired power plants. This regulation outlines Continuous Emissions Monitoring (CEM) compliance monitoring of total vapor phase mercury using sorbent trap monitoring systems. ***http://ecfr.gpoaccess.gov*** (Title 40, Parts 72-80)



Detector Tubes and Pumps

MSA/Auer Detector Tubes



MSA/Auer Detector tubes contain treated adsorbent granules that react with specific compound(s) in the air sample causing the adsorbent to change color. A sample is collected by attaching the detector tube to a special bellows-type pump that draws a known volume of air with each stroke. After sampling, the length of the adsorbent bed that has undergone the color change is measured from a graduated scale printed on the tube, allowing direct readings of the vapor concentration – no extraction, no analysis, and no calculations are required.

Detector tubes are particularly useful in situations where quick screening is required, such as Haz-Mat Response, and for use in various industries in which specific, routine groups of compounds are monitored regularly. These MSA tubes and pumps are interchangeable with Draeger tubes and pumps.

MSA/Auer Detector Tubes

Analyte Group	Range (ppm)	Pkg.	Cat. No.
Triethylamine	5-30	10	**28184-U**
Ammonia	2-500	10	**28161-U**
Bromobenzene	5-500	10	**28162-U**
Benzene	0.5-25	10	**28163-U**
Chlorine	0.2-30	10	**28164-U**
Carbon Monoxide	5-1000	10	**28166-U**
Carbon Monoxide	10-3000	10	**28167-U**
Carbon Dioxide	0.1-7.0% (v/v)	10	**28168-U**
Carbon Dioxide	100-3000	10	**28169-U**
Formaldehyde	0.1- 55	10	**28171-U**
Hydrogen Sulfide	1-200	10	**28172-U**
Hydrogen Sulfide	100-4000	10	**28173-U**
Hydrogen Chloride	1-30	10	**28174-U**
Hexane	20-3200	10	**28175-U**
Nitrous Fumes	0.5-50	10	**28176-U**
Nitrous Fumes	50-3000	10	**28177-U**
Nitrogen Dioxide	0.5-50	10	**28178-U**
Ozone	0.05-5	10	**28179-U**
Phosphine	0.05-3	10	**28181-U**
Sulfur Dioxide	0.5-25	10	**28182-U**
1,1,2-Trichlorethane	10-170	10	**28183-U**

Toximeter II Auto Detector Tube Pump

Preset number of 100 mL pump strokes. Doubles as a sampling pump for other tubes, bags, impingers. Constant flow rate of 300 mL/min for adsorbent tubes with 8 hours of operating time. Fault recognition for low battery of obstructed flow. Rechargeable NiCd battery pack included.



E000056C

Description	Pkg.	Cat. No.
Detector Tube Pump		
Toximeter II, Automatic	1	**28188-U**
Omega Battery Charger		
110 V, units charged: 1	1	**28157-U**
240 V, units charged: 1	1	**28158-U**

Kwik Draw Deluxe Detector Tube Pump

One hand operation, simply squeeze handle to compress bellows, features a stroke counter and end-of-stroke indicator. Consistent 100 mL sample draw.



P000660

Gas-Tester II Detector Tube Pump

This pump offers both a stroke counter and end-of-stroke indicator with a unique locking system. Consistent 100 mL sample draw.



E000057

Description	Pkg.	Cat.No.
Kwik Draw Deluxe Detector Tube Pump	1	**28185-U**
Gas-Tester II Detector Tube Pump	1	**28186-U**



Thermal Desorption Tubes

For Active & Passive* Sampling

Supelco is recognized as the world leader in adsorbent technology. Our evaluation and development of air sampling adsorbents has produced the industry's most comprehensive selection of adsorbent tubes – Carbotrap tubes – offering superior performance for trapping and thermally desorbing organic compounds. Selection of the proper adsorbent(s) is critical to achieving the best results for a thermal desorption application. An ideal adsorbent tube will trap and retain compounds of interest for the entire sampling period, then allow total analyte desorption without thermal decomposition. The rate of release will be as rapid as possible, to minimize analysis time and provide the most efficient separation, especially when the analytes are desorbed directly to a chromatographic column held at ambient or above-ambient temperature. Thermal stability is also an important attribute of an ideal adsorbent. Stable adsorbents ensure the best detection limits by minimizing the possibility of breakdown products interfering with quantification in addition to a long lifetime.

Multi-Bed Adsorbent Tubes

Because no single adsorbent is capable of trapping and efficiently releasing all compounds, many Carbotrap thermal desorption tubes contain more than one adsorbent. Multiple beds of adsorbents enable you to analyze a wider range of compounds in a single sampling.

In multi-bed adsorbent tubes, the adsorbents are arranged in order of increasing adsorbent strength, from sample inlet to sample outlet. The largest molecules in the sample are trapped by the first bed of adsorbent, preventing them from coming into contact with stronger materials that could release them too slowly – or not at all. Smaller molecules are trapped by the succeeding, stronger beds. To avoid forcing analytes through an adsorbent that is too strong, desorption flow is always in the direction opposite of sample collection flow.

*Carbopack X for Passive Sampling. pg. 21.

Tube Construction

The design of a thermal desorption tube and its contents is critical to a well-performing air monitoring system. Glass tube blanks are manufactured to close tolerances, to ensure consistent lot-to-lot performance. As discussed, the adsorbents must retain the desired compounds effectively, release them quickly and completely, and be thermally stable at the temperatures required for analyte desorption. Every thermal desorption tube we make meets these criteria. After extensive thermal conditioning, we seal each tube. For convenient and reliable identification, we mark each of our glass tubes with a permanent unique number. Thermal desorption tubes are most commonly made of glass or stainless steel, with glass wool, wire gauze, or glass frits to hold the adsorbents in place. Tube lengths and outside diameters are dictated by the instrument of choice. Tubes having a large internal volume (4 mm I.D. or greater) are typically used for sampling because they hold relatively large size beds of adsorbents. In many cases, however, analytical results can be improved by transferring the analytes from the large I.D. sampling tube to a tube of smaller I.D. (1-2 mm), thus "focusing" the sample into a smaller volume. Subsequent desorption from the smaller ID tube to the chromatography column gives a higher linear velocity of desorption flow through the tube, delivering the sample to the column more rapidly and in a much narrower band.

Empty Tubes

We mark these specially cleaned glass tubes with an arrow to indicate sampling flow direction. Fill them in this direction with successively stronger adsorbents. You can fill an empty 4 mm I.D. tube with adsorbents for air sampling, or with a solid sample (soil, plastic, etc.) for a thermal extraction analysis. Use our empty 1 mm I.D. and 2 mm I.D tubes to create your own focusing tubes for better chromatography.

When you intend to trap especially sensitive compounds, use an adsorbent tube with a frit in the inlet, rather than a glass wool plug. The frit will hold the adsorbent in place without adsorbing or decomposing the analytes; glass wool plugs can adsorb or degrade sensitive compounds.



Custom-Made Thermal Desorption Tubes

We routinely manufacture thermal desorption tubes on request, for standard methods or customer-specific applications. Our in-house glass and machine shops fabricate glass and metal tubes to be compatible with commercially available desorption systems, or to unique specifications. We offer the widest range of adsorbent materials, including porous polymers (Chromosorb, Porapak, Tenax), carbon molecular sieves (Carbosieve, Carboxen), graphitized carbons (Carbopack, Carbotrap), and activated charcoals. Prices for custom prepared tubes are comparable to prices for our stock items.

For more information see the Custom Tube Order Form, page 51.

Overview on Carbotrap Thermal Desorption Tubes with Multiple Beds

Tube Name	Adsorbents	Compounds
Carbotrap 100	Carbotrap B	C-5-C12 compounds in air
Carbotrap 150	Glass beads, Carbotrap C	Large molecules in air or aqueous samples
Carbotrap 200	Glass beads, Carbotrap B, Carbosieve S-III	C2-C14 compounds in air
Carbotrap 201	Carbopack B, Carboxen-1000	Focusing semivolatile to very volatile compounds
Carbotrap 202	Carbopack B, Carbopack C	C5-C20 compounds in air
Carbotrap 217	Carbotrap B, Carboxen-1000	TO-17 compounds & other volatile compounds in air
Carbotrap 300	Carbotrap C, Carbotrap B, Carbosieve S-III	C2 and larger compounds in air
Carbotrap 301	Carbopack C, Carbopack B, Carboxen-1000	Focusing volatile and semivolatile compounds
Carbotrap 302	Carbopack C, Carbopack B, Carboxen-1001	Volatile compounds in aqueous solutions
Carbotrap 317	Carbotrap C, Carbotrap B, Carboxen-1000	TO-17 compounds and other volatile and semivolatile compounds in air
Carbotrap 349	Carbopack Y, Carbopack B, Carboxen-1003	NIOSH 2549: Volatile organic compounds in air
Carbotrap 370	Carbopack F, Carbopack C, Carbopack B	C5-C30 compounds thermally extracted from solid samples; focusing semivolatile compounds
Carbotrap 400	Carbotrap F, Carbotrap C, Carbotrap B, Carboxen-569	C2 and larger compounds in aqueous samples

For PerkinElmer Instruments

Supelco offers both Stainless Steel and Glass pre-packed sampling tubes that are fully compatible with the ATD-50 the ATD-400, and the TurboMatrix instrument. Each tube has a unique number. The tubes are available either pre-conditioned and ready for use with brass Swagelok end caps or unconditioned.

We also offer unconditioned tubes that must be conditioned as described.

- Each tube is sealed with Swagelok fittings.
- Fits: ATD-50, ATD-400 and TurboMatrix. 1/4 in. O.D. × 3.5 in. Long.
- Stainless steel 5 mm I.D., glass 4 mm I.D.

Stainless Steel

O.D. x length: 1/4 in. x 3 1/2 in., I.D.: 5 mm

Description	Pkg.	Application	Cat. No.
Preconditioned			
Carbotrap 100	10	ASTM D6196	**25052**
Carbotrap 202	10		**25058-U**
Carbotrap 300	10	EPA TO-17	**25050**
Carbotrap 349	10	NIOSH 2549	**25057-U**
Air Toxics	10	EPA TO-14	**25051**
Carbosieve S-III	10	EPA TO-2	**25053**
Tenax GR	10	Extends range of Tenax TA	**25054**
Tenax TA	10	EPA TO-1, EPA IP-1B	**25055**
Chromosorb 106	10	ASTM D6196, MDHS 72	**25056-U**



E000993

Description	Pkg.	Application	Cat. No.
NEW! Unconditioned			
Carbopack B	10	ASTM D6196	**28939-U**
Air Toxics	10	EPA TO-14	**28938-U**
Carbosieve SIII	10	EPA TO-2	**28942-U**
Carbotrap 300	10	EPA TO-17	**28937-U**
Carbotrap 349	10	NIOSH 2549, EPA IP-1B	**28949-U**
Tenax GR	10	Extends range of Tenax TA	**28946-U**
Tenax TA	10	EPA TO-1, EPA IP-1B	**28947-U**
Chromosorb 106	10	ASTM D6196, MDHS 72	**28948-U**
Empty			
SS Tube w/screens	1		**25049**
SS Tube w/screens w/PTFE analytical endcaps for TMX	10		**28014-U**
	50		**28015-U**



NEW! Supel-Inert Passive Sampling Device with Carbopack X for Thermal Desorption



E000973

Our new Carbopack X adsorbent tube was developed in collaboration with the US EPA for diffusive monitoring of **1,3-Butadiene** and 24 other VOC's. Monitoring 1,3-Butadiene is important due to the adverse health effects of this compound at trace atmospheric levels. (i.e. 0.03 µg/m^3). The major sources of 1,3-Butadiene are combustion engines and tobacco smoking. In addition to 1,3-Butadiene, Carbopack X can effectively retain and release other VOC's of interest in the C4-C10 range. Suitable for vapor intrusion. Diffusion cap purchased separately. Diffusion cap w/silicone membrane recommended for sampling higher humidity environments. Decreases sampling rate by approximately 10%.*

Deactivated – Stainless Steel Tube

OD x length: 1/4 in. x 3 1/2 in., ID: 5 mm

Description	Application	Pkg.	Cat. No.
Preconditioned			
Carbopack X	1,3-Butadiene, EPA-TO-17 Compounds	10	**59701-U**
Passive Sampling Accessories			
Pen Clips for SS Tubes		10	**28016-U**
Diffusion Caps (standard)		10	**28017-U**
Diffusion Caps (w/silicone membrane)		10	**28018-U**



For more in-depth information:

T408041H – New Carbopack X Metal-Passivated Adsorbent Tube for 24-Hour Diffusive Sampling of 1,3-Butadiene and 24 Additional Volatile Organic Compounds

The US EPA website that describes the Detroit Exposure and Aerosol Research Study (DEARS): *http://www.epa.gov/dears*

Glass



E000994

O.D. x length: 1/4 in. x 3 1/2 in., I.D.: 4 mm

Description	Application	Pkg.	Cat. No.
Preconditioned			
Carbotrap 100	ASTM D6196	10	**25087**
Carbotrap 202		10	**25093-U**
Carbotrap 300	EPA TO-17	10	**25085**
Carbotrap 349	NIOSH 2549, EPA IP-1B	10	**25092-U**
Air Toxics	EPA TO-14	10	**25086**
Carbosieve S-III	EPA TO-2	10	**25088**
Tenax GR	Extends range of Tenax TA	10	**25089**
Tenax TA	EPA TO-1, EPA IP-1B	10	**25090-U**
Chromosorb 106	ASTM D6196, MDHS 72	10	**25091**
NEW! Unconditioned			
Air Toxics	EPA TO-14	10	**28953-U**
Carbosieve S-III	EPA TO-2	10	**28956-U**
Carbotrap 100	ASTM D6196	10	**28954-U**
Carbotrap 202		10	**28967-U**
Carbotrap 300	EPA TO-17	10	**28952-U**
Carbotrap 349	NIOSH 2549, EPA IP-1B	10	**28966-U**
Tenax GR	Extends range of Tenax TA	10	**28957-U**
Tenax TA	EPA TO-1, EPA IP-1B	10	**28958-U**
Chromosorb 106	ASTM D6196, MDHS 72	10	**28965-U**
Empty			
Glass Tube w/PTFE Analytical Endcaps for TMX		1	**25084**
Glass Tube w/PTFE Analytical Endcaps for TMX		10	**28013-U**
ATD-400 Accessories (See page 20)			
Washed Stainless Steel Clip for ATD-400		100	**23393-U**

Accessories

Description	Pkg.	Cat. No.
Storage Endcaps (For Glass and Stainless Steel Tubes)		
Replacement ferrules for TMX Brass Caps	20	**28012-U**
TurboMatrix™ Brass Caps	20	**28011-U**
PTFE Analytical Endcaps for TMX	20	**28002-U**
PTFE Analytical Endcaps for ATD-400	20	**28019-U**
TDS^3 Storage Container		
For ATD-50, ATD-400, TurboMatrix	1	**25097-U**



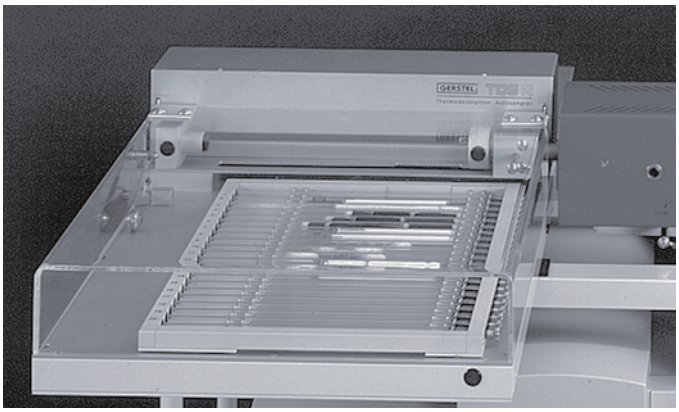
*References

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3. R.W. Williams, A.F. Vette, D.A. Whitaker, C.W. Croghan, P.A. Jones, H. Daughtrey, K. Oliver, H. Jacumin, D.D. Williams, C.E. Rodes, J.W. Thornburg, J.S. Herrington, and J. Zhang. The impact of passive sampling methodologies used in the DEARS. Presented at the National Environmental Monitoring Conference (NEMC), Cambridge, MA, August 20-24, 2007.



For Gerstel ThermoDesorption System

Supelco offers both stainless steel and glass pre-packed sampling tubes that are fully compatible with the Gerstel TDS and TDSA instruments. Each tube is thermally conditioned and batch tested for backpressure and background. The pre-packed tubes are sealed in our exclusive TDS³ storage containers. All of the pre-packed glass sampling tubes incorporate a glass frit at the inlet, which increases their performance, and are individually numbered. The stainless steel tubes use a stainless steel screen at both inlet and outlet to keep the adsorbent beds secure during use.



E000840

Stainless Steel

O.D. x length: 6 mm x 7 in., I.D.: 4 mm
Fits Models: TDS A & TDS 2

Description	Application	Pkg.	Cat. No.
Carbotrap 300	EPA TO-17	1	**28273-U**
Carbosieve S-III	EPA TO-2	1	**28274-U**
Tenax GR	Extends range of Tenax TA	1	**28272-U**
Tenax TA	EPA TO-1, EPA IP-1B	1	**28271-U**
Chromosorb 106	ASTM D6196, MDHS 72	1	**28275-U**
Empty SS GERSTEL Tube		1	**28276-U**
Screens for SS GERSTEL Tube		10	**28277-U**

Glass

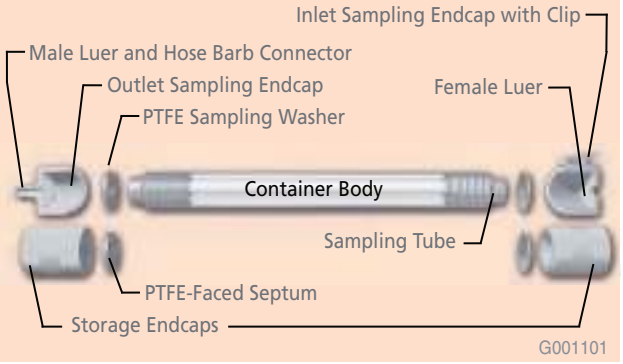
O.D. x length: 6 mm x 7 in., I.D.: 4 mm

Description	Application	Pkg.	Cat. No.
Carbotrap 300	EPA TO-17	1	**28283-U**
Carbotrap 202		1	**28313-U**
Carbotrap 217	EPA TO-17	1	**28312-U**
Carbotrap 349	NIOSH 2549, EPA IP-1B	1	**28311-U**
Carbosieve S-III	EPA TO-2	1	**28284-U**
Tenax GR	Extends range of Tenax TA	1	**28282-U**
Tenax TA	EPA TO-1, EPA IP-1B	1	**28281-U**
Chromosorb 106	ASTM D6196, MDHS 72	1	**28285-U**
Empty Fritted		1	**28286-U**
Empty non-Fritted		1	**28287-U**

Accessories

Description	Pk	Cat. No.
TDS³ Storage Container for TDS2/TDS/A	1	**25095-U**
TDS³ Storage Container for TDU (60 mm Tubes)	1	**28307-U**

TDS³ Storage Container



G001101

For additional TDS³ containers and accessories, see page 25.



For CDS/Dynatherm Instruments

Supelco offers a complete line of both pre-packed and empty tubes for the Dynatherm Thermal Desorbers. Each tube is individually numbered, thermally conditioned, and batch tested for backpressure and background. The pre-packed standard sampling tubes are sealed in our exclusive TDS³ storage containers and the fast-flow tubes are sealed with Swagelok® fittings. All of the pre-packed glass sampling tubes incorporate a glass frit at the inlet, which increases their performance. The focusing tubes are used to refocus the sample for better chromatography of the early eluting compounds.



P000679

Glass

O.D. x length: 6 mm x 4.5 in., I.D.: 4 mm
Fits models: ACEM-9300, ACEM-900 850/890 TDU, MTDU and OI Analytical Air Tube Desorber or DMP-16

Description	Application	Pkg.	Cat. No.
Glass Fritted Sampling Tubes			
Carbotrap 100	ASTM D6196	1	**20872**
Carbotrap 150		1	**20381**
Carbotrap 200		1	**20873**
Carbotrap 217	EPA TO-17	1	**20895-U**
Carbotrap 300	EPA TO-17	1	**20875**
Carbotrap 302		1	**20356**
Carbotrap 317	EPA TO-17	1	**20877**
Carbotrap 349	NIOSH 2549, EPA IP-1B	1	**20243**
Carbotrap 400		1	**20882**
Tenax TA	EPA TO-1, EPA IP-1B	1	**20896-U**
Empty Fritted		1	**20235-U**
Non-Fritted Glass Sampling Tubes			
Carbotrap 100	ASTM D6196	1	**20238**
Carbotrap 200		1	**20242**
Carbotrap 300	EPA TO-17	1	**20379**
Carbotrap 400		1	**20359**
Empty non-Fritted		1	**20380-U**

Fast Flow

These glass tubes have a 7 mm I.D. that allows faster flow rates to pass through tubes while sampling.

O.D. x length: 10 mm x 4.5 in., I.D.: 7 mm
Fits models: ACEM-9300, IACEM-980, ACEM-900 and MTDU equipped with fast-flow "FF" option
Sealed with Swageloks

Description	Application	Pkg.	Cat. No.
Carbotrap 217	EPA TO-17	1	**20724**
Carbotrap 317	EPA TO-17	1	**20881**
Tenax TA	EPA TO-1, EPA IP-1B	1	**20894**

Focusing Tubes

Fits models: 850/890 TDU

Description	Pkg.	Cat. No.
Carbotrap 200 - 2 mm x 6 mm x 4.5 in.	1	**20244**
Carbotrap 201 - 1 mm x 6 mm x 4.5 in.	1	**20361**
Carbotrap 300 - 2 mm x 6 mm x 4.5 in.	1	**20382**
Carbotrap 301 - 1 mm x 6 mm x 4.5 in. (I.D. tapers to 0.75 mm)	1	**20354**
Carbotrap 370 - 2 mm x 6 mm x 4.5 in.	1	**20373**
Empty - 2 mm x 6 mm x 4.5 in.	1	**20237**
For Model ACEM900/901FF		
Carbotrap 201 - 1 mm x 6 mm x 7.5 in.	1	**20865**

NEW!
Color-Coded Tenax TA Tube

Glass Fritted Standard Sampling Tubes

Simplify your field sampling process and reduce error in the field with our color-coded glass fritted sampling tubes. Each color can represent a different sample in the field or a different testing protocol the laboratory. All tubes contain Tenax TA.



E000986

O.D. x length: 6 mm x 4.5 in. I.D.: 4 mm
Fits models: ACEM-9300, ACEM-900 850/890 TDU, MTDU and OI Analytical Air Tube Desorber or DMP-16
Application: EPA TO-1, EPA IP-1B

Description	Pkg.	Cat. No.
White Dot	1	**11271-U**
Black Dot	1	**11272-U**
Red Dot	1	**11273-U**
Green Dot	1	**11274-U**

CDS Adsorbent Tube

O.D. x length: 6.25 mm x 3 in., I.D. 3.9 mm

Description	Application	Pkg.	Cat. No.
Carbotrap 300	EPA TO-17	1	**20372**

Stainless Steel

Length: 115 mm

Description	Application	Pkg.	Cat. No.
Tenax TA	EPA TO-1, EPA IP-1B	1	**20367-U**

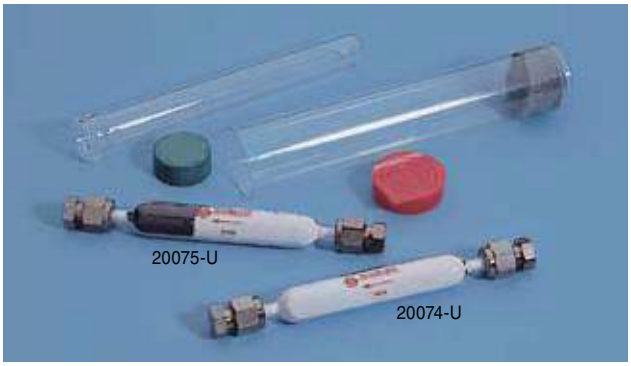
Accessories

Description	Pkg.	Cat. No.
TDS³ Storage Container for Dynatherm	1	**25096-U**
Fits Standard Tubes 850/890 & ACEM 900-901FF		



VOST Stack Sampling Tubes

VOST Tubes (Volatile Organic Sampling Train) are designed to meet specifications in US EPA SW-846, Method 0030. Each tube is individually numbered, pre-conditioned, and sealed with stainless steel Swagelok fittings before stored in a glass storage container. Each lot is tested for background and backpressure.



9960072

O.D. x length: 16 mm x 5 in. (1/4 in O.D. ends)
Fits models: Dynatherm 9300 TDA

Description	Application	Pkg.	Cat. No.
VOST Stack Sampling Tube			
Tenax TA, 35/60	EPA 0031, EPA SW-846, EPA 0030	1	**20074-U**
Tenax TA, 35/60: Petroleum charcoal	EPA 0031, EPA SW-846, EPA 0030	1	**20075-U**
Empty glass VOST Tube		1	**21993**
VOST Storage Container		1	**21998**
Analytical Column			
SPB-624 Fused Silica Capillary Column, 75 m x 0.53 mm I.D., 3 µm film		1	**25432**

For Teledyne Tekmar Instruments

Supelco offers both glass and stainless steel tubes for Teledyne Tekmar instruments. Our prepacked tubes are thermally conditioned and tested for background levels and backpressure. The 1/4 in. O.D. tubes are sealed in our exclusive TDS[3] storage container and the 1/2 in. O.D. tubes are sealed in a glass storage container. Fits AEROTrap 6000 instrument.



9960072

Stainless Steel

These stainless steel tubes have a 5 mm I.D. that allows faster flow rates to pass through tubes while sampling.

O.D. x length: 1/4 in. x 7 in., I.D.: 5 mm
Fits models: AEROTrap 6000

Description	Application	Pkg.	Cat. No.
Carbotrap 100	ASTM D6196	1	**20241**
Carbotrap 300	EPA IP-1B	1	**20370-U**
Tenax TA	EPA TO-1, EPA IP-1B	1	**20913-U**
Empty SS Tekmar Tube, 5 mm I.D.		1	**20920-U**
O.D. x length: 1/2 in. x 7 in., I.D.: 12 mm			
Tenax TA	EPA TO-1, EPA IP-1B	1	**20984**
Empty SS Tekmar Tube, 12 mm I.D.		1	**20924**

Glass

O.D. x length: 1/2 in. x 7 in., I.D.: 10 mm

Description	Application	Pkg.	Cat. No.
Carbotrap 300	EPA IP-1B	1	**20983**
Empty Glass Tekmar Tube, 10 mm I.D.		1	**20922**
O.D. x length: 4 in x 7 in., I.D.: 4 mm			
Carbotrap 300	EPA IP-1B	1	**20912-U**
Empty Glass Tekmar Tube, 4 mm I.D.		1	**20918**

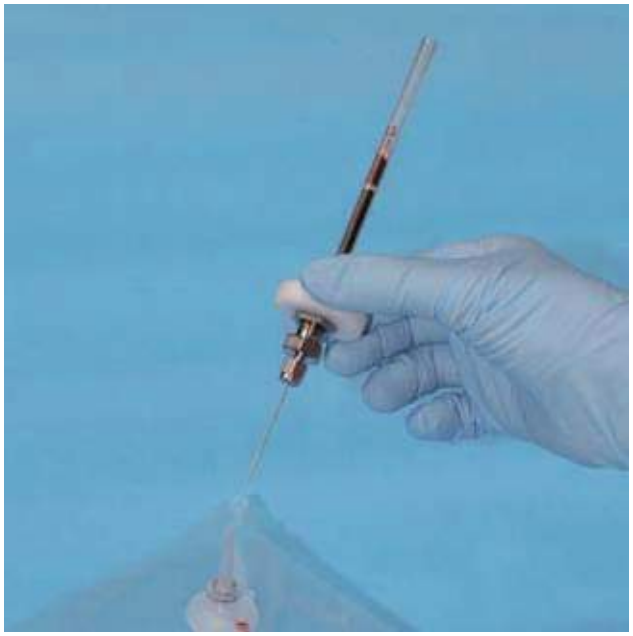
Accessories

Description	Pkg.	Cat. No.
TDS[3] Storage Container for Tekmar Tube	1	**25095-U**
Storage Container for 1/2 in. x 7 in. TD Tube	1	**20853**



Thermal Desorption Accessories

NEW!
Needle Sampling Kit for Thermal Desorption Tubes



E000991

The needle sampling kit is an accessory designed to assist users of thermal desorption tubes to attach a needle to the inlet of the tube for various sampling applications. The kit includes ferrules for thermal tubes with outside diameters of 1/4 in. or 6 mm. Choose the ferrule for the size of tube you are using.

The kit includes the following:

- Stainless steel 22s gauge needle with a bevel point
- Stainless steel fitting
- Acetal/stainless steel thumbwheel
- 1/4 in. PTFE ferrule (white)
- 1/4 in. M-2 VESPEL® ferrule (orange)
- 6 mm M-2A VESPEL graphite ferrule (black)

Description	Pkg.	Cat. No.
Needle Sampling Kit for Thermal Desorption Tubes	1	29023-U
Replacement Needles		
22s gauge 2" long with #2 bevel point●	3	20798
22s gauge 2" long with #3 blunt point	3	20862

Description	Max. Temp.	Qty.	Cat. No.
Replacement Ferrules			
0.8 mm I.D. M-2A for 22s gauge needle■	400 °C	10	22489
1/4 in. I.D. M-2 for 1/4 O.D. tubes■ (orange)	350 °C	10	22320-U
1/4 in. I.D. M-2A for 1/4 O.D. tubes (black)	400 °C	10	22481
1/4 in. I.D. PTFE for 1/4 O.D. tubes■ (white)	250 °C	10	29024-U
6 mm I.D. M-2A for 6, O.D. tubes■ (black)	400 °C	10	22393
Replacement thumbwheel	100 °C	1	28529-U

● Size and type of needle included with this kit
■ Size and type of ferrule included with this kit
For a complete description of the various needle types, see the Supelco catalog.

TDS³ Storage Container



E000992

Use our TDS³ storage sampling system to simplify the Thermal Desorption sample prep process. The TDS³ storage containers will maintain the sample integrity of both the tubes to be sampled or those which already have a sample adsorbed. The optional Sampling Caps (25069) convert the TDS³ storage container into a convenient tube holder that makes connecting the tube to the sampling pump very easy.

Description	Pkg.	Cat. No.
TDS³ Storage Container by Instrument Manufacturer/Model		
PerkinElmer, Markes Unity, and DANI Tubes	1	25097-U
Dynatherm Standard Tubes	1	25096-U
Chrompack TD Tubes	1	25098-U
GERSTEL TDS/TDS²/TDSA Tubes	1	25095-U
GERSTEL 60 mm Tubes	1	28307-U
Tekmar AEROTrap 6000 Tubes	1	25095-U
Envirochem, 810 Tubes	1	25100-U
TDS³ Storage Container Accessories		
Replacement Septa for all TDS³ containers	50	25073
Male Luer Plug	12	504351
Female Luer Cap	12	57098
Sampling caps w/washers for ½ in TDS³	10	25069
Tubing Adapter		
For use with 1/8 in. tubing to male luer	20	21016
For use with 3/16 in. tubing to male luer	20	23364
For use with 1/4 in. tubing to male luer	10	24856
Tubing Coupler		
For use with male to male luer	20	25064-U

PTFE Packed Column Ferrule



I.D. 1/4 in., configured for 1/4 O.D. column
Maximum Temperature: 250 °C

Description	Pkg.	Cat. No.
Ferrule, PTFE – 1/4 in.	10	29024-U



ATIS Adsorbent Tube Injector System

Sample Preparation Device for Thermal and Solvent Desorption Tubes

The Supelco ATIS is a sample preparation device for adsorbent tubes. The Adsorbent Tube Injector System employs the technique of flash vaporization to vaporize the sample into a continuous flow of inert gas, which carries the sample to the adsorbent tube. The sample pathway is constructed of glass and stainless steel. The calibration standard is injected by a syringe through a replaceable septum in the center of the injection glassware, which is heated.



P001253

Benefits:

- Inject calibration standards directly onto adsorbent tube to calibrate your analytical system
- Inject surrogates and system monitoring compounds onto adsorbent tubes before or after sampling
- Removes moisture from tubes prior to analysis (dry purge)
- Connect air-sampling bag to the ATIS outlet to vaporize calibration standards to assure complete vaporization
- Easy installation – plumb into a regulated source of nitrogen or helium and plug into appropriate electrical source

The ATIS will accept either 1/4 in. or 6 mm O.D. Thermal Desorption tubes. Included with this system:

- Luer/hose barb adapter to connect a variety of solvent desorption tubes
- Injection glassware
- Constant flow controller with an on/off valve - flow range: 0-100 mL/min
- Heating source - temperature range: ambient to 120 °C
- Spare parts along with all the necessary fittings and tubing

Description	Pkg.	Cat. No.
ATIS System, 110V	1	28520-U
ATIS System, 230V	1	28521-U
Replacement Luer/Hose Barb	1	28525-U
Replacement Standard Injection Glassware	1	28526-U
Replacement Thumbwheel Nut	1	28529-U

Purge and Trap/Humidifier Module for the ATIS

A separate module is available that will allow you to purge aqueous samples onto an adsorbent tube at ambient temperatures. This module can also be used to generate a dynamic humidified stream of the carrier gas for spiking calibration standards. The purge and trap module includes purge and trap glassware, and a separate flow controller that allows the user to set a separate purge (wet) flow rate independently of the dry flow rate. The purge and trap module accepts standard 22 mL threaded vials to simplify your sample prep.



P000851

Description	Pkg.	Cat. No.
ATIS Purge and Trap/Humidifier Module	1	28522-U
ATIS Replacement Purge and Trap/ Humidifier Glassware	1	28527-U
ATIS Replacement Purge and Trap Transfer Tube	1	28528-U

Thermal Extraction Glassware

Use the ATIS to thermally extract samples onto an adsorbent tube. The opening of the glassware will accept solid samples up to 1/2 in. (13 mm) in diameter and up to 3 in. long (76 mm) to be inserted into the glassware. The extraction glassware simply slides into the ATIS heating block. Two types of glass joints are available.

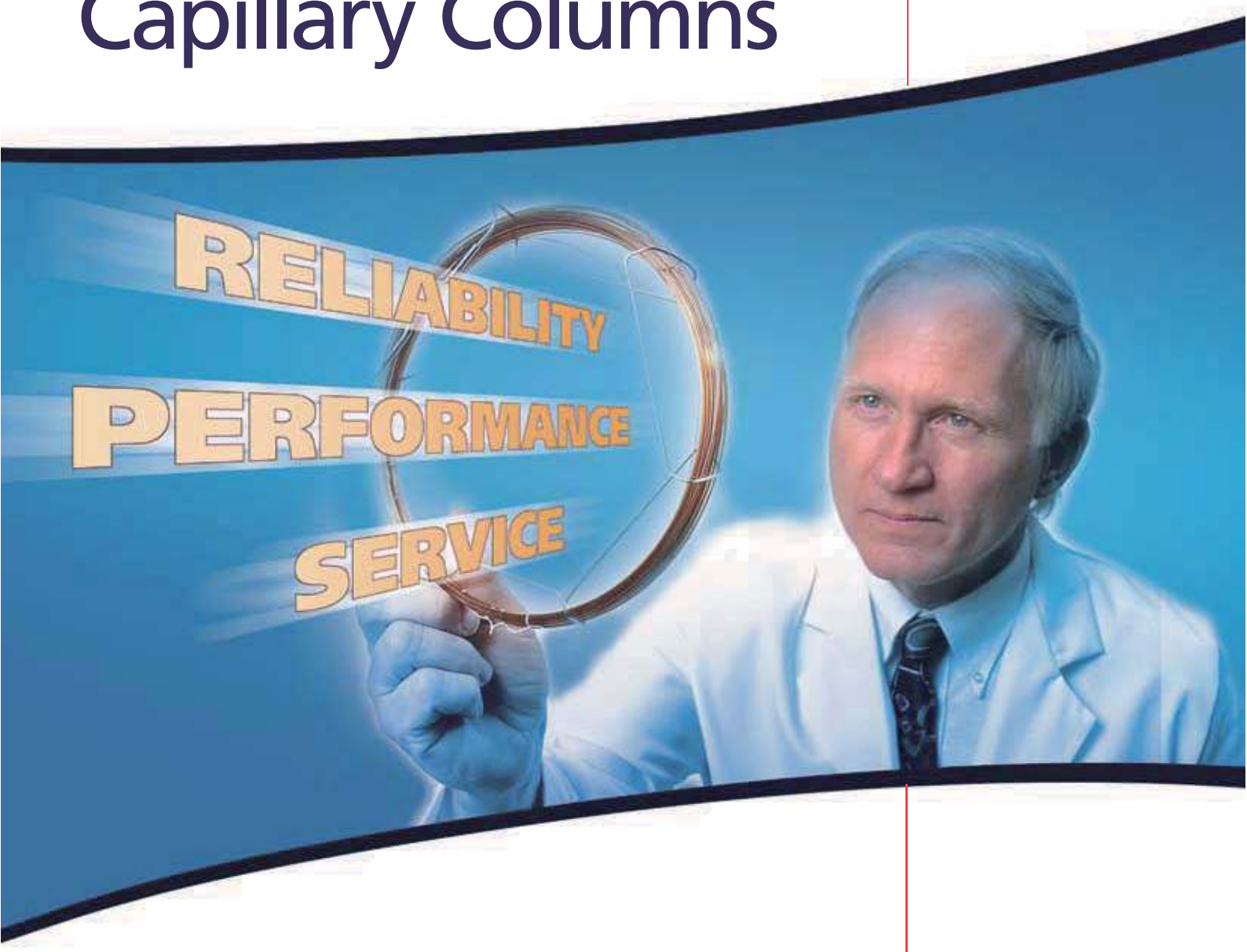


P000850

Description	Pkg.	Cat. No.
Extraction Glassware w/Ground Joint	1	28524-U
Extraction Glassware w/Micro Connector	1	28523-U

Supelco GC Capillary Columns

SUPELCO Analytical



Supelco is dedicated to the development of leading-edge technology to meet the needs of our loyal customer base.

- Special purpose columns for many specific applications
- Columns for general purpose uses
- Each capillary column individually tested to ensure quality
- Guaranteed satisfactory performance
- Superior technical service before and after your purchase

For more information, visit ***sigma-aldrich.com/gc*** or contact Supelco Technical Service at ***800-359-3041*** (USA and Canada only), ***814-359-3041***, or email ***techservice@sial.com***



Column Selection by Industry

Supelco has developed the most extensive line of special purpose columns designed for industry specific applications. These columns are manufactured to deliver high resolution, great analyte response, low bleed, and long column life; allowing analysts to achieve the analytical performance they require. This easy-to-read phase selection chart is conveniently arranged to simplify the process of selecting the proper phase. Simply locate your application to identify the recommended phase.

These columns can be used with methodologies for determining indoor air quality as well as outdoor organic compounds.

	Indoor Air Quality - EPA IP-8	Indoor Air Quality - NIOSH 1003	Indoor Air Quality - NIOSH 1403	Indoor Air Quality - NIOSH 1500/1501	Indoor Air Quality - NIOSH 2530	Indoor Air Quality - NIOSH 2542	Indoor Air Quality - NIOSH 5503	Indoor Air Quality - OSHA 53	Indoor Air Quality - OSHA 56	Indoor Air Quality - OSHA 62	Indoor Air Quality - OSHA 80	Toxic Organics - TO-1/TO-2	Toxic Organics - TO-4/TO-10	Toxic Organics - TO-9	Toxic Organics - TO-13	Toxic Organics - TO-14/TO-15/TO-17	Hazardous Air Pollutants
SPB™-HAP	■		■		■		■		■		■		■		■		■
Equity®-1	■		■	■	■	■	■	■	■		■	■	■		■	■	■
SLB™-5ms	■		■		■		■		■	■	■		■	■	■		■
VOCOL™	■	■	■		■		■		■		■		■		■		■
SPB-608	■		■		■		■		■		■		■		■		■
Equity-1701	■		■		■		■		■		■		■		■		■
SPB-225	■		■		■		■		■		■		■	■	■		■
SUPELCOWAX™ 10	■		■		■		■		■		■		■		■		■
SP™-2331	■		■		■		■		■		■		■	■	■		■



Solutions Sampling

Impingers and Bubblers



E000252

Our borosilicate glass impingers (for particles) and bubblers (for gases and vapors) are ideal for NIOSH and OSHA methods that require collection of airborne contaminants by drawing them into solution.

Standard Impinger and Bubbler

Length:	186 mm (7.3 in.)
Reservoir Length:	152 mm (6 in.)
Reservoir Capacity:	25 mL
Graduations:	5 mL
Glass Joint:	24/40 taper
Impinger:	Standard Glass Stem
Bubbler:	Fritted Glass Stem

Volume (mL)	Pkg.	Cat. No.
Standard Impinger	1	20270-U
Standard Bubbler	1	64835-U

Threaded Midget Impingers and Bubblers



E000251

Threaded midget impingers and bubblers make your sampling process more convenient. The vial can be capped after sampling, thus reducing sample handling in the field – no transferring of samples from the reservoir to a separate vial. The reservoir may be easily replaced with a standard or graduated screw-top vial.

Specifications:

	Threaded Midget Impinger	Threaded Midget Bubbler	Spill Resistant Midget Bubbler
Length (without vial):	143 mm (5 5/8 in.)	143 mm (5 5/8 in.)	143 mm (5 5/8 in.)
Vial Capacity (mL):	22	22	40
Thread (mm):	20	20	24
Graduation Mark (mL):	-	15	15
Pack Size (ea):	2	1	1
Cat. No.:	64712-U	64834-U	64832

Replacement Vials, screw top (cap not included)

Description	Pkg.	Cat. No.
Clear Vials		
22 mL vial, 23 mm x 85 mm, thread 24-400	100	27173
40 mL vial, 29 mm x 82 mm, thread 24-400	100	27184
40 mL vial, 28 mm x 95 mm, thread 24-400	100	27184
Amber Vials		
22 mL vial, 23 mm x 85 mm, thread 20-400	100	27073-U
40 mL vial, 29 mm x 82 mm, thread 24-400	100	27185-U
40 mL vial, 28 mm x 95 mm, thread 24-400	100	27382

Impinger Accessories


9960284

In-Line Impinger Trap

Bottom cap allows easy emptying – 15 mL capacity for absorbing solution. Can be packed with charcoal or other adsorbent (sold separately). Cap and PTFE liner included. Length 152 mm (6 in.): 20 mm threads.


9950155

Impinger Holder

Insert your impinger, bubbler, or in-line trap in this holder and attach to your lapel, shirt pocket or belt.

Description	Pkg.	Cat. No.
In-line Impinger Trap w/20 mm Thread	1	64833
Impinger Holder	1	20271

Plastic Clips/PTFE Sleeves


9130299

Plastic clips fit over the connection on our 24/40 taper ground glass joints to ensure secure connections. Use the PTFE sleeves in ground glass joints for inert, tight seals without the possibility of frozen joints. For use with standard impingers and bubblers.

Volume (mL)	Pkg.	Cat. No.
Plastic Clip for use with 24/40	1	64764
PTFE Sleeve for use with 24/40	1	64761



Passive Sampling

Overview

Passive/diffusive sampling relies on the unassisted molecular diffusion of gaseous agents (analytes) through a diffusive surface onto an adsorbent. Unlike active (pumped) sampling, passive samplers require no electricity (expensive pumps), have no moving parts, and are simple to use (no pump operation or calibration). After sampling, the adsorbed analytes are desorbed off the adsorbent by solvent or thermal desorption.

Benefits of Passive/Diffusive Sampling:

- Compact, portable, unobtrusive, and inexpensive
- Offers indication of average pollution levels over time periods of 8 hours to weeks/months
- Requires no supervision, is non-flammable, and noiseless
- Low cost allows for sampling at multiple locations (e.g., for highlighting pollution "hotspots"; or determining long term data trends in a specific geographical area)
- Amenable to personal monitoring (breathing zone), indoor air analysis, and outdoor ambient air analysis

Fick's Law:

$$\frac{dm}{dt} = D \cdot S \cdot \frac{dC}{dl}$$

Where,
- Q = dm/dt = adsorbed mass m during time t (sampling rate)
- D = diffusion coefficient (constant for each analyte)
- S = diffusive surface
- dC/dl = concentration gradient
- K = geometric constant of the sampler

To determine C:

$$C\left[\mu g \cdot m^{-3}\right] = \frac{m[\mu g]}{Q[mL \cdot min^{-1}] \cdot t[min]} \cdot 1{,}000{,}000$$

From Fick's Law, we know that the sampling rate (Q) is a function of the diffusion coefficient of a given analyte (D) and the geometric constant of the sampler (K): Q = D x K The diffusion coefficient (D) always remains constant for a given analyte; therefore, to improve sampling rate (Q), the geometric constant (K) must be improved: K = S/l where S is diffusive surface and l is the distance between the diffusive and adsorbing surface.

Configuration of a Diffusive Gas-Sampling Device (Axial)

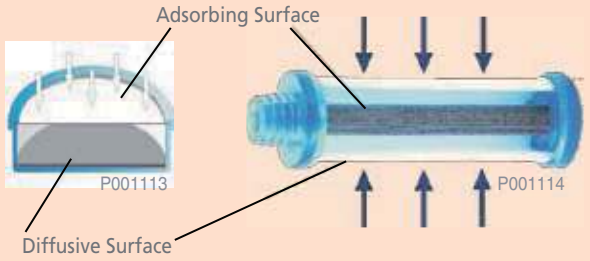


Most commercially available passive/diffusive samplers are planar or axial in shape and offer lower sampling rates and limited sampling capacity. As a result, sensitivity can suffer during short-term analysis (due to low sampling rates), or long-term sampling (analyte back diffusion to low capacity). A radial coaxial design circumvents this issue by improving the geometry, resulting in up to 10X higher sampling rates.

Example Sampling Rates for Benzene (25 °C)

Axial Sampler
7-8 mL/min.

Radial Sampler
80 mL/min.





radiello

What is Radiello?

In the mid 1990s, Dr. Vincenzo Cocheo, Director of the Fondazione Salvatore Maugeri (FSM), Padova, Italy, in collaboration with the European Commission Joint Research Center and other institutions, developed and patented a revolutionary diffusive sampling design - Radial symmetry (now a registered trademarked as radiello). It consists of a microporous cylindrical polypropylene diffusive body. Housed within the diffusive body is a removable cartridge adsorbent. Each cartridge adsorbent contains a unique adsorbent that is application specific. The radial symmetry design offers a very large diffusive surface relative to the adsorbing surface allowing for an exponential increase in uptake rate when compared to traditional passive samplers. This translates to shorter necessary sampling times that are close to the range of active sampling.

Radiello offers Higher Capacity

With active sampling, i.e. using a pump, adsorbed gaseous compounds move through the axial sampler (adsorbent tube) as a gaussian peak. This means only a part of the adsorbent bed is used for trapping the analyte, and in addition, it is forced through the tube by the sample flow. Eventually breakthrough will occur.

In the diffusive radiello samplers, the analytes are not forced through the adsorbent cartridge which results in a more complete use of the adsorbent bed and a higher capacity, providing longer possible sampling times or broader concentration ranges.
To read more about the capacity comparison between active and passive sampling, please request the radiello brochure (T406090 - IXV) or visit tghe website *sigma-aldrich.com/radiello*

How to Use Radiello Samplers

Assembly of the Radiello sampler is simple. Sampling using Radiello monitors begins with a quick assembly of the support plate.

1. Transfer adsorbent cartridge from the storage container into the appropriate diffusive body.

2a. Screw diffusive body into triangular support plate.

2b. Use vertical adapter for personal sampling.

3. Document date and time on the enclosed barcode label and insert label into sampler pocket.

Sampling has begun.

4. At the conclusion of sampling, transfer the adsorbent cartridge from the diffusive body to the original storage container, and document date, time, and temperature on the barcode label. Transfer label to the storage container and send this to the lab for analysis.

5. Desorb and analyze adsorbing cartridge.



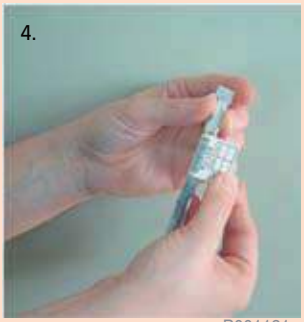
P001117



P001120



P001118



P001121



P001119



P001122





P001123

Outdoor Shelters

Protective outdoor shelters are recommended for environmental/ambient air sampling (available as easy to assemble & use accessory, see page 35).

Desorption and Analysis

For each compound/compound group, the Fondazione Salvatore Maugeri has developed detailed desorption and analytical protocols involving analytical techniques typical of most independent, academic, industrial, and regulatory laboratories. Detailed desorption and analytical conditions are available in the Radiello manual (IYP) which can be viewed and downloaded at ***sigma-aldrich.com/radiello.***

Analytical services are available in the US and to European customers directly through the Fondazione Salvatore Maugeri. For more information, please contact the Fondazione Salvatore Maugeri IRCCS under email ***fsmpd@fsm.it*** or refer to web ***radiello.com***

Official Methods

Radiello Samplers are suitable for a variety of methods for diffusive sampling, but are explicitly listed in the following:

- **EN 14412:2004 Indoor Air Quality** – Diffusive samplers for the determination of concentrations of gases and vapors
- **EN 14662-5:2005 Ambient Air Quality** – Standard method for measurement of benzene concentrations
- **ISO/FDIS 16200-2 Workplace Air Quality** – Sampling and analysis of VOCs by solvent desorption/gas chromatography

For more in-depth information:

More official method listings can be found in the Radiello brochure T406090 (IXV), The Radiello CD (IXW) and the Radiello Manual (IYP). To request this information, visit ***sigma-aldrich.com/radiello***



Radiello Products and Accessories

Cartridge Adsorbents

Cat. No.	Matrix	Compounds	Pkg.	Radiello No.
RAD165	2,4-DNPH Coated Florisil®	Aldehydes	20	Code 165
RAD145	350 mg Carbograph 4 (35/50)	BTEX/VOC's (Thermal Desorption)	20	Code 145
RAD130	Activated charcoal (30/50)	BTEX/VOC's (CS_2 Desorption)	20	Code 130
RAD166	Microporous PE Impregnated w/ wet TEA	HF, NO_2, and SO_2	20	Code 166
RAD172	Microporous PE w/4,4'-dipyridylethylene coated silica	Ozone (O_3)	20	Code 172
RAD170	Microporous PE Coated with Zinc Acetate	Hydrogen Sulfide (H_2S)	20	Code 170
RAD168	Microporous PE Impregnated w/Phosphoric Acid	Ammonia (NH_2)	20	Code 168
RAD132	Mix of Molesieve and activated charcoal (30/50)	Anaesthetic gases and vapors	20	Code 132
RAD147	250 mg Tenax TA (20/35)	Phenolic compounds (Thermal Desorption)	20	Code 147
RAD169	Silica Gel (100-400 µm particles)	HCl	20	Code 169

Radiello Diffusive Bodies



RAD120 P001129



RAD120-1 P001130



RAD120-2 P001131



RAD120-3 P001132

Cat. No.	Color	Configured for	Body	Pkg.	Radiello No.
RAD120	White	General Use	Polyethylene	20	Code 120
RAD1201	Blue	Light Sensitive Compounds	Polyethylene	20	Code 120-1
RAD1202	Yellow	Reduced Sampling Rates	Polyethylene	20	Code 120-2
RAD1203	Grey	Anaesthetic Gases and Vapors	Permeative Silicone	20	Code 120-3

Radiello Key Components



RAD121

P001136

The **triangular support plate** acts as both a closure and means of suspension for the diffusive body and cartridge adsorbent during sampling. Each support plate is threaded for easy diffusive body attachment. Each plate includes a clip and transparent adhesive pocket to hold the barcode label.



RAD190 P001137

Each **Barcode Label** is self-adhesive with a unique barcode for the unmistakable identification of the cartridge adsorbent during sampling, desorption and analysis.



RAD1221

P001138

RAD122

P001139

The **Vertical Adapter** is available to position the diffusive body vertically on the triangular support plate for personal (breathing zone) sampling.

Description	Pkg.	Cat. No
Triangle Support Plate	20	**RAD121**
Radiello Clips	20	**RAD195**
Bar Code Labels	198	**RAD190**
Radiello Vertical Adapter		
Threaded for Standard Use	20	**RAD122**
Non-Threaded for Ready-to-Use Samplers	20	**RAD1221**

New! Radiello VOC/BTEX Starter Kits for Chemical and Thermal Desorption

Handy trial size includes everything you need to make the first steps with the Radiello passive/diffusive air samplers. Each containing one complete sampler plus an additional adsorbent cartridge. No additional parts are needed.



P001111

Each kit includes:

- 1 Diffusive body
- 1 Vertical adapter
- 1 Triangular base plate
- 2 Adsorbent cartridges and barcode label
- 1 Instruction sheet

Cat. No.	Matrix	Compounds	Pkg.	Radiello No.
RAD130S	Activated charcoal (30/50), activated	BTEX/VOC's (CS2 Desorption)	1	Code 130S
RAD145S	Carbograph 4 (35/50)	BTEX/VOC's (Thermal Desorption)	1	Code 145S



Radiello Ready-to-Use Diffusive Sampler

Radiello Cartridge Adsorbents

The Radiello ready-to-use (RTU) diffusive samplers come preassembled with the cartridge adsorbent pre-contained within the diffusive body, and sealed with a polycarbonate screw-thread cap. To avoid premature sampling, the entire unit is enclosed in an airtight polypropylene (PP) container.

They are snapped to the ready-to-use vertical adapter, pre-fixed to the triangular support plate. Once sampling is complete, the diffusive sampling unit is removed from the support plate and resealed into the PP container. The RTU diffusive samplers are ideal for workplace sampling but not recommended for low concentrations in outdoor or domestic environments.

Shelf life: 3 months



P001132



P001133

Each ready to use sampler includes:

- A sampler unit (sealed diffusive body with cartridge adsorbent)
- Glass or plastic tube for storage prior to analysis
- Ready-to-use vertical adapter
- Barcode label
- Polypropylene container

Note: Please order Triangular Support Plates separately

Cat. No.	Diffusive Body	Cartridge Adsorbent	Compounds	Pkg.	Radiello No.
RAD1231	RAD120 White	RAD130	BTEX/VOC's (CS_2 Desorption)	5	Code 123-1
RAD1232	RAD1202 Yellow	RAD145	BTEX/VOC's (Thermal Desorption)	5	Code 123-2
RAD1233	RAD1201 Blue	RAD166	HF, NO_2, and SO_2	5	Code 123-3
RAD1234	RAD1201 Blue	RAD165	Aldehydes	5	Code 123-4
RAD1235	RAD1201 Blue	RAD172	Ozone (O_3)	5	Code 123-5
RAD1236	RAD120 White	RAD170	Hydrogen Sulfide (H_2S)	5	Code 123-6
RAD1237	RAD1201 Blue	RAD168	Ammonia (NH_2)	5	Code 123-7
RAD1238	RAD120 White	RAD169	HCl	5	Code 123-8

Anesthetic Gases and Vapor Sampler (Sterile)

This kit is developed to sample nitrous oxide, isofluorane, ethrane, halothane, and sevorane in surgical theaters. Parts for one complete sampler are packed separately in one sealed and sterile bag. Pack of 10 sterile bags.

Sterile bag contains:

- 1 permeative body
- 1 support plate
- 1 vertical adapter
- 1 adsorbing cartridge

Cat. No.	Description	Pkg.
RAD125	Anesthetic Gas Sampler	10



E000985



Accessories & Replacement Parts

Radiello Outdoor Shelter

The protective outdoor shelter is designed to accommodate up to four Radiello samplers and is recommended for outdoor/ambient sampling. The shelter allows for adequate ventilation while simultaneously protecting the samplers from harsh weather conditions. It can be mounted to a variety of outdoor fixtures such as lamp-posts, traffic lights, and telephone poles of various diameters. It can be easily transported from one lab and mounted without the use of tools. Dimensions: 159 mm x 230 mm, pack of 10 and includes 20 mounting strips.



P001140



P001141

Description	Pkg.	Cat. No.
Radiello Outdoor Shelter	10	RAD196
Replacement Mounting Strips	100	RAD198

Radiello On-Field Thermometer and Temperature Reader

Uptake rates are dependent on temperature; therefore concentration values obtained during sampling will be more accurate if precise temperature values are recorded during sampling. The thermometer acts like a mini (< 1 cm^3 in size) temperature measurement station that can be mounted on the triangular support plate in conjunction with the diffusive body that is pre-attached to a vertical adapter. The thermometer offers a precision of ± 0.5 °C between –20 to 80 °C and can log up to 2048 data points allowing you to record one reading every 15 min. for 22 days, every 30 min. for 43 days and every 60 min. for 85 days. It requires no batteries and is amenable to harsh weather conditions.



P001145

Thermometer

A Temperature **Reader** (purchased separately) connects the thermometer to your PC (via RS232 serial port) allowing the user to program the thermometer prior to sampling and download readings after sampling. Each thermometer has a unique serial number for easy identification. A user-friendly software package is included with the reader to perform statistical and graphic analysis.



P001146

Description	Pkg.	Cat. No.
Reader	1	RAD127
Standard Use Configuration		
Thermometer plus vertical adapter (RAD122)	3	RAD126
Ready-to-Use Configuration (for RTU samplers)		
Thermometer plus RTU vertical adapter (RAD1221)	3	RAD1261

Radiello Filtration Kit

The filtration kit consists of a graduated polypropylene syringe and 13 mm diameter syringe filters with 0.45 µm porosity. It is ideal for filtering aqueous samples prior to reversed-phase HPLC and ion-chromatography.



P001149

Description	Pkg.	Cat. No.
Radiello Filtration Kit	20	RAD174



Calibration Kits

Radiello BTEX Calibration Kits

The BTEX Calibration Kit is available for CS2 Desorption and Thermal Desorption, both kits are designed for analysis of BTEX in urban environments. The kit may be used for both routine calibration and quality control. The calibration kit includes: 12 cartridge adsorbents of which three are blanks, and the remaining nine are divided into three concentration groups preloaded with BTEX to simulate 7-day exposures (100,800 minutes). Concentrations are described in the listed tables below. The values shown are indicative. Actual concentrations are certified for each lot. Cartridges are stable for at least 12 months when stored at 4 °C.

CS2 Desorption Kit

Includes: 12 RAD130 Cartridge Adsorbents
Simulated Concentrations in µg/m^3
Exposure Limit: 7 days equivalent

	Group 1	Group 2	Group 3
Benzene	1	10	50
Toluene	2	20	100
Ethylbenzene	1	10	50
m-xylene	1	10	50
p-xylene	1	10	50
o-xylene	1	10	50

Description	Pkg.	Cat. No.
CS2 Desorption Kit	1 kit	RAD405

Thermal Desorption Kit

Includes: 12 RAD145 Cartridge Adsorbents
Simulated Concentrations in µg/m^3
Exposure Limit: 7 days equivalent

	Group 1	Group 2	Group 3
Benzene	1	5	25
Toluene	2	10	50
Ethylbenzene	1	5	25
m-xylene	1	5	25
p-xylene	1	5	25
o-xylene	1	5	25

Description	Pkg.	Cat. No.
Thermal Desorption Kit	1 kit	RAD407

VOC Calibration Kit (Chemical Desorption) (Workplace Environment)



P001150

The VOC Calibration Kit is ideal for conducting scheduled quality control runs when analyzing workplace environments. The calibration kit includes: 12 cartridge adsorbents of which three are blanks, and the remaining nine are divided into three concentration groups preloaded with VOC's to simulate 8-hour (480 minutes) exposure. Concentrations are described in the listed table below. The values shown are indicative. Actual concentrations are certified for each lot. The composition of VOC's represents a broad range of polarity. The spiked concentrations represent 0.5, 1.0, and 2.0 times the threshold limit values (TLV) for each compound. VOC's are spiked onto the cartridges by injecting vaporized VOC standards in CS2 under nitrogen flow. Cartridges are stable for at least four months when stored at 4 °C.

Includes: 12 RAD130 Cartridge Adsorbents
Simulated Concentrations in µg/m^3
Exposure Limit: 8 hours equivalent

	Group 1	Group 2	Group 3
Benzene	0.1	0.2	0.4
Toluene	19	38	76
Ethylbenzene	12	24	48
m-xylene	12	24	48
p-xylene	12	24	48
o-xylene	12	24	48
Butanol	15	30	60
2-ethyoxyethyl acetate	2.5	5	10

Description	Pkg.	Cat. No.
VOC Calibration Kit	1 kit	RAD406



Calibration Standards

Aldehyde Calibration Standard

The aldehyde calibration standard consists of nine 2,4-dinitrophenylhydrazones (2,4-DNPH) diluted in acetonitrile. Actual concentrations for each component are certified for each lot. The standard stock solution is shipped in a pierceable-septum crimped cap. Cartridges are stable for at least four months when stored at 4 °C.

50 µg/mL of each compound in acetonitrile (aldehyde equivalent)
Exception: Acrolein (10 µg/mL)

Components

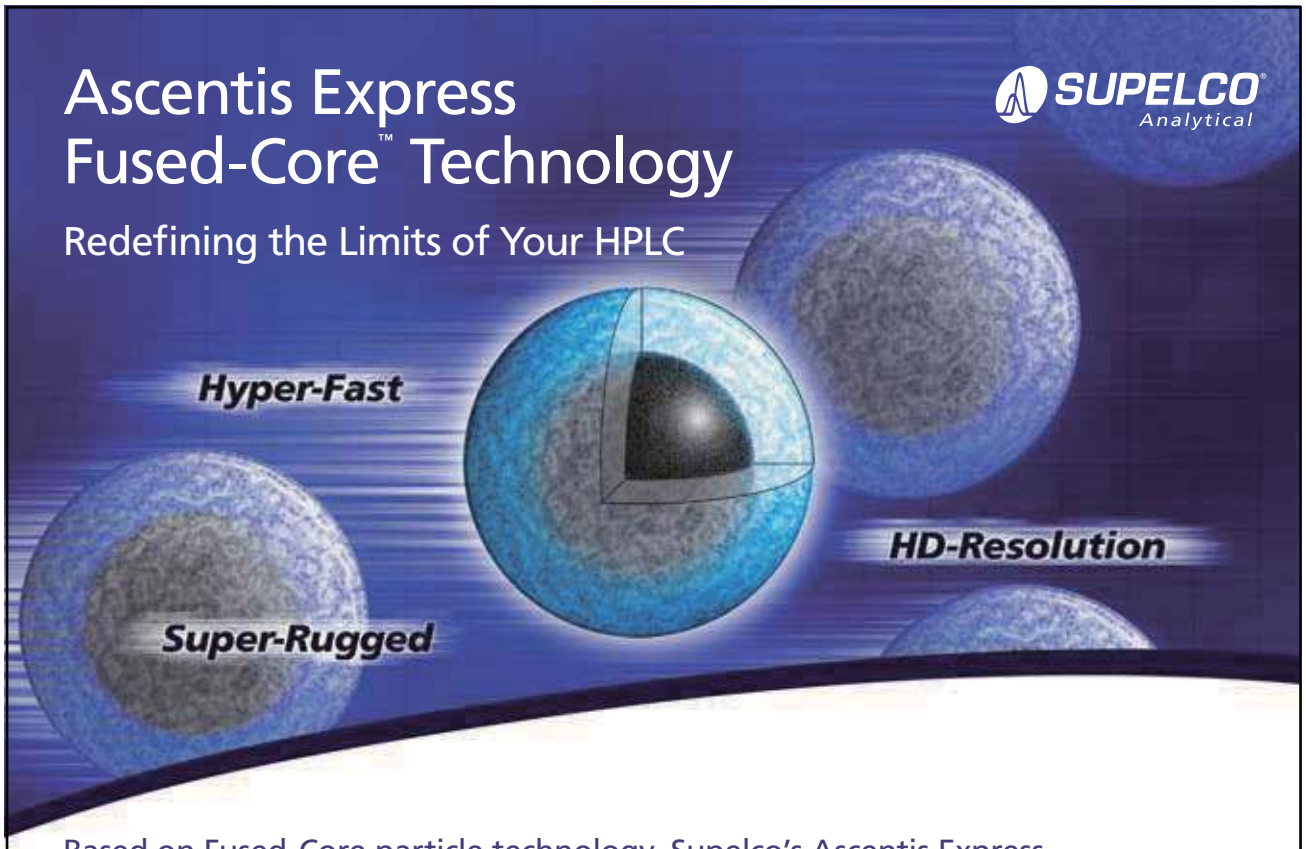
Formaldehyde-2,4-DNPH
Acetaldehyde-2,4-DNPH
Acrolein-2,4-DNPH
Propanal-2,4-DNPH
Butanal-2,4-DNPH
Isopentanal-2,4-DNPH
Pentanal-2,4-DNPH
Hexanal-2,4-DNPH
Benzaldehyde-2,4-DNPH

Description	Pkg.	Cat. No.
Aldehyde Calibration Standard	10 mL	RAD302

Methylene Blue Calibration Standard for H_2S (Hydrogen Sulfide)

The hydrogen sulfide calibration standard contains a Methylene blue concentrate that, once diluted 1:50 (v/v) with water, provides the same absorbance value of hydrogen sulfide at 665 nm at a concentration of 1.145 µg/mL sulfide ions. This concentration value is the highest absorbance value within linear range of the spectrophotometer and can be used as a stock solution to prepare standards for the calibration curve. The concentrate is suitable for preparing up to 50 calibration curves and is stable for at least 1 year.

Description	Pkg.	Cat. No.
Methylene Blue Calibration Standard	100 mL	RAD171



Based on Fused-Core particle technology, Supelco's Ascentis Express columns provide a breakthrough in HPLC column performance.

- Double the efficiencies of conventional 3 µm particles
- Equal efficiencies of sub-2 µm columns at half of the backpressure
- Rugged design capable of high pressure operation

The Future is Now! Call 800-325-3010 to order your Ascentis Express HPLC Columns Today!

For additional information, call our technical experts at 800-359-3041/814-359-3041 or visit ***sigma-aldrich.com/express***



DSD-DNPH

NEW! - *DSD-DNPH Passive Sampling Device*

High Efficiency Diffusive Sampler for Determination of Aldehydes and Ketones in Indoor Air

The DSD-DNPH diffusive sampler was introduced first in Japan and was an integral device for monitoring carbonyls in indoor air, specifically related to "sick house syndrome". Sick house syndrome results from exposure to building materials that emit VOC's such as formaldehyde. Common building materials known to emit formaldehyde are: adhesives, paints, plywood, and wallpaper.


E000962

The DSD-DNPH is comprised of a porous polyethylene tube, which acts as the diffusive membrane, to which is attached a small syringe barrel used for the elution of the analytes from the adsorbent. Because the diffusive membrane is round, it permits exposure from all sides, making it unique compared to other diffusive samplers. Silica gel coated with 2,4-dinitrophenylhydrazine (DNPH) acts as the adsorbent and moves from the diffusive end during sample collection to the syringe end for sample extraction, by inverting the device. Aldehydes and ketones diffuse through the membrane reacting with DNPH to form stable derivatives. The DNPH-derivatives are then eluted with acetonitrile and analyzed by high performance liquid chromatography (HPLC).

Simple

Versatile

Safe



Benefits:

- Specified in OSHA 1007 Method for Determination of Aldehydes
- Collection and analysis of carbonyls without transfer of the adsorbent, which minimizes the risk of contamination
- High-purity adsorbent provides collection of ppb levels of a wide range of carbonyls in a convenient, easy-to-use configuration
- Excellent uptake rates – faster, stable for wind, temperature and humidity
- Stable blank data – important LOQ
- Simple elution
- Versatile – use for indoor air, personal sampling, and ambient air

Description	Pkg.	Cat. No.
DSD-DNPH Diffusive Sampling Device	10	**28221-U**
Accessories		
Perforated Holder	10	**28222-U**
Female Luer Fitting to Tubing 5/32 in.	20	**28224-U**
Lapel Clip	10	**21019-U**
Filtration Column w/o frit 6 mL	30	**57242**
Plastic color-coded cap insert	100	**000J004**
Visiprep™-DL vacuum manifold	1	**57044**
Visi-1™ Sample Processor	1	**57080-U**
Calibration Standards		
TO-11/IP-6A Aldehyde/Ketone-DNPH Mix	1	**47285-U**
Formaldehyde-DNPH	1 mL	**47177**
Acetaldehyde-DNPH	1 mL	**47340-U**
Acetone-DNPH	1 mL	**47341**
Acrolein-DNPH	1 mL	**47342**
Propionaldehyde	1 mL	**47181**
Analytical Columns for Carbonyl DNPH Analysis		
Discovery RP Amide, 25 cm x 4.6 mm I.D., 5µm	1	**505064**
Ascentis C18, 15 cm x 4.6 mm I.D., 3 µm	1	**581322-U**
Ascentis C18, 25 cm x 4.6 mm I.D., 5 µm	1	**581325-U**
Ascentis RP-Amide, 15 cm x 4.6 mm I.D., 3 µm	1	**565322-U**
Ascentis RP-Amide, 25 cm x 4.6 mm I.D., 5 µm	1	**565325-U**

For more in-depth information:

OSHA 1007: Method for Determination of Aldehydes

Visit *sigma-aldrich.com/air_monitoring* to obtain the following:

T708004 DSD-DNPH Application Manual for complete sampling and analysis information.

T408065 (KIX) DSD-DNPH Flyer for summary of performance, features and benefits.

T400128 (DIC) Poster: High Efficiency Diffusive Sampler for Determination of Aldehydes and Ketones

References

1. S. Uchiyama, S Aoyagi, ad Ando, Masanori, "Evaluation of a Diffusive Sampler for Measurement of Carbonyl Compounds in Air", Atmospheric Environment, 2004, 38, 6319-6326.
2. S. Uchiyama and S Hasegawa, "A Reactive Sensitive Diffusion Sampler for the Determination of Aldehydes and Ketones in Ambient Air", Atmospheric Environment, 1999, 33, 1999-2005.

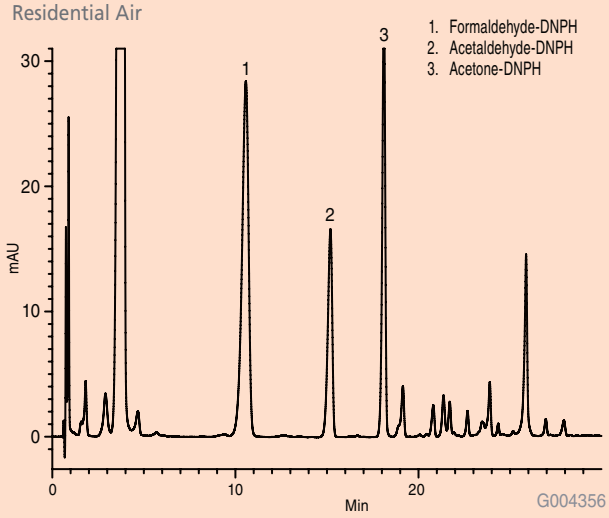


DNPH Product Applications

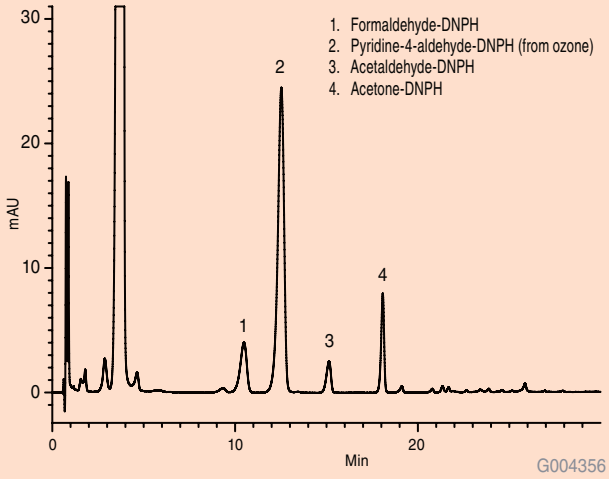
Ozone and Carbonyls: Residential and Laboratory Air

column: Ascentis C18, 15 cm x 4.6 mm I.D., 5 µm particles (581324-U)
mobile phase: 2 mM ammonium acetate in water:acetonitrile (65:35, 10 min. hold), gradient to 75% acetonitrile at 25 min. (5 min. hold)
flow rate: 1.9 mL/min.
det: UV-Vis, 360 nm
injection: 20 µL
sampling cartridge: BPE-DNPH Rezorian Cartridge (54269-U)
sampling: 90 mL/min for 24 hours
extraction: 3 mL acetonitrile/DMSO (70:30), allow to set 2 hours before HPLC injection

Residential Air



Laboratory Air



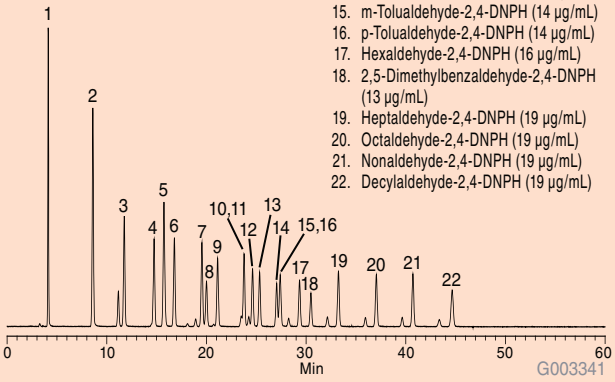
Analysis of 21 Aldehyde / Ketone DNPH Derivatives Using Ascentis RP-Amide

This application demonstrates the suitability of the Ascentis RP-Amide for the analysis of 21 aldehyde ketone derivatives.

column: Ascentis RP-Amide, 15 cm x 4.6 mm I.D., 3 µm particles (565322-U)
mobile phase A: 60:40, water:acetonitrile
mobile phase B: 25:75, water:acetonitrile
flow rate: 1.5 mL/min.
temp.: 30 °C
det.: UV at 360 nm
injection: 10 µL
sample: as listed in mobile phase
gradient:

Min	%A	%B
0	100	0
5	100	0
25	40	60
40	0	100
60	0	100

1. Dinitrophenylhydrazine (100 µg/mL)
2. Formaldehyde-2,4-DNPH (40 µg/mL)
3. Acetaldehyde-2,4-DNPH (29 µg/mL)
4. Acetone-2,4-DNPH (23 µg/mL)
5. Acrolein-2,4-DNPH (24 µg/mL)
6. Propionaldehyde-2,4-DNPH (23 µg/mL)
7. Crotonaldehyde-2,4-DNPH (20 µg/mL)
8. 2-Butanone-2,4-DNPH (10 µg/mL)
9. Butyraldehyde-2,4-DNPH (20 µg/mL)
10. Benzaldehyde-2,4-DNPH (15 µg/mL)
11. Cyclohexanone-2,4-DNPH (10 µg/mL)
12. Isovaleraldehyde-2,4-DNPH (18 µg/mL)
13. Valeraldehyde-2,4-DNPH (18 µg/mL)
14. o-Tolualdehyde-2,4-DNPH (14 µg/mL)
15. m-Tolualdehyde-2,4-DNPH (14 µg/mL)
16. p-Tolualdehyde-2,4-DNPH (14 µg/mL)
17. Hexaldehyde-2,4-DNPH (16 µg/mL)
18. 2,5-Dimethylbenzaldehyde-2,4-DNPH (13 µg/mL)
19. Heptaldehyde-2,4-DNPH (19 µg/mL)
20. Octaldehyde-2,4-DNPH (19 µg/mL)
21. Nonaldehyde-2,4-DNPH (19 µg/mL)
22. Decylaldehyde-2,4-DNPH (19 µg/mL)



Did you know?

Supelco has a wide range of Air Monitoring Application Notes available on request and on our website. Please contact Technical Service at 800-359-3041 or visit our website for more application information.



SPME

SPME for Air Sampling – Grab Sampling

SPME is another way to perform Grab sampling. It is highly sensitive, simple-to-use and easy to deploy in the field.

SPME consists of a coated fiber that can be exposed to the air. Analytes are trapped on the fiber and are later thermally desorbed in the hot injector block of a gas chromatograph.

SPME requires no solvents or complicated apparatus. It can concentrate volatile and nonvolatile compounds in both gaseous and liquid samples for analysis by GC, GC-MS, or HPLC

SPME Fiber Assortment Kits Suitable for Air Sampling

Each kit contains one each specified fiber

For use with	Needle	Cat. No.
SPME StableFlex™ Fiber Assortment Kit		
Kit Contains: 65 µm PDMS/DVB coating, 50/30 µm DVB/Carboxen/PDMS coating, 85 µm Carboxen/PDMS, and 85 µm Polyacrylate coating		
Manual Holder	24 gauge	**57550-U**
Autosampler	24 gauge	**57551-U**
Autosampler	23 gauge	**57284-U**
SPME Fiber Assortment Kit 1 for Volatile and Semi-Volatiles		
Kit Contains: 100 µm PDMS, 7 µm PDMS, and 85 µm Polyacrylate coating		
Manual Holder	24 gauge	**57306**
Autosampler	24 gauge	**57307**
Autosampler	23 gauge	**57285-U**
SPME Fiber Assortment Kit 4 for Flavors and Odors		
Kit Contains: 100 µm PDMS, 65 µm PDMS/DVB, and 75 µm Carboxen PDMS coating		
Manual Holder	24 gauge	**57324-U**
Autosampler	24 gauge	**57235-U**
Autosampler	23 gauge	**57287-U**
SPME Fiber Assortment Kit 5 for Flavors and Odors		
Kit Contains: 100 µm PDMS, 65 µm PDMS/DVB, and 85 µm Carboxen/PDMS coating and 50/30 µm DVB/Carboxen/PDMS coating		
Autosampler	23 gauge (4 each)	**57362-U**

For more in-depth information:

For more information on SPME, please visit us on our website ***sigma-aldrich.com/spme*** and request the most recent edition of the SPME CD. You can view detailed applications and informative materials and video sequences demonstrating the use of SPME.

SPME Portable Field Samplers



The portable field samplers collect organic compounds in air. In our studies, the sampler allowed us to monitor typical HPLC and GC solvents at ppb levels common in laboratory air. Three fibers are available: a polydimethylsiloxane (PDMS)/Carboxen fiber for trace levels of volatiles, a general-purpose PDMS fiber and a PDMS/DVB for semi-volatiles and larger volatile compounds.

Five slots in the needle guide/depth gauge control the depth of needle insertion into a sample container, or into the injection port during fiber desorption.

Assemblies contain 24 gauge needles. 23 gauge and other coatings available as custom (on request).

Description	Pkg.	Cat. No.
SPME Portable Field Sampler		
100 µm polydimethylsiloxane	2	**504823**
75 µm Carboxen/polydimethylsiloxane	2	**504831**
65 µm PDMS/DVB StableFlex fiber	2	**57359-U**
Thermogreen® LB-2 Septa		
Diam. 5.0 mm (3/16 in.)	50	**20638**
SPME Septum Removing Tool		
For Portable Field Sampler	1	**504858**

SPME Fiber Holder



The holder protects/guides the fiber assembly and controls exposure of the fiber during analyte adsorption and desorption. The holder is reusable indefinitely and accepts the replaceable fiber assembly. First time users must order both a holder and a fiber assembly.

Fiber holders are available for:

- Manual sampling
- Automated sampling or HPLC analysis
- CTC CombiPAL™ and Varian® 8400/8410 autosampler

Description	Pkg.	Cat. No.
SPME Fiber Holder, for use with manual sampling	1	**57330-U**
SPME Fiber Holder, for use with Autosampler or HPLC, Varian	1	**57331**
SPME Fiber Holder, for use with CTC CombiPAL, GERSTEL MPS 2 and Thermo TriPlus Autosamplers	1	**57347-U**



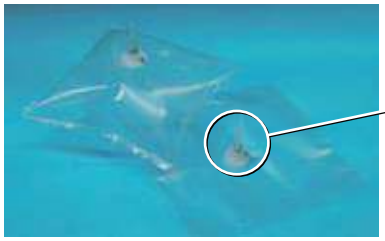
Whole Air Sampling

Overview

A whole air sample is collected when the air is drawn into some sort of containment vessel such as a Tedlar bag, stainless steel or glass canister. The method of collection is easy and the compounds of interest are recovered directly from the vessel. Recovery is a function of several factors which include, the surface area of the vessel, the chemistry and vapor pressure of the contaminants, the influence of various matrix effects, and the ability to begin with a vessel free of contamination. Supelco offers Gas Sampling Bags (Tedlar) and Glass Bulbs for whole air sampling.

Tedlar Gas Sampling Bags

Tedlar gas sampling bags are recommended in many US EPA methods including TCLP and Methods TO-3 (VOCs), TO-12 (NMOC), TO-14A (VOCs), TO-15 (VOCs), ASTM D-5504 (reduced sulfur compounds) and a variety of atmospheric gas methods.



E000995



E000996

Benefits:

- Patented 2-in-1 valve with unique push-pull device operates with one hand so you have your other hand free for other operations.
- Valve consistently achieves a positive open or closed setting.
- Unique valve and seam-sealing process ensures bags are sturdy and leak-proof under demanding sampling conditions.
- 2-mil Dupont Tedlar material for superior inertness and impermeability.
- Bags assembled in a controlled environment, eliminating contamination during manufacture.

Max Vol. (L)	W x Depth (in.)	Pkg.	Cat. No.
1	7 x 7	10	**24633**
2	9 x 9	10	**24654**
5	12 x 12	10	**24655**
10	12 x 19	10	**24634**
25	18 x 24	5	**24656**

Gas Sampling Bulbs

Glass sampling bulbs may be used as an alternative to Tedlar bags to trap and transport a gas sample. To analyze the sample, take an aliquot (through the plug-type septum). Our bulbs are oven annealed to prevent damage during transportation and on-site use.



9970169

Sampling Bulbs with Glass Stopcocks

Volume (mL)	Pkg.	Cat. No.
Glass Stopcock		
125	1	**22146-U**
250	1	**22147-U**
500	1	**22148-U**
1000	1	**22144-U**
PTFE Stopcock		
125	1	**22161**
250	1	**22162-U**
500	1	**22163-U**
1000	1	**22145-U**
Stopcock Plug	1	**64779-U**
Thermogreen LB-1 Septa for Shimadzu		
Cylindrical w/half-hole	100	**20668**

Static Dilution Bottle

- Two-liter, round-bottom flask with a threaded neck
- Accommodates a Mininert® valve



9960281

Use the static dilution bottle to prepare gaseous volatile organic standards, using a technique developed by the US EPA for air analyses. Simply inject neat compound through the valve and allow it to vaporize; then withdraw the aliquots using a gas-tight syringe. Multicomponent standards are conveniently prepared and may be stored for at least one week.

Description	Pkg.	Cat. No.
Static Dilution Bottle w/Mininert Valve	1	**21992**
Septum inserter, for use with Mininert Valves	1	**33311**
Replacement Mininert Septa, length 0.308 in. × O.D. 0.125 in.	50	**33310-U**
Mininert Valve, for use with 24/400 mm thread	12	**33304**



Air Monitoring Pumps & Accessories

Air Sampling Pumps

Escort Elf Air Sampling Pump and Accessories

An electronic laminar flow sensor in this easy-to-operate, state-of-the-art sampling pump provides constant flow control, unaffected by changes in battery voltage, temperature, sample load, or altitude. An internal secondary standard calibrates the pump continuously, requiring only monthly calibration with a primary standard. A built-in counter monitors total operating time, and reminds you when a primary calibration is required. The pump also features a low battery function with an indicator light, and blocked flow detection. LED readout alternately displays flow rate and elapsed sampling time. It may not be used with Tedlar bags. Order charger separately.

Gemini Twin Port Sampler

This pump attachment is designed for low flow industrial hygiene sampling, such as gas and vapor monitoring, using sorbent tubes. Two needle valves provide independent flow control for simultaneous collection on two tubes, but can also be used for a single tube by closing the flow to one valve. The sampler is compatible with any personal sampling pump capable of 1.5 L/min flow rate and a load of 25 in. of water. Total flow cannot exceed 500 mL/min. Each sampler comes with two tube protectors, one for small tubes (<2 in. long) and one for large tubes (<4.5 in. long), and the tubing required to connect the sampler to the sampling pump.



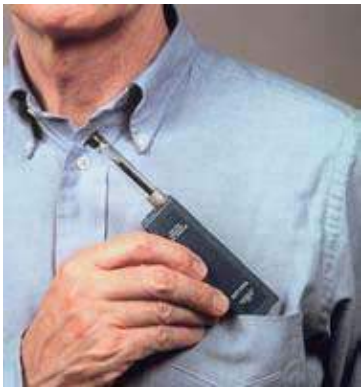
P000747

Description	Pk	Cat. No
Escort Elf Sampling Pump	1	28160-U
Gemini Twin Port Sampler	1	28118-U

Accessories

Description	Pkg.	Cat. No.
Omega Battery Charger		
12 Volt	1	28155-U
110 Volt, units charged: 1	1	28157-U
240 Volt, units charged: 1	1	28158-U
120 V/240 V, units charged: 5	1	28159-U

PAS-500 Micro Air Sampler



9940285

This low flow pump is lightweight (4 oz.) and compact (7 in. high), fitting easily into your shirt pocket. The adsorbent tube connects directly to the inlet of the pump. This sampler is versatile, adapts to fit both 6 mm and 8 mm tubes and the flow range is 40-200 cc/min. The low flow adapter enables you to sample at 20 cc/min.

This unit is powered by a convenient and easily replaceable 9-volt battery. The full flow regulation feature provides constant voltage to the pump, even as battery voltage drops. It is intrinsically safe – a built-in resistor limits the power current, preventing any short circuit.

Description	Pkg.	Cat. No.
PAS-500 Micro Air Sampler with Low Flow Orifice		
Includes sampler, 6 mm tube holder, screwdriver, and 9-volt battery	1	24865
Tube Holder for PAS-500 Pump		
For use with 6 mm adsorbent tube	1	24867
For use with 8 mm adsorbent tube	1	24868
For use with detector tube	1	24869
Carrying Case for PAS-500		
Single pump case	1	24871
Eight pump case	1	24872



Field Sampling Pumps for Active and Whole Air Samplers



E000129



E000018

Description	Recommended For	Pkg.	Cat. No.
Model 1060 Bag Sampler	Single 1-2 Liter Tedlar Bags	1	24622-U
Model 1062 Bag Sampler	Single 1-10 Liter Tedlar Bags	1	24623
Model 1063 Bag Sampler	Six 1 Liter Tedlar Bags	1	24647
Model 1067 Tube Sampler* (Dual Channel)	Adsorbent Tubes (ORBO & TD)	1	507113

*Includes universal charger

Accessories

Description	Pkg.	Cat. No.
Battery Charger		
For Model 1060, 110V	1	24643
For Models 1062 & 1063, 110V	1	24644
Universal Charger, 110V/240V For use with 1060,1062,1063 &1067	1	24697-U
Replacement Battery for Field Sampling Pump		
For Model 1060	1	24635
For Models 1062, 1063, & 1067	1	24636
Critical Orifice for 1063 Bag Sampler		
Flow Rate: 1 mL/min	1	24667
Flow Rate: 10 mL/min	1	24668
Filter, SS, 40 µm	1	24672

Bubble Flow Meters



P000854

Description	Pkg.	Cat. No.
Bubble Meter Kit, 500 mL	1	20414
Bubble Meter Kit, 1000 mL	1	20415
Replacement Bubble Meter, 500 mL	1	20427-U
Replacement Bubble Meter, 1000 mL	1	20428-U
Stopwatch	1	23011



P000299

Flow Calibration Devices for Air Sampling Pumps



P000853

Description	Pkg.	Cat. No.
Mini-Buck Flow Calibrator		
Model M-5*, Flow Rate 1-6000 mL/min	1	24843
Model M-30*, Flow Rate 1-30 mL/min	1	24845
Battery Charger for M-5/M-30, 110V	1	24844
Battery Charger for M-5/M-30, 220V	1	24846

*Battery charger not included with 24843 and 24845, order separately

Digital Flow Calibrator



9130186

Measures volumetric flows between 5 to 5.000 mL/min with accuracy to within ±3% of the reading. A microprocessor indicates fault and low battery conditions and automatically adjusts the meter to the air flow rate. Comes complete with a 9-volt battery, Tygon tubing, and instructions.

Description	Pkg.	Cat. No.
Humonics Flowmeter		
Model 650, Flow range: 5-5000 mL/min	1	22912



Air Monitoring Standards

ASTM Methods

American Society for Testing and Materials (ASTM) Methods

The following standards are for use with methods developed under ASTM Committee D-22, described in the Annual Book of ASTM Methods, Volume 11.03, Atmospheric Analysis, Occupational Health and Safety. The standards are quantitative formulations for use as chromatographic calibration or spiking solutions. Products include a Certificate of Analysis describing lot-specific production and analytical information. Free data packets are available for most of these products. Data packets contain data on raw materials and final production. Request the data packet when ordering the standard; the order number is the same as that for the standard, preceded by the letters DP.

ASTM D5197 Method Description: Analysis of Aldehydes in Air

Description standard type calibration	Concentration	Pkg.	Cat. No.
TO11/IP-6A Aldehyde/Ketone-DNPH Mix	15 µg/mL each component in acetonitrile (aldehyde equivalent)	1 mL	47285-U

Acetaldehyde-2,4-dinitrophenylhydrazone
Acetone-2,4-dinitrophenylhydrazone
Acrolein-2,4-dinitrophenylhydrazone
Benzaldehyde-2,4-dinitrophenylhydrazone
Butyraldehyde-2,4-dinitrophenylhydrazone
Crotonaldehyde-2,4-dinitrophenylhydrazone
2,5-Dimethylbenzaldehyde-2,4-dinitrophenylhydrazone
Formaldehyde-2,4-dinitrophenylhydrazone
Hexaldehyde-2,4-dinitrophenylhydrazone
Isovaleraldehyde-2,4-dinitrophenylhydrazone
Propionaldehyde-2,4-dinitrophenylhydrazone
o-Tolualdehyde-2,4-dinitrophenylhydrazone
m-Tolualdehyde-2,4-dinitrophenylhydrazone
p-Tolualdehyde-2,4-dinitrophenylhydrazone
Valeraldehyde-2,4-dinitrophenylhydrazone

California Air Resources Board (CARB) Methods

Analysis of Carbonyls in Ambient Air

California Air Resources Board (CARB) – The following quantitative formulations were developed to support the analysis of aldehydes in ambient air by CARB Method 1004. Analysis is of the dinitrophenylhydrazine (DNPH) derivatives by HPLC-UV. **Concentrations stated are of the equivalent carbonyl before derivatization, except where noted.** The Certificate of Analysis accompanying these products states both DNPH derivatized and non-derivatized concentrations.

Description standard type calibration	Concentration	Pkg.	Cat. No.
CARB Carbonyl-DNPH Mix 1	in acetonitrile (varied)	1 mL	47649-U

Acetaldehyde-2,4-dinitrophenylhydrazone, 1000 µg/mL
Acetone-2,4-dinitrophenylhydrazone, 500 µg/mL
Acrolein-2,4-dinitrophenylhydrazone, 500 µg/mL
Benzaldehyde-2,4-dinitrophenylhydrazone, 500 µg/mL
Butyraldehyde-2,4-dinitrophenylhydrazone, 500 µg/mL
Formaldehyde-2,4-dinitrophenylhydrazone, 1500 µg/mL
Propionaldehyde-2,4-dinitrophenylhydrazone, 500 µg/mL

CARB Method 1004 DNPH Mix 1	3 µg/mL in acetonitrile (aldehyde equivalent)	1 mL	47650-U
CARB Method 1004 DNPH Mix 2	30 µg/mL in acetonitrile (aldehyde equivalent)	1 mL	47651-U

Acetaldehyde-2,4-dinitrophenylhydrazone
Acetone-2,4-dinitrophenylhydrazone
Acrolein-2,4-dinitrophenylhydrazone
Benzaldehyde-2,4-dinitrophenylhydrazone
2-Butanone-2,4-dinitrophenylhydrazone
Butyraldehyde-2,4-dinitrophenylhydrazone
Crotonaldehyde-2,4-dinitrophenylhydrazone
Formaldehyde-2,4-dinitrophenylhydrazone
Hexaldehyde-2,4-dinitrophenylhydrazone
Methacrolein-2,4-dinitrophenylhydrazone
Propionaldehyde-2,4-dinitrophenylhydrazone
m-Tolualdehyde 2,4-dinitrophenylhydrazone
Valeraldehyde-2,4-dinitrophenylhydrazone



European Mixes

DNPH Mixes - The following dinitrophenylhydrazine (DNPH) standards were developed in response to European requests for working and calibration check standards for the ambient air analysis of carbonyl emissions from automobile exhaust. Methods for this analysis are equivalent to California Air Resources Board 1004 (Sacramento, CA, USA). Concentrations are of the equivalent carbonyl quantity before derivatization. The Certificate of Analysis accompanying each of these products states both DNPH-derivatized and non-derivatized concentrations.

Description standard type calibration	Concentration	Pkg.	Cat. No.
Carbonyl-DNPH Mix 1	20 µg/mL in acetonitrile (except where indicated; aldehyde equivalent) *Acetaldehyde-2,4-dinitrophenylhydrazone* *Acetone-2,4-dinitrophenylhydrazone* *Acrolein-2,4-dinitrophenylhydrazone* *Benzaldehyde-2,4-dinitrophenylhydrazone* *2-Butanone-2,4-dinitrophenylhydrazone* *Butyraldehyde-2,4-dinitrophenylhydrazone* *Crotonaldehyde-2,4-dinitrophenylhydrazone* *Formaldehyde-2,4-dinitrophenylhydrazone, 40 µg/mL* *Hexaldehyde-2,4-dinitrophenylhydrazone* *Methacrolein-2,4-dinitrophenylhydrazone* *Propionaldehyde-2,4-dinitrophenylhydrazone* *p-Tolualdehyde 2,4-dinitrophenylhydrazone* *Valeraldehyde-2,4-dinitrophenylhydrazone*	1 mL	**47672-U**
Carbonyl-DNPH Mix 2	2 µg/mL in acetonitrile (except where indicated; aldehyde equivalent) *Acetaldehyde-2,4-dinitrophenylhydrazone* *Acetone-2,4-dinitrophenylhydrazone* *Acrolein-2,4-dinitrophenylhydrazone* *Benzaldehyde-2,4-dinitrophenylhydrazone* *2-Butanone-2,4-dinitrophenylhydrazone* *Butyraldehyde-2,4-dinitrophenylhydrazone* *Crotonaldehyde-2,4-dinitrophenylhydrazone* *Cyclohexanone 2,4-dinitrophenylhydrazone, 5 µg/mL* *Formaldehyde-2,4-dinitrophenylhydrazone, 4 µg/mL* *Hexaldehyde-2,4-dinitrophenylhydrazone* *Methacrolein-2,4-dinitrophenylhydrazone* *Propionaldehyde-2,4-dinitrophenylhydrazone* *p-Tolualdehyde 2,4-dinitrophenylhydrazone* *Valeraldehyde-2,4-dinitrophenylhydrazone*	1 mL	**47671-U**
Cyclohexanone-2,4-DNPH solution	500 µg/mL in acetonitrile	1 mL	**47673-U**

Oximes

PFBHA (O-(2,3,4,5,6-pentafluorobenzyl)hydroxylamine) derivatives do not decompose at an elevated temperature. For this reason, PFBHA derivatives are a good alternative to 2,4-DNPH derivatives when using GC.

Material purity ≥98% by GC except where noted.

Description	Material Number	Pkg.
Acetaldehyde-O-pentafluorphenylmethyl-oxime purum	15875	10 mg
Acetone-O-pentafluorphenylmethyl-oxime purum	44114	10 mg, 50 mg
Acrolein-O-pentafluorphenylmethyl-oxime purum (≥95%)	65819	10 mg, 50 mg
Crotonaldehyde-O-pentafluorphenylmethyl-oxime purum	42094	10 mg
Formaldehyde-O-pentafluorphenylmethyl-oxime purum	41558	10 mg
Glutaraldehyde bis-O-pentafluorophenylmethyl-oxime purum	03718	10 mg
Propionaldehyde O-pentafluorophenylmethyl-oxime purum	43508	10 mg
Valeraldehyde O-pentafluorophenylmethyl-oxime purum	66156	10 mg, 50 mg

DAIH

(2-Diphenylacetyl-indan-1,3-dione-1-ethylidenehydrazone) derivatives of aldehydes and ketones.

Material purity ≥98% by GC.

Description	Material Number	Pkg.
Acetaldehyde, DAIH derivative	14423	50 mg
Acetone, DAIH derivative	02819	50 mg
Acrolein, DAIH derivative	13173	50 mg
Crotonaldehyde, DAIH derivative	55556	50 mg
Cyclohexanone, DIAH derivative	91547	50 mg
Formaldehyde, DAIH derivative	06947	50 mg
Propionaldehyde, DAIH derivative	51299	50 mg



Aldehyde & Ketone DNPH Derivatives, Neats & Solutions

These solutions of DNPH derivatives are designed as quantitative calibration mixtures where a multi-component solution is not suitable. At concentration indicated in 1 mL (actual filling 1.1-1.2 mL) acetonitrile, in amber glass ampul.

Description	Concentration	Pkg.	Cat. No.
2,5-Dimethylbenzaldehyde-2,4-DNPH		100 mg	442321-U
2-Butanone-2,4-DNPH		100 mg	442339
2-Butanone-2,4-DNPH solution	100 µg/mL in acetonitrile	1 mL	47344
Acetaldehyde-2,4-DNPH solution	1000 µg/mL in acetonitrile	1 mL	47340-U
Acetaldehyde-2,4-DNPH solution	1000 µg/mL in acetonitrile	5 x 1 mL	4M7340-U
Acetaldehyde-2,4-DNPH		100 mg	442434
Acetone-2,4-DNPH		50 mg	442436
Acrolein-2,4-DNPH solution	1000 µg/mL in acetonitrile	1 mL	47342
Acrolein-2,4-DNPH		25 mg	442441
Benzaldehyde-2,4-DNPH solution	100 µg/mL in acetonitrile	1 mL	47343
Benzaldehyde-2,4-DNPH		100 mg	442469
Butyraldehyde-2,4-DNPH solution	1000 µg/mL in acetonitrile	1 mL	47345-U
Butyraldehyde-2,4-DNPH		100 mg	442504
Crotonaldehyde-2,4-DNPH solution	100 µg/mL in acetonitrile	1 mL	47175-U
Crotonaldehyde-2,4-DNPH		100 mg	442529
Cyclohexanone DNPH solution	500 µg/mL in acetonitrile	1 mL	47673-U
Cyclohexanone DNPH		10 mg	442533
Decanal 2,4-dinitrophenylhydrazone		100 mg	33852
Formaldehyde-2,4-DNPH solution	100 µg/mL in acetonitrile	1 mL	47177
Formaldehyde-2,4-DNPH solution	100 µg/mL in acetonitrile	5 x 1 mL	4M7177
Formaldehyde-2,4-DNPH		100 mg	442597
Formaldehyde-2,4-DNPHydrazide solution	100 µg/mL in acetonitrile	3 x 2 mL	49208-U
Glutaraldehyde-2,4-DNPH solution	100 µg/mL in acetonitrile	1 mL	47564-U
Heptanal 2,4-dinitrophenylhydrazone		100 mg	33848
Hexaldehyde-2,4-DNPH solution	1000 µg/mL in acetonitrile	1 mL	47178-U
Hexaldehyde-2,4-DNPH		100 mg	442614
Isobutyraldehyde-2,4-DNPH solution	100 µg/mL in acetonitrile	1 mL	47886
Isovaleraldehyde-2,4-DNPH solution	1000 µg/mL in acetonitrile	1 mL	47179
Methacrolein-2,4-DNPH solution	100 µg/mL in acetonitrile	1 mL	47180-U
Methacrolein-2,4-DNPH		100 mg	442639
Nonanal 2,4-dinitrophenylhydrazone		100 mg	33851
Octanal 2,4-dinitrophenylhydrazone		100 mg	33849
o-Phthaldialdehyde-$(DNPH)_2$ solution	10 µg/mL in acetonitrile/DMSO (7:3)	1 mL	47032-U
m-Tolualdehyde-2,4-DNPH solution	100 µg/mL in acetonitrile	1 mL	47183
o-Tolualdehyde-2,4-DNPH solution	100 µg/mL in acetonitrile	1 mL	47182
o-Tolualdehyde-2,4-DNPH		100 mg	442722
p-Tolualdehyde-2,4-DNPH solution	100 µg/mL in acetonitrile	1 mL	47184-U
p-Tolualdehyde-2,4-DNPH		100 mg	442735
Propionaldehyde-2,4-DNPH solution	1000 µg/mL in acetonitrile	1 mL	47181
Propionaldehyde-2,4-DNPH		100 mg	442768
Valeraldehyde-2,4-DNPH solution	100 µg/mL in acetonitrile	1 mL	47185-U
Valeraldehyde-2,4-DNPH		100 mg	442834

Analytical Columns for Carbonyl DNPH Analysis

Discovery RP Amide, 25 cm x 4.6 mm I.D., 5 µm	1	505064
Ascentis C18, 15 cm x 4.6 mm I.D., 3 µm	1	581322-U
Ascentis C18, 25 cm x 4.6 mm I.D., 5 µm	1	581325-U
Ascentis RP-Amide, 15 cm x 4.6 mm I.D., 3 µm	1	565322-U
Ascentis RP-Amide, 25 cm x 4.6 mm I.D., 5 µm	1	565325-U



Alternative Aldehyde and Ketone Derivatives

NIOSH and OSHA Methods

NIOSH and OSHA Methods for Workplace Atmospheres

The following standards are for use with methods listed in OSHA and NIOSH manuals of methods for analysis of workplace contaminants. The standards are quantitative formulations for use as chromatographic calibration or spiking solutions. Products include a Certificate of Analysis describing lot-specific production and analytical information.

Free data packets containing data on raw materials and final production are available for most products. Request the data packet when ordering the standard; the order number is the same as that for the standard, preceded by the letters DP.

NIOSH 2541/OSHA 52: Analysis of Formaldehyde in Indoor Air

Description standard type calibration	Concentration	Pkg.	Cat. No.
Formaldehyde Oxazolidine solution	2000 µg/mL in toluene	1 mL	48414

US EPA IP Methods

Compendium of Methods for the Determination of Air

The following standards are for use with EPA document number EPA/600/4-90/010. The standards are quantitative formulations for use as chromatographic calibration or spiking solutions. Products include a Certificate of Analysis describing lot-specific production and analytical information. Free data packets are available for these products. Data packets contain data on raw materials and final production. Request the data packet when ordering the standard; the order number is the same as that for the standard, preceded by the letters DP.

IP1: Analysis of Volatile Organics (BP 80-200 °C) in Indoor Air by GC-MS

Description standard type calibration	Concentration		Pkg.	Cat. No.
EPA TO-1 Toxic Organic Mix 1A	2 mg/mL each component in methanol		1 mL	48896
Benzene	*Heptane*	*o-Xylene*		
Cumene	*1-Heptene*	*m-Xylene*		
Ethylbenzene	*Toluene*	*p-Xylene*		
EPA TO-1 Toxic Organic Mix 1B	2 mg/mL each component in methanol		1 mL	48897
Acrylonitrile	*Chlorobenzene*	*1,3-Dichloropropane*		
Allyl chloride	*Chloroform*	*Tetrachloroethylene*		
Bromobenzene	*1,2-Dibromoethane*	*1,1,1-Trichloroethane*		
Bromoform	*1,2-Dichloroethane*	*Trichloroethylene*		
Carbon tetrachloride	*1,2-Dichloropropane*			

IP6: Analysis of Aldehydes and Ketones in Indoor Air by HPLC/UV

Description standard type calibration	Concentration		Pkg.	Cat. No.
TO-11/IP-6A Aldehyde/Ketone-DNPH Mix	15 µg/mL each component in acetonitrile (aldehyde equivalent)		1 mL	47285-U
			3 × 1 mL	4M7285-U
Acetaldehyde-2,4-dinitrophenylhydrazone	*Crotonaldehyde-2,4-dinitrophenylhydrazone*	*Propionaldehyde-2,4-dinitrophenylhydrazone*		
Acetone-2,4-dinitrophenylhydrazone	*2,5-Dimethylbenzaldehyde 2,4-dinitrophenylhydrazone*	*o-Tolualdehyde 2,4-dinitrophenylhydrazone*		
Acrolein-2,4-dinitrophenylhydrazone	*Formaldehyde-2,4-dinitrophenylhydrazone*	*m-Tolualdehyde 2,4-dinitrophenylhydrazone*		
Benzaldehyde-2,4-dinitrophenylhydrazone	*Hexaldehyde-2,4-dinitrophenylhydrazone*	*p-Tolualdehyde 2,4-dinitrophenylhydrazone*		
Butyraldehyde-2,4-dinitrophenylhydrazone	*Isovaleraldehyde 2,4-dinitrophenylhydrazone*	*Valeraldehyde-2,4-dinitrophenylhydrazone*		



US EPA TO Methods

Toxic Organic Compounds in Air (TO)

TO-1: Volatile Organic Compounds

Description standard type calibration	Concentration		Pkg.	Cat. No.
EPA TO-1 Toxic Organic Mix 1A	2 mg/mL each component in methanol		1 mL	**48896**
Benzene	*Heptane*	*o-Xylene*		
Cumene	*1-Heptene*	*m-Xylene*		
Ethylbenzene	*Toluene*	*p-Xylene*		
EPA TO-1 Toxic Organic Mix 1B	2 mg/mL each component in methanol		1 mL	**48897**
Acrylonitrile	*Chlorobenzene*	*1,3-Dichloropropane*		
Allyl chloride	*Chloroform*	*Tetrachloroethylene*		
Bromobenzene	*1,2-Dibromoethane*	*1,1,1-Trichloroethane*		
Bromoform	*1,2-Dichloroethane*	*Trichloroethylene*		
Carbon tetrachloride	*1,2-Dichloropropane*			

TO-2: Volatile Organic Compounds

Description standard type calibration	Concentration		Pkg.	Cat. No.
EPA Toxic Organic Mix 2A	2 mg/mL each component in methanol		1 mL	**48898**
Dichloromethane	*Vinyl chloride*	*Vinylidene chloride*		

TO-5/TO-11: Aldehydes and Ketones by HPLC/UV

Description standard type calibration	Concentration		Pkg.	Cat. No.
TO11/IP-6A Aldehyde/Ketone-DNPH Mix	15 µg/mL each component in acetonitrile (aldehyde equivalent)		1 mL 3 x 1 mL	**47285-U** **4M7285-U**
Acetaldehyde-2,4-dinitrophenylhydrazone	*Benzaldehyde-2,4-dinitrophenylhydrazone*	*2,5-Dimethylbenzaldehyde-2,4-dinitro-phenylhydrazone*		
Acetone-2,4-dinitrophenylhydrazone	*Butyraldehyde-2,4-dinitrophenylhydrazone*			
Acrolein-2,4-dinitrophenylhydrazone	*Crotonaldehyde-2,4-dinitrophenylhydrazone*	*Formaldehyde-2,4-dinitrophenylhydrazone*		

TO-11A Formaldehyde by HPLC

Description	Concentration		Pkg.	Cat. No.
TO-11A Six Component Carbonyl-DNPH Mix	15 µg/mL each component in acetonitrile		1.5 mL	**48149-U**
Acetaldehyde-2,4-dinitrophenylhydrazone	*Acrolein-2,4-dinitrophenylhydrazone*	*Formaldehyde-2,4-dinitrophenylhydrazone*		
Acetone-2,4-dinitrophenylhydrazone	*Crotonaldehyde-2,4-dinitrophenylhydrazone*	*Propionaldehyde-2,4-dinitrophenylhydrazone*		



TO-15/17 Volatile Organic Compounds by GC-MS

Description	Concentration	Pkg.	Cat. No.
TO-15/17 Calibration Mix (62 components)	100 ppb each in N_2	110 L	41974-U
	1 ppm each in N_2	110 L	41973-U

Acetone
Benzene
*Benzyl chloride**
Bromoform
Bromomethane
Bromodichloromethane
1,3-Butadiene
2-Butanone (MEK)
*Carbon disulfide**
Carbon tetrachloride
Chlorobenzene
Chloroethane
Chloroform
Cyclohexane
Chloromethane
Dibromochloromethane
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
trans-1,2-Dichloroethene
1,2-Dichloropropane
cis-1,3-Dichloropropene
trans-1,3-Dichloropropene
1,4-Dioxane
*Ethanol**
Ethyl acetate
Ethylbenzene
Ethyl dibromide (1,2-dibromoethane)
4-Ethyltoluene
Freon® 11 (Trichlorofluoromethane)
Freon 12 (Dichlorodifluoromethane)
Freon 113 (1,1,2-Trichlorotrifluoroethane)
Freon 114 (1,2-Dichlorotetrafluoroethane)
Heptane
Hexachloro-1,3-butadiene
Hexane
2-Hexanone (MBK)
4-Methyl-2-pentanone (MIBK)
Methylene chloride
Methyl-tert-butylether (MTBE)
*2-Propanol**
Propylene
Styrene
1,1,2,2-Tetrachloroethane
Tetrachloroethene
Tetrahydrofuran
Toluene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene
1,2,4-Trichlorobenzene
1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene
Vinyl acetate
Vinyl chloride
m-Xylene
o-Xylene
p-Xylene

Blend Tolerance and Analytical Accuracy = +/- 25% (**41974-U**)

TO-15/17 Subset 25 Component Calibration Mix	100 ppb in N_2	110 L	41979-U
	1 ppm in N_2	110 L	41978-U

Acetone
Allyl chloride
*Benzyl chloride**
Bromodichloromethane
Bromoform
1,3-Butadiene
2-Butanone (MEK)
*Carbon disulfide**
Cyclohexane
Dibromochloromethane
1,4-Dioxane
Ethyl acetate
4-Ethyltoluene
Heptane
Hexane
2-Hexanone (MBK)
4-Methyl-2-pentanone (MIBK)
Methyl-tert-butylether (MTBE)
*2-Propanol**
Propylene
Tetrahydrofuran
trans-1,2-Dichloroethene
2,2,4-Trimethylpentane
Vinyl acetate
Vinyl bromide

*** Blend Tolerance and Analytical Accuracy = +/- 25% (41979-U)**

TO-15 SUBSET A (12 Components)	1 ppm in N_2	110 L	41983-U

Acetonitrile
Acrylonitrile
Allyl chloride
*Benzyl chloride**
1,3-Butadiene
Ethyl bromide
Hexane
Methyl ethyl ketone
Methyl-isobutyl-ketone
2,2,4-Trimethylpentane
Vinyl acetate
Vinyl bromide

*** Blend Tolerance and Analytical Accuracy = +/- 25%**



Ozone Precursor / PAMS Method

Description	Concentration	Pkg.	Cat. No.
Ozone Precursor / PAMS Mix (57 components)	100 ppb each in N_2	110 L	41975-U
	1 ppm each in N_2	110 L	41976-U
	EPA Conc. ppbC in N_2	110 L	41977-U

Acetylene
Benzene
n-Butane
1-Butene
cis-2-Butene
trans-2-Butene
Cyclohexane
Cyclopentane
n-Decane
m-Diethylbenzene
p-Diethylbenzene
2,2-Dimethylbutane
2,3-Dimethylbutane
2,3-Dimethylpentane
2,4-Dimethylpentane
n-Dodecane
Ethane
Ethylbenzene
Ethylene
m-Ethyltoluene
o-Ethyltoluene
p-Ethyltoluene
n-Heptane
n-Hexane
1-Hexene
Isobutane
Isopentane
Isoprene
Isopropylbenzene
Methylcyclohexane
Methylcyclopentane
2-Methylheptane
3-Methylheptane
2-Methylhexane
3-Methylhexane
2-Methylpentane
3-Methylpentane
n-Nonane
n-Octane
n-Pentane
1-Pentene
cis-2-Pentene
trans-2-Pentene
Propane
n-Propylbenzene
Propylene
Styrene
Toluene
1,2,3-Trimethylbenzene
1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene
2,2,4-Trimethylpentane
2,3,4-Trimethylpentane
n-Undecane
m/p-Xylene (combined)
o-Xylene

Alternative VOC Methods

Description	Concentration	Pkg.	Cat. No.
Massachusetts APH Mix (26 components)	EPA Concentrations, in N_2	110 L	41982-U

	ppmv		ppmv		ppmv
Benzene	*0.5*	*n-Heptane*	*0.25*	*Toluene*	*2*
1,3-Butadiene	*1*	*n-Hexane*	*0.5*	*Toluene-d_8 (IS)*	*0.5*
Butylcyclohexane	*1*	*Isopentane*	*0.5*	*1,2,3-Trimethylbenzene*	*1*
Cyclohexane	*0.5*	*Isopropylbenzene*	*0.25*	*1,3,5-Trimethylbenzene*	*0.5*
n-Decane	*0.25*	*p-Isopropyltoluene*	*1*	*n-Undecane*	*0.25*
2,3-Dimethylheptane	*0.25*	*1-Methyl-3-ethylbenzene*	*1*	*m- & p-Xylene (50% each)*	*2*
2,3-Dimethylpentane	*1*	*Methyl tert-butyl ether (MTBE)*	*1*	*o-Xylene*	*0.5*
n-Dodecane	*0.25*	*n-Nonane*	*0.25*		
Ethylbenzene	*1*	*n-Octane*	*0.5*		

Japanese Air Monitoring Methods

Description	Concentration	Pkg.	Cat. No.
Japanese 50-Component Indoor Air Standard	100 µg/mL in methanol:water (95:5)	1 x 1 mL	49148-U
	100 µg/mL in methanol:water (95:5)	3 x 1 mL	4M9148-U
	1000 µg/mL in methanol:water (97:3)	1 x 1 mL	49149-U

Acetone
1-Butanol
Chloroform
Dibromochloromethane
Dichloromethane
Dodecane
Ethylbenzene
4-Ethyltoluene
Hexane
Nonane
Pentadecane
1-Propanol
Tetrachloroethylene
Toluene
1,2,3-Trimethylbenzene
2,2,4-Trimethylpentane (isooctane)
o-Xylene
Benzene
2-Butanone
Decanal
1,4-Dichlorobenzene
1,2-Dichloropropane
Ethanol
2-Ethyltoluene
Heptane
(R)-(+)-Limonene
1-Nonanol
(1S)-(-)-alpha-Pinene
2-Propanol
Tetradecane
Trichloroethylene
1,2,4-Trimethylbenzene
Undecane
p-Xylene
Bromodichloromethane
Butyl acetate
Decane
1,2-Dichloroethane
2,4-Dimethylpentane
Ethyl acetate
3-Ethyltoluene
Hexadecane
4-Methyl-2-pentanone
Octane
(-)-beta-Pinene
Styrene
1,2,4,5-Tetramethylbenzene
Tridecane
1,3,5-Trimethylbenzene (mesitylene)
m-Xylene

Japan Calibration Mix (9 components)	1 ppm in N_2	110 L	41981-U

1,2-Dichloroethane
1,3-Butadiene
Acrylonitrile
Benzene
Chloroform
Dichloromethane
Tetrachloroethylene
Trichloroethylene
Vinyl chloride
Balance Gas - Nitrogen

TRADEMARKS: Amberlite, Ambersorb, XAD – **Rohm and Haas Co.;** Carbopack, Carbosieve, Carbotrap, Carboxen, Equity, ORBO, Radiello, Rezorian, SLB, SPB, StableFlex, SUPELCOSIL. SUPELCOWAX, Supelpak, Thermogreen, Visi-1, Visiprep, VOCOL – **Sigma-Aldrich Biotechnology LP;** Chromosorb – **Celite Corp.;** Dynatherm – **CDS Analytical;** Florisil – **US Silica Company;** Freon, Tedlar, VESPEL – **E.I. duPont de Nemours & Co., Inc.;** GERSTEL – **Gerstel GmbH;** Metricel, Zefluor, Zylon – **Pall Corporation;** Mininert – **Valco Instruments;** PerkinElmer, TurboMatrix – **PerkinElmer Corp.;** Porapak – **Waters Associates, Inc.;** Swagelok – **Swagelok Co.;** Tekmar –**Tekmar Co.;** Tenax – **BUCHEM B.V.;** Varian – **Varian Associates Corp.**

Carbosieve – **US Patent No. 3,239,997**



How to Order Custom-Made Sampling Tubes

To order custom-made air sampling tubes, simply complete this form, then fax or mail us a copy, or call us and provide the information. U.S.: Phone 800-247-6628 or 814-359-3441; Fax 800-447-3044 or 814-359-3044. All other countries, contact your local Sigma-Aldrich office.

Name: _____

Address: _____

Phone/Fax: _____ email: _____

May we contact you by email? ❍ Yes ❍ No

❍ Solvent Desorption Tubes or ❍ Thermal Desorption Tubes ❍ Repeat Order? (Previous MR#)

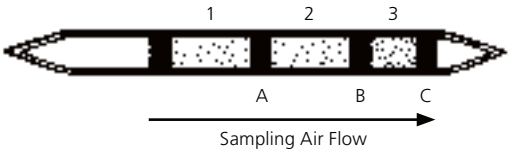
Quote Number: _____

Number of Tubes: _____

Application _____

Tube Specifications

Solvent Desorption Tubes



❍ 6 mm O.D. glass _____

❍ 7 mm O.D. glass _____

❍ 8 mm O.D. glass _____

❍ 10 mm O.D. glass _____

❍ Other O.D.: _____

Length: _____

_____

Retaining Plugs:

Silanized glass wool	❍ A	❍ B	❍ C
Glass wool	❍ A	❍ B	❍ C
Foam	❍ A	❍ B	❍ C

❍ Stainless steel clip

Adsorbent(s) and Bed Weight(s):[1]

1. _____

2. _____

3. _____

Thermal Desorption Tubes



❍ Glass

❍ Stainless steel

Dimensions:

O.D.: _____ I.D.: _____

Length: _____

Length: _____

Length of heated zone of instrument: _____

Retaining Plugs:

❍ Fritted (in glass tubes only)
❍ Glass wool
❍ Screens (in stainless steel tubes only)
❍ Stainless steel clip (in glass tubes only)

TDU Instrument*: Model No.:_____

❍ CDS Analytical	❍ Chrompak	❍ Dynatherm
❍ Entech	❍ Envirochem	❍ GERSTEL
❍ Markes International	❍ OI Analytical	❍ PerkinElmer
❍ Teledyne-Tekmar		

*If your instrument is not listed, please contact Technical Service.

Adsorbent(s) and Bed Weight(s) or Length(s):[1]

1. _____

2. _____

3. _____

Comments/Special Request:

_____

_____

_____

[1] Up to three beds available.

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SUPELCO

Air Methods Guide

2nd edition

T411091D

SUPELCO

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Supelco Air Methods Guide

The Supelco Air Methods Guide is a resource of sampling and analytical methods for more than 1000 compounds in air. Air monitoring of many matrices – workplace, indoor, ambient, and source – are integrated into this one easy-to-read reference.

The guide lists:

- compound (alphabetically)
- method reference
- sample volume and flow rate
- sampling media description and Supelco catalog number
- analytical technique

Note that a compound of interest may be listed by more than one chemical name and/or category classification (e.g., VOCs).

The guide also features:

- NIOSH, OSHA, EPA, and ASTM validated methods
- cross reference to SKC part numbers
- latest updates through May 1999

Please note:
This guide is for general information only. It is not intended to replace careful review of applicable agency methods, equipment operating instructions, or national or regional legal regulations.

Key to Abbreviations

Sampling Devices

Abbrev.	Description
1-2PP	1-(2-pyridyl)piperazine
2-HMP	2-(hydroxymethyl)piperadine
c/w	coated with
DMBA	3,4-dimethoxybenzylamine
DNPH	2,4-dinitrophenylhydrazine
DOP	di-n-octyl phthalate
MCE	mixed cellulose ester
NBDC	7-chloro-4-nitrobenzo-2-oxa-1,3-diazole
NITC	1-naphthylisothiocyanate
NPMPA	N-[(4-nitrophenyl)methyl]propylamine
OVS	OSHA versatile sampler
PVC	polyvinyl chloride
t/w	treated with
TBC	4-tert-butylcatechol
TEA	triethanolamine

Other

Abbrev.	Description
NA	not available

Trademarks

Anasorb – SKC, Inc.
Cellosolve – Union Carbide Corp.
Chromosorb – Celite Corp.
Florisil – U.S. Silica Co.
Freon – E.I. duPont de Nemours & Co., Inc.
Gas Chrom – Applied Science Laboratories, Inc.
Hopcalite – Mine Safety Appliances Company.
Porapak – Waters Associates, Inc.
Tedlar – E.I. du Pont de Nemours & Co., Inc.
Teflon – E.I. du Pont de Nemours & Co., Inc.
Tenax – Enka Research Institute Arnhem
XAD – Rohm and Haas Co.
Carbosieve, Carbotrap, Carboxen, ORBO, Supelpak – Sigma-Aldrich Co.

Analytical Techniques

Abbrev.	Description
AACV	atomic adsorption cold vapor
AAFAG	atomic adsorption flame arsine generation
AAGF	atomic adsorption graphite furnace
AAS	atomic adsorption spectrophotometry
AAS-HGA	flame atomic adsorption spectrophotometry - heated graphite furnace atomizer
ASV	anodic stripping voltametry
DPP	differential pulse polarography
EGA-TOA	evolved gas analysis - thermal optical sensor
ELISA	enzyme linked immunosorbent assay
FAAS	flame atomic adsorption spectrophotometry
GC-AED	gas chromatography - atomic emission detector
GC-ECD	gas chromatography - electron capture detector
GC-ECN	gas chromatography - electrolytic conductivity detector
GC-ELCD	gas chromatography - electrochemical detector
GC-FID	gas chromatography - flame ionization detector
GC-FPD	gas chromatography - flame photometric detector
GC-MS	gas chromatography - mass spectrometry
GC-NPD	gas chromatography - nitrogen/phosphorus detector
GC-PID	gas chromatography - photoionization detector
GC-SCLD	gas chromatography - sulfur chemiluminescence detector
GC-TCD	gas chromatography - thermal conductivity detector
GC-TEA	gas chromatography - thermal energy analyzer
HPLC-AAGF	high performance liquid chromatography - atomic adsorption graphite furnace
HPLC-FL	high performance liquid chromatography - fluorescence
HPLC-TEA/UV	high performance liquid chromatography - thermal energy analyzer/ultraviolet
HPLC-UV	high performance liquid chromatography - ultraviolet
HPLC-UV/ELCD	high performance liquid chromatography - ultraviolet/electrochemical detector
HPLC-UV/FL	high performance liquid chromatography - ultraviolet/fluorescence
HPLC-VIS	high performance liquid chromatography - visible absorption spectrophotometry
IC	ion chromatography
IC-AAS	ion chromatography - atomic absorption spectrophotometry
IC-CD	ion chromatography - conductivity detector
IC-ELCD	ion chromatography - electrochemical detector
IC-PCR	ion chromatography - post-column reactor
IC-PED	ion chromatography - pulsed electrochemical detector
IC-UV	ion chromatography - ultraviolet
ICP-AES	inductively coupled plasma/atomic emission spectroscopy
IR	infrared spectrophotometry
ISE	ion-specific electrode
NDIR	nondispersive infrared spectrophotometry
PCD	post-column derivatization
PCM	phase contrast microscopy
PES	plasma emission spectrometry
PLM	polarized light microscopy
TD-GC/MS	thermal desorption - gas chromatography - mass spectrometry
TD-IR	thermally desorbed infrared spectrophotometry
TEM	transmission electron microscopy
UV	ultraviolet
VIS	visible absorption spectrophotometry
XPD	x-ray powder diffraction
XRD	x-ray diffraction
XRF	x-ray fluorescence
XRF/XRD	x-ray fluorescence/x-ray diffraction

Compound	Method	Volume Liters	Rate Liters/Min	Medium and/or Sample Collection Device	Supelco Model No.	Supelco Cat. No.	SKC Equiv	Analytical Technique
Acenaphthene	NIOSH 5506	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	HPLC-UV/Fl
Acenaphthene	NIOSH 5515	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	GC-FID
Acenaphthylene	NIOSH 5506	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	HPLC-UV/Fl
Acenaphthylene	NIOSH 5515	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	GC-FID
Acetaldehyde	NIOSH 2538	1-12	0.01-0.05	XAD-2 c/w 2-HMP	ORBO-25	20357	226-27	GC-FID
Acetaldehyde	NIOSH 2539	5	0.01-0.05	XAD-2 c/w 2 HMP	ORBO-23	20257-U	226-118	GC-FID
Acetaldehyde	NIOSH 3507	6-60	0.1-0.5	fritted bubbler	-----	64835-U	225-36-2	HPLC-UV
Acetaldehyde	OSHA 68	3	0.05	XAD-2 c/w 2-HMP	ORBO-25	20357	226-27	GC-NPD
Acetic Acid	NIOSH 1603	20-300	0.01-0.1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Acetic Acid	US Army	10-25		Chromosorb P c/w Na2CO3	ORBO-70	20256-U	NA	GC-FID
Acetic Anhydride	NIOSH 3506	25-100	0.2-1	fritted bubbler	-----	64835-U	225-36-2	VIS
Acetic Anhydride	OSHA 102	7.5	0.05-0.5	glass fiber filter c/w DMBA & DOP	894	custom	225-9010	GC-NPD
Acetic Anhydride	OSHA 82	0.75	0.05	glass fiber filter c/w 1-2PP	821	custom	225-9009	GC-NPD
Acetone	NIOSH 1300	0.50-3	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Acetone	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
Acetone	OSHA 69	3	0.05	Carbosieve S-III (Anasorb CMS)	ORBO-91	20360	226-121	GC-FID
Acetone Cyanohydrin	NIOSH 2506	0.30-12	0.2	Porapak QS	ORBO-1101	20061	226-59-09	GC-NPD
Acetonitrile	NIOSH 1606	1-25	0.01-0.2	coconut charcoal	ORBO-32L	20228	226-09	GC-FID
Acetylene Dichloride	NIOSH 1003	0.2-5	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Acetylene Tetrabromide	NIOSH 2003	50-100	0.2-1	silica gel	ORBO-52S	20229	226-10	GC-FID
Acetylene Tetrachloride	NIOSH 1019	3-30	0.01-0.2	petroleum charcoal	ORBO-303	20040-U	226-38	GC-FID
Acid Mist	OSHA ID 165SG	96	0.20	silica gel/glass fiber filter	ORBO-53	20265	226-10-03	IC
Acids, Inorganic	NIOSH 7903	3-100	0.2-0.5	silica gel/glass fiber filter	ORBO-53	20265	226-10-03	IC
Acridine	OSHA 58	960	2	glass fiber filter	-----	23378	225-7	HPLC-UV
Acrolein	NIOSH 2501	1.50-48	0.01-0.1	XAD-2 c/w 2-HMP	ORBO-23	20257-U	226-118	GC-NPD
Acrolein	NIOSH 2539	5	0.01-0.05	XAD-2 c/w 2-HMP	ORBO-23	20257-U	226-118	GC-FID
Acrolein	OSHA 52	48	0.1	XAD-2 c/w 2-HMP	ORBO-24	20231	226-117	GC-NPD
Acrylamide	OSHA 21	120	1	silica gel glass fiber filter	ORBO-52S ----	20229 23376	226-10 225-16	GC-NPD
Acrylic Acid	OSHA 28	24	0.1	XAD-8	ORBO-601	20048	226-30-08	HPLC-UV
Acrylic acid	OSHA 312	24	0.1	(2) XAD-8	ORBO-601	20048	226-30-08	HPLC-UV
Acrylonitrile	NIOSH 1604	3.50-20	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Acrylonitrile	OSHA 37	20	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-NPD
Aerobic Bacteria by GC-FAME	NIOSH 0801	50-300	28.30	Andersen Impactor				GC-FID
Air Exchange Rate	EPA IP-4A			perfluorocarbon tracer				GC-ECD
Air Exchange Rate	EPA IP-4B			tracer gas				GC-ECD
Alachlor	NIOSH 5603	70-1750	1	SPE disk				ELISA
Aldehydes	EPA 0011			DNPH absorbing solution				HPLC-UV
Aldehydes (screening)	NIOSH 2539	5	0.01-0.05	XAD-2 c/w 2-HMP	ORBO-23	20257-U	226-118	GC-FID
Aldehydes/Ketones	EPA 0100		1	silica gel c/w DNPH	LpDNPH S10	21026-U	226-119	HPLC-UV
Aldehydes/Ketones	EPA IP-6A		0.5-1.2	silica gel c/w DNPH	LpDNPH S10	21026-U	226-119	HPLC-UV
Aldehydes/Ketones	EPA IP-6B			continuous colorimetric analyzer				colorimetric
Aldehydes/Ketones	EPA IP-6C			diffusive sampler	-----	NA		HPLC-UV
Aldehydes/Ketones	EPA TO-11A	280	0.1-2	silica gel c/w DNPH ozone scrubber	LpDNPH S10 -----	21026-U 505285	226-119 NA	HPLC-UV
Aldehydes/Ketones	EPA TO-5	<80	0.1-1	DNPH absorbing solution				HPLC-UV
Aldicarb (Temik)	OSHA 74	480	1	XAD-2/glass fiber filter (OVS)	ORBO-49P	20350	226-30-16	GC-NPD
Aldrin	NIOSH 5502	18-240	0.2-1	glass fiber filter fritted bubbler	----- -----	23378 64835-U	225-7 225-36-2	GC-ECD
Alkaline Dusts	NIOSH 7401	70-1000	1-4	PTFE filter	-----	23383	225-1710	titration
Allyl Alcohol	NIOSH 1402	1-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Allyl Chloride	NIOSH 1000	16-100	0.01-1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID

Compound	Method	Volume Liters	Rate Liters/Min	Medium and/or Sample Collection Device	Supelco Model No.	Supelco Cat. No.	SKC Equiv	Analytical Technique
Allyl Chloride	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Allyl Glycidyl Ether	NIOSH 2545	1.5-8	0.01-0.2	Tenax	ORBO-402	20832-U	226-35-03	GC-FID
Allyl Trichloride	NIOSH 1003	2-60	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Alumina	NIOSH 0500	7-133	1-2	PVC filter	-----	23387	225-8-01	gravimetric
Aluminum	NIOSH 7300	5-100	1-4	MCE filter	-----	23381	225-5	ICP-AES
Aluminum, Al compounds (as Al)	NIOSH 7013	10-400	1-3	MCE filter	-----	23381	225-5	FAAS
Amines, Aliphatic	NIOSH 2010	3-30	0.01-1	silica gel	ORBO-52S	20229	226-10	GC-FID
Amines, Aliphatic	Supelco			Carbotrap	ORBO-100	20255-U	NA	GC-NPD
Amines, Aromatic	NIOSH 2002	30-150	0.2-1	silica gel	ORBO-52S	20229	226-10	GC-FID
Aminobenzene	NIOSH 2002	30-150	0.2-1	silica gel	ORBO-52S	20229	226-10	GC-FID
4-Aminodiphenyl (4-Aminobiphenyl)	NIOSH 4/269	0.2		silica gel glass fiber filter	ORBO-502 -----	20030-U 23376	226-51 225-16	GC-FID
4-Aminodiphenyl (4-Aminobiphenyl)	OSHA 93	100	1.0	glass fiber filter c/w H2SO4	822	20065	225-9004	GC-ECD
Aminoethanol Compounds II	NIOSH 3509	5-300	0.5-1	impinger	-----	20270-U	225-36-1	IC
2-Aminoethanol (Ethanolamine)	NIOSH 2007	4-24	0.01-0.2	silica gel	ORBO-506	20032	226-10-04	GC-FID
2-Aminoethanol (Ethanolamine)	NIOSH 3509	5-300	0.5-1	impinger	-----	20270-U	225-36-1	IC
p-Aminophenylarsonic Acid	NIOSH 5022	50-1000	1-3	PTFE filter	-----	23383	225-1710	IC-AAS
2-Aminopyridine	NIOSH 4/S158	12	0.01-0.2	Tenax	ORBO-405	custom	226-35	GC-FID
2-Aminotoluene	NIOSH 2002	10-150	0.02-1	silica gel	ORBO-52S	20229	226-10	GC-FID
Ammonia	NIOSH 6015	0.1-96	0.1-0.2	silica gel c/w H2SO4	ORBO-555	custom	226-10-06	VIS
Ammonia	NIOSH 6016	0.1-96	0.1-0.5	silica gel c/w H2SO4	ORBO-555	custom	226-10-06	IC-CD
Ammonia	OSHA ID 188	7.50-24	0.1-0.5	Purosieve c/w H2SO4	ORBO-77	20036	226-29	IC
Ammonium Sulfamate	NIOSH 5/S348	90	1.5-2	MCE filter	-----	23381	225-5	IC-CD
Amyl Acetate	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
n-Amyl Acetate	NIOSH 1450	1-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
n-Amyl Acetate	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
sec-Amyl Acetate	NIOSH 1450	1-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
sec-Amyl Acetate	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Aniline	NIOSH 2002	5-30	0.02-0.2	silica gel	ORBO-52S	20229	226-10	GC-FID
Aniline	NIOSH 2017	5-50	0.2	silica gel + glass fiber filter c/w H2SO4	ORBO-507 822	20870-U 20065	226-15 225-9004	GC-FID
Anisidine	NIOSH 2514	24-320	0.5-1	XAD-2	ORBO-608	20050-U	226-30-05	HPLC-UV
Anthracene	NIOSH 5506	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	HPLC-UV/Fl
Anthracene	NIOSH 5515	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	GC-FID
Anthracene	OSHA 58	960	2	glass fiber filter	-----	23378	225-7	HPLC-UV
Antimony	NIOSH 1/173	180	1.5	MCE filter	-----	23381	225-5	AAS
Antimony	NIOSH 1/189		1.5-2	MCE filter	-----	23381	225-5	ASV
Antimony	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Antimony, Sb Compounds (as Sb)	NIOSH 2/S2		1.5	MCE filter	-----	23381	225-5	AAS
Antimony, Sb Compounds (as Sb)	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Antimony, Sb Compounds (as Sb)	OSHA ID 125G	480	2	MCE filter	-----	23381	225-5	ICP-AES
Antimony Particulates	NIOSH 4/261	45	1.5	MCE filter	-----	23381	225-5	AAGF
ANTU (Alphanaphthyl thiourea)	NIOSH 5/S276	480	1.5-2	PTFE filter	-----	23383	225-1710	HPLC-UV
Aqua Fortis	NIOSH 7903	3-100	0.2-0.5	silica gel/glass fiber filter	ORBO-53	20265	226-10-03	IC
p-Arsanilic acid	NIOSH 5022	50-1000	1-3	PTFE filter	-----	23383	225-1710	IC-AAS
Arsenic	NIOSH 7300	5-2000	1-4	MCE filter	-----	23381	225-5	ICP-AES
Arsenic, As Compounds (as As)	NIOSH 7900	30-1000	1-3	MCE filter	-----	23381	225-5	AAFAG
Arsenic, Organo	NIOSH 5022	50-1000	1-3	PTFE filter	-----	23383	225-1710	IC-AAS

Compound	Method	Volume Liters	Rate Liters/Min	Medium and/or Sample Collection Device	Supelco Model No.	Supelco Cat. No.	SKC Equiv	Analytical Technique
Arsenic, Particulate & Volatiles	OSHA ID 105	480-960	2	MCE filter + support pad c/w Na2CO3	845	custom	225-9005 225-9001	AAGF
Arsenic Trioxide (as As)	NIOSH 7901	30-1000	1-3	MCE filter w/ support pad c/w Na2CO3	824	20067	NA	AAGF
Arsine	NIOSH 6001	0.1-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	AAGF
Arsine	OSHA ID 105	120-240	0.5	MCE filter + support pad c/w Na2CO3	845	custom	225-9005 225-9001	AAGF
Asbestos	NIOSH 9000			bulk		-----		XRD
Asbestos	NIOSH 9002			bulk		-----		PLM
Asbestos	OSHA ID 191			bulk		-----		PLM
Asbestos Fibers	NIOSH 7400	400-	0.5-16	MCE filter	-----	23380-U	225-19	PCM
Asbestos Fibers	NIOSH 7402	400-	0.5-16	MCE filter	-----	23380-U	225-19	TEM
Asbestos in Air	OSHA ID 160	25-1200	0.5-2.5	MCE filter	-----	23380-U	225-19	PCM
Aspartame	NIOSH 5031	70-1200	1-3	PTFE filter	-----	23383	225-1710	HPLC-UV
Asphalt Fumes (Petroleum)	OSHA 58	960	2	glass fiber filter	-----	23378	225-7	HPLC-UV
Azelaic Acid	NIOSH 5019	200-1000	1-3	PVC filter	-----	23387	225-8-01	GC-FID
Azinphos, Methyl	NIOSH 5600	12-240	0.2-1	XAD-2/quartz filter (OVS)	ORBO-49Q	custom	226-58	GC-FPD
Barium	NIOSH 1/173	180	1.5	MCE filter	-----	23381	225-5	AAS
Barium (soluble compounds)	NIOSH 7056	50-2000	1-4	MCE filter	-----	23381	225-5	AAS
Barium (soluble compounds)	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Benz(a)anthracene	NIOSH 5506	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	HPLC-UV/Fl
Benz(a)anthracene	NIOSH 5515	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	GC-FID
Benzaldehyde	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
Benzene	NIOSH 1500	2-30	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Benzene	NIOSH 1501	5-30	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Benzene	NIOSH 2549	1-6	0.01-0.5	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
Benzene	NIOSH 3700	<80% vol	0.02-5	5L sampling bag	-----	24655	232-05	GC-PID
Benzene	OSHA 12	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Benzene-Soluble Fraction & Total Particulate (Asphalt Fume)	NIOSH 5042	28-400	1-4	PTFE filter	-----	23390-U	225-17-07	gravimetric
Benzene-Soluble Particulate Matter	ASTM D4600	960	2	glass fiber filter	-----	23378	225-7	gravimetric
Benzidine	NIOSH 5509	20-100	0.2	glass fiber filter	-----	23376	225-16	HPLC-UV
Benzidine	OSHA 65	100	1	glass fiber filter c/w H2SO4	822	20065	225-9004	GC-ECD
Benzidine Dyes	NIOSH 5013	150-500	1-3	PTFE filter	-----	23389	225-17	HPLC-UV
Benzin (petroleum ether)	NIOSH 1550	1.3-20	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Benzo(a)pyrene (BAP)	NIOSH 5506	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	HPLC-UV/Fl
Benzo(a)pyrene (BAP)	NIOSH 5515	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	GC-FID
Benzo(a)pyrene (BAP)	OSHA 58	960	2	glass fiber filter	-----	23378	225-7	HPLC-UV
Benzo(b)fluoranthene	NIOSH 5506	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	HPLC-UV/Fl
Benzo(b)fluoranthene	NIOSH 5515	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	GC-FID
Benzo(e)pyrene	NIOSH 5506	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	HPLC-UV/Fl
Benzo(e)pyrene	NIOSH 5515	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	GC-FID
Benzo(ghi)perylene	NIOSH 5506	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	HPLC-UV/Fl
Benzo(ghi)perylene	NIOSH 5515	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	GC-FID
Benzo(k)fluoranthene	NIOSH 5506	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	HPLC-UV/Fl
Benzo(k)fluoranthene	NIOSH 5515	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	GC-FID

Compound	Method	Volume Liters	Rate Liters/Min	Medium and/or Sample Collection Device	Supelco Model No.	Supelco Cat. No.	SKC Equiv	Analytical Technique
Benzothiazole in Asphalt Fume	NIOSH 2550	480-960	1-2	XAD-2 PTFE filter	ORBO-42L -----	20264-U 23390-U	NA 225-17-07	GC-SCLD
Benzoyl Peroxide	NIOSH 5009	40-400	1-3	MCE filter	-----	23381	225-5	HPLC-UV
Benzyl Chloride	NIOSH 1003	6-50	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Benzyl Chloride	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Beryllium	NIOSH 7300	1250-2000	1-4	MCE filter	-----	23381	225-5	ICP-AES
Beryllium	OSHA ID 125G	480	2	MCE filter	-----	23381	225-5	ICP-AES
Beryllium, Be Compounds (as Be)	NIOSH 7102	25-1000	1-4	MCE filter	-----	23381	225-5	AAGF
BHT (Butylated Hydroxytoluene)	NIOSH 1/226	10	0.2	silica gel	ORBO-504	20031	NA	GC-FID
Bioaerosol Sampling	NIOSH 0800			Andersen cascade impactor Andersen N-6 sampler				
Biphenyl (Diphenyl)	NIOSH 2530	15-30	0.01-0.5	Tenax	ORBO-404	custom	226-35-01	GC-FID
bis-Chloromethyl Ether	NIOSH 1/213	5	0.08	Chromosorb 101	ORBO-703	custom	226-102	GC-MS
bis-Chloromethyl Ether	OSHA 10	50	0.5	fritted bubbler	-----	64835-U	225-36-2	GC-ECD
Bismuth	NIOSH 1/173	180	1.5	MCE filter	-----	23381	225-5	AAS
Bisphenol A (BPA)	NIOSH 6/333	288	1.6	glass fiber filter	-----	23378	225-7	HPLC-UV
Boroethane (Diborane)	NIOSH 6006	60-260	0.5-1	charcoal c/w oxidizer PTFE filter	ORBO-352 -----	20043 special order	226-151	PES
Boron Carbide	NIOSH 7506	100-1000	1.7 or 2.2	PVC filter	-----	23387	225-8-01	XPD
Boron Oxide	NIOSH 0500	25-133	1.5-2	PVC filter	-----	23387	225-8-01	gravimetric
BPA (Bisphenol A)	NIOSH 6/333	288	1.6	glass fiber filter	-----	23378	225-7	HPLC-UV
Bromine	NIOSH 6011	8-360	0.3-1	PTFE filter + silver membrane	885	custom	225-9006	IC-CD
Bromine	OSHA ID 108	7.5-30	0.5	fritted bubbler	-----	64835-U	225-36-2	IC
Bromoethane (Ethyl Bromide)	NIOSH 1011	0.5-4	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Bromoform	NIOSH 1003	4-70	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Bromoform	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Bromotrifluoromethane	NIOSH 1017	0.1-1	0.01-0.05	(2) coconut charcoal	ORBO-32S + ORBO-32L	20267-U 20228	226-01 226-09	GC-FID
Bromoxynil	NIOSH 5010	2-400	1-3	PTFE filter	-----	23390-U	225-17-07	HPLC-UV
Bromoxynil Octanoate	NIOSH 5010	90-400	1-3	PTFE filter	-----	23390-U	225-17-07	HPLC-UV
1,3-Butadiene	NIOSH 1024	5-25	0.01-0.5	coconut charcoal	ORBO-32L	20228	226-09	GC-FID
1,3-Butadiene	OSHA 56	3	0.05	charcoal c/w TBC	ORBO-351	20042	226-73	GC-FID
1-Butanethiol (n-Butyl Mercaptan)	NIOSH 2525	1-4	0.01-0.05	Chromosorb 104	-----	NA	226-109	GC-FPD
2-Butanone (MEK)	NIOSH 2500	.25-12	0.01-0.2	Carboxen 564	ORBO-90	20358	226-81 226-121	GC-FID
2-Butanone (MEK)	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
2-Butanone (MEK)	OSHA 84	3	0.05	Carbosieve S-III	ORBO-91	20360	226-121	GC-FID
2-Butoxyethanol (Butyl Cellosolve)	NIOSH 1403	2-10	0.01-0.05	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
2-Butoxyethanol	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
2-Butoxyethanol	OSHA 83	48	0.1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
2-Butoxyethyl Acetate (Butyl Cellosolve Acetate)	OSHA 83	48	0.1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Butyl Acetate	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
Butyl Acetate	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Butyl Acetate, sec- & tert-	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
n-Butyl Acetate	NIOSH 1450	1-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
sec-Butyl Acetate	NIOSH 1450	1-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
tert-Butyl Acetate	NIOSH 1450	1-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Butyl Alcohol	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
Butyl Alcohol	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Butyl Alcohol, n- & sec-	NIOSH 1401	2-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
sec-Butyl Alcohol	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID

Compound	Method	Volume Liters	Rate Liters/Min	Medium and/or Sample Collection Device	Supelco Model No.	Supelco Cat. No.	SKC Equiv	Analytical Technique
tert-Butyl Alcohol	NIOSH 1400	1-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
tert-Butyl Alcohol	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
n-Butylamine	NIOSH 2012	2-100	0.01-1	silica gel c/w H2SO4	ORBO-554	20033	226-53	GC-FID
Butyl Cellosolve - see 2-Butoxyethanol								
Butyl Cellosolve Acetate - see 2-Butoxyethyl Acetate								
n-Butyl Glycidyl Ether	NIOSH 1616	15-30	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
n-Butyl Glycidyl Ether	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
n-Butyl Mercaptan	NIOSH 2525	1-4	0.01-0.05	Chromosorb 104	-----	NA	226-109	GC-FPD
n-Butyl Mercaptan	NIOSH 2542	10-150	0.01-0.2	glass fiber filter c/w mercuric acetate	826	20068	225-9007	GC-FPD
p-tert-Butyltoluene	NIOSH 1501	1-29	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
p-tert-Butyltoluene	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Butylated Hydroxytoluene (BHT)	NIOSH 1/226	10	0.2	silica gel	ORBO-504	20031	NA	GC-FID
1,3-Butylene Glycol	NIOSH 5523	5-60	0.5-2	XAD-7/glass fiber filter (OVS)	ORBO-47P	custom	226-57	GC-FID
Butyraldehyde	NIOSH 2539	5	0.01-0.05	XAD-2 c/w 2 HMP	ORBO-23	20257-U	226-118	GC-FID
Cadmium	NIOSH 7300	13-2000	1-4	MCE filter	-----	23381	225-5	ICP-AES
Cadmium	OSHA ID 189	960	2.0	MCE filter	-----	23381	225-5	AAS or AAS-HGA
Cadmium, Cd Compounds (as Cd)	NIOSH 7048	25-1500	1-3	MCE filter	-----	23381	225-5	AAS
Cadmium Dust (as Cd)	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Cadmium Dust (as Cd)	OSHA ID 125G	480	2	MCE filter	-----	23381	225-5	ICP-AES
Cadmium Fume (as Cd)	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Cadmium Fume (as Cd)	OSHA ID 125G	480	2	MCE filter	-----	23381	225-5	ICP-AES
Calcium	NIOSH 7300	5-200	1-4	MCE filter	-----	23381	225-5	ICP-AES
Calcium & compounds	NIOSH 7020	20-400	1-3	MCE filter	-----	23381	225-5	AAS
Camphor	NIOSH 1301	1-25	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Camphor	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Capsaicin	NIOSH 5041	5-1000	1-3	glass fiber filter	-----	23376	225-16	HPLC-FL
Carbaryl (Sevin)	NIOSH 5006	20-400	1-3	glass fiber filter	-----	23378	225-7	VIS
Carbaryl (Sevin)	OSHA 63	60	1	XAD-2/glass fiber filter (OVS)	ORBO-49P	20350	226-30-16	HPLC-UV
Carbitol	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
Carbon, Elemental (Diesel Particulate)	NIOSH 5040	142-19,000	2-4	quartz fiber filter (37mm)	-----	special order	225-1809	EGA-TOA
Carbon Black	NIOSH 5000	30-570	1-2	PVC filter	-----	23387	225-8-01	gravimetric
Carbon Black	OSHA ID 196	480-960	2	PVC filter	-----	23387	225-8-01	gravimetric
Carbon Dioxide	EPA IP-3A			nondispersive infrared				NDIR
Carbon Dioxide	EPA IP-3B			continuous gas filter correlation				CFC Spectometry
Carbon Dioxide	EPA IP-3C			electrochemical CO monitor				Electrochemical Oxidation
Carbon Dioxide	NIOSH 6603	80% vol	0.02-1	5L sampling bag	-----	24655	232-05	GC-TCD
Carbon Dioxide	OSHA ID 172	2-5	0.01-0.05	5L sampling bag	-----	24655	232-05	GC-TCD
Carbon Disulfide	NIOSH 1600	2-25	0.01-0.2	coconut charcoal in-line trap	ORBO-32S -----	20267-U custom	226-01 -----	GC-FPD
Carbon Monoxide	EPA IP-3A			nondispersive infrared				NDIR
Carbon Monoxide	EPA IP-3B			continuous gas filter correlation				CFC Spectometry
Carbon Monoxide	EPA IP-3C			electrochemical CO monitor				Electrochemical Oxidation
Carbon Monoxide	NIOSH 6604			portable instrument				sensor
Carbon Monoxide	OSHA ID 209			direct reading instrument				
Carbon Monoxide	OSHA ID 210	2-5	0.01-0.05	5L sampling bag	-----	24655	232-05	GC-TCD
Carbon Tetrachloride	NIOSH 1003	3-150	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Carbon Tetrachloride	OSHA 7	15	0.1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID

Compound	Method	Volume Liters	Rate Liters/Min	Medium and/or Sample Collection Device	Supelco Model No.	Supelco Cat. No.	SKC Equiv	Analytical Technique
Carbonyls - see Aldehydes/Ketones								
delta-3-Carene	NIOSH 1552	2-30	0.01-0.02	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Chlordane	ASTM D4947	250	1-5	polyurethane foam (PUF)	ORBO-1000	20557	226-92	GC-ECD
Chlordane	NIOSH 5510	10-200	0.5-1	XAD-2 MCE filter stainless steel screen	ORBO-44 ----- -----	20260-U 23381 custom	226-30-04 225-5	GC-ECD
Chlordane	OSHA 67	480	1	XAD-2/glass fiber filter (OVS)	ORBO-49P	20350	226-30-16	GC-ECD
Chlorides	EPA 0050			filter + absorbing solutions				IC
Chlorides	EPA 0051	120	2	filter + absorbing solutions				IC
Chlorinated Camphene (Toxaphene)	NIOSH 5039	2-30	0.2-1	MCE filter	-----	23381	225-5	GC-ECD
Chlorinated Diphenyl Ether	NIOSH 5025	8-200	0.5-1.5	MCE filter	-----	23381	225-5	GC-ECD
Chlorinated Terphenyl (60% chlorine)	NIOSH 5014	100-1500	1-3	glass fiber filter	-----	23378	225-7	GC-ECD
Chlorine	NIOSH 6011	2-90	0.3-1	PTFE filter + silver membrane	885	custom	225-9006	IC-CD
Chlorine	OSHA ID 101	15-240	1	fritted bubbler	-----	64835-U	225-36-2	ISE
Chlorine Dioxide	OSHA ID 202	7.50-120	0.5	fritted bubbler	-----	64835-U	225-36-2	IC
Chloroacetaldehyde	NIOSH 2015	3-16	0.05-0.2	silica gel	ORBO-507	20870-U	226-15	GC-ECD
Chloroacetaldehyde	OSHA 76	7.5	0.5	silica gel	ORBO-507	20870-U	226-15	GC-ECD
Chloroacetic Acid	NIOSH 2008	1-100	0.05-0.2	silica gel	ORBO-505	custom	226-47-01	IC
α-Chloroacetophenone	NIOSH 5/291	12	0.01-0.2	Tenax	ORBO-405	custom	226-35	GC-FID
Chlorobenzene	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Chlorobenzene (Monochlorobenzene)	NIOSH 1003	1.50-40	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
o-Chlorobenzylidene Malonitrile	NIOSH 5/304	90	1.5	Tenax PTFE stainless steel screen	ORBO-408 ----- -----	custom 23383 custom	226-35-07 225-1710	HPLC-UV
Chlorobromomethane	NIOSH 1003	0.5-8	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Chlorodifluoromethane	NIOSH 1018	1-4	0.01-0.05	(2) coconut charcoal	ORBO-32S + ORBO-32L	20267-U 20228	226-01 226-09	GC-FID
Chlorodiphenyl (42% & 54% Cl)	NIOSH 5503	1-50	0.05-0.2	glass fiber filter florisil	----- ORBO-60	23376 20351	225-16 226-39	GC-ECD
Chloroethane (Ethyl Chloride)	NIOSH 2519	0.3-3	0.02-0.05	(2) coconut charcoal	ORBO-32L	20228	226-09	GC-FID
2-Chloroethanol	NIOSH 2513	2-35	0.01-0.2	petroleum charcoal	ORBO-303	20040-U	226-38	GC-FID
Chloroform (Trichloromethane)	NIOSH 1003	1-50	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Chloroform (Trichloromethane)	OSHA 5	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Chloromethyl Methyl Ether	NIOSH 1/220		1.5	fritted bubbler	-----	64835-U	225-36-2	GC-ECD
Chloromethyl Methyl Ether	OSHA 10	50	0.5	fritted bubbler	-----	64835-U	225-36-2	GC-ECD
4-Chloronitrobenzene	NIOSH 2005	1-150	0.01-1	silica gel	ORBO-52S	20229	226-10	GC-FID
1-Chloro-1-nitropropane	NIOSH 5/S211	12	0.04-0.2	Chromosorb 108	ORBO-710	20058	226-113	GC-FID
p-Chlorophenol	NIOSH 2014	1.5-40	0.05-0.2	silica gel	ORBO-52S	20229	226-10	HPLC-UV
Chloroprene	NIOSH 1002	1.5-8	0.01-0.1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Chloroprene	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
beta-Chloroprene	OSHA 112	6	0.05	Chromosorb 106	ORBO-711	20059	226-111	GC-ECD
Chlorpyrifos (Dursban)	NIOSH 5600	12-240	0.2-1	XAD-2/quartz filter (OVS)	ORBO-49Q	custom	226-58	GC-FPD
Chlorpyrifos (Dursban)	OSHA 62	480	1	XAD-2/glass fiber filter (OVS)	ORBO-49P	20350	226-30-16	GC-FPD
Chromic Acid	NIOSH 7600	8-400	1-4	PVC filter	-----	23387	225-8-01	VIS
Chromic Acid	NIOSH 7604	100-1000	1-4	PVC filter	-----	23387	225-8-01	IC-CD
Chromic Acid, Chromates (as CrO3)	OSHA ID 103	30-960	2	PVC filter	-----	23387	225-8-01	DPP

Compound	Method	Volume Liters	Rate Liters/Min	Medium and/or Sample Collection Device	Supelco Model No.	Supelco Cat. No.	SKC Equiv	Analytical Technique
Chromium	NIOSH 7300	5-1000	1-4	MCE filter	-----	23381	225-5	ICP-AES
Chromium, Cr Compounds (as Cr)	NIOSH 7024	10-1000	1-3	MCE filter	-----	23381	225-5	AAS
Chromium (metal & insoluble compounds)	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Chromium (metal & insoluble compounds)	OSHA ID 125G	480	2	MCE filter	-----	23381	225-5	ICP-AES
Chromium Acetate (listed as II & III compounds)	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Chromium Carbonate (listed as II & III compounds)	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Chromium, Hexavalent	EPA 0061			KOH absorbing solution				IC/PCR
Chromium, Hexavalent	NIOSH 7600	8-400	1-4	PVC filter	-----	23387	225-8-01	VIS
Chromium, Hexavalent	NIOSH 7604	100-1000	1-4	PVC filter	-----	23387	225-8-01	IC-CD
Chromium, Hexavalent	NIOSH 9101			chromate test kit				
Chromium, Hexavalent	OSHA ID 215	960	2	PVC filter	-----	23387	225-8-01	IC-UV, PCD
Chromium Phosphate (listed as II & III compounds)	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Chromium, Soluble Salts (IC/OUS) (listed as II & III compounds)	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Chrysene	NIOSH 5506	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	HPLC-UV/FI
Chrysene	NIOSH 5515	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	GC-FID
Chrysene	OSHA 58	960	2	glass fiber filter	-----	23378	225-7	HPLC-UV
Chrysotile Fibers	NIOSH 7400	400-varies	0.5-16	MCE filter	-----	23380-U	225-19	PCM
Coal Tar Naphtha	NIOSH 1550	1.3-20	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Coal Tar Pitch Volatiles	OSHA 58	960	2	glass fiber filter	-----	23378	225-7	HPLC-UV
Cobalt	NIOSH 7300	25-2000	1-4	MCE filter	-----	23381	225-5	ICP-AES
Cobalt	OSHA ID 213	30-480	2	MCE filter	-----	23381	225-5	ICP-AES
Cobalt, Co Compounds (as Co)	NIOSH 7027	30-1500	1-3	MCE filter	-----	23381	225-5	AAS
Cobalt, Metal, Dust & Fume	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Cobalt, Metal, Dust & Fume	OSHA ID 125G	480	2	MCE filter	-----	23381	225-5	ICP-AES
Coke Oven Emissions	OSHA 58	960	2	glass fiber filter	-----	23378	225-7	HPLC-UV
Copper	NIOSH 7300	5-1000	1-4	MCE filter	-----	23381	225-5	ICP-AES
Copper, Dust & Fume	NIOSH 7029	50-1500	1-3	MCE filter	-----	23381	225-5	AAS
Copper, Dusts & Mists	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Copper, Dusts & Mists	OSHA ID 125G	480	2	MCE filter	-----	23381	225-5	ICP-AES
Copper Fume	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Copper Fume	OSHA ID 125G	480	2	MCE filter	-----	23381	225-5	ICP-AES
Crag Herbicide (total dust)	NIOSH 5/S356	90	1-1.5	MCE filter	-----	23381	225-5	VIS
Cresol	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
Cresol	OSHA 32	24	0.1	XAD-7 (Supelpak 70)	ORBO-47	20349	226-95	HPLC-UV
Cresol, all isomers	NIOSH 2546	1-24	0.01-0.1	XAD-7 (Supelpak 70)	ORBO-47	20349	226-95	GC-FID
Cresols (Methylphenols)	EPA TO-8	<80	0.1-1	NaOH absorbing solution				HPLC UV/ELCD/FI
Cristobalite	OSHA ID 142	816	1.7	PVC filter 10mm nylon cyclone	----- -----	23387 NA	225-8-01	XRD
Crocidolite Fibers	NIOSH 7400	400-	0.5-16	MCE filter	-----	23380-U	225-19	PCM
Crotonaldehyde	NIOSH 2539	5	0.01-0.05	XAD-2 c/w 2-HMP	ORBO-23	20257-U	226-118	GC-FID
Crotonaldehyde	NIOSH 3516	1-49	0.1-0.2	fritted bubbler	-----	64835-U	225-36-2	DPP
Crotonaldehyde	OSHA 81	6	0.1	glass fiber filter c/w DNPH	827	20069	225-9003	HPLC-UV

Compound	Method	Volume Liters	Rate Liters/Min	Medium and/or Sample Collection Device	Supelco Model No.	Supelco Cat. No.	SKC Equiv	Analytical Technique
Cryofluorane	NIOSH 1018	1-4	0.01-0.05	(2) coconut charcoal	ORBO-32S + ORBO-32L	20267-U 20228	226-01 226-09	GC-FID
Cryolite	NIOSH 7902	12-800	1-2	MCE filter + support pad c/w Na2CO3	845	custom	225-9005 225-9001	ISE
Cumene	NIOSH 1501	1-30	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Cumene	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Cyanide (as CN)	OSHA ID 120	90-120	1	MCE filter impinger	----- -----	23381 20270-U	225-5 225-36-1	ISE
Cyanides	NIOSH 6010	2-90	0.05-0.2	soda lime	ORBO-1006	custom	226-28	VIS
Cyanides, Aerosol & Gas	NIOSH 7904	10-180	0.5-1	MCE filter fritted bubbler	----- -----	23381 64835-U	225-5 225-36-2	ISE
Cyanuric Acid	NIOSH 5030	10-1000	1-3	PVC filter	-----	23387	225-8-01	HPLC-UV
Cyclohexane	NIOSH 1500	2.50-5	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Cyclohexane	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Cyclohexanol	NIOSH 1402	1-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Cyclohexanol	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Cyclohexanone	NIOSH 1300	1-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Cyclohexanone	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
Cyclohexanone	OSHA 1	10	0.05-0.2	Chromosorb 106	ORBO-704	custom	226-110	GC-FID
Cyclohexene	NIOSH 1500	5-7	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Cyclohexene	OSHA 7	5	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
1,3-Cyclopentadiene	NIOSH 2523	1-5	0.01-0.05	Chromosorb 104 c/w maleic anhydride	-----	NA	NA	GC-FID
2,4-D	NIOSH 5001	15-200	1-3	glass fiber filter	-----	23378	225-7	HPLC-UV
DDT	NIOSH 3/S274	90	1.5	glass fiber filter	-----	23378	225-7	GC-ELCD
n-Decane	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
Demeton	NIOSH 5514	30-500	0.2-1	XAD-2 MCE filter stainless steel screen	ORBO-608 ----- -----	20050-U 23381 custom	226-30-05 225-5	GC-FPD
Desflurane	OSHA 106	3	0.05	Carbosieve S-III (Anasorb 747)	ORBO-91	20360	226-81A	GC-FID
Di-(2-ethylhexyl) phthalate	NIOSH 5020	10-200	1-3	MCE filter	-----	23381	225-5	GC-FID
Di-(2-ethylhexyl) phthalate	OSHA 104	240	1	Tenax/glass fiber filter (OVS)	ORBO-410P	custom	226-56	GC-FID
Diacetone Alcohol	NIOSH 1402	1-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Diacetone Alcohol	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
o-Dianisidine	NIOSH 5013	150-500	1-3	PTFE filter	-----	23389	225-17	HPLC-UV
o-Dianisidine	OSHA 71	100	1	glass fiber filter c/w H2SO4	822	20065	225-9004	GC-ECD
Diatomaceous Earth	NIOSH 7501	50-400	1-3	PVC filter	-----	23387	225-8-01	XRD
Diazinon	NIOSH 5600	12-240	0.2-1.0	XAD-2/quartz filter (OVS)	ORBO-49Q	custom	226-58	GC-FPD
Diazinon	OSHA 62	480	1	XAD-2/glass fiber filter (OVS)	ORBO-49P	20350	226-30-16	GC-FPD
Diazomethane	NIOSH 2515	6-30	0.2	XAD-2 c/w octanoic acid	ORBO-651	custom	226-23	GC-FID
Dibenz(a,h)anthracene	NIOSH 5506	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	HPLC-UV/Fl
Dibenz(a,h)anthracene	NIOSH 5515	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	GC-FID
Diborane	NIOSH 6006	60-260	0.5-1	charcoal c/w oxidizer PTFE filter	ORBO-352 -----	20043 special order	226-151	PES
Dibromodifluoromethane	NIOSH 1012	2.5-10	0.01-0.2	(2) coconut charcoal	ORBO-32S or ORBO-301	20267-U or 20039	226-01 NA	GC-FID
1,2-Dibromoethane (Ethylene Dibromide)	NIOSH 1008	0.1-25	0.02-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-ECD
1,2-Dibromoethane	OSHA 2	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-ECD
2-Dibutylaminoethanol	NIOSH 2007	4-24	0.01-0.2	silica gel	ORBO-506	20032	226-10-04	GC-FID
Dibutyl Phosphate	NIOSH 5017	50-250	1-3	PTFE filter	-----	23383	225-1710	GC-FPD
Dibutyl Phthalate	NIOSH 5020	6-200	1-3	MCE filter	-----	23381	225-5	GC-FID
Dibutyl Phthalate	OSHA 104	240	1	Tenax/glass fiber filter (OVS)	ORBO-410P	custom	226-56	GC-FID
Dibutyltin bis (Isooctyl Mercaptoacetate)	NIOSH 5504	50-500	1-1.5	XAD-2 glass fiber filter	ORBO-614 -----	custom 23378	226-30 225-7	HPLC-AAGF

Compound	Method	Volume Liters	Rate Liters/Min	Medium and/or Sample Collection Device	Supelco Model No.	Supelco Cat. No.	SKC Equiv	Analytical Technique
o-Dichlorobenzene	NIOSH 1003	1-60	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
o-Dichlorobenzene	OSHA 7	3	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
o,p-Dichlorobenzene	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
p-Dichlorobenzene	NIOSH 1003	1-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
p-Dichlorobenzene	OSHA 7	3	0.05	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
3,3'-Dichlorobenzidine	NIOSH 5509	20-100	0.2	glass fiber filter	-----	23376	225-16	HPLC-UV
3,3'-Dichlorobenzidine	OSHA 65	100	1	glass fiber filter c/w H2SO4	822	20065	225-9004	GC-ECD
Dichlorodifluoromethane (F-12)	NIOSH 1018	1-4	0.01-0.05	(2) coconut charcoal	ORBO-32S + ORBO-32L	20267-U 20228	226-01 226-09	GC-FID
1,1-Dichloroethane	NIOSH 1003	0.5-15	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
1,1-Dichloroethane	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
1,2-Dichloroethane – see Ethylene dichloride								
1,1-Dichloroethene – see Vinylidene Chloride								
1,2-Dichloroethylene	NIOSH 1003	0.2-5	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
1,2-Dichloroethylene	OSHA 7	3	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Dichloroethyl Ether	NIOSH 1004	2-15	0.01-1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Dichloroethyl Ether	OSHA 7	15	1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
1,1-Dichloro-1-fluoroethane (Freon 141b)	OSHA 113	1	0.05	(2) Carbosieve S-III (Anasorb CMS)	ORBO-91	20360	226-121	GC-FID
Dichlorofluoromethane	NIOSH 2516	0.25-3	0.01-0.05	(2) coconut charcoal	ORBO-32L	20228	226-09	GC-FID
Dichloromethane (Methylene Chloride)	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
Dichloromethane	OSHA 80	3	0.05	Carbosieve S-III	ORBO-91	20360	226-121	GC-FID
Dichloromethane	NIOSH 1005	0.5-2.5	0.01-0.2	(2) coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
1,1-Dichloro-1-nitroethane	NIOSH 1601	1.5-15	0.01-1	petroleum charcoal	ORBO-303	20040-U	226-38	GC-FID
1,1-Dichloro-1-nitroethane	OSHA 7	15	1	petroleum charcoal	ORBO-303	20040-U	226-38	GC-FID
1,2-Dichloropropane	NIOSH 1013	0.10-3.50	0.01-0.2	petroleum charcoal	ORBO-303	20040-U	226-38	GC-ECN
1,2-Dichlorotetra-fluoroethane	NIOSH 1018	1-4	0.01-0.05	(2) coconut charcoal	ORBO-32S + ORBO-32L	20267-U 20228	226-01 226-09	GC-FID
Dichlorvos	NIOSH 5/295	120	0.5-1	XAD-2	ORBO-603	custom	226-30-03	GC-FPD
Dichlorvos	OSHA 62	480	1	XAD-2/glass fiber filter (OVS)	ORBO-49P	20350	226-30-16	GC-FPD
Dicrotophos	NIOSH 5600	12-240	0.2-1	XAD-2/quartz filter (OVS)	ORBO-49Q	custom	226-58	GC-FPD
Dieldrin	NIOSH 3/S283	180	1.5	glass fiber filter	-----	23378	225-7	GC-ELCD
Diesel Exhaust	NIOSH 5040	106-4300	1-4	quartz fiber filter (37mm)	-----	special order	225-1809	EGA-TOA
Diethanolamine	NIOSH 3509	5-300	0.5-1	impinger	-----	20270-U	225-36-1	IC
Diethylamine	NIOSH 2010	3-30	0.01-1	silica gel	ORBO-52S	20229	226-10	GC-FID
Diethylamine	OSHA 41	10	0.2	XAD-7 c/w 10% NBDC	ORBO-653	custom	226-96	HPLC-VIS
2-Diethylaminoethanol	NIOSH 2007	4-24	0.01-0.2	silica gel	ORBO-506	20032	226-10-04	GC-FID
Diethyl Carbamoyl Chloride	NIOSH 6/317	12	0.2	Porapak P	ORBO-1102	20062	226-114	GC-FID
Diethyl Ether	NIOSH 1610	0.25-3	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Diethyl Phthalate	OSHA 104	240	1	Tenax/glass fiber filter (OVS)	ORBO-410P	custom	226-56	GC-FID
Diethylene Dioxide - see Dioxane								
Diethylene Gycol	NIOSH 5523	5-60	0.5-2	XAD-7/glass fiber filter (OVS)	ORBO-47P	custom	226-57	GC-FID
Diethylene Glycol Ether	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
Diethylenetriamine (DETA)	NIOSH 2540	1-20	0.01-0.1	XAD-2 c/w 10% NITC	ORBO-654	custom	226-30-18	HPLC-UV
Diethylenetriamine (DETA)	OSHA 60	10	0.1	XAD-2 c/w 10% NITC	ORBO-654	custom	226-30-18	HPLC-UV
Difluorodibromomethane	NIOSH 1012	2.5-10	0.01-0.2	(2) coconut charcoal	ORBO-32S or ORBO-301	20267-U or 20039	226-01 NA	GC-FID

Compound	Method	Volume Liters	Rate Liters/Min	Medium and/or Sample Collection Device	Supelco Model No.	Supelco Cat. No.	SKC Equiv	Analytical Technique
Difluorodibromomethane	OSHA 7	10	0.2	(2) coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Difluorodichloromethane	NIOSH 1018	1-4	0.01-0.05	(2) coconut charcoal	ORBO-32S + ORBO-32L	20267-U 20228	226-01 226-09	GC-FID
Diglycidyl Ether of Bisphenyl A (DGEBA)	NIOSH 6/333	288	1.6	glass fiber filter	-----	23378	225-7	HPLC-UV
Dihydrocapsaicin	NIOSH 5041	7-1000	1-3	glass fiber filter	-----	23376	225-16	HPLC-FL
Diisobutyl Ketone	NIOSH 1300	1-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Diisobutyl Ketone	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Dimethoxymethane (Methylal)	NIOSH 1611	1-3	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Dimethylacetamide	NIOSH 2004	15-80	0.01-1	silica gel	ORBO-52S	20229	226-10	GC-FID
Dimethylamine	NIOSH 2010	3-30	0.01-1	silica gel	ORBO-52S	20229	226-10	GC-FID
Dimethylamine	OSHA 34	10	0.2	XAD-7 c/w 10% NBDC	ORBO-653	custom	226-96	HPLC-VIS
N,N-Dimethylaniline	NIOSH 2002	3-30	0.02-1	silica gel	ORBO-52S	20229	226-10	GC-FID
N,N-Dimethylaniline	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Dimethylarsinic Acid	NIOSH 5022	50-1000	1-3	PTFE filter	-----	23383	225-1710	IC-AAS
Dimethylformamide	NIOSH 2004	15-80	0.01-1	silica gel	ORBO-52S	20229	226-10	GC-FID
N,N-Dimethylformamide	OSHA 66	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-NPD
1,1-Dimethylhydrazine	NIOSH 3515	2-100	0.2-1	fritted bubbler	-----	64835-U	225-36-2	VIS
Dimethyl Phthalate	OSHA 104	240	1	Tenax/glass fiber filter (OVS)	ORBO-410P	custom	226-56	GC-FID
Dimethyl Sulfate	NIOSH 2524	0.25-12	0.01-0.2	Porapak P	ORBO-1102	20062	226-114	GC-ECD
Dimethyl Sulfate	NIOSH 5/301	12	0.05	Porapak P	ORBO-1102	20062	226-114	GC-ECN
N,N-Dimethyl-p-toluidine	NIOSH 2002	20-100	0.02-1	silica gel	ORBO-52S	20229	226-10	GC-FID
Dinitrobenzene (all isomers)	NIOSH 4/S214	90	1.5	MCE filter fritted bubbler	----- -----	23381 64835-U	225-5 225-36-2	HPLC-UV
Dinitro-o-cresol	NIOSH 5/S166	180	1.5	MCE filter stainless steel screen fritted bubbler	----- ----- -----	23381 custom 64835-U	225-5 225-36-2	HPLC-UV
2,4-Dinitrotoluene	OSHA 44	60	1	Tenax/glass fiber filter	ORBO-79	custom	NA	GC-TEA
Di-n-octyl Phthalate	OSHA 104	240	1	Tenax/glass fiber filter (OVS)	ORBO-410P	custom	226-56	GC-FID
Dioxane (Diethylene Dioxide)	NIOSH 1602	0.5-15	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Dioxane (Diethylene Dioxide)	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Dioxins	EPA TO-9A	325,000	225	quartz fiber filter polyurethane foam (PUF)	----- ORBO-2000	custom 20037	226-131	GC-MS
Dioxins	EPA 0023A			glass fiber filter XAD-2	----- Supelpak 2	custom 20279	NA	GC-MS
Diphenyl (Biphenyl)	NIOSH 2530	15-30	0.01-0.5	Tenax	ORBO-404	custom	226-35-01	GC-FID
Diphenylamine	OSHA 78	100	1	(2) glass fiber filter c/w H2SO4	822	20065	225-9004	HPLC-UV
Dipropylene Glycol Methyl Ether	NIOSH 2/S69	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Dipropylene Glycol Methyl Ether	OSHA 101	10	0.1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Dipropylene Glycol Methyl Ether	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Disul	NIOSH 5/S356	90	1-1.5	MCE filter	-----	23381	225-5	VIS
Disulfoton	NIOSH 5600	12-240	0.2-1	XAD-2/quartz filter (OVS)	ORBO-49Q	custom	226-58	GC-FPD
2,6-Di-t-butyl-p-cresol (DBPC)	NIOSH 1/226	10	0.2	silica gel	ORBO-504	20031	NA	GC-FID
Divinylbenzene	OSHA 89	12	0.05	charcoal c/w TBC	ORBO-356	20047	NA	GC-FID
Dursban	OSHA 62	480	1	XAD-2/glass fiber filter (OVS)	ORBO-49P	20350	226-30-16	GC-FPD
Dust, Respirable Nuisance	NIOSH 0600	75-1000	1.7	PVC filter	-----	23387	225-8-01	gravimetric
Dust, Total Nuisance	NIOSH 0500	7-133	1-2	PVC filter	-----	23387	225-8-01	gravimetric
Dyes, Benzidine	NIOSH 5013	150-500	1-3	PTFE filter	-----	23389	225-17	HPLC-UV

Compound	Method	Volume Liters	Rate Liters/Min	Medium and/or Sample Collection Device	Supelco Model No.	Supelco Cat. No.	SKC Equiv	Analytical Technique
Dyes, o-Dianisidine	NIOSH 5013	150-500	1-3	PTFE filter	-----	23389	225-17	HPLC-UV
Dyes, o-Toluidine	NIOSH 5013	150-500	1-3	PTFE filter	-----	23389	225-17	HPLC-UV
EDA – see Ethylenediamine								
Elements	NIOSH 7300	varies	1-4	MCE filter	-----	23381	225-5	ICP-AES
Endrin	NIOSH 5519	12-400	0.5-1	Chromosorb 102 MCE filter	ORBO-706 ------	20057 23381	226-107 225-5	GC-ECD
Enflurane (Ethrane)	OSHA 103	12	0.05	Carbosieve S-III (Anasorb 747)	ORBO-91	20360	226-81A	GC-FID
Epichlorohydrin	NIOSH 1010	2-30	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Epichlorohydrin	OSHA 7	20	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
EPN – see o-Ethyl-o-(p-nitro-phenyl) phenylphosphorothioate								
Ethanol	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
Ethanol (Ethyl Alcohol)	NIOSH 1400	0.1-1	0.01-0.05	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Ethanol (Ethyl Alcohol)	OSHA 100	12	0.05	Carbosieve S-III (Anasorb 747)	ORBO-91	20360	226-82	GC-FID
Ethanol (Ethyl Alcohol)	OSHA 7	1	0.05	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Ethanolamine - see 2-Aminoethanol								
3-Ethenylpyridine	ASTM D5075	90	<1.5	XAD-4	ORBO-613	20052	226-93	GC-NPD
Ethion	NIOSH 5600	12-240	0.2-1	XAD-2/quartz filter (OVS)	ORBO-49Q	custom	226-58	GC-FPD
Ethoprop	NIOSH 5600	12-240	0.2-1	XAD-2/quartz filter (OVS)	ORBO-49Q	custom	226-58	GC-FPD
2-Ethoxyethanol (Cellosolve)	NIOSH 1403	1-6	0.01-0.05	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
2-Ethoxyethanol (Cellosolve)	OSHA 79	15-48	0.1-1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
2-Ethoxyethyl Acetate (Cellosolve Acetate)	NIOSH 1450	1-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
2-Ethoxyethyl Acetate	OSHA 79	15-48	0.1-1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
2-Ethoxyethyl Acetate	OSHA 7	10	0.1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Ethrane (Enflurane)	OSHA 103	12	0.05	Carbosieve S-III (Anasorb 747)	ORBO-91	20360	226-81A	GC-FID
Ethyl Acetate	NIOSH 1457	0.1-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Ethyl Acetate	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
Ethyl Acetate	OSHA 7	5	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Ethyl Acrylate	NIOSH 1450	1-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Ethyl Acrylate	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Ethyl Acrylate	OSHA 92	12	0.05	charcoal c/w TBC	ORBO-356	20047	NA	GC-FID
Ethylamine	NIOSH 3/S144	30	0.2	silica gel	ORBO-52S	20229	226-10	GC-FID
Ethylamine	OSHA 36	10	0.2	XAD-7 c/w 10% NBDC	ORBO-653	custom	226-96	HPLC-VIS
Ethyl Amyl Ketone (5-Methyl-3-heptanone)	NIOSH 1301	1-25	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Ethylbenzene	NIOSH 1501	1-24	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Ethylbenzene	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Ethyl Bromide	NIOSH 1011	0.5-4	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Ethyl Bromide	OSHA 7	5	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Ethyl Butyl Ketone (3-Heptanone)	NIOSH 1301	1-25	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Ethyl Butyl Ketone (3-Heptanone)	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Ethyl Chloride	NIOSH 2519	0.3-3	0.02-0.05	(2) coconut charcoal	ORBO-32L	20228	226-09	GC-FID
Ethyl-2-cyanoacrylate	OSHA 55	12	0.1	XAD-7 t/w H3PO4	ORBO-655	20054	226-98	HPLC-UV
Ethyl Ether	NIOSH 1610	0.25-3	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Ethyl Ether	OSHA 7	3	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Ethyl Formate	NIOSH 1452	0.3-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Ethyl Formate	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID

Compound	Method	Volume Liters	Rate Liters/Min	Medium and/or Sample Collection Device	Supelco Model No.	Supelco Cat. No.	SKC Equiv	Analytical Technique
Ethyl Mercaptan	NIOSH 2542	10-150	0.1-0.2	glass fiber filter c/w mercuric acetate	826	20068	225-9007	GC-FPD
Ethyl Silicate	NIOSH 3/S264	9	0.05	XAD-2	ORBO-605	20049	NA	GC-FID
Ethylene Chlorohydrin	NIOSH 2513	2-35	0.01-0.2	petroleum charcoal	ORBO-303	20040-U	226-38	GC-FID
Ethylene Chlorohydrin	OSHA 7	20	0.2	petroleum charcoal	ORBO-303	20040-U	226-38	GC-FID
Ethylenediamine (EDA)	NIOSH 2540	1-20	0.01-0.1	XAD-2 c/w 10% NITC	ORBO-654	custom	226-30-18	HPLC-UV
Ethylenediamine (EDA)	OSHA 60	10	0.1	XAD-2 c/w 10% NITC	ORBO-654	custom	226-30-18	HPLC-UV
Ethylene Dibromide – see 1,2-Dibromoethane								
Ethylene Dichloride (1,2-Dichlorethane)	NIOSH 1003	1-50	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Ethylene Dichloride (1,2-Dichlorethane)	OSHA 3	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-ECD
Ethylene Glycol	NIOSH 5523	5-60	0.5-2	XAD-7/glass fiber filter (OVS)	ORBO-47P	custom	226-57	GC-FID
Ethylene Glycol Dinitrate	NIOSH 2507	3-100	0.2-1	Tenax	ORBO-402	20832-U	226-35-03	GC-ECD
Ethylene Glycol Dinitrate	OSHA 43	15	1	Tenax	ORBO-402	20832-U	226-35-03	HPLC-TEA/UV
Ethylene Oxide	ASTM D4413	3-20	0.01-0.2	coconut charcoal	ORBO-32J	custom	226-16	GC-FID
Ethylene Oxide	ASTM D5578	1-10	0.02-0.1	Carboxen-564 c/w HBr	ORBO-78	20355	NA	GC-ECD
Ethylene Oxide	NIOSH 1614	1-24	0.05-0.15	petroleum charcoal c/w HBr	ORBO-353	20044	226-38-03	GC-ECD
Ethylene Oxide	NIOSH 3702	<80% vol	>0.02	5L sampling bag	-----	24655	232-05	GC-PID
Ethylene Oxide	OSHA 49		0.0493	3M #3551 diffusive sampler	-----	20253-U		GC-ECD
Ethylene Oxide	OSHA 50	24	0.1	petroleum charcoal c/w HBr	ORBO-353	20044	226-38-03	GC-ECD
Ethylene Oxide (Qazi-Ketcham)	AIHAJ 11/77	4.8-9.6	0.2	petroleum charcoal	ORBO-33	20259	226-36	GC-FID
Ethylene Thiourea	NIOSH 5011	200-800	1-3	MCE filter	-----	23381	225-5	VIS
Ethylene Thiourea	OSHA 95	480	2	(2) glass fiber filter	-----	23376	225-16	HPLC-UV
Ethylenimine	NIOSH 3514	1-48	0.2	fritted bubbler	-----	64835-U	225-36-2	HPLC-UV
N-Ethylmorpholine	NIOSH 3/S146	10	0.2	silica gel	ORBO-52S	20229	226-10	GC-FID
o-Ethyl-o-(p-nitro-phenyl)-phenylphos phorothioate (EPN)	NIOSH 5012	15-700	1-2	glass fiber filter	-----	23378	225-7	GC-FPD
Ethyl sec-Amyl Ketone (5-Methyl-3-heptanone)	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Ethylvinylbenzene	OSHA 89	12	0.05	charcoal c/w TBC	ORBO-356	20047	NA	GC-FID
Fenamiphos	NIOSH 5600	12-240	0.2-1	XAD-2/quartz filter (OVS)	ORBO-49Q	custom	226-58	GC-FPD
Ferrovanadium Dust	NIOSH 1/173	180	1.5	MCE filter	-----	23381	225-5	AAS
Ferrovanadium Dust	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Ferrovanadium Dust	OSHA ID 125G	480	2	MCE filter	-----	23381	225-5	ICP-AES
Fluoranthene	NIOSH 5506	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	HPLC-UV/Fl
Fluoranthene	NIOSH 5515	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	GC-FID
Fluorene	NIOSH 5506	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	HPLC-UV/Fl
Fluorene	NIOSH 5515	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	GC-FID
Fluoride (F- & HF)	OSHA ID 110	22.5-90	1.5	MCE filter + support pad c/w Na2CO3	845	custom	225-9005 225-9001	ISE
Fluoride Particles	OSHA ID 110	22.5-90	1.5	MCE filter	-----	23381	225-5	ISE
Fluorides	ASTM D4765	varies	2	MCE filter + support pad c/w Na2CO3	845	custom	225-9005 225-9001	ISE
Fluorides, Aerosol & Gas	NIOSH 7906	1-120	1-2	MCE filter + support pad c/w Na2CO3	845	custom	225-9005 225-9001	IC-CD
Fluorides, Aerosol & Gas	NIOSH 7902	12-800	1-2	MCE filter + support pad c/w Na2CO3	845	custom	225-9005 225-9001	ISE
Fluorotrichloromethane	NIOSH 1006	0.3-7	0.01-0.05	coconut charcoal	ORBO-32L	20228	226-09	GC-FID
Fonofos	NIOSH 5600	12-240	0.2-1	XAD-2/quartz filter (OVS)	ORBO-49Q	custom	226-58	GC-FPD
Formaldehyde	ASTM D5197	see method	0.5-1.5	silica gel c/w DNPH	LpDNPH S10	21026-U	226-119	HPLC-UV

Compound	Method	Volume Liters	Rate Liters/Min	Medium and/or Sample Collection Device	Supelco Model No.	Supelco Cat. No.	SKC Equiv	Analytical Technique
Formaldehyde	EPA 0100		1	silica gel c/w DNPH	LpDNPH S10	21026-U	226-119	HPLC-UV
Formaldehyde	NIOSH 2016	1-15	0.1-1.5	silica gel c/w DNPH	LpDNPH S10	21026-U	226-119	HPLC-UV
Formaldehyde	NIOSH 2539	5	0.01-0.05	XAD-2 c/w 2-HMP	ORBO-23	20257-U	226-118	GC-FID
Formaldehyde	NIOSH 2541	1-36	0.01-0.1	XAD-2 c/w 2-HMP	ORBO-23	20257-U	226-118	GC-FID
Formaldehyde	NIOSH 3500	1-100	0.2-1	PTFE filter (2) impingers	----- -----	23383 20270-U	225-1710 225-36-1	VIS
Formaldehyde	OSHA 52	3-24	0.1-0.2	XAD-2 c/w 2-HMP	ORBO-24	20231	226-117	GC-NPD
Formaldehyde	OSHA ID 102	30-160	0.5-1	MCE filter fritted bubbler	----- -----	23381 64835-U	225-5 225-36-2	DPP
Formaldehyde	OSHA ID 205		0.0614	3M #3721 diffusive sampler	-----	NA		colorimetric
Formaldehyde (on dust)	NIOSH 5700	240-1050	2	PVC filter inhalable sampler	----- -----	special order		HPLC-UV
Formic Acid	NIOSH 2011	1-24	0.05-0.2	silica gel/glass fiber filter	ORBO-53	20265	226-10-03	IC
Formic Acid	US Army	10-25		Chromosorb P c/w Na2CO3	ORBO-70	20256-U	NA	GC-FID
Furfural	NIOSH 2529	1-12	0.01-0.05	XAD-2 c/w 2-HMP	ORBO-23	20257-U	226-118	GC-FID
Furfural	NIOSH 2539	5	0.05	XAD-2 c/w 2-HMP	ORBO-23	20257-U	226-118	GC-FID
Furfural	OSHA 72	180	1	petroleum charcoal	ORBO-303	20040-U	226-38	GC-FID
Furfuryl Alcohol	NIOSH 2505	3-25	0.01-0.05	Porapak Q	ORBO-1103	20063	226-115	GC-FID
Gallium	NIOSH 1/177	100	1.5-2	MCE filter	-----	23381	225-5	ASV
Glass, Fibrous	NIOSH 7400	400-	0.5-16	MCE filter	-----	23380-U	225-19	PCM
Glutaraldehyde	NIOSH 2532	1-30	0.05-0.5	silica gel c/w DNPH	LpDNPH H10	505315	226-119	HPLC-UV
Glutaraldehyde	OSHA 64	15	1	glass fiber filter c/w DNPH	827	20069	225-9003	HPLC-UV
Glycerin Mist	NIOSH 0500	7-133	1-2	PVC filter	-----	23387	225-8-01	gravimetric
Glycidol (2,3-Epoxy-1-propanol)	NIOSH 1608	5-100	0.01-1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Glycidol (2,3-Epoxy-1-propanol)	OSHA 7	50	1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Glycols	NIOSH 5523	5-60	0.5-2	XAD-7/glass fiber filter (OVS)	ORBO-47P	custom	226-57	GC-FID
Hafnium	NIOSH 5/S194	90	1.5-2	MCE filter	-----	23381	225-5	PES
Halothane	OSHA 103	12	0.05	Carbosieve S-III (Anasorb 747)	ORBO-91	20360	226-81A	GC-FID
Heptachlor	ASTM D4947	250	1-5	polyurethane foam (PUF)	ORBO-1000	20557	226-92	GC-ECD
Heptachlor	NIOSH 5/S287	60	0.01-1	Chromosorb 102	ORBO-706	20057	226-107	GC-ECD
Heptanal	NIOSH 2539	5	0.01-0.05	XAD-2 c/w 2-HMP	ORBO-23	20257-U	226-118	GC-FID
n-Heptane	NIOSH 1500	4	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
n-Heptane	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
n-Heptane	OSHA 7	5	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
3-Heptanone	NIOSH 1301	1-25	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
3-Heptanone	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Herbicides, Chlorinated and Organonitrogen (Hand Wash)	NIOSH 9200			polyethylene bag				GC-ECD
Herbicides, Chlorinated and Organonitrogen (Patch)	NIOSH 9201			PUF pads				GC-ECD
Herbicides, Chlorinated, Organonitrogen, and Acid	NIOSH 5602	12-480	0.2-1	XAD-2/quartz filter (OVS)	ORBO-49Q	custom	226-58	GC-ECD
Hexachlorobutadiene	NIOSH 2543	1-100	0.05-0.2	XAD-2	ORBO-608	20050-U	226-30-05	GC-ECD
Hexachloro-1,3-cyclopentadiene	NIOSH 2518	0.25-90	0.01-0.2	(2) Porapak T	ORBO-1105	custom	226-116	GC-ECD
Hexachloroethane	NIOSH 1003	3-70	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Hexachloroethane	OSHA 7	30	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Hexachloronaphthalene	NIOSH 2/S100	30	1	MCE filter	-----	23381	225-5	GC-ECD
1,6-Hexamethylene Diisocyanate (HDI)	OSHA 42	15	1	glass fiber filter c/w 1-2PP	ORBO-80	20811	225-9002	HPLC-UV
1,6-Hexamethylene-diisocyanate (HDI)	NIOSH 5521	5-500	1	impinger	-----	20270-U	225-36-1	HPLC-UV ELCD
Hexamethylene Diisocyanate	NIOSH 5522	15-360	1-2	impinger	-----	20270-U	225-36-1	HPLC-FL
Hexamethylenetetramine (HMTA)	NIOSH 4/263	15	1.5	MCE filter fritted bubbler	----- -----	23381 64835-U	225-5 225-36-2	VIS

Compound	Method	Volume Liters	Rate Liters/Min	Medium and/or Sample Collection Device	Supelco Model No.	Supelco Cat. No.	SKC Equiv	Analytical Technique
Hexanal	NIOSH 2539	5	0.01-0.05	XAD-2 c/w 2-HMP	ORBO-23	20257-U	226-118	GC-FID
Hexanal	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
n-Hexane	NIOSH 1500	4	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
n-Hexane	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
n-Hexane	OSHA 7	5	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
2-Hexanone (MBK)	NIOSH 1300	1-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
2-Hexanone (MBK)	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Hexavalent Chromium - see Chromium								
Hexone (MIBK)	NIOSH 1300	1-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Hexone (MIBK)	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
Hexone (MIBK)	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
sec-Hexyl Acetate	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Hydrazine	NIOSH 3503	7-100	0.2-1	fritted bubbler	-----	64835-U	225-36-2	VIS
Hydrazine	OSHA 108	240	1	(2) glass fiber filters c/w H2SO4	840	custom	NA	HPLC-UV
Hydrazoic Acid	OSHA ID 211	>5	1.0	silica gel c/w NaOH PVC filter	ORBO-560 -----	custom 23387	226-55 225-8-01	IC-UV
Hydrazoic Acid	US Army	10-25		Chromosorb P c/w Na2CO3	ORBO-70	20256-U	NA	VIS
Hydrobromic Acid	NIOSH 7903	3-100	0.2-0.5	silica gel/glass fiber filter	ORBO-53	20265	226-10-03	IC
Hydrocarbons, General	Supelco			Carbotrap	ORBO-100	20255-U	NA	GC-FID
Hydrocyanic Acid	NIOSH 6010	2-90	0.05-0.2	soda lime	ORBO-1006	custom	226-28	VIS
Hydrocyanic Acid	NIOSH 7904	7-100	0.5-1	MCE filter fritted bubbler	----- -----	23381 64835-U	225-5 225-36-2	ISE
Hydrocyanic Acid	OSHA ID 120	90-120	1	MCE filter impinger	----- -----	23381 20270-U	225-5 225-36-1	ISE
Hydrofluoric Acid	NIOSH 7902	12-800	1-2	MCE filter + support pad c/w Na2CO3	845	custom	225-9005 225-9001	ISE
Hydrofluoric Acid	NIOSH 7903	3-100	0.2-0.5	silica gel/glass fiber filter	ORBO-53	20265	226-10-03	IC
Hydrogen Bromide	NIOSH 7903	3-100	0.2-0.5	silica gel/glass fiber filter	ORBO-53	20265	226-10-03	IC
Hydrogen Bromide	OSHA ID 165SG	96	0.20	silica gel/glass fiber filter	ORBO-53	20265	226-10-03	IC
Hydrogen Chloride	NIOSH 7903	3-100	0.2-0.5	silica gel/glass fiber filter	ORBO-53	20265	226-10-03	IC
Hydrogen Chloride	OSHA ID 174	7.5	0.5	silica gel/glass fiber filter	ORBO-53	20265	226-10-03	IC
Hydrogen Cyanide	NIOSH 6010	2-90	0.05-0.2	soda lime	ORBO-1006	custom	226-28	VIS
Hydrogen Cyanide	NIOSH 7904	7-100	0.5-1	MCE filter fritted bubbler	----- -----	23381 64835-U	225-5 225-36-2	ISE
Hydrogen Cyanide	OSHA ID 120	90-120	1	MCE filter impinger	----- -----	23381 20270-U	225-5 225-36-1	ISE
Hydrogen Fluoride	NIOSH 7906	1-800	1-2	MCE filter + support pad c/w Na2CO3	845	custom	225-9005 225-9001	IC
Hydrogen Fluoride – see Hydrofluoric Acid								
Hydrogen Sulfide	NIOSH 6013	1.2-40	0.1-1.5	coconut charcoal	ORBO-34	20211	NA	IC-CD
Hydrogen Sulfide	OSHA ID 141	2-6	0.1-0.2	MCE filter c/w AgNO3	828	20070-U	225-9008	DPP
Hydroquinone	NIOSH 5004	30-180	1-4	MCE filter	-----	23381	225-5	HPLC-UV
Indeno(1,2,3-cd)pyrene	NIOSH 5506	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	HPLC-UV/Fl
Indeno(1,2,3-cd)pyrene	NIOSH 5515	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	GC-FID
Indium	NIOSH 1/173	180	1.5	MCE filter	-----	23381	225-5	AAS
Indium	NIOSH 1/190	100	1.5-2	MCE filter	-----	23381	225-5	ASV
Iodine	NIOSH 6005	15-225	0.5-1	charcoal c/w KOH	ORBO-354	20045	226-27	IC
Iodine	OSHA ID 212	2.5-7.5	0.5	beaded carbon c/w KOH	ORBO-1010W	custom	226-80	IC-PED
Iron	NIOSH 7300	5-100	1-4	MCE filter	-----	23381	225-5	ICP-AES
Iron	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Iron Oxide Fume	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Iron Oxide Fume	OSHA ID 125G	480	2	MCE filter	-----	23381	225-5	ICP-AES
Isoamyl Acetate	NIOSH 1450	1-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Isoamyl Acetate	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Isoamyl Alcohol	NIOSH 1402	1-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Isobutyl Acetate	NIOSH 1450	1-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Isobutyl Acetate	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Isobutyl Alcohol	NIOSH 1401	2-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID

Compound	Method	Volume Liters	Rate Liters/Min	Medium and/or Sample Collection Device	Supelco Model No.	Supelco Cat. No.	SKC Equiv	Analytical Technique
Isobutyl Alcohol	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Isobutyraldehyde	NIOSH 2539	5	0.01-0.05	XAD-2 c/w 2-HMP	ORBO-23	20257-U	226-118	GC-FID
Isocyanates	NIOSH 5521	5-500	1	impinger	-----	20270-U	225-36-1	HPLC-UV ELCD
Isocyanates	NIOSH 5522	15-360	1-2	impinger	-----	20270-U	225-36-1	HPLC-FL
Isocyanates – see HDI, MDI, TDI								
Isoflurane	OSHA 103	12	0.05	Carbosieve S-III (Anasorb 747)	ORBO-91	20360	226-81A	GC-FID
Isophorone	NIOSH 2508	2-25	0.01-1	petroleum charcoal	ORBO-303	20040-U	226-38	GC-FID
Isophorone	OSHA 7	10	0.2	petroleum charcoal	ORBO-303	20040-U	226-38	GC-FID
Isopropyl Acetate	NIOSH 1454	0.1-9	0.02-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Isopropyl Acetate	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Isopropyl Alcohol	NIOSH 1400	0.2-3	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Isopropyl Alcohol	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
Isopropyl Alcohol	OSHA 7	3	0.1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Isopropylamine	NIOSH 3/S147	100	1	fritted bubbler	-----	64835-U	225-36-2	GC-FID
N-Isopropylaniline	OSHA 78	100	1	(2) glass fiber filter c/w H2SO4	822	20065	225-9004	HPLC-UV
Isopropyl Ether	NIOSH 1618	0.1-3	0.01-0.05	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Isopropyl Ether	OSHA 7	3	0.05	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Isopropyl Glycidyl Ether (IGE)	NIOSH 1620	1-30	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Isopropyl Glycidyl Ether (IGE)	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Isovaleraldehyde	NIOSH 2539	5	0.01-0.05	XAD-2 c/w 2-HMP	ORBO-23	20257-U	226-118	GC-FID
Kepone	NIOSH 5508	50-600	0.5-1	MCE filter impinger	----- -----	23381 20270-U	225-5 225-36-1	GC-ECD
Kerosene	NIOSH 1550	1.3-20	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Ketene	NIOSH 2/S92	50	1	fritted bubbler	-----	64835-U	225-36-2	colorimetric
Ketones	EPA 0011			DNPH absorbing solution				HPLC-UV
Ketones – see Aldehydes								
Lead	NIOSH 7082	200-1500	1-4	MCE filter	-----	23381	225-5	AAS
Lead	NIOSH 7105	1-1500	1-4	MCE filter	-----	23381	225-5	AAGF
Lead	NIOSH 7300	1250-	1-4	MCE filter	-----	23381	225-5	ICP-AES
Lead	NIOSH 7700	10-240	2	MCE filter	-----	23381	225-5	Spot
Lead	NIOSH 7701	20-1500	1-4	MCE filter	-----	23381	225-5	ASV
Lead	NIOSH 9100			wipes	-----			AAS, ICP
Lead by Field Portable XRF	NIOSH 7702	570-1900	1-4	MCE filter	-----	23381	225-5	XRF
Lead, Inorganic Fumes & Dusts (as Pb)	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Lead, Inorganic Fumes & Dusts (as Pb)	OSHA ID 125G	480	2	MCE filter	-----	23381	225-5	ICP-AES
Lead Sulfide	NIOSH 7505	600-1000	1.7 or 2.2	PVC filter	-----	23387	225-8-01	XPD
Limonene	NIOSH 1552	2-30	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Limonene	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
Lindane (γ-BHC)	NIOSH 5502	18-240	0.2-1	glass fiber filter impinger	----- -----	23378 64835-U	225-7 225-36-2	GC-ECD
Lithium	NIOSH 7300	100-2000	1-4	MCE filter	-----	23381	225-5	ICP-AES
Lithium Hydroxide	NIOSH 7401	70-1000	1-4	PTFE filter	-----	23383	225-1710	titration
Magnesium	NIOSH 7300	5-67	1-4	MCE filter	-----	23381	225-5	ICP-AES
Magnesium	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Magnesium Oxide Fume	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Malathion	NIOSH 5012	15-130	1-2	glass fiber filter	-----	23378	225-7	GC-FPD
Malathion	NIOSH 5600	12-60	0.2-1	XAD-2/quartz filter (OVS)	ORBO-49Q	custom	226-58	GC-FPD
Malathion	OSHA 62	60	1	XAD-2/glass fiber filter (OVS)	ORBO-49P	20350	226-30-16	GC-FPD
Maleic Anhydride	NIOSH 3512	40-500	0.2-1.5	fritted bubbler	-----	64835-U	225-36-2	HPLC-UV
Maleic Anhydride	OSHA 86	60	0.5	(2) glass fiber filter c/w DMBA	834	20072	NA	HPLC-UV
Maneb	OSHA 107	500	2	MCE filter	-----	23380-U	225-19	HPLC-UV
Manganese	NIOSH 7300	5-200	1-4	MCE filter	-----	23381	225-5	ICP-AES

Compound	Method	Volume Liters	Rate Liters/Min	Medium and/or Sample Collection Device	Supelco Model No.	Supelco Cat. No.	SKC Equiv	Analytical Technique
Manganese, Mn Compounds (as Mn)	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Manganese, Mn Compounds (as Mn)	OSHA ID 125G	480	2	MCE filter	-----	23381	225-5	ICP-AES
Manganese Oxide	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Manganese Oxide	OSHA ID 125G	480	2	MCE filter	-----	23381	225-5	ICP-AES
MBK – see 2-Hexanone								
MDI – see Methylene Bisphenyl Isocyanate and Isocyanates								
Mercaptans	NIOSH 2542	10-150	0.1-0.2	glass fiber filter c/w mercuric acetate	826	20068	225-9007	GC-FPD
Mercury	NIOSH 6009	2-100	0.15-0.25	Hopcalite	ORBO-1002	20863	226-17-1A	AAS
Mercury, Organic	NIOSH 6/S342	3-12	0.01-0.2	Carbosieve B	ORBO-910	custom	NA	AAS
Mercury, Particulate	OSHA ID 145	10	2	MCE filter	-----	23381	225-5	AACV
Mercury, Vapor	OSHA ID 140	3-100	0.2	Hopcalite	ORBO-1002	20863	226-17-1A	AACV
Mesityl Oxide	NIOSH 1301	1-25	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Mesityl Oxide	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Metal Particulates	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Metal Particulates	OSHA ID 125G	30-480	2	MCE filter	-----	23381	225-5	ICP-AES
Metal/Metalloid Particulates	OSHA ID 206	480	2	MCE filter	-----	23381	225-5	ICP-AES
Metals	ASTM D4185	varies	2	MCE filter	-----	23381	225-5	AAS
Metals	EPA 0060			filter + absorbing solutions				ICP-AES
Metals	NIOSH 7300	varies-2000	1-4	MCE filter	-----	23381	225-5	ICP-AES
Methacrylic Acid	OSHA 312	24	0.1	(2) XAD-8	ORBO-601	20048	226-30-08	HPLC-UV
Methamidophos	NIOSH 5600	12-240	0.2-1	XAD-2/quartz filter (OVS)	ORBO-49Q	custom	226-58	GC-FPD
Methanol	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
Methanol (Methyl Alcohol)	NIOSH 2000	1-5	0.02-0.2	silica gel	ORBO-502	20030-U	226-51	GC-FID
Methanol (Methyl Alcohol)	OSHA 91	3-5	0.05	Carbosieve S-III (Anasorb 747)	ORBO-91	20360	226-82	GC-FID
Methoxychlor	NIOSH 4/S371	100	1.5	glass fiber filter	-----	23378	225-7	GC-ELCD
2- Methoxyethanol (Methyl Cellosolve)	NIOSH 1403	6-50	0.01-0.05	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
2-Methoxyethanol	OSHA 79	15-48	0.1-1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
2-Methoxyethyl Acetate (Methyl Cellosolve Acetate)	NIOSH 1451	0.2-20	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
2-Methoxyethyl Acetate	OSHA 79	15-48	0.1-1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
1-Methoxy-2-propanol (1M2P)	OSHA 99	10	0.1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
2-Methoxy-1-propanol (2M1P)	OSHA 99	10	0.1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
1-Methoxy-2-propyl Acetate (1M2PA)	OSHA 99	10	0.1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
2-Methoxy-1-propyl Acetate (2M1PA)	OSHA 99	10	0.1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Methyl Acetate	NIOSH 1458	0.2-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Methyl Acetate	OSHA 7	5	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Methyl Acetylene	NIOSH 5/S84	3-4	0.01-0.05	5L sampling bag	-----	24655	232-05	GC-FID
Methyl Acetylene Propadiene Mix	OSHA 7	2	0.05	(2) coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Methyl Acetylene Propadiene Mix (MAPP)	NIOSH 6/S85	3-4	0.01-0.05	5L sampling bag	-----	24655	232-05	GC-FPD

Compound	Method	Volume Liters	Rate Liters/Min	Medium and/or Sample Collection Device	Supelco Model No.	Supelco Cat. No.	SKC Equiv	Analytical Technique
Methyl Acrylate	NIOSH 1459	1-5	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Methyl Acrylate	OSHA 7	5	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Methyl Acrylate	OSHA 92	12	0.05	charcoal c/w TBC	ORBO-356	20047	NA	GC-FID
Methyl Amine	NIOSH 4/277		0.2	silica gel	ORBO-508	custom	226-14	GC-FID
Methyl Amine	NIOSH 6/S148	24	0.02-0.2	silica gel	ORBO-508	custom	226-14	IC-ELCD
Methyl Amine	OSHA 40	10	0.2	XAD-7 c/w 10% NBDC	ORBO-653	custom	226-96	HPLC-VIS
4-Methylamino-azobenzene	NIOSH 4/284	72	0.2	Gas Chrom P glass fiber filter	ORBO-1001 -----	custom 23376	226-52 225-16	GC-FID
Methyl(n-amyl)ketone	NIOSH 1301	1-25	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Methyl Bromide	NIOSH 2520	1-5	0.01-0.1	Na2SO4 drying tube (2) petroleum charcoal	ORBO-971 ORBO-310	custom custom	226-44-02 226-38-02	GC-AED
Methyl-n-butyl Ketone – see 2-Hexanone								
Methyl Chloride	NIOSH 1001	0.40-3	0.01-0.1	(2) coconut charcoal	ORBO-32S ORBO-32L	20267-U 20228	226-01 226-09	GC-FID
Methyl Chloroform	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
Methyl Chloroform – see 1,1,1-Trichloroethane								
Methyl-2-cyanoacrylate	OSHA 55	12	0.1	XAD-7 t/w H3PO4	ORBO-655	20054	226-98	HPLC-UV
Methyl Cyclohexane	NIOSH 1500	4	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Methyl Cyclohexane	OSHA 7	5	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Methyl Ethyl Ketone	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
Methyl Ethyl Ketone (MEK) – see 2-Butanone								
Methyl Ethyl Ketone Peroxide	NIOSH 3508	52-520	0.5-2	impinger	-----	20270-U	225-36-1	VIS
Methyl Ethyl Ketone Peroxide	OSHA 77	15	1	XAD-4	ORBO-613	20052	226-93	HPLC-UV PCD
Methyl Formate	NIOSH 5/S291	3	0.01-0.05	Carbosieve G	ORBO-901	custom	NA	GC-FID
5-Methyl-3-heptanone	NIOSH 1301	1-25	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
5-Methyl-3-heptanone	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Methyl Iodide	NIOSH 1014	15-50	0.01-1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Methyl Isoamyl Acetate	NIOSH 1450	1-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Methyl Isobutyl Carbinol	NIOSH 1402	1-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Methyl Isobutyl Carbinol	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Methyl Isobutyl Ketone (MIBK) – see Hexone								
Methyl Isocyanate	OSHA 54	15	0.05	XAD-7 c/w H2SO4 & 1-2PP	ORBO-657	20055	NA	HPLC-UV
Methyl Mercaptan	NIOSH 2542	10-150	0.1-0.2	glass fiber filter c/w mercuric acetate	826	20068	225-9007	GC-FPD
Methyl Mercaptan	OSHA 26	20	0.2	glass fiber filter c/w mercuric acetate	826	20068	225-9007	GC-FPD
Methyl Methacrylate	NIOSH 2537	1-8	0.01-0.05	XAD-2	ORBO-609	20051	226-30-06	GC-FID
Methyl Methacrylate	OSHA 94	3	0.05	charcoal c/w TBC	ORBO-356	20047	NA	GC-FID
Methyl Parathion	NIOSH 5600	12-240	0.2-1	XAD-2/quartz filter (OVS)	ORBO-49Q	custom	226-58	GC-FPD
Methyl Phenol	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
N-Methyl-2-pyrrolidinone	NIOSH 1302	0.5-125	0.05-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-NPD/FID
α-Methyl Styrene	NIOSH 1501	1-30	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
α-Methyl Styrene	OSHA 7	3	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Methyl tert-Butyl Ether (MTBE)	NIOSH 1615	2-96	0.1-0.2	(2) coconut charcoal	ORBO-32L	20228	226-09	GC-FID
N-Methyl-N-2,4,6-tetranitrobenzamine	NIOSH 3/S225	1	1.5	MCE filter	-----	23381	225-5	VIS
Methylal	NIOSH 1611	1-3	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Methylal	OSHA 7	2	0.05	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Methylarsonic Acid	NIOSH 5022	50-1000	1-3	PTFE filter	-----	23383	225-1710	IC-AAS
Methylcyclohexanol	NIOSH 1404	1-15	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Methylcyclohexanone	NIOSH 2521	1-6	0.01-0.05	Porapak Q	ORBO-1103	20063	226-115	GC-FID

Compound	Method	Volume Liters	Rate Liters/Min	Medium and/or Sample Collection Device	Supelco Model No.	Supelco Cat. No.	SKC Equiv	Analytical Technique
4,4'-Methylene Bis(2-chloroaniline) (MOCA)	NIOSH 1/236	3-480	0.2-1	silica gel glass fiber filter	ORBO-501 -----	custom 23376	226-63 225-16	HPLC-UV
4,4'-Methylene Bis(2-chloroaniline)	OSHA 71	100	1	glass fiber filter c/w H2SO4	822	20065	225-9004	GC-ECD
Methylene Bisphenyl Isocyanate (MDI)	NIOSH 5521	5-500	1	impinger	-----	20270-U	225-36-1	HPLC-UV ELCD
Methylene Bisphenyl Isocyanate (MDI)	OSHA 47	15	1	glass fiber filter c/w 1-2PP	ORBO-80	20811	225-9002	HPLC-UV
Methylene Chloride	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
Methylene Chloride	OSHA 59	10	0.05	coconut charcoal (3-section, 350mg)	ORBO-32TB	custom	226-09-02	GC-FID
Methylene Chloride – see Dichloromethane								
4,4'-Methylene Dianiline (MDA)	NIOSH 5029	10-1000	1-2	filter gasket glass fiber filter c/w H2SO4	----- 822	NA 20065	225-9004	HPLC-UV ELCD
4,4'-Methylene Dianiline (MDA)	OSHA 57	100	1	glass fiber filter c/w H2SO4	822	20065	225-9004	GC-ECD
Mevinphos (Phosdrin)	NIOSH 5600	12-240	0.2-1	XAD-2/quartz filter (OVS)	ORBO-49Q	custom	226-58	GC-FPD
Mineral Spirits	NIOSH 1550	1.3-20	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Mineral Spirits	OSHA 48	3	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
MOCA - see 4,4'-Methylene Bis(2-chloroaniline)								
Molybdenum	NIOSH 7300	5-67	1-4	MCE filter	-----	23381	225-5	ICP-AES
Molybdenum Insolubles (as Mo)	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Molybdenum Insolubles (as Mo)	OSHA ID 125G	480	2	MCE filter	-----	23381	225-5	ICP-AES
Molybdenum Solubles (as Mo)	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Monochloroacetic Acid	NIOSH 2008	1-100	0.05-0.2	silica gel	ORBO-505	custom	226-47-01	IC
Monochlorobenzene	NIOSH 1003	1.5-40	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Monochlorobenzene	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Monocrotophos	NIOSH 5600	12-240	0.2-1	XAD-2/quartz filter (OVS)	ORBO-49Q	custom	226-58	GC-FPD
Monomethylaniline	NIOSH 3511	11-100	0.2-1	fritted bubbler	-----	64835-U	225-36-2	GC-FID
Monomethylhydrazine	NIOSH 3510	3-20	0.5-1.5	fritted bubbler	-----	64835-U	225-36-2	VIS
Morpholine	NIOSH 3/S150	20	0.2	silica gel	ORBO-52S	20229	226-10	GC-FID
Mycobacterium Tuberculosis Airborne	NIOSH 0900		>4	PTFE filter	-----	23391	225-1705	Polymerase Chain Reaction
Naphtha	OSHA 48	3	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Naphtha (Coal Tar)	NIOSH 1550	1.3-20	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Naphthalene	NIOSH 1501	100-200	0.01-1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Naphthalene	NIOSH 5506	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	HPLC-UV/FI
Naphthalene	NIOSH 5515	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	GC-FID
Naphthalene	OSHA 35	10	0.2	Chromosorb 106	ORBO-704	custom	226-110	GC-FID
α-Naphthalthiourea	NIOSH 5/S276	480	1.5-2	PTFE filter	-----	23383	225-1710	HPLC-UV
α-Naphthylamine (1-Naphthylamine)	NIOSH 5518	30-100	0.2-0.8	silica gel glass fiber filter	ORBO-502 -----	20030-U 23376	226-51 225-16	GC-FID
α-Naphthylamine (1-Naphthylamine)	OSHA 93	100	1	glass fiber filter c/w H2SO4	822	20065	225-9004	GC-ECD
β-Naphthylamine (2-Naphthylamine)	NIOSH 5518	30-100	0.2-0.8	silica gel glass fiber filter	ORBO-502 -----	20030-U 23376	226-51 225-16	GC-FID
β-Naphthylamine (2-Naphthylamine)	OSHA 93	100	1	glass fiber filter c/w H2SO4	822	20065	225-9004	GC-ECD
Nickel	NIOSH 7300	25-1000	1-4	MCE filter	-----	23381	225-5	ICP-AES

Compound	Method	Volume Liters	Rate Liters/Min	Medium and/or Sample Collection Device	Supelco Model No.	Supelco Cat. No.	SKC Equiv	Analytical Technique
Nickel Carbonyl	NIOSH 6007	7-80	0.05-0.2	low Ni charcoal MCE filter	ORBO-304 -----	20041 23381	NA 225-5	AAGF
Nickel, Insoluble Compounds (as Ni)	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Nickel, Insoluble Compounds (as Ni)	OSHA ID 125G	480	2	MCE filter	-----	23381	225-5	ICP-AES
Nickel, Metal & Soluble Compounds (as Ni)	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Nickel, Metal & Soluble Compounds (as Ni)	OSHA ID 125G	480	2	MCE filter	-----	23381	225-5	ICP-AES
Nicotine	ASTM D5075	90	<1.5	XAD-4	ORBO-613	20052	226-93	GC-NPD
Nicotine	EPA IP-2A		1	XAD-4	ORBO-613	20052	226-93	GC-NPD
Nicotine	EPA IP-2B		1.7-3	2 Teflon coated glass fiber filters, 1 t/w sodium	-----	custom		GC-NPD
Nicotine	NIOSH 2544	60-400	1	XAD-2	ORBO-43	20258	226-30-04	GC-NPD
Nicotine	NIOSH 2551	0.5-600	0.1-1	XAD-4	ORBO-613	20052	226-93	GC-NPD
Nicotine	NIOSH 3/S293	100	1	XAD-2	ORBO-605	20049	NA	GC-FID
Nitric Acid	NIOSH 7903	3-100	0.2-0.5	silica gel/glass fiber filter	ORBO-53	20265	226-10-03	IC
Nitric Acid	OSHA ID 127	120	1	fritted bubbler	-----	64835-U	225-36-2	IC
Nitric Acid	OSHA ID 165SG	96	0.20	silica gel/glass fiber filter	ORBO-53	20265	226-10-03	IC
Nitric Oxide	NIOSH 6014	1.5-6	0.025	molecular sieve c/w TEA + oxidizer	ORBO-904 ORBO-905	custom custom	226-40	VIS
Nitric Oxide	OSHA ID 190	6	0.025	(2) molecular sieve c/w TEA + (1) oxidizer tube	ORBO-906 ORBO-905	custom custom	226-40-02 NA	IC-CD
p-Nitroaniline	NIOSH 5033	16-350	1-3	MCE filter	-----	23381	225-5	HPLC-UV
Nitrobenzene	NIOSH 2005	10-150	0.01-1	silica gel	ORBO-52S	20229	226-10	GC-FID
Nitrobenzene	NIOSH 2017	5-50	0.2	silica gel + glass fiber filter c/w H2SO4	ORBO-507 822	20870-U 20065	226-15 225-9004	GC-FID
4-Nitrobiphenyl	NIOSH 4/273	48	0.2	silica gel glass fiber filter	ORBO-502 -----	20030-U 23376	226-51 225-16	GC-FID
p-Nitrochlorobenzene	NIOSH 2005	1-150	0.01-1	silica gel	ORBO-52S	20229	226-10	GC-FID
Nitroethane	NIOSH 2526	1.5-3	0.01-0.05	XAD-2	ORBO-610	custom	226-30-02	GC-FID
Nitrogen Dioxide	EPA IP-5A			continuous luminox monitor				
Nitrogen Dioxide	EPA IP-5B			Palmes diffusion tube	-----	NA		VIS
Nitrogen Dioxide	EPA IP-5C			diffusive sampler	-----	NA		IC
Nitrogen Dioxide	NIOSH 6014	1.5-6	0.025-0.2	molecular sieve c/w TEA + oxidizer	ORBO-904 ORBO-905	custom custom	226-40	VIS
Nitrogen Dioxide	NIOSH 6700	0.25-8hr		Palmes diffusion tube	-----	NA		VIS
Nitrogen Dioxide	OSHA ID 182	3	0.2	(2) molecular sieve c/w TEA + (1) oxidizer tube	ORBO-906 ORBO-905	custom custom	226-40-02 NA	IC
Nitrogen Dioxide	OSHA ID 190	6	0.025	(2) molecular sieve c/w TEA + (1) oxidizer tube	ORBO-906 ORBO-905	custom custom	226-40-02 NA	IC-CD
Nitroglycerin	NIOSH 2507	3-100	0.2-1	Tenax	ORBO-402	20832-U	226-35-03	GC-ECD
Nitroglycerin	OSHA 43	15	1	Tenax	ORBO-402	20832-U	226-35-03	HPLC-TEA/UV
Nitromethane	NIOSH 2527	1.2-3	0.01-0.05	Chromosorb 106	ORBO-711	20059	226-111	GC-FPD
1-Nitropropane	OSHA 46	4	0.1	XAD-4	ORBO-613	20052	226-93	GC-FID
2-Nitropropane	NIOSH 2528	0.1-2	0.01-0.05	Chromosorb 106	ORBO-704	custom	226-110	GC-FID
2-Nitropropane	OSHA 46	4	0.1	XAD-4	ORBO-613	20052	226-93	GC-FID
Nitrosamines	NIOSH 2522	15-1000	0.2-2	Thermosorb/N	-----	NA	NA	GC-TEA
N-Nitrosodiamylamine (NDAMA)	OSHA 38	75	1	Thermosorb/N	-----	NA	NA	GC-TEA
N-Nitrosodibutylamine	NIOSH 2522	15-1000	0.2-2	Thermosorb/N	-----	NA	NA	GC-TEA
N-Nitrosodi-n-butylamine	OSHA 27	75	1	Thermosorb/N	-----	NA	NA	GC-TEA
N-Nitrosodiethanolamine	OSHA 31	480	2	glass fiber filter	-----	23378	225-7	GC-TEA
N-Nitrosodiethylamine	NIOSH 2522	15-1000	0.2-2	Thermosorb/N	-----	NA	NA	GC-TEA
N-Nitrosodiethylamine	OSHA 27	75	1	Thermosorb/N	-----	NA	NA	GC-TEA
N-Nitrosodi-isopropylamine (NDIPA)	OSHA 38	75	1	Thermosorb/N	-----	NA	NA	GC-TEA
N-Nitrosodimethylamine	EPA TO-7	<300	0.1-2	Thermosorb/N	-----	NA	NA	GC-MS
N-Nitrosodimethylamine	NIOSH 2522	15-1000	0.2-2	Thermosorb/N	-----	NA	NA	GC-TEA

Compound	Method	Volume Liters	Rate Liters/Min	Medium and/or Sample Collection Device	Supelco Model No.	Supelco Cat. No.	SKC Equiv	Analytical Technique
N-Nitrosodimethylamine	OSHA 27	75	1	Thermosorb/N	-----	NA	NA	GC-TEA
N-Nitrosodiphenylamine	OSHA 23	250	1	fritted bubbler	-----	64835-U	225-36-2	HPLC-UV
N-Nitrosodi-n-propylamine	OSHA 27	75	1	Thermosorb/N	-----	NA	NA	GC-TEA
N-Nitrosodipropylamine	NIOSH 2522	15-1000	0.2-2	Thermosorb/N	-----	NA	NA	GC-TEA
N-Nitrosoethyl-n-butylamine (NEBA)	OSHA 38	75	1	Thermosorb/N	-----	NA	NA	GC-TEA
N-Nitrosomethyl-n-butylamine (NMBA)	OSHA 38	75	1	Thermosorb/N	-----	NA	NA	GC-TEA
N-Nitrosomethyl-ethylamine (NMEA)	OSHA 38	75	1	Thermosorb/N	-----	NA	NA	GC-TEA
N-Nitrosomorpholine	NIOSH 2522	15-1000	0.2-2	Thermosorb/N	-----	NA	NA	GC-TEA
N-Nitrosomorpholine	OSHA 27	75	1	Thermosorb/N	-----	NA	NA	GC-TEA
N-Nitrosopiperidine	NIOSH 2522	15-1000	0.2-2	Thermosorb/N	-----	NA	NA	GC-TEA
N-Nitrosopiperidine	OSHA 27	75	1	Thermosorb/N	-----	NA	NA	GC-TEA
N-Nitroso-n-propyl-n-butylamine (NPBA)	OSHA 38	75	1	Thermosorb/N	-----	NA	NA	GC-TEA
N-Nitrosopyrrolidine	NIOSH 2522	15-1000	0.2-2	Thermosorb/N	-----	NA	NA	GC-TEA
N-Nitrosopyrrolidine	OSHA 27	75	1	Thermosorb/N	-----	NA	NA	GC-TEA
Nitrotoluene	NIOSH 2005	1-30	0.01-0.02	silica gel	ORBO-52S	20229	226-10	GC-FID
Nitrous Oxide	NIOSH 6600	80% vol		5L sampling bag	-----	24655	232-05	IR
Nitrous Oxide	OSHA ID 166			Landauer diffusive sampler				TD-IR
Non-Methane Organic Compounds	EPA TO-12			glass bead trap canister		custom NA	NA	FID
Octachloronaphthalene	NIOSH 2/S97	30	1.30	MCE filter	-----	23381	225-5	GC-ECD
Octamethylcyclo-tetrasiloxane	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
Octane	OSHA 7	5	0.1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
n-Octane	NIOSH 1500	4	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
n-Octane	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
1-Octanethiol	NIOSH 2510	1-15	0.01-0.2	Tenax	ORBO-403	20034	NA	GC-FPD
Oil Mist, Mineral	NIOSH 5026	20-500	1-3	MCE filter or glass fiber filter or PVC filter or PTFE filter	----- ----- ----- -----	23381 23378 23387 23390-U	225-5 225-7 225-8-01 225-17-07	IR
Oil of Vitriol (Sulfuric Acid)	NIOSH 7903	3-100	0.2-0.5	silica gel/glass fiber filter	ORBO-53	20265	226-10-03	IC
Organic Vapors	ASTM D3686	see method	0.001-0.2	coconut charcoal	ORBO-32S ORBO-32L	20267-U 20228	226-01 226-09	GC-FID
Organics	EPA 0040	20	0.5	Tedlar bag	-----	24656	231-15	GC-MS
Organotin Compounds (as Sn)	NIOSH 5504	50-500	1-1.5	XAD-2 glass fiber filter	ORBO-614 -----	custom 23378	226-30 225-7	HPLC-AAGF
Oxygen	NIOSH 6601	1		portable O2 monitor				sensor
Ozone	NIOSH 1/153	variable	1-2	impinger	-----	20270-U	225-36-1	colorimetric
Ozone	NIOSH 1/154	45	1	impinger	-----	20270-U	225-36-1	colorimetric
Ozone	NIOSH 2/S8		1	impinger	-----	20270-U	225-36-1	colorimetric
Ozone	OSHA ID 214	22.5-90	0.25-1.5	(2) glass fiber filter c/w $NaNO_2$, K_2CO_3, glycerol	850	custom	NA	IC-UV
PAHs – see Polynuclear Aromatic Hydrocarbons								
Palladium	NIOSH 1/173	180	1.5	MCE filter	-----	23381	225-5	AAS
Paraquat	NIOSH 5003	40-1000	1-4	PTFE filter	-----	23383	225-1710	HPLC-UV
Parathion	NIOSH 5600	12-240	0.2-1	XAD-2/quartz filter (OVS)	ORBO-49Q	custom	226-58	GC-FPD
Parathion	OSHA 62	480	1	XAD-2/glass fiber filter (OVS)	ORBO-49P	20350	226-30-16	GC-FPD
Particulate Matter, Respirable	EPA IP-10A			size specific impaction				gravimetric
Particulate Matter, Respirable	EPA IP-10B			continuous particulate monitor				gravimetric
Particulates	NIOSH 0600	20-400	1.7 or 2.2	PVC filter cyclone	----- -----	23387 NA	225-8-01	gravimetric

Compound	Method	Volume Liters	Rate Liters/Min	Medium and/or Sample Collection Device	Supelco Model No.	Supelco Cat. No.	SKC Equiv	Analytical Technique
PCBs – Aroclor 1242 (42% Cl)	NIOSH 5503	1-50	0.05-0.2	glass fiber filter Florisil	----- ORBO-60	23376 20351	225-16 226-39	GC-ECD
PCBs – Aroclor 1254 (54% Cl)	NIOSH 5503	1-50	0.05-0.2	glass fiber filter Florisil	----- ORBO-60	23376 20351	225-16 226-39	GC-ECD
Pentachlorobenzene	NIOSH 5517	3-12	0.01-0.2	XAD-2 PTFE filter	ORBO-44 -----	20260-U special order	226-30-04	GC-ECD
Pentachloroethane	NIOSH 2517	1-10	0.01-0.2	Porapak R	ORBO-1104	20064	226-59-04	GC-ECD
Pentachloronaphthalene	NIOSH 2/S96	250	1.3	glass fiber filter fritted bubbler	----- -----	23378 64835-U	225-7 225-36-2	GC-ECD
Pentachlorophenol	NIOSH 5512	48-480	0.5-1	MCE filter stainless steel screen fritted bubbler	----- ----- -----	23381 custom 64835-U	225-5 225-36-2	HPLC-UV
Pentachlorophenol	OSHA 39	48	0.2	XAD-7 XAD-7/glass fiber filter (set of 3)	ORBO-602	custom	226-97	HPLC-UV
Pentamidine Isethionate	NIOSH 5032	50-1500	1-2	PVC filter	-----	23387	225-8-01	HPLC-FL
Pentane	OSHA 7	2	0.05	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
n-Pentane	NIOSH 1500	2	0.01-0.05	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
n-Pentane	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
2-Pentanone	NIOSH 1300	1-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
2-Pentanone	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Perchloroethylene	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
Perchloroethylene in exhaled breath and air	NIOSH 3704		0.02-5	1L sampling bag	-----	24633	232-01	portable GC-PID
Perchloroethylene – see also Tetrachloroethylene								
Pesticides	ASTM D4861	240-7200	1-5	polyurethane foam (PUF)	ORBO-1000	20557	226-92	GC-ECD
Pesticides	US Air Force		0.6-1	XAD-2	ORBO-42S	20262	NA	GC-ECD or HPLC-UV
Pesticides, Organochlorine	EPA IP-8		1-5	polyurethane foam (PUF) glass fiber filter cartridge	ORBO-1000 -----	20557 21031	226-126	GC-ECD
Pesticides, Organonitrogen	NIOSH 5601	<480	0.1-1	XAD-2/glass fiber filter XAD-2/quartz filter (OVS)	ORBO-49P or ORBO-49Q	20350 custom	226-30-16 226-58	HPLC-UV
Pesticides, Organophosphorus	NIOSH 5600	12-240	0.2-1	XAD-2/quartz filter (OVS)	ORBO-49Q	custom	226-58	GC-FPD
Pesticides/PCBs	EPA TO-10A		1-5	polyurethane foam (PUF) quartz filter cartridge	ORBO-1000 -----	20557 21031	226-126	GC/ECD/NPD/FPD/MS
Pesticides/PCBs	EPA TO-4A	320,000	225	polyurethane foam (PUF)	ORBO-2000	20037	226-131	GC/ECD/NPD/FPD/MS
Petroleum Distillates (Naphtha)	NIOSH 1550	1.3-20	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Petroleum Distillates (Naphtha)	OSHA 48	3	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Petroleum Ether (Benzin)	NIOSH 1550	1.3-20	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Phenanthrene	NIOSH 5506	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	HPLC-UV/FI
Phenanthrene	NIOSH 5515	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	GC-FID
Phenanthrene	OSHA 58	960	2	glass fiber filter	-----	23378	225-7	HPLC-UV
Phenol	EPA TO-8	<80	0.1-1	NaOH absorbing solution				HPLC UV/ELCD/FI
Phenol	NIOSH 2546	1-24	0.01-0.1	XAD-7 (Supelpak 70)	ORBO-47	20349	226-95	GC-FID
Phenol	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
Phenol	OSHA 32	24	0.1	XAD-7 (Supelpak 70)	ORBO-47	20349	226-95	HPLC-UV
Phenyl Ether	NIOSH 1617	1-50	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Phenyl Ether	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Phenyl Ether – Biphenyl Mixture	NIOSH 2013	1-40	0.01-0.2	silica gel	ORBO-52S	20229	226-10	GC-FID
Phenyl Glycidyl Ether	NIOSH 1619	80-150	0.01-1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID

Compound	Method	Volume Liters	Rate Liters/Min	Medium and/or Sample Collection Device	Supelco Model No.	Supelco Cat. No.	SKC Equiv	Analytical Technique
Phenyl Glycidyl Ether	OSHA 7	50	0.1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Phenylhydrazine	NIOSH 3518	25-120	0.2-1	fritted bubbler	-----	64835-U	225-36-2	VIS
N-Phenyl-1-naphthylamine	OSHA 96	240	1	glass fiber filter c/w ascorbic acid	893	custom	NA	HPLC-FI
N-Phenyl-2-naphthylamine	OSHA 96	240	1	glass fiber filter c/w ascorbic acid	893	custom	NA	HPLC-FI
o-, m-, p-Phenylenediamine	OSHA 87	100	1	glass fiber filter c/w H2SO4	822	20065	225-9004	HPLC-UV
Phorate	NIOSH 5600	12-240	0.2-1	XAD-2/quartz filter (OVS)	ORBO-49Q	custom	226-58	GC-FPD
Phosdrin (Mevinphos)	NIOSH 5600	12-240	0.2-1	XAD-2/quartz filter (OVS)	ORBO-49Q	custom	226-58	GC-FPD
Phosgene	EPA TO-6	<50	<1	aniline in toluene absorbing solution				HPLC-UV
Phosgene	NIOSH 1/219	25-50	1	impinger	-----	20270-U	225-36-1	colorimetric
Phosgene	OSHA 61	240	1	XAD-2 c/w 2-HMP	ORBO-24	20231	226-117	GC-NPD
Phosphine	NIOSH 6002	1-16	0.01-0.2	silica gel c/w mercuric cyanide	ORBO-553	NA	NA	VIS
Phosphine	OSHA ID 180	36	0.05-0.15	carbon c/w KOH	ORBO-1004	20035	226-31	IC
Phosphoric Acid	OSHA ID 111	960	2	MCE filter	-----	23381	225-5	IC
Phosphoric acid	OSHA ID 165SG	96	0.20	silica gel/glass fiber filter	ORBO-53	20265	226-10-03	IC
m-Phosphoric Acid	NIOSH 7903	3-100	0.2-0.5	silica gel/glass fiber filter	ORBO-53	20265	226-10-03	IC
o-Phosphoric Acid	NIOSH 7903	3-100	0.2-0.5	silica gel/glass fiber filter	ORBO-53	20265	226-10-03	IC
Phosphorus	NIOSH 7300	50-2000	1-4	MCE filter	-----	23381	225-5	ICP-AES
Phosphorus	NIOSH 7905	5-100	0.01-0.2	Tenax	ORBO-402	20832-U	226-35-03	GC-FPD
Phosphorus Pentachloride	NIOSH 5/S257	48	0.2	PVC filter fritted bubbler	----- -----	custom 64835-U	225-36-2	colorimetric
Phosphorus Trichloride	NIOSH 6402	11-100	0.05-0.2	fritted bubbler	-----	64835-U	225-36-2	VIS
Phthalic Anhydride	NIOSH 3/S179	100	1.5	MCE filter	-----	23381	225-5	HPLC-UV
Phthalic Anhydride	OSHA 90	75	1	(2) glass fiber filter c/w DMBA	835	custom	NA	HPLC-UV
Picric Acid	NIOSH 4/S228	180	1.5	MCE filter	-----	23381	225-5	HPLC-UV
Pinene	NIOSH 1552	2-30	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Pinene	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
Platinum	NIOSH 7300	13-2000	1-4	MCE filter	-----	23381	225-5	ICP-AES
Polychlorinated Dibenzofurans	EPA 23			XAD-2	Supelpak 2	20279	NA	GC-MS
Polychlorinated Dibenzo-p-dioxins – see Dioxins	EPA 23			XAD-2	Supelpak 2	20279	NA	GC-MS
Polychlorobenzenes	NIOSH 5517	3-12	0.01-0.2	XAD-2 PTFE filter	ORBO-44 -----	20260-U special order	226-30-04	GC-ECD
Polychlorobiphenyls (also see PCBs)	ASTM D4861	240-7200	1-5	polyurethane foam (PUF)	ORBO-1000	20557	226-92	GC-ECD
Polycyclic Aromatic Compounds, Total (PACs)	NIOSH 5800	5-1000	1-2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	Flow injection, FI
Polymethylsiloxane Mist	NIOSH 1/227	408	1.7	MCE filter	-----	23381	225-5	AAS
Polynuclear Aromatic Hydrocarbons (PAHs)	EPA IP-7	30,000	20	polyurethane foam (PUF)	ORBO-2000	20037	226-131	GC-FID HPLC-UV
Polynuclear Aromatic Hydrocarbons	EPA TO-13A	<320,000	225	polyurethane foam (PUF) or XAD-2	ORBO-2000 Supelpak 2	20037 or 20279	226-131	GC-MS
Polynuclear Aromatic Hydrocarbons	ASTM D6209	<350,000	225	polyurethane foam (PUF) or XAD-2	ORBO-2000 Supelpak 2	20037 or 20279	226-131	GC-MS
Polynuclear Aromatic Cmpds by HPLC	NIOSH 5506	200-1000	2	XAD-2 PTFE filter	ORBO-43 or ORBO-42L -----	20258 20264-U 23390-U	226-30-04 NA 225-17-07	HPLC-UV/FI
Polynuclear Aromatic Hydrocarbons	NIOSH 5515	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	GC-FID
Polynuclear Aromatic Hydrocarbons, Selected	OSHA 58	960	2	glass fiber filter	-----	23378	225-7	HPLC-UV

Compound	Method	Volume Liters	Rate Liters/Min	Medium and/or Sample Collection Device	Supelco Model No.	Supelco Cat. No.	SKC Equiv	Analytical Technique
Portland Cement (Total Dust)	OSHA ID 207	240	1	PVC filter	-----	23387	225-8-01	gravimetric, XRF
Potassium	NIOSH 1/173	180	1.5	MCE filter	-----	23381	225-5	AAS
Potassium, K	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Potassium Hydroxide	NIOSH 7401	70-1000	1-4	PTFE filter	-----	23383	225-1710	titration
Propargyl Alcohol	OSHA 97	6	0.05	petroleum charcoal c/w HBr	ORBO-353	20044	226-38-03	GC-ECD
Propionaldehyde	NIOSH 2539	5	0.01-0.05	XAD-2 c/w 2-HMP	ORBO-23	20257-U	226-118	GC-FID
n-Propyl Acetate	NIOSH 1450	1-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
n-Propyl Acetate	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Propyl Alcohol	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
n-Propyl Alcohol	NIOSH 1401	1-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
n-Propyl Nitrate	NIOSH 3/S227	70	1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
n-Propyl Nitrate	OSHA 7	50	0.1	petroleum charcoal	ORBO-303	20040-U	226-38	GC-FID
Propylene Dichloride	NIOSH 1013	0.1-3.5	0.01-0.2	petroleum charcoal	ORBO-303	20040-U	226-38	GC-ECN
Propylene Dichloride	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Propylene Glycol	NIOSH 5523	5-60	0.5-2	XAD-7/glass fiber filter (OVS)	ORBO-47P	custom	226-57	GC-FID
Propylene Glycol Momomethyl Ethers/Acetates - see Methoxypropanols, Methoxypropyl Acetates								
Propylene Oxide	NIOSH 1612	0.5-5	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Propylene Oxide	OSHA 88	5	0.1	Carbosieve S-III (Anasorb 747)	ORBO-91	20360	226-81A	GC-FID
Prussic Acid	NIOSH 7904	7-100	0.5-1	MCE filter fritted bubbler	----- -----	23381 64835-U	225-5 225-36-2	ISE
Prussic Acid	OSHA ID 120	90-1280	1	MCE filter impinger	----- -----	23381 20270-U	225-5 225-36-1	ISE
Prussic Acid (Hydrogen Cyanide)	NIOSH 6010	2-90	0.05-0.2	soda lime	ORBO-1006	custom	226-28	VIS
Pyrene	NIOSH 5506	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	HPLC-UV/Fl
Pyrene	NIOSH 5515	200-1000	2	XAD-2 PTFE filter	ORBO-43 -----	20258 23390-U	226-30-04 225-17-07	GC-FID
Pyrene	OSHA 58	960	2	glass fiber filter	-----	23378	225-7	HPLC-UV
Pyrethrum	NIOSH 5008	20-400	1-4	glass fiber filter	-----	23378	225-7	HPLC-UV
Pyrethrum	OSHA 70	60	1	XAD-2/glass fiber filter (OVS)	ORBO-49P	20350	226-30-16	GC-ECD
Pyridine	NIOSH 1613	18-150	0.01-1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Pyridine	OSHA 7	50	1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Qualitative X-ray Fluorescence Analysis of Workplace Substances	OSHA ID 204	960	2	MCE filter PVC filter	----- -----	23381 23387	225-5 225-8-01	XRF
Quartz	OSHA ID 142	816	1.7	PVC filter 10mm nylon cyclone	----- -----	23387 NA	225-8-01	XRD
Quartz, Respirable, in Coal Dust	NIOSH 7603	300-1000	1.7 or 2.2	PVC filter	-----	23387	225-8-01	IR
Quicklime (Calcium)	NIOSH 7020	20-400	1-3	MCE filter	-----	23381	225-5	AAS
Quinone	NIOSH 4/S181	24	0.01-0.2	XAD-2	ORBO-605	20049	NA	HPLC-UV
Reactive Acidic and Basic Gases and Particulate Matter	EPA IP-9			annular denuder system				IC
Resorcinol	NIOSH 5701	5-160	0.2-1	XAD-7/glass fiber filter (OVS)	ORBO-47P	custom	226-57	GC-FID
Rhodium, Metal, Fumes & Dust	NIOSH 3/S188	720	1.5	MCE filter	-----	23381	225-5	AAS
Rhodium, Soluble Salts	NIOSH 3/S189	370	1.5	MCE filter	-----	23381	225-5	AAGF
Ribavirin	NIOSH 5027	5-1000	1-4	glass fiber filter	-----	23378	225-7	HPLC-UV
Ronnel	NIOSH 5600	12-60	0.2-1	XAD-2/quartz filter (OVS)	ORBO-49Q	custom	226-58	GC-FPD
Rotenone	NIOSH 5007	8-400	1-4	PTFE filter	-----	23383	225-1710	HPLC-UV
Rubidium	NIOSH 1/173	180	1.5	MCE filter	-----	23381	225-5	AAS

Compound	Method	Volume Liters	Rate Liters/Min	Medium and/or Sample Collection Device	Supelco Model No.	Supelco Cat. No.	SKC Equiv	Analytical Technique
Selenium	NIOSH 7300	5-2000	1-4	MCE filter	-----	23381	225-5	ICP-AES
Selenium	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Semivolatiles	EPA 0010			glass fiber filter XAD-2	----- Supelpak 2	custom 20279	NA	GC-MS
Semivolatiles (SASS)	EPA 0020			glass fiber filter XAD-2	----- Supelpak 2	custom 20279	NA	GC-MS
Sevin	NIOSH 5006	20-400	1-3	glass fiber filter	-----	23378	225-7	VIS
Sevin	OSHA 63	60	1	XAD-2/glass fiber filter (OVS)	ORBO-49P	20350	226-30-16	HPLC-UV
Silica, Amorphous	NIOSH 7501	50-400	1.7 or 2.2	PVC filter	-----	23387	225-8-01	XPD
Silica, Crystalline	NIOSH 7601	400-800	1.7 or 2.2	MCE filter or PVC filter + 10mm nylon cyclone	----- ----- -----	23381 23387 NA	225-5 225-8-01	VIS
Silica, Crystalline	NIOSH 7602	400-800	1.7 or 2.2	MCE filter or PVC filter + 10mm nylon cyclone	----- ----- -----	23381 23387 NA	225-5 225-8-01	IR
Silica, Crystalline, Respirable	NIOSH 7500	400-1000	1.7 or 2.2	PVC filter	-----	23387	225-8-01	XPD
Silica (Quartz, Respirable) also see Quartz	OSHA ID 142	816	1.7	PVC filter	-----	23387	225-8-01	XRD
Silica, Quartz, in Coal Dust	NIOSH 7603	300-1000	1.7 or 2.2	PVC filter	-----	23387	225-8-01	IR
Silicon	NIOSH 1/173	180	1.5	MCE filter	-----	23381	225-5	AAS
Silver	NIOSH 7300	250-2000	1-4	MCE filter	-----	23381	225-5	ICP-AES
Silver (as Ag)	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Sodium Azide	OSHA ID 211	>5	1.0	silica gel c/w NaOH PVC filter	ORBO-560 -----	custom 23387	226-55 225-8-01	IC-UV
Sodium Dichloroisocyanurate Dihyrate	NIOSH 5/314	400	1.7	PVC filter	-----	23387	225-8-01	titration
Sodium Fluoride	NIOSH 7902	12-800	1-2	MCE filter + support pad c/w Na2CO3	845	custom	225-9005 225-9001	ISE
Sodium Fluoroacetate	NIOSH 5/S301	480	1.5-2	Nucleopore cellulosic membrane	-----	special order		IC-ELCD
Sodium Hexafluoroaluminate	NIOSH 7902	12-800	1-2	MCE filter + support pad c/w Na2CO3	845	custom	225-9005 225-9001	ISE
Sodium Hexafluoroaluminate	NIOSH 7906	120-800	1-2	MCE filter + support pad c/w Na2CO3	845	custom	225-9005 225-9001	IC
Sodium Hydroxide	NIOSH 7401	70-1000	1-4	PTFE filter	-----	23383	225-1710	titration
Sodium Hydroxide	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Sodium Polyacrylate	NIOSH 5035	50-1500	1-3	PVC filter	-----	23387	225-8-01	ICP-AES or AAS
Solder Metals	OSHA ID 206	480	2	MCE filter	-----	23381	225-5	ICP-AES
Stibine	NIOSH 6008	4-50	0.01-0.2	silica gel c/w mercuric chloride	ORBO-551	custom	226-10-02	VIS
Stoddard Solvent	NIOSH 1550	1.3-20	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Stoddard Solvent	OSHA 48	3	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Strychnine	NIOSH 5016	70-1000	1-3	glass fiber filter	-----	23378	225-7	HPLC-UV
Styrene (Phenylethylene)	OSHA 9	10-15	0.2-1.0	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Styrene	NIOSH 1501	1-14	0.01-1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Styrene	OSHA 89	12	0.05	charcoal c/w TBC	ORBO-356	20047	NA	GC-FID
Styrene Oxide	NIOSH 5/303	13	0.01-0.2	Tenax	ORBO-406	custom	226-35-06	GC-FID
Sulfur Dioxide	NIOSH 6004	4-200	0.5-1.5	MCE filter + support pad c/w Na2CO3	845	custom	225-9005 225-9001	IC
Sulfur Dioxide	OSHA ID 104	15-60	1	MCE filter fritted bubbler	----- -----	23381 64835-U	225-5 225-36-2	IC
Sulfur Dioxide	OSHA ID 200	1.5-12	0.1	carbon c/w KOH	ORBO-1010	custom	226-80	IC
Sulfur Hexafluoride	NIOSH 5/S244	3-4	0.01-0.05	5L sampling bag	-----	24655	232-05	GC-TCD
Sulfur Hexafluoride	NIOSH 6602	80% vol	0.01-0.05	5L sampling bag	-----	24655	232-05	GC-ECD
Sulfuric Acid	NIOSH 7903	3-100	0.2-0.5	silica gel/glass fiber filter	ORBO-53	20265	226-10-03	IC
Sulfuric Acid	OSHA ID 113	480	2	MCE filter	-----	23381	225-5	IC
Sulfuric Acid	OSHA ID 165SG	96	0.20	silica gel/glass fiber filter	ORBO-53	20265	226-10-03	IC
Sulfuric Acid Mist	ASTM D4856	40	1	MCE filter	-----	23381	225-5	IC

Compound	Method	Volume Liters	Rate Liters/Min	Medium and/or Sample Collection Device	Supelco Model No.	Supelco Cat. No.	SKC Equiv	Analytical Technique
Sulfuryl Fluoride	NIOSH 6012	1.3-10	0.05-0.1	coconut charcoal	ORBO-32J	custom	226-16	IC
Sulprofos	NIOSH 5600	12-240	0.2-1	XAD-2/quartz filter (OVS)	ORBO-49Q	custom	226-58	GC-FPD
Super Absorbent Polymers	NIOSH 5035	50-1500	1-3	PVC filter	-----	23387	225-8-01	ICP-AES or AAS
2,4,5-T	NIOSH 5001	15-200	1-3	glass fiber filter	-----	23378	225-7	HPLC-UV
Talc, Respirable	NIOSH 355 2nd ed. update	200	1.7	PVC filter 10mm nylon cyclone	----- -----	23387 NA	225-8-01	XRD
Tellurium	NIOSH 7300	25-2000	1-4	MCE filter	-----	23381	225-5	ICP-AES
Tellurium	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Tellurium Hexafluoride	NIOSH 3/S187	400	1	coconut charcoal	ORBO-32S	20267-U	226-01	AAS
Temik	OSHA 74	480	1	XAD-2/glass fiber filter (OVS)	ORBO-49P	20350	226-30-16	GC-NPD
Terbufos	NIOSH 5600	12-240	0.2-1	XAD-2/quartz filter (OVS)	ORBO-49Q	custom	226-58	GC-FPD
Terpenes	NIOSH 1552	2-30	0.01-2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
o-Terphenyl	NIOSH 5021	2-30	1-3	PTFE filter	-----	23390-U	225-17-07	GC-FID
1,1,2,2-Tetra-bromoethane	NIOSH 2003	50-100	0.2-1	silica gel	ORBO-52S	20229	226-10	GC-FID
Tetrabutyltin	NIOSH 5504	50-500	1-1.5	XAD-2 glass fiber filter	ORBO-614 -----	custom 23378	226-30 225-7	HPLC-AAGF
1,2,4,5-Tetrachlorobenzene	NIOSH 5517	3-12	0.01-0.2	XAD-2 PTFE filter	ORBO-44 -----	20260-U special order	226-30-04	GC-ECD
1,1,1,2-Tetrachloro-2,2-difluoroethane	NIOSH 1016	0.5-2	0.01-0.035	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
1,1,1,2-Tetrachloro-2,2-difluoroethane	OSHA 7	2	0.05	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
1,1,2,2-Tetrachloro-1,2-difluoroethane	NIOSH 1016	0.5-2	0.01-0.035	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
1,1,2,2-Tetrachloro-1,2-difluoroethane	OSHA 7	2	0.05	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
1,1,2,2-Tetrachloroethane	NIOSH 1019	3-30	0.01-0.2	petroleum charcoal	ORBO-303	20040-U	226-38	GC-FID
1,1,2,2-Tetrachloroethane	OSHA 7	10	0.2	petroleum charcoal	ORBO-303	20040-U	226-38	GC-FID
Tetrachloroethylene (Perchloroethylene)	NIOSH 1003	0.2-40	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Tetrachloroethylene	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Tetrachloronaphthalene	NIOSH 2/S130	100	1.3	glass fiber filter fritted bubbler	----- -----	23378 64835-U	225-7 225-36-2	GC-FID
2,3,4,6-Tetrachlorophenol	OSHA 45	48	0.2	XAD-7 XAD-7/glass fiber filter (set of 3)	ORBO-602	custom	226-97	HPLC-UV
Tetraethyl Lead	NIOSH 2533	30-200	0.01-1	XAD-2	ORBO-605	20049	NA	GC-PID
Tetraethyl Pyrophosphate	NIOSH 2504	20-48	0.01-0.2	(2) Chromosorb 102	ORBO-707	custom	226-105	GC-FPD
Tetraethyltin	OSHA 110	3-48	0.2	XAD-7 (Supelpak 70)	ORBO-47	20349	226-95	GC-FID
Tetraethylene Glycol	NIOSH 5523	5-60	0.5-2	XAD-7/glass fiber filter (OVS)	ORBO-47P	custom	226-57	GC-FID
Tetrahydrofuran	NIOSH 1609	1-9	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Tetrahydrofuran	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Tetramethyl Lead (as Pb)	NIOSH 2534	15-100	0.01-0.2	XAD-2	ORBO-609	20051	226-30-06	GC-PID
Tetramethylper-oxidicarbonicdiamide (Thiram)	NIOSH 5005	10-400	1-4	PTFE filter	-----	23383	225-1710	HPLC-UV
Tetramethyl Succinonitrile	NIOSH 3/S155	50	1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Tetramethyl Succinonitrile	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Tetramethyl Thiourea	NIOSH 3505	50-250	0.2-1	impinger	-----	20270-U	225-36-1	VIS

Compound	Method	Volume Liters	Rate Liters/Min	Medium and/or Sample Collection Device	Supelco Model No.	Supelco Cat. No.	SKC Equiv	Analytical Technique
Tetranitromethane	NIOSH 3/S224	250	1	impinger	-----	20270-U	225-36-1	GC-FID
Tetranitromethane	NIOSH 3513	20-250	0.5-1	impinger	-----	20270-U	225-36-1	GC-FID
Tetryl (2,4,6-trinitrophenyl-methylnatramine)	NIOSH 3/S225	100	1.5	MCE filter	-----	23381	225-5	VIS
Thallium	NIOSH 7300	25-2000	1-4	MCE filter	-----	23381	225-5	ICP-AES
Thallium (as Tl)	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Thiophene	NIOSH 1/255	70	1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FPD
Thiram	NIOSH 5005	10-400	1-4	PTFE filter	-----	23383	225-1710	HPLC-UV
Tin (as Sn), Tin Oxide	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Tin (Organic Compounds)	NIOSH 5504	50-500	1-1.5	XAD-2 glass fiber filter	ORBO-614 -----	custom 23378	226-30 225-7	HPLC-AAGF
Titanium	NIOSH 7300	5-100	1-4	MCE filter	-----	23381	225-5	ICP-AES
Titanium Diboride	NIOSH 6/323	500	1.7	PVC filter	-----	23387	225-8-01	XRD
Titanium Dioxide	NIOSH 3/S385	100	1.5	MCE filter	-----	23381	225-5	AAS
o-Tolidine	NIOSH 5013	150-500	1-3	PTFE filter	-----	23389	225-17	HPLC-UV
o-Tolidine	OSHA 71	100	1	glass fiber filter c/w H2SO4	822	20065	225-9004	GC-ECD
Toluene	NIOSH 1500	2-8	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Toluene	NIOSH 1501	1-8	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Toluene	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
Toluene	NIOSH 4000	15m-8h		3M #3500 diffusive sampler	-----	20249-U		GC-FID
Toluene	OSHA 111	12	0.05	coconut charcoal or Carbosieve SIII (Anasorb 747) or 3M #3520 diffusive sampler	ORBO-32S ORBO-91 -----	20267-U 20360 207121	226-01 226-81A 575-002	GC-FID
Toluene	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
2,4-Toluenediamine	NIOSH 5516	30-500	1	impinger	-----	20270-U	225-36-1	HPLC-UV
2,4-Toluenediamine	OSHA 65	100	1	glass fiber filter c/w H2SO4	822	20065	225-9004	GC-ECD
2,6-Toluenediamine	NIOSH 5516	30-500	1	impinger	-----	20270-U	225-36-1	HPLC-UV
2,6-Toluenediamine	OSHA 65	100	1	glass fiber filter c/w H2SO4	822	20065	225-9004	GC-ECD
2,4-Toluene Diisocyanate (TDI)	ASTM D5836	15	1	glass fiber filter c/w 1-2PP	ORBO-80	20811	225-9002	HPLC-UV
2,4-Toluene Diisocyanate (TDI)	OSHA 42	15	1	glass fiber filter c/w 1-2PP	ORBO-80	20811	225-9002	HPLC-UV
Toluene-2,4-diisocyanate	NIOSH 5522	15-380	1-2	impinger	-----	20270-U	225-36-1	HPLC-FL
Toluene-2,4-diisocyanate (TDI)	NIOSH 2535	2-170	0.2-1	glass wool c/w NPMPA	ORBO-1007	custom	special order	HPLC-UV
Toluene-2,4-diisocyanate (TDI)	NIOSH 5521	5-500	1	impinger	-----	20270-U	225-36-1	HPLC-UV ELCD
2,6-Toluene Diisocyanate (TDI)	ASTM D5836	15	1	glass fiber filter c/w 1-2PP	ORBO-80	20811	225-9002	HPLC-UV
2,6-Toluene Diisocyanate (TDI)	OSHA 42	15	1	glass fiber filter c/w 1-2PP	ORBO-80	20811	225-9002	HPLC-UV
Toluene-2,6-diisocyanate	NIOSH 5521	5-500	1	impinger	-----	20270-U	225-36-1	HPLC-UV ELCD
Toluene-2,6-diisocyanate	NIOSH 5522	15-380	1-2	impinger	-----	20270-U	225-36-1	HPLC-FL
p-Toluenesulfonic Acid	NIOSH 5043	10-1000	1-3	glass fiber filter	-----	23376	225-16	HPLC-UV
m-Toluidine	OSHA 73	100	1	glass fiber filter c/w H2SO4	822	20065	225-9004	GC-ECD
o-Toluidine	NIOSH 2002	10-150	0.02-1	silica gel	ORBO-52S	20229	226-10	GC-FID
o-Toluidine	NIOSH 2017	5-50	0.2	silica gel + glass fiber filter c/w H2SO4	ORBO-507 822	20870-U 20065	226-15 225-9004	GC-FID
o-Toluidine	OSHA 73	100	1	glass fiber filter c/w H2SO4	822	20065	225-9004	GC-ECD
p-Toluidine	OSHA 73	100	1	glass fiber filter c/w H2SO4	822	20065	225-9004	GC-ECD
Tremolite Fibers	NIOSH 7400	400-	0.5-16	MCE filter	-----	23380-U	225-19	PCM
Tribromomethane	NIOSH 1003	4-70	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Tributyl Phosphate	NIOSH 5034	2-100	1-3	MCE filter	-----	23381	225-5	GC-FPD
Tributyltin Chloride	NIOSH 5504	50-500	1-1.5	XAD-2 glass fiber filter	ORBO-614 -----	custom 23378	226-30 225-7	HPLC-AAGF
1,2,4-Trichlorobenzene	NIOSH 5517	3-12	0.01-0.2	XAD-2 PTFE filter	ORBO-44 -----	20260-U special order	226-30-04	GC-ECD
1,1,1-Trichloroethane	NIOSH 1003	0.1-8	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID

Compound	Method	Volume Liters	Rate Liters/Min	Medium and/or Sample Collection Device	Supelco Model No.	Supelco Cat. No.	SKC Equiv	Analytical Technique
1,1,1-Trichloroethane	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
1,1,1-Trichloroethane	OSHA 14	3	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
1,1,2-Trichloroethane	NIOSH 1003	2-60	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
1,1,2-Trichloroethane	OSHA 11	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Trichloroethylene	NIOSH 1022	1-30	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Trichloroethylene	NIOSH 3701	<80% vol	0.02-0.05	5L sampling bag	-----	24655	232-05	GC-PID
Trichloroethylene	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Trichlorofluoromethane	NIOSH 1006	0.3-7	0.01-0.05	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Trichloroisocyanuric Acid	NIOSH 5/314	400	1.7	PVC filter	-----	23387	225-8-01	titration
Trichloronaphthalene	NIOSH 2/S128	100	1.3	glass fiber filter fritted bubbler	----- -----	23378 64835-U	225-7 225-36-2	GC-FID
1,2,3-Trichloropropane	NIOSH 1003	0.6-60	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
1,2,3-Trichloropropane	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon113)	NIOSH 1020	0.1-3	0.01-0.05	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon113)	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	OSHA 113	1	0.05	(2) Carbosieve S-III (Anasorb CMS)	ORBO-91	20360	226-121	GC-FID
Tricyclohexyltin Hydroxide	NIOSH 5504	50-500	1-1.5	XAD-2 glass fiber filter	ORBO-614 -----	custom 23378	226-30 225-7	HPLC-AAGF
Triethanolamine	NIOSH 3509	5-300	0.5-1	impinger	-----	20270-U	225-36-1	IC
Triethylamine	NIOSH 3/S152	100	1	fritted bubbler	-----	64835-U	225-36-2	GC-FID
Triethylene Glycol	NIOSH 5523	5-60	0.5-2	XAD-7/glass fiber filter (OVS)	ORBO-47P	custom	226-57	GC-FID
Triethylenetetramine (TETA)	NIOSH 2540	1-20	0.01-0.1	XAD-2 c/w 10% NITC	ORBO-654	custom	226-30-18	HPLC-UV
Triethylenetetramine (TETA)	OSHA 60	10	0.1	XAD-2 c/w 10% NITC	ORBO-654	custom	226-30-18	HPLC-UV
Trifluorobromomethane	NIOSH 1017	0.1-1	0.01-0.05	(2) coconut charcoal	ORBO-32S + ORBO-32L	20267-U 20228	226-01 226-09	GC-FID
Trimellitic Anhydride	NIOSH 5036	400-1000	1.5-2	37mm PVC-copolymer filter 0.8um	-----	special order		GC-FID
Trimellitic Anhydride	OSHA 98	480	2	glass fiber filter c/w DMBA & DOP	894	custom	225-9010	HPLC-UV
2,4,7-Trinitrofluoren-9-one	NIOSH 5018	100-500	1-3	PTFE filter	-----	special order	225-17-04	HPLC-UV
2,4,6-Trinitrotoluene (TNT)	OSHA 44	60	1	Tenax/glass fiber filter	ORBO-79	custom	NA	GC-TEA
Triorthocresyl Phosphate	NIOSH 5037	2-100	1-3	MCE filter	-----	23381	225-5	GC-FPD
Triphenyl Phosphate	NIOSH 5038	10-400	1-3	MCE filter	-----	23381	225-5	GC-FPD
Tungsten	OSHA ID 213	30-480	2	MCE filter	-----	23381	225-5	ICP-AES
Tungsten, Insoluble	NIOSH 7074	200-1000	1-4	MCE filter	-----	23381	225-5	AAS
Tungsten, Soluble	NIOSH 7074	200-1000	1-4	MCE filter	-----	23381	225-5	AAS
Turpentine	NIOSH 1551	1-10	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Turpentine	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
V M & P Naphtha	NIOSH 1550	1.30-20	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Valeraldehyde	NIOSH 2536	0.5-10	0.01-0.04	XAD-2 c/w 2-HMP	ORBO-23	20257-U	226-118	GC-FID
Valeraldehyde	NIOSH 2539	5	0.01-0.05	XAD-2 c/w 2-HMP	ORBO-23	20257-U	226-118	GC-FID
Valeraldehyde	OSHA 85	3	0.05	glass fiber filter c/w DNPH	827	20069	225-9003	HPLC-UV
Vanadic Anhydride	NIOSH 7504	200-1000	1.7 or 2.2	PVC filter	-----	23387	225-8-01	XPD
Vanadic Oxide	NIOSH 7504	200-1000	1.7 or 2.2	PVC filter	-----	23387	225-8-01	XPD
Vanadium	NIOSH 7300	5-2000	1-4	MCE filter	-----	23381	225-5	ICP-AES
Vanadium (V205) Dust (as V)	OSHA ID 125G	480	2	MCE filter	-----	23381	225-5	ICP-AES

Compound	Method	Volume Liters	Rate Liters/Min	Medium and/or Sample Collection Device	Supelco Model No.	Supelco Cat. No.	SKC Equiv	Analytical Technique
Vanadium (V205) Fume (as V)	OSHA ID 125G	480	2	MCE filter	-----	23381	225-5	ICP-AES
Vanadium Oxides	NIOSH 7504	200-1000	1.7 or 2.2	PVC filter	-----	23387	225-8-01	XPD
Vanadium Pentoxide	OSHA ID 185	816	1.7	PVC filter	-----	23387	225-8-01	XRF/XRD
Vinyl Acetate	NIOSH 1453	0.085-24	0.1-0.2	Carboxen 564	ORBO-92	20362	NA	GC-FID
Vinyl Acetate	OSHA 51	24	0.1	Carboxen 564	ORBO-92	20362	NA	GC-FID
Vinyl Benzene (Styrene)	NIOSH 1501	1-14	0.01-1	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Vinyl Bromide	NIOSH 1009	2-10	0.01-0.2	coconut charcoal	ORBO-32L	20228	226-09	GC-FID
Vinyl Bromide	OSHA 8	5	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Vinyl Chloride	ASTM D4766	25	0.05-0.1	coconut charcoal	ORBO-32J	custom	226-16	GC-FID
Vinyl Chloride	NIOSH 1007	0.7-5	0.05	(2) coconut charcoal	ORBO-301	20039	NA	GC-FID
Vinyl Chloride	OSHA 75	3	0.05	Carbosieve S-III	ORBO-91	20360	226-121	GC-FID
Vinyl Toluene	NIOSH 1501	24	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Vinyl Toluene	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Vinylidene Chloride (1,1-Dichloroethene)	NIOSH 1015	2.5-7	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Vinylidene Chloride	OSHA 19	3	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
Volatile Organic Compounds (VOST)	EPA 0030	20	1	Tenax + Tenax/charcoal	VOST 100 + VOST 200	20074-U 20075-U	226-134 226-135	GC-MS
Volatile Organic Compounds (VOST)	EPA 0031	20	1	(2) Tenax + (1) Carbosieve S-III (Anasorb 747)	VOST 100 + VOST 150	20074-U custom	226-134 226-133	GC-MS
Volatile Organic Compounds (VOCs)	EPA IP-1A			canister	-----	NA	NA	GC-MS
Volatile Organic Compounds (VOCs)	EPA IP-1B	17-23	0.02-0.06	3-bed thermal desorption tube	Carbotrap 300	20379		TD-GC/MS
Volatile Organic Compounds (VOCs)	EPA TO-1	varies		3-bed thermal desorption tube	Carbotrap 300	20379		GC-MS
Volatile Organic Compounds (VOCs)	EPA TO-2	20-100	0.020-0.5	3-bed thermal desorption tube	Carbotrap 300	20379		GC-MS
Volatile Organic Compounds (VOCs)	EPA TO-3	0.1-1	0.01-0.1	3-bed thermal desorption tube	Carbotrap 300	20379		GC/ECD/FID
Volatile Organic Compounds (VOCs)	EPA TO-14			canister	-----	NA	NA	GC-MS or NPD/FID/ECD/ PID
Volatile Organic Compounds (VOCs)	EPA TO-15		0.0035-0.007	canister focusing trap	----- Purge Trap H	NA 20321	NA NA	GC-MS
Volatile Organic Compounds (VOCs)	EPA TO-16			FTIR and other remote sensing instruments				FTIR
Volatile Organic Compounds (VOCs)	EPA TO-17	1 & 4	0.01-0.2	multi-bed thermal desorption tube	Carbotrap 217 Carbotrap 317 Air Toxics Air Toxics Carbotrap 300 Carbotrap 300	20895-U 20877 25086 25051 25085 25050		TD-GC/MS
Volatile Organic Compounds (VOCs)	ASTM D6196	<10	<0.2	multi-bed thermal desorption tube	Carbotrap 217 Carbotrap 317 Air Toxics Air Toxics Carbotrap 300 Carbotrap 300	20895-U 20877 25086 25051 25085 25050		TD-GC/MS
Volatile Organic Compounds (VOCs)	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243		TD-GC/MS
Warfarin	NIOSH 5002	200-1000	1-4	PTFE filter	-----	23383	225-1710	HPLC-UV
Welding Fumes	OSHA ID 125G	480	2	MCE filter	-----	23381	225-5	ICP-AES

Compound	Method	Volume Liters	Rate Liters/Min	Medium and/or Sample Collection Device	Supelco Model No.	Supelco Cat. No.	SKC Equiv	Analytical Technique
Xylene	NIOSH 2549	1-6	0.01-0.05	3-bed thermal desorption tube	Carbotrap 349	20243	NA	TD-GC/MS
Xylene	OSHA 7	10	0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
m-Xylene	NIOSH 1501	2-23	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
o-Xylene	NIOSH 1501	2-23	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
p-Xylene	NIOSH 1501	2-23	0.01-0.2	coconut charcoal	ORBO-32S	20267-U	226-01	GC-FID
m-Xylene-α,α'-diamine	OSHA 105	15	1	glass fiber filter c/w H2SO4	822	20065	225-9004	HPLC-UV
p-Xylene-α,α'-diamine	OSHA 105	15	1	glass fiber filter c/w H2SO4	822	20065	225-9004	HPLC-UV
2,4-Xylidine	NIOSH 2002	3-20	0.02-0.2	silica gel	ORBO-52S	20229	226-10	GC-FID
Yttrium	NIOSH 7300	5-1000	1-4	MCE filter	-----	23381	225-5	ICP-AES
Zinc, Zinc Compounds (as Zn)	NIOSH 7030	2-400	1-3	MCE filter	-----	23381	225-5	AAS
Zinc, Zinc Compounds (as Zn)	NIOSH 7300	5-200	1-4	MCE filter	-----	23381	225-5	ICP-AES
Zinc, Zinc Compounds (as Zn)	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Zinc, Zinc Compounds (as Zn)	OSHA ID 125G	480	2	MCE filter	-----	23381	225-5	ICP-AES
Zinc Chloride Fume	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Zinc Oxide	NIOSH 7502	10-400	1-3	PVC filter	-----	special order		XPD
Zinc Oxide	OSHA ID 143	30-960	2	PVC filter	-----	23387	225-8-01	XRD
Zineb	OSHA 107	500	2	MCE filter	-----	23380-U	225-19	HPLC-UV
Zirconium	NIOSH 7300	5-200	1-4	MCE filter	-----	23381	225-5	ICP-AES
Zirconium	OSHA ID 121	480-960	2	MCE filter	-----	23381	225-5	AAS
Zirconium Oxides	NIOSH 4/250	90	1.7	PVC filter	-----	23387	225-8-01	XRD

If you have questions concerning this guide, please contact our Technical Service specialists. For additional method information, visit the agency websites listed below.

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Syringes

for Chromatographic & Analytical Applications



Autosampler Syringes

Manual Syringes

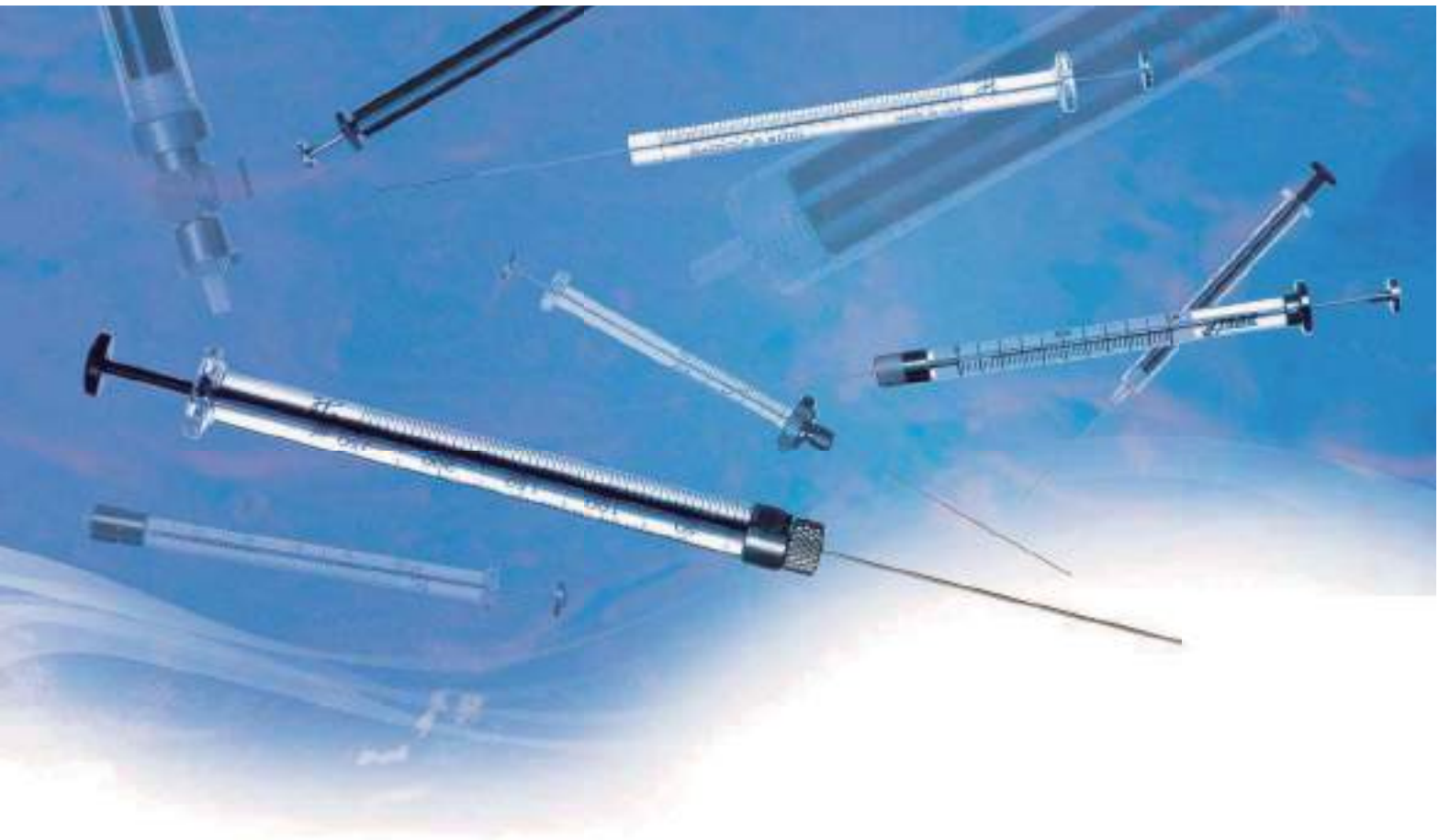
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Look to Sigma-Aldrich for High-Quality Syringes for Chromatography and Other Analytical Applications

Like vials and other components that come in contact with the sample, syringes can be a critical component of a successful analysis. The right choice of syringe is vital to ensure proper fit and operation within the instrument, accurate and precise injections, and long functional lifetime. An incorrect or poor quality syringe can damage the instrument and cause downtime. Structurally, syringes must ensure a tight and secure fit in the injection port and withstand repeated injection cycles without bending or breaking. Compositionally, they must be able to withstand chemical and mechanical forces within a defined range. Chemically, they must be inert and not introduce extraneous, interfering compounds into the sample. Syringes also must deliver accurate and precise volumes with no dead volume or carryover between injections.

All Major Syringe Brands

Supelco not only supplies high-quality analytical syringes, we use them! Chemists in our R&D, Applications, and Quality Control departments rely on HPLC, GC, headspace, and purge & trap syringes for exactly the same reasons as you do: accuracy, precision, ruggedness, and instrument compatibility. The syringes we list in this brochure have been selected for quality and seamless integration with today's analytical instruments. We carry the popular and high-quality Hamilton, SGE and VICI® Precision Sampling analytical gas and liquid syringes and accessories. The selection of brands gives you choices based on the product offering, application relevance, instrument compatibility, and personal preference. We continually work with our customers, suppliers, and instrument manufacturers to make sure our syringe line stays up-to-date. As with all of our products, they are backed by Sigma-Aldrich's commitment to innovation, quality, and service.

Sigma-Aldrich is Dedicated to Complete Customer Satisfaction

Although this catalog contains select syringes, all SGE, Hamilton or VICI Precision Sampling syringe products are available from Supelco. If you want a syringe or accessory that does not appear in this catalog, we will gladly supply it for you. We can also obtain syringes with different terminations, needle styles or lengths. Custom orders follow the same prompt delivery and competitive pricing as our stocked products.

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Choosing a Syringe

Guidelines and Factors to Consider

The fact that we've dedicated an entire brochure to syringes testifies to the large number of syringes that are available. Choosing from among them can be confusing. From our experience, here are some guidelines we've put together to help make the choice easier.

1. Are you using an autosampler?

- If yes, then go directly to the section in this brochure that lists the major autosamplers. We've simplified your choice by listing the right syringe for each autosampler. The major difference is the format of the plunger.

2. Are you doing manual HPLC injection using a Rheodyne or Waters U6K valve?

- If yes, then go directly to Page 28. We've chosen the best syringes for these valves.

3. Do you have a preferred manufacturer?

- If yes, then refer to the sections in this brochure that describe the analytical syringes carried by Hamilton, SGE and Valco VICI.

4. The important syringe parameters that you have to choose between include:

- Manufacturer (often a matter of personal preference)
- Volume range
- Termination – the interface between the syringe and its mating connection, usually a needle. Syringe manufacturers have their own nomenclature.
  - Cemented (fixed) – economical, autosamplers, one syringe-one method
  - Luer tip or Luer-Lok™ – syringe filter or pump priming
  - Removable needle – one syringe-many methods
  - Knurled hub
  - SampleLock™ (Hamilton) or Pressure-Lok® (VICI) – collect and store volatile samples
- Needles
  - Point style (styles 2 and 3 are common)
  - Gauge (22, 23, 26 and 23-26 dual taper are common)
  - Length (depends on application, ~2" is common)
- Special features
  - Attachments and other features that increase the ruggedness of the syringe
  - Guides that permit better sample repeatability (e.g. Chaney adapters)
  - Accommodations for extremely small volumes (e.g. SGE's Needle-in-Plunger option)
  - Application-specific features

5. Guiding the selection of syringe parameters are three user-related areas:

- Sample type
- Volume range
- Application

6. Type of sample

- Syringes suitable for both gas and liquid applications typically have a PTFE plunger tip that forms a gas tight fit with the syringe barrel. The PTFE tip scrapes sample from the barrel, like a spatula.
- Syringe for liquid only are manufactured using a hand-fitted plunger and a barrel with tight tolerances for inside diameter.
- For viscous or heterogenous samples, Hamilton Gastight and SGE Gas Tight syringes are recommended to avoid seizing a fitted plunger.

7. Sample volume

- Although syringe designs differ, it is recommended that the smallest injectable volume from a syringe be no less than 20% of its total volume. The smallest dispensing volume should be no less than 10% of the total volume.
- Refer to the sections in this brochure that describe the analytical syringes carried by Hamilton, SGE and Valco VICI. The sections list volume ranges for each syringe model.

8. Application

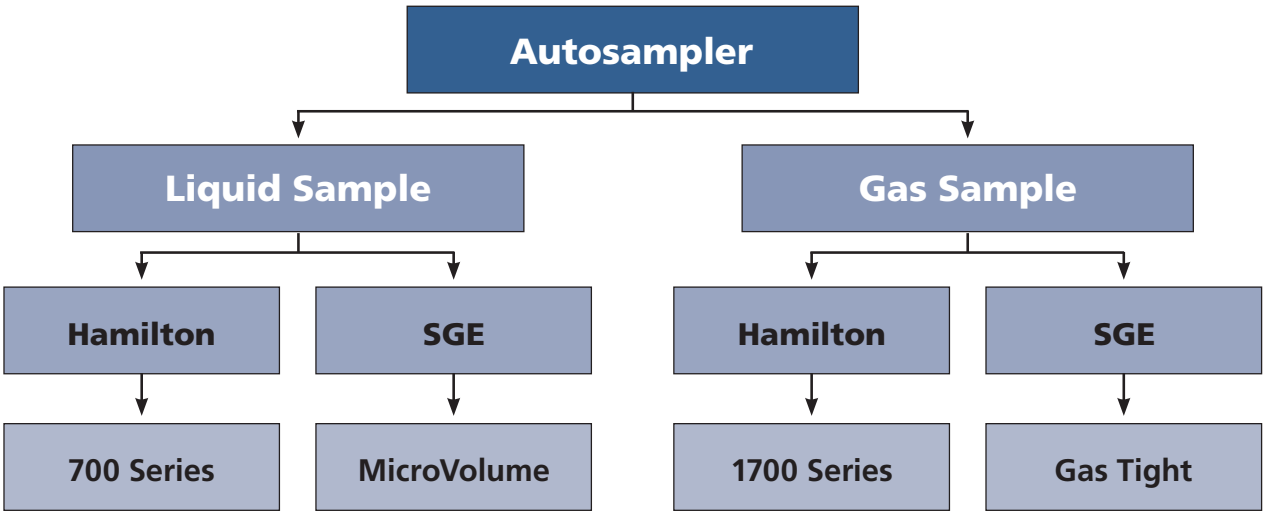
It is impossible to recommend syringes for all possible analytical applications. Some general guidelines follow.

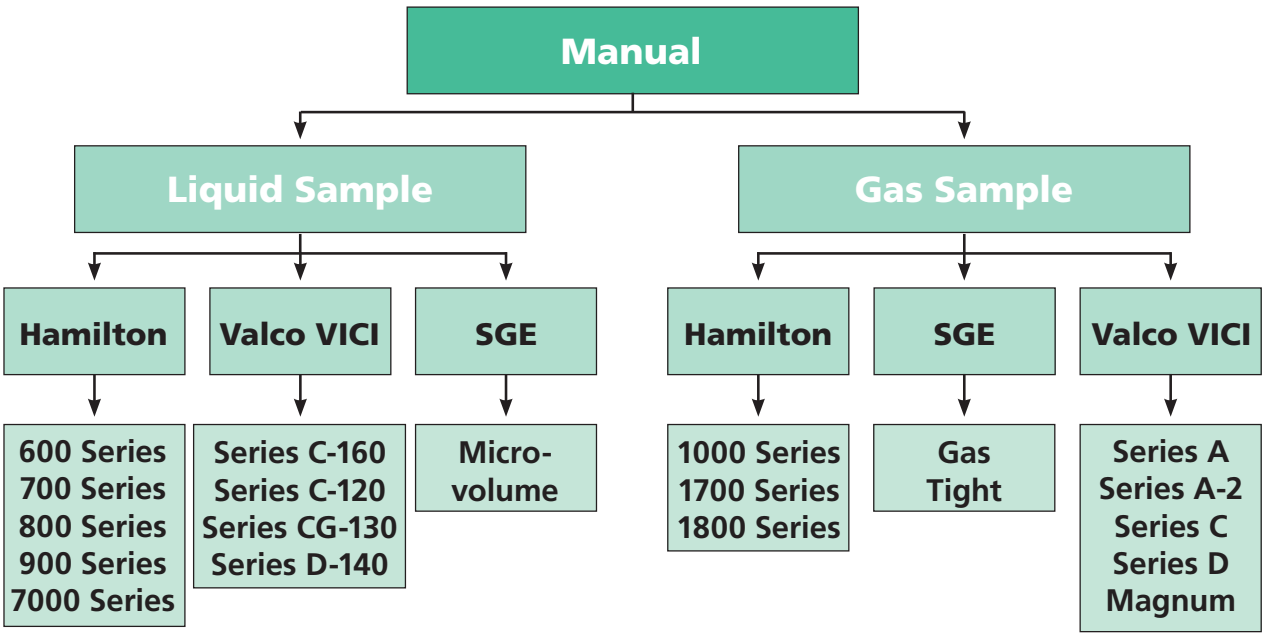
- Head space sampling
  - Environmental sample collection and storage
  - SampleLock (Hamilton) or Pressure-Lok® (VICI) are ideal
- Extremely small samples (< 1 µL)
  - Choose from several styles, including SGE's Needle-in-Plunger option
- Teaching laboratories or novice users
  - Economical syringes with ruggedness as a design feature
  - SGE SuperFlex™ design
- Multiple, rapid manual injections
  - Syringes with guides and/or reinforced plungers
  - SGE guided plunger or plunger protection syringes
- Field use, dirty samples
  - Removable, replaceable needles

Still can't decide what you need?

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Generalized Decision Trees for Syringe Selection





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Syringe Parameters

Termination Choices

The termination is the interface, or connection, between the syringe barrel and the needle. The choice depends on the application. Each manufacturer has its own specification nomenclature.

Fixed (cemented) – Economical, reproducible injections, for autosamplers, one syringe-one method, do not heat above 50 °C

Removable needle – One syringe-many methods, simplicity of fixed needle, but needle can be replaced if damaged or clogged, do not heat above 115 °C

Knurled hub – Creates a leak-tight seal that can be retightened to compensate for wear

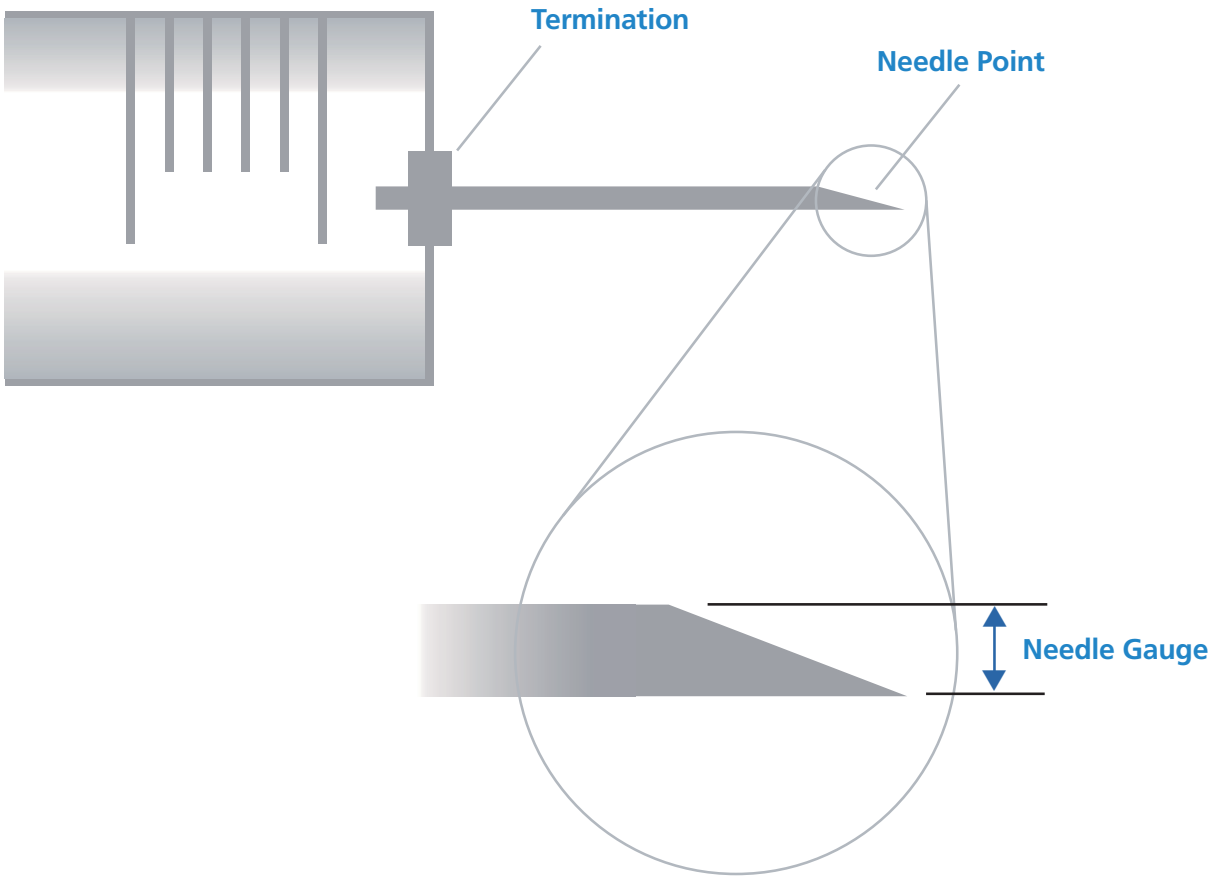
Luer tip – Easy, fast needle replacement, syringe filter or pump priming, Luer tip is ground glass suitable for mounting chromatographic or PTFE needles, syringes can be autoclaved (without plunger or needle)

Luer-Lok – Security of a locked needle, syringe filter or pump priming, PTFE, male Luer taper with nickel-plated brass locking hub for use with KEL-F® or metal hub needles and universal connectors

Syringe-Valves – Syringe with On-Off valves, head space applications, collect and store volatile samples, examples are SampleLock (Hamilton) or Pressure-Lok (VICI).

Hamilton Termination Nomenclature:
N – Fixed needle, **RN** – Removable needle, **LT** – Luer tip, **KH** – Knurled hub, **TLL** – PTFE Luer-Lok, **WG** – Plunger guides which prevent bending the syringe, **CH** – Chaney adapter, **SL** – SampleLock

SGE Termination Nomenclature:
F – Fixed needle provides reproducible injects at an economical price, **R** – Removable needle, **LL** – Luer-Lok, **LT** – Luer tip, **B** – Plunger-in-Needle

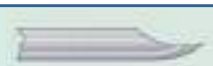
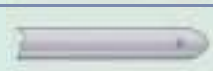


Needle Point Styles

Standard needles are most often point style 2 (sharp point) or 3 (blunt point). For HPLC injections and sample pipetting, the blunt-tip style 3 is preferred. The blunt tip has chamfered and polished edges that eliminate damage to the valve's rotor seal and stator face. This style can also be used for pipetting liquids.

For manual GC injections, a beveled tip, like style 2 is preferred for optimum septum penetration and to prevent septum coring. Also, Hamilton point style AS and SGE cone-tip needles are specially designed for this application. When using an autosampler, consult the instrument manual for the preferred point style.

In syringes with point style 5, conical with side port, liquid samples can be filled and dispensed through the hole in the side. Septum damage is minimized by the solid domed tip.

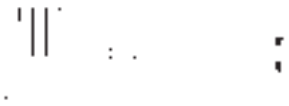
Point Style 2		**Sharp, beveled,** curved, non-coring needle point recommended for septum penetration. Available gauges: 33-10.
Point Style 3		**Blunt** needle point for use with HPLC injection valves and for sample pipetting. Available gauges: 33-10
Point Style 4		**Standard 12° beveled needle** point is recommended for life science applications. Available gauges: 33-10 Special point styles such as 30°, 45°, or any other angle are available upon request.
Point Style 5		**Conical needle** with side port for penetration of septa, thin-gauged vinyls and plastics without coring. Available gauges: 26-10
Point Style AS	 G003817	**Spherical conical style** needle point used on autosampler syringes. The non-coring needle point is recommended for septum penetration. Available gauges: 26-22

Needle Gauges

Gauge is the thickness of the needle. The gauge required depends on the injector. For example, in HPLC applications, Waters instruments use a 25 gauge needle, while Rheodyne, Valco, Altex and SSI valves use 22 gauge.

23 or 23s Single Gauge

- Merlin Microseal™ septa
- Packed column injector ports
- Split/splitless injector ports


795-0455

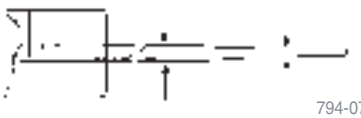
26 or 26s Single Gauge

- Packed column injector ports
- Split/splitless injector ports


795-0456

Dual-Gauge 23-26 or 23s-26s Tapered

- Durability of a 23-gauge
- Versatility of a 26-gauge for split/splitless and on-column injection


794-0711

ordering: 800-247-6628 (US only) / 814-359-3441 technical service: 800-359-3041 (US and Canada only) / 814-359-3041

Overview of Hamilton Syringes

Hamilton syringes are accurate to within ±1% of nominal volume with a precision of 1% at 80% of the total volume. Their stainless steel, borosilicate type I glass or PTFE composition ensures a chemically inert fluid path. Hamilton syringes are available in two styles, Gastight and Microliter™, which differ primarily in the design of the plunger. Besides the extensive list of Hamilton syringes presented in this brochure, we can also supply any other Hamilton syringe.

Gas/Liquid Syringes

Delivery Volume: 0.05 µL – 500 µL

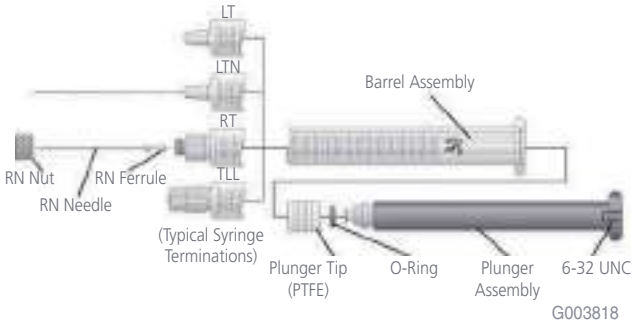
Gastight syringes have a precision machined PTFE plunger tip which provides a tight, leak-free seal for both liquids and gases. Replacement plunger assemblies are available for most Gastight syringes.

1000 Series

Luer Tip Cemented Needle (LTN), Luer Tip Special Cemented Needle (LTSN), Luer Tip (LT), Removable Needle (RN), SampleLock (SL), and PTFE Luer-Lok (TLL)

Delivery Volume: 100 µL – 100 mL, Syringe Volumes: 1 mL, 1.25 mL, 2.5 mL, 5 mL, 10 mL, 25 mL, 50 mL, 100 mL

- Mid-volume solution for all liquid and gas handling
- Ideal for manual and automated HPLC injections
- Commonly used in syringe pumps and other liquid handling instrumentation

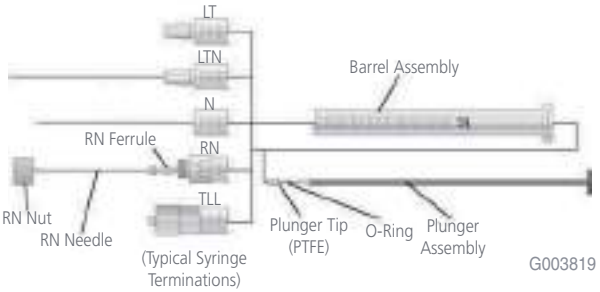


1700 Series

Cemented Needle (N), Special Cemented Needle (SN), Luer Tip Cemented Needle (LTN), Luer Tip Special Cemented Needle (LTSN), Luer Tip (LT), Removable Needle (RN), SampleLock (SL), and PTFE Luer-Lok (TLL)

Delivery Volume: 1 – 500 µL, Syringe Volumes: 10 µL, 25 µL, 50 µL, 100 µL, 250 µL, 500 µL

- Gastight version of the original Hamilton 700 series
- Ideal for low volume gas or liquid handling
- Excellent for manual & automated GC & HPLC injections
- Commonly used in syringe pumps and other liquid handling instrumentation

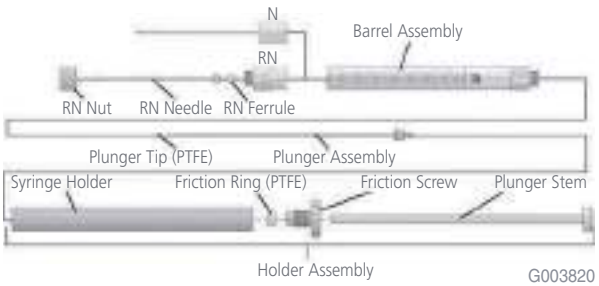


1800 Series

Cemented Needle (N) and Removable Needle (RN)

Delivery Volume: 1 – 250 µL, Syringe Volumes: 10 µL, 25 µL, 50 µL, 100 µL, 250 µL

- Designed to eliminate the possibility of plunger damage
- Same liquid handling capabilities as the 1700 series but the extended plunger eliminates breakage and allows the user some control over the dispensing rate
- Ideal when the plunger of a 1700 syringe may be bent



Liquid Syringes

Delivery Volume: 0.05 µL – 500 µL

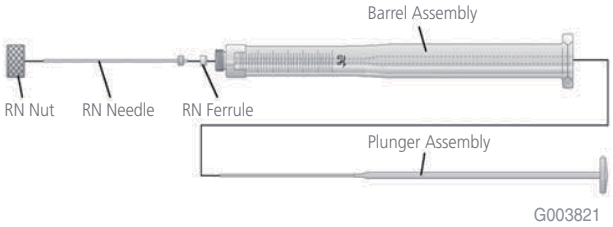
Microliter syringes feature a stainless steel plunger which is individually hand-fitted to its matching glass barrel. The hand-fitting process is finely controlled to create a liquid-tight seal between the barrel and the plunger. Microliter syringes are for use with liquids and incorporates a stainless steel plunger that is individually fitted to its matching syringe barrel. These syringes are ideal for homogenous samples that are not prone to precipitation or bonding with glass. Plungers for Microliter syringes cannot be interchanged or replaced if damaged. If working with heterogeneous samples, we recommend frequent, diligent cleaning, or using a Gastight syringe instead.

600 Series

Removable Needle (RN)

Delivery Volume: 0.25 µL - 5 µL, Syringe Volumes: 2.5 µL, 5 µL

- Robust design
- Consists of two distinct parts: bottom half of the barrel accurately measures the liquid sample and the top half supports the plunger
- Top section of the plunger is thicker to reduce the risk of bending
- Require half of the standard stroke length making them ideal for one-handed operation
- Plungers and barrels are not interchangeable or replaceable

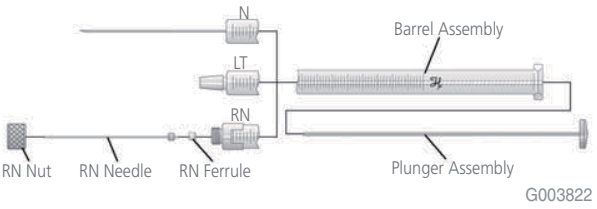


700 Series

Cemented Needle (N), Special Cemented Needle (SN), Removable Needle (RN) and Luer Tip (LT)

Delivery Volume: 0.5 µL - 500 µL, Syringe Volumes: 5 µL, 10 µL, 25 µL, 50 µL, 100 µL, 250 µL, 500 µL

- The original Hamilton syringe
- Still has wide applicability - industry standard
- Solves general liquid handling requirements
- Plungers and barrels are not interchangeable or replaceable.

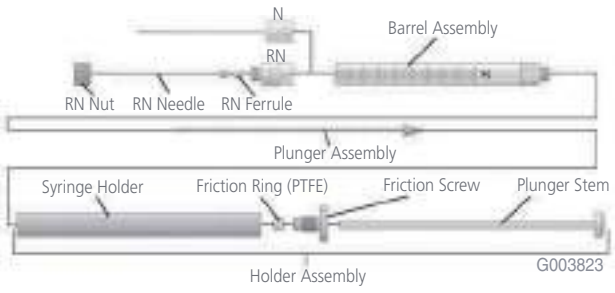


800 Series

Cemented Needle (N), Special Cemented Needle (SN), and Removable Needle (RN)

Delivery Volume: 0.5 µL - 250 µL, Syringe Volumes: 5 µL, 10 µL, 25 µL, 50 µL, 100 µL, 250 µL

- Intended for applications where the plunger on a 700 series syringe might be bent
- Aluminum syringe holder eliminates plunger damage
- A friction screw at the top of the barrel can be adjusted to give the user some control over dispensing speed and prevent the accidental removal of the plunger.
- Syringe holder can be fitted with different barrel/ plunger assemblies to cover a range of volumes
- Excellent for novice users



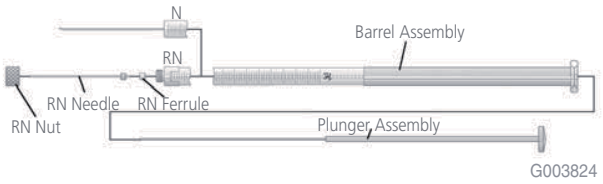
ordering: 800-247-6628 (US only) / 814-359-3441 technical service: 800-359-3041 (US and Canada only) / 814-359-3041

900 Series

Cemented Needle (N), Special Cemented Needle (SN), and Removable Needle (RN)

Delivery Volume: 0.5 µL - 10 µL, Syringe Volumes: 5 µL, 10 µL

- Economical version of the 800 series
- Contains no replaceable parts, reducing initial cost
- Perfect when a robust syringe is desired and budget is a consideration

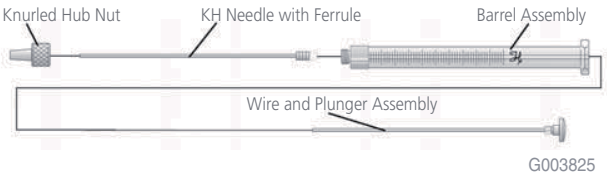


7000 Series

Knurled Hub (KH)

Delivery Volume: 0.05 µL – 5 µL, Syringe Volumes: 0.5 µL, 1 µL, 2 µL, 5 µL

- For manual and automated GC and HPLC injections
- Employs a tungsten plunger wire inside the needle to accurately dispense ultra-low volumes
- Ideal for everyday applications that require ultra-small measurements of liquid
- Needle is bored to extremely accurate tolerances to accommodate the plunger wire
- When plunger is inside the needle, the standard dead volume inside the needle is eliminated
- Removable needles, PTFE-tipped replaceable plungers



Syringe Tip: *Don't Force it!*

When using Gastight syringes, do not apply excessive force to move the plunger. The PTFE tip on the plunger creates a gas-tight fit against the interior of the glass barrel making these syringes ideal for gas or liquids. Always inspect the syringe barrel for cracks before use. Too much pressure can cause the glass barrel on the syringe to crack.



Various Hamilton Syringes

Overview of SGE Syringes

SGE syringes are designed and tested to meet critical autosampler specifications. The SGE design includes a unique plunger that resists bending and seizing. The needle point style withstands multiple and fast septum injections, making it one of the most trouble-free autosampler syringes available. Both fixed- and removable-style needles are available. SGE syringes are available for GC and LC manual injection and all major brands of HPLC and GC autosamplers. We can also supply any SGE syringe not shown in this brochure.

Gas/Liquid Syringes

SGE Microvolume Syringe



P001077

Designers of syringes for microliter sample injections face two interesting problems: extremely fine plungers and proportionally large sample hold-up in the needle. SGE's Plunger-in-Needle feature, which permits extremely small sample injections, and the SuperFlex plunger, which resists bending and kinking, addresses both of these problems. These options are available on some microvolume syringes.

Microvolume syringes also feature:

- Sharp and clear fused graduation
- Extended graduation lines and wide white backing for reduced errors
- Angled needle tip for optimum septum penetration
- Standard plunger is stainless steel individually fitted to its barrel
- **Plunger Protection** – An option on some SGE microvolume syringes. Extended protection tube from top of the flange helps prevent plunger bending during injection
- **Rugged Guided Plunger** – An option on some SGE microvolume syringes. Extended barrel guides the plunger during injection and is suitable for training and student use
  - Robust
    - *Rugged (student or tech) use*
    - *Used by a variety of people*





0.1 – 5 µL Delivery Volume

Plunger-in-Needle Style: 0.5, 1, 5 µL syringe volumes, fixed needle, cone and bevel tips

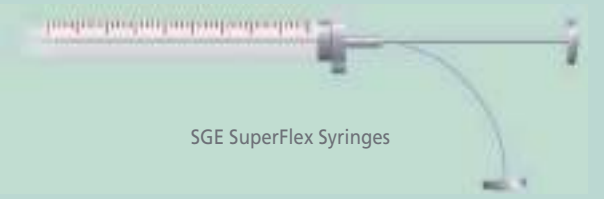
Plunger-in-Barrel Style: 5 µL syringes, fixed and removable needles, cone and bevel tips,

Rugged guided plunger available on 5 µL plunger-in-barrel syringes, fixed and removable needles, bevel tips

- Inject down to 0.1 µL with high precision and accuracy
- Perfect for microvolume capillary chromatography injection
- International Standards Traceability

Feature: SuperFlex Plungers

SGE microvolume 10 µL syringes feature the SuperFlex flexible plunger, which is rugged enough to withstand repeated injections without bending. Made from a titanium/nickel alloy, it is nearly indestructible and ideal for novices.



E000949

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1.5 – 8 µL Delivery Volume

SuperFlex plunger, 10 µL syringe volume, fixed and removable needles, cone and bevel tips, SuperFlex plunger

Rugged Guided Plunger: 10 µL syringes, fixed and removable needles, bevel tips

- Accuracy and reproducibility of ±1%
- Metal plunger syringes are ideal for making microvolume injections of 1.5 µL to 8 µL

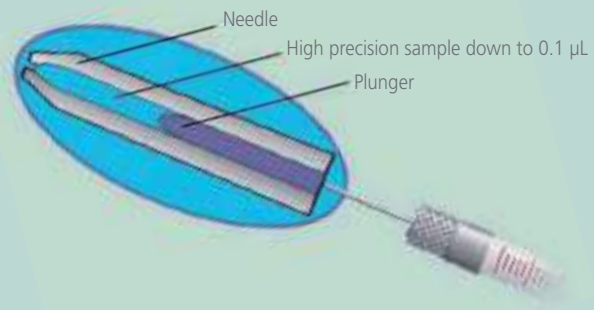
2.5 – 500 µL Delivery Volume

Syringe Volumes: 25 µL, 50 µL, 100 µL, 250 µL, 500 µL. Fixed and removable needles, bevel tips

Feature: Plunger-in-Needle

The Plunger-in-Needle feature of SGE microvolume 0.5, 1 and 5 µL syringes permits injection down to 0.1 µL with high precision and accuracy making them perfect for micro capillary chromatography injection.

Cutaway of SGE Plunger-in-Needle Design



E000948

Gas Tight Syringes

Delivery Volume: 1 µL – 100 mL

- Constructed from borosilicate glass, PTFE plunger tips and KEL-F or PTFE Luer cones where applicable
- Assembled with an interference fit between plunger tip and barrel to affect the gas sealing properties of the syringe
- Accuracy and reproducibility: ± 1%

1 µL to 500 µL Delivery Volume

Syringe Volumes: 10 µL, 25 µL, 50 µL, 100 µL, 250 µL, 500 µL

Fixed and removable needle, bevel tips

Plungers are interchangeable on these syringes



P001077

0.1 mL to 100 mL Delivery Volume

Syringe Volumes: 1 mL, 2.5 mL, 5 mL, 10 mL (Removable needle)

Syringe Volumes: 1 mL, 2.5 mL, 5 mL, 10 mL, 25 mL, 50 mL, 100 mL (Fixed Luer-Lok needle)

Bevel tips

Replacement plungers available



9100522

Overview of Valco VICI Precision Sampling Syringes

Supelco carries the most popular VICI Precision Sampling syringes from Valco. These syringes have wide applicability for both gases and liquids. The pressurization option is valuable when dealing with transport and storage of volatile samples. We can also supply any Precision Sampling syringe not shown in this brochure.

Gas/Liquid Syringes

Series A

Pressurized storage with built-in rotary valve


P000433A

Removable needle, bevel, open end

Delivery Volumes: 10 µL – 10 mL, Syringe Volumes: 100 µL, 250 µL, 500 µL, 1 mL, 2 mL, 5 mL, 10 mL

- Integral sample storage valve - actuated by turning the nosepiece
- Positive rear flange plunger stop - prevents plunger from blowing out of barrel at elevated pressure
- Carrier back-flushing is eliminated - resulting in sharper peaks and better separations
- Modular construction - all components may be quickly disassembled for easy cleaning or replacement
- Leak tight to 250 psi for both liquids and gases
- Has all the standard Pressure-Lok features such as a PTFE plunger tip, PTFE-sealed needle, and ultra-smooth bore

Series A-2

Pressurized storage with built-in push-button valve


P000433B

Removable needle, bevel, open end, also available with Luer needle

Delivery Volumes: 2.5 µL – 10 mL, Syringe Volumes: 25 µL, 50 µL, 100 µL, 250 µL, 500 µL, 1 mL, 2 mL, 5 mL, 10 mL

- Push-button valve - allows sample storage to 250 psi in syringes as small as 25 µL and instantaneous injection
- Smaller volumes - great for small volatile samples
- Useful with small liquid samples containing low-boiling components which would be lost through evaporation using ordinary syringes
- Positive rear stop (in 250 µL and larger sizes) prevents plunger blowout at elevated pressures, protecting against sample loss or operator injury
- Has all the standard Pressure-Lok features such as a PTFE plunger tip, PTFE-sealed needle, and ultra-smooth bore

Series C

The perfect syringe for everyday use


P000433C

Removable needle, bevel, open end, also available with Luer needle or with Chaney adapter

Delivery Volumes: 10 µL – 10 mL, Syringe Volumes: 100 µL, 250 µL, 500 µL, 1 mL, 2 mL, 5 mL, 10 mL

- Positive rear plunger stop
- Low-dead volume removable needle
- Has all the standard Pressure-Lok features such as a PTFE plunger tip, PTFE-sealed needle, and ultra-smooth bore, but without a valve for pressurized sample storage
- Sample storage capability can be added with a Mininert syringe valve
- Optional Chaney adapter offers much lower dead volume than Luer-style connectors

Series D

Economically priced gas syringe


P000433D

Removable needle, bevel, open end

Delivery Volumes: 100 µL – 2 mL, Syringe Volumes: 1 mL, 2 mL

- Leak-tight to 250 psi
- Pressure-Lok plunger tip
- No dead volume barrel design
- Special low dead volume needle connector for accurate delivery of gas samples

ordering: 800-247-6628 (US only) / 814-359-3441 technical service: 800-359-3041 (US and Canada only) / 814-359-3041

Magnum Series

Pressurized storage of large volumes for trace sample isolation

Removable needle, bevel, open end

Delivery Volume: 2 mL – 500 mL, Syringe Volumes:
20 mL, 50 mL, 100 mL, 250 mL, 500 mL



9130435

- Ideal for collection, trace analysis and sample concentration of environmental contaminants
- A low-dead volume needle is used in this syringe
- A rotary valve allows on-site sampling for later analysis
- Positive displacement capability of the durable PTFE plunger seal permits use in a variety of subsequent procedures involving extraction or concentration of trace components
- The standard termination is a female threaded fitting (1/4-28), which accepts a variety of Cheminert connectors or adapters. Specially formed seals permit leak-tight operation to 30 psi (approximately 2 atmospheres).

Liquid Syringes

Series C-160

VICI basic PTFE plunger-tipped microsyringe

Fixed and removable needles, bevel, open end

Delivery Volumes: 0.5 µL – 100 µL, Syringe Volumes: 5 µL, 10 µL, 25 µL, 50 µL, 100 µL



E000819

- Day-in, day-out dependability at an economical price
- Leak-tight to 250 psi - liquids and gases
- PTFE plunger tip is self-lubricating and durable
- PTFE needle seat at rear of needle prevents possible dissolution of needle cement or contamination of sample

Series C-120

Barrel extension for attaching a vacuum bulb or line

Fixed needle, bevel, open end

Delivery Volumes: 0.5 µL – 100 µL, Syringe Volumes: 5 µL, 10 µL, 25 µL, 50 µL, 100 µL



E000804

- Leak-tight to 250 psi - liquids and gases
- PTFE plunger tip
- Barrel extension beyond the rear flange – permits attachment of a vacuum bulb or line for easier filling or cleaning
- Standard Pressure-Lok features

Series CG-130

Reinforced plunger to prevent bending

Fixed and removable needles, bevel, open end

Delivery Volumes: 5 µL, 10 µL



P000434C

- Leak-tight to 250 psi - liquids and gases
- Heavy, reinforced plunger within an enlarged plunger guide - eliminates plunger bending
- Lower plunger section confined within the guide section
- Sturdy upper section absorbs the force of a rapid down-stroke

Series D-140

For small (<10 µL) injections

Removable needle: size and style vary with syringe size

Delivery Volumes: 1 µL, 2 µL, 5 µL, 10 µL



P000434D

- Designed for small volume injection into gas chromatographs
- Total sample displacement - the entire sample is contained in the needle
- Positive rear plunger stop - eliminates accidental plunger removal
- Superior alignment - permits repeated reassembly without difficulty or damage
- PTFE seals, needle, plunger, and barrel are all replaceable



Popular Syringes and Replacement Parts

Description	Supelco Cat. No.	Manufacturer Cat. No.	Page
Hamilton			
Syringes			
Syringe for liquid injection, 701N, pk/6	**20779**	80366	25
Syringe, 701N, 10 µL	**20734**	80300	25
Autosampler Syringe for Agilent 7683, pk/6, 701ASN, 10 µL, 0.64 mm O.D.	**21317**	80390	16
Autosampler Syringe for Agilent 7683, pk/6, 701ASN 10 µL, 23s-26s Needle	**24574**	80391	16
Syringe, 1010TLL, 10 mL	**21000-U**	81620	20
Replacement Needles			
800 Series, 25s gauge, 50 mm (1.97 in.), point style 3, pk/6	**58399**	8648-01	32
22 gauge, 51 mm (2 in.), point style 2, 250 µL-10 mL, pk/6	**19137-U**	7779-01	32
22 gauge, 51 mm (2 in.), point style 5, 250 µL-10 mL, pk/6	**19154-U**	7784-02	32
SGE			
Syringes			
Gas Tight, Luer Lock, 10 mL	**509507**	008960 (10MDR-LL-GT)	24
Microvolume, 50 mm × 0.63 mm, 23 gauge, point style 1, 1 µL	**509221**	000500 (1BR-5)	27
Microvolume, 70 mm × 0.63 mm, 23 gauge, point style 1, 1 µL	**24408**	000505 (1BR-7)	27
Plunger-Protected, Fixed Needle, 10 µL	**21933-U**	002000	27
for Shimadzu Autosamplers, 10 µL	**24419**	002898 (10R-S-0.63)	19
for Varian 8035, 8100 and 8200 Autosamplers, 10 µL	**24421**	002924	19
Syringe Valves, Luer-Lok with Luer Tip	**509361**	031915	36
Replacement Needles			
for 10R-VA8X (for Varian 8035, 8100 & 8200 Autosamplers)	**24445**	037777 (N10-VA8100H)	34
for Luer-Lok Syringes, 22 gauge, pk/2	**26274**	039895	34
for Luer-Lok Syringes, 23 gauge, pk/2	**26271**	39803	34
for Luer-Lok Syringes, 23 gauge, pk/5	**26270-U**	039802	34
for 10R-VA8 Autosampler Syringe (Varian), 10 µL	**21924**	031218	19
Valco VICI Precision Sampling			
Syringes			
Series A-2, 25 µL	**22268**	050023	23
Series A-2, 0.5 mL	**22272**	050032	23
Series A-2, 1 mL	**22273**	50033	23
Series A-2, 2 mL	**22274**	050034	23
Mininert Push Button Valve for use with Hamilton TLL syringes	**22285**	654051	36
Replacement Needles			
Series A-2, C, D, VICI, side port, taper, pk/3	**22289**	943052	34
Series A, A-2, C and D, 0.5 mL, pk/2	**21950**	013932	34
Series A, A-2, C and D, 1 mL, pk/2	**21951**	013933	34

Autosampler Syringes (GC and HPLC)

The syringe is the interface between the sample and the chromatograph. Rapid and precise sampling requires a tight fit of the syringe in the instrument. An incorrect or poor quality syringe can cause poor results and, more seriously, can damage the instrument. Supelco carries two brands of top-quality syringes, Hamilton and SGE, which serve all major makes and models of GC and HPLC autosamplers that permit syringe replacement.

Manufacturer Model Number	Volume	Needle Length in./mm	Gauge	OD mm	Point Style	Manufacturer Part No.	Pkg. Size	Cat. No.	Replacement Needle Cat. No.
Agilent									
1090 and 1100 HPLC*									
Hamilton									
Gastight Syringes - Removable Needle									
1702RN	25 µL	2/51	22s	0.72	2	80230	1	**20781**	**19133-U**
1725RN	250 µL	2/51	22s	0.72	2	81130	1	**20784**	**19133-U**
* Note: These syringes should not use the needle that is supplied with this syringe for the Agilent 1090A.									
7673, 7683 and 6850									
Hamilton									
Modified Microliter Syringes - Removable Needle									
7000.5ASRN	0.5 µL	1.71/43	23s	0.64	Cone	86276	1	**26214**	Inquire
7000.5ASRN	0.5 µL	1.71/43	26s	0.47	Cone	86274	1	**26215**	**26747-U**
7001ASRN	1 µL	1.71/43	23s	0.64	Cone	80176	1	**26216**	Inquire
7001ASRN	1 µL	1.71/43	26s	0.47	Cone	80175	1	**26217**	Inquire
Microliter Syringes - Fixed Needle									
75ASN	5 µL	1.71/43	23s	0.64	Cone	87987	1	**21311**	---
75ASN	5 µL	1.71/43	26s	0.47	Cone	87988	1	**21310-U**	---
75ASN	5 µL	1.71/43	23s-26s	0.64-0.47	Cone	87993	1	**24570-U**	---
75ASN	5 µL 6/pk	1.71/43	23s	0.64	Cone	87990	6	**21315**	---
75ASN	5 µL 6/pk	1.71/43	26s	0.47	Cone	87989	6	**21314**	---
75ASN	5 µL 6/pk	1.71/43	23s-26s	0.64-0.47	Cone	87994	6	**24571**	---
75ASN	5 µL	1.71/43	23s	0.64	Bevel	87991	1	**26714**	---
75ASN	5 µL	1.71/43	26s	0.47	Bevel	87992	1	**26721**	---
701ASN	10 µL	1.71/43	23s	0.64	Cone	80387	1	**21313**	---
701ASN	10 µL	1.71/43	26s	0.47	Cone	80388	1	**21312**	---
701ASN	10 µL	1.71/43	23s-26s	0.64-0.47	Cone	80393	1	**24573**	---
701ASN	10 µL 6/pk	1.71/43	23s	0.64	Cone	80390	6	**21317**	---
701ASN	10 µL 6/pk	1.71/43	26s	0.47	Cone	80389	6	**21316**	---
701ASN	10 µL 6/pk	1.71/43	23s-26s	0.64-0.47	Cone	80391	6	**24574**	---
701ASN	10 µL	1.71/43	23s	0.64	Bevel	80398	1	**26715**	---
701ASN	10 µL	1.71/43	26s	0.47	Bevel	80399	1	**26722**	---
Microliter Syringes - Removable Needle									
75ASRN	5 µL	1.71/43	23s	0.64	Cone	87957	1	**21321**	**21327-U**
75ASRN	5 µL	1.71/43	26s	0.47	Cone	87958	1	**21320-U**	**21326**
75ASRN	5 µL	1.71/43	23s-26s	0.64-0.47	Cone	87959	1	**24572**	**24582**
701ASRN	10 µL	1.71/43	23s	0.64	Cone	80357	1	**21323-U**	**21327-U**
701ASRN	10 µL	1.71/43	26s	0.47	Cone	80358	1	**21322-U**	**21326**
701ASRN	10 µL	1.71/43	23s-26s	0.64-0.47	Cone	80359	1	**24575**	**24582**
Gastight Syringes - Fixed Needle									
175	5 µL	1.71/43	23s	0.64	Cone	80074	1	**26716**	---
175	5 µL 6/pk	1.71/43	23s	0.64	Cone	80090	6	**26700-U**	---
175	5 µL 6/pk	1.71/43	23s-26s	0.64-0.47	Cone	80092	6	**24577**	---
1701	10 µL	1.71/43	23s	0.64	Cone	80080	1	**26719**	---
1701	10 µL	1.71/43	23s-26s	0.64-0.47	Cone	80079	1	**24579**	---
1701	10 µL 6/pk	1.71/43	23s	0.64	Cone	80094	6	**26701**	---
1701	10 µL 6/pk	1.71/43	23s-26s	0.64-0.47	Cone	80096	6	**24580**	---
Gastight Syringes - Removable Needle									
175	5 µL	1.71/43	23s-26s	0.64-0.47	Cone	80086	1	**24578**	**24582**
1701	10 µL	1.71/43	23s	0.64	Cone	80087	1	**21325-U**	**21327-U**
1701	10 µL	1.71/43	26s	0.47	Cone	80088	1	**21324**	**21326**
1701	10 µL	1.71/43	23s-26s	0.64-0.47	Cone	80089	1	**24581**	**24582**

Manufacturer Model Number	Volume	Needle Length in./mm	Gauge	OD mm	Point Style	Manufacturer Part No.	Pkg. Size	Cat. No.	Replacement Needle Cat. No.
7673, 7683 and 6850 (contd.)									
SGE									
Fixed Needle									
SK-5F-HP-0.47	5 µL	1.65/42	26	0.47	Cone	001804	6	**21910**	---
5F-HP-0.63	5 µL	1.65/42	23	0.63	Cone	001810	1	**21542**	---
SK-5F-HP-0.63	5 µL	1.65/42	23	0.63	Cone	001814	6	**21911**	---
10F-HP-0.47	10 µL	1.65/42	26	0.47	Cone	002800	1	**21541**	---
SK-10F-HP-0.47	10 µL	1.65/42	26	0.47	Cone	002804	6	**21912**	---
10F-HP-0.63	10 µL	1.65/42	23	0.63	Cone	002810	1	**21543**	---
SK-10F-HP-0.63	10 µL	1.65/42	23	0.63	Cone	002814	6	**21544**	---
Fixed Needle - Dual Gauge									
5F-HP-0.63/0.47	5 µL	1.65/42	23-26	0.63/0.47	Cone	001822	6	**26887-U**	---
10F-HP-0.63/0.47	10 µL	1.65/42	23-26	0.63/0.47	Cone	002822	6	**26889-U**	---
Gas Tight - Fixed Needle									
10R-HP-GT-0.47	10 µL	1.65/42	26	0.47	Cone	002817	1	**509671**	---
Gas Tight - Fixed Needle, Dual Gauge									
10F-HP-GT-0.63/0.47	10 µL	1.65/42	23-26	0.63/0.47	Cone	002826	1	**26890-U**	---
SK-10F-HP-GT-0.63/0.47	10 µL	1.65/42	23-26	0.63/0.47	Cone	002827	6	**26891-U**	---
25F-HP-GT-0.63/0.47	25 µL	1.65/42	23-26	0.63/0.47	Cone	003668	1	**26892-U**	---
50F-HP-GT-0.63/0.47	50 µL	1.65/42	23-26	0.63/0.47	Cone	004668	1	**26893-U**	---
100F-HP-GT-0.63/0.47	100 µL	1.65/42	23-26	0.63/0.47	Cone	005668	1	**26894-U**	---
Removable Needle									
0.5BR-HP-0.47	0.5 µL	1.65/42	26	0.47	Cone	000400	1	**24402**	**24426**
0.5BR-HP-0.63	0.5 µL	1.65/42	23	0.63	Cone	000410	1	**24403**	**24427**
5R-HP-0.47	5 µL	1.65/42	26	0.47	Cone	001805	1	**23963**	**23977**
5R-HP-0.63	5 µL	1.65/42	23	0.63	Cone	001815	1	**23962**	---
10R-HP-0.47	10 µL	1.65/42	26	0.47	Cone	002805	1	**24417**	**24440-U**
10R-HP-0.63	10 µL	1.65/42	23	0.63	Cone	002815	1	**24416**	**24439**
25R-HP-0.63	25 µL	1.65/42	23	0.63	Cone	003865	1	**509701**	**509728**
Gas Tight - Removable Needle									
10R-HP-GT-0.47	10 µL	1.65/42	26	0.47	Cone	002817	1	**509671**	**24440-U**
Removable Needle - Flexible Plunger									
10RX-HP-0.47	10 µL	1.65/42	26	0.47	Cone	002844	1	**23959**	**24440-U**
10RX-HP-0.63	10 µL	1.65/42	23	0.63	Cone	002845	1	**23958**	**24439**
7670, 7671 and 7672									
Hamilton									
Microliter Syringes - Fixed Needle									
75	5 µL	2/51	26s	0.47	Bevel	87900	1	**26200-U**	---
701	10 µL	2/51	26s	0.47	Bevel	80300	1	**20734**	---
701	10 µL	2/51	26s	0.47	Bevel	80366	6	**20779**	---
Microliter Syringes - Removable Needle									
701	10 µL	2/51	26s	0.47	Bevel	80338	1	**21357**	**19131-U**
Gastight Syringes - Fixed Needle									
1701	10 µL	2/51	26s	0.47	Bevel	80000	1	**20972**	---
SGE									
Removable Needle									
1BR-FV-56	1 µL	2.2/56	23	0.64	Bevel	000587	1	**24409**	**24433**

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Manufacturer Model Number	Volume	Needle Length in./mm	Gauge	OD mm	Point Style	Manufacturer Part No.	Pkg. Size	Cat. No.	Replacement Needle Cat. No.
CTC									
A200S, GC PAL Autosamplers									
Hamilton									
Microliter Syringes - Fixed Needle									
7701.2N	1.2 µL	2/51	26P	---	Cone	203185	1	**28617-U**	---
Microliter Syringes - Fixed Needle									
75N	5 µL	2/51	26s	0.47	Cone	203189	1	**28613-U**	---
701N	10 µL	2/51	26s	0.47	Bevel	203072	1	**28614-U**	---
701N	10 µL	2/51	26s	0.47	Cone	203205	1	**28615-U**	---
Gastight Syringes - Fixed Needle									
1702N	25 µL	2/51	26s	0.47	Cone	203043	1	**28649-U**	---
1710N	100 µL	2/51	26s	0.47	Cone	203076	1	**28651-U**	---
1725N	250 µL	2/51	26s	0.47	Cone	203078	1	**28652-U**	---
1750N	500 µL	2/51	26s	0.47	Cone	203080	1	**28653-U**	---
CombiPAL Autosamplers, GC Headspace									
Hamilton									
Gastight Syringes - Fixed Needle									
1000LTN	1 mL	2.2/56	23	0.64	Cone tip, Side-port	203082	1	**28621-U**	---
1001LTN	1 mL	2.2/56	26	0.47	Cone tip, Side-port	203141	1	**28622-U**	---
1002LTN	2.5 mL	2.2/56	23	0.64	Cone tip, Side-port	203084	1	**28626-U**	---
1002LTN	2.5 mL	2.2/56	26	0.47	Cone tip, Side-port	203181	1	**28627-U**	---
1005LTN	5 mL	2.2/56	23	0.64	Cone tip, Side-port	203086	1	**28628-U**	---
1005LTN	5 mL	2.2/56	26	0.47	Cone tip, Side-port	203182	1	**28629-U**	---
HTS PAL Autosamplers, HPLC Sampling*									
Hamilton									
Microliter Syringes - Fixed Needle									
701N	10 µL	2/51	22s	0.72	Blunt	203073	1	**28618-U**	---
Gastight Syringes - Fixed Needle									
1701N	10 µL	2/51	22s	0.72	Blunt	203194	1	**28632-U**	---
1702N	25 µL	2/51	22s	0.72	Blunt	203075	1	**28633-U**	---
1710N	100 µL	2/51	22s	0.72	Blunt	203077	1	**28634-U**	---
1710N	100 µL	2/51	22	0.72	Blunt	203235	1	**28635-U**	---
1725N	250 µL	2/51	22	0.72	Blunt	203079	1	**28636-U**	---
1001LTN	1 mL	2.2/56	22	0.72	Blunt	203081	1	**28637-U**	---
1002LTN	2.5 mL	2.2/56	22	0.72	Blunt	203083	1	**28638-U**	---
1005LTN	5 mL	2.2/56	22	0.72	Blunt	203085	1	**28639-U**	---
PerkinElmer									
GC Autosystem and Clarus® 500									
Hamilton									
Microliter Syringes - Fixed Needle									
75ASN/PE	5 µL	2.75/70	26s	0.47	Blunt	88040	1	**24522**	---
75ASN/PE	5 µL	2.75/70	23s	0.64	Blunt	88035	1	**24523**	---
SGE									
Fixed Needle									
5F-PE-0.47	5 µL	2.75/70	26	0.47	Cone	001953	1	**509736**	---
5F-PE-0.63	5 µL	2.75/70	23	0.63	Cone	001954	1	**509744**	---
Gas Tight Syringes - Fixed Needle									
5F-PE-GT-0.47	5 µL	2.75/70	26	0.47	Cone	001955	1	**21930-U**	---
5F-PE-GT-0.63	5 µL	2.75/70	23	0.63	Cone	001957	1	**21929-U**	---
Removable Needle (Plunger-in-needle)									
0.5BR-PE-0.47	0.5 µL	2.75/70	26	0.47	Cone	000475	1	**24406**	---
0.5BR-PE-0.63	0.5 µL	2.75/70	23	0.63	Cone	000478	1	**24407**	24431
AS100, AS2000, AS3000									
SGE									
Standard Syringes - Fixed Needle									
5F-PE-0.47	5 µL	2.75/70	26	0.47	Cone	001953	1	**509736**	---
5F-PE-0.63	5 µL	2.75/70	23	0.64	Cone	001954	1	**509744**	---

* See replacement parts section for replacement plungers for all CTC syringes.

Manufacturer Model Number	Volume	Needle Length in./mm	Gauge	OD mm	Point Style	Manufacturer Part No.	Pkg. Size	Cat. No.	Replacement Needle Cat. No.
AS100, AS2000, AS3000 (contd.)									
Standard Syringes - Removable Needle									
0.5BR-PE-0.47	0.5 µL	2.75/70	26	0.47	Cone	000475	1	**24406**	Inquire
0.5BR-PE-0.63	0.5 µL	2.75/70	23	0.64	Cone	000478	1	**24407**	**24431**
Gas Tight Syringes - Fixed Needle									
5F-PE-GT-0.47	5 µL	2.75/70	26	0.47	Cone	001955	1	**21930-U**	---
5F-PE-GT-0.63	5 µL	2.75/70	23	0.64	Cone	001957	1	**21929-U**	---
Phillips/Unicam									
S8 and 4700 GC Autosampler									
SGE									
Removable Needle (Plunger-in-Needle)									
1BR-7	1 µL	2.75/70	23	0.63	Cone	000505	1	**24408**	**24432**
Shimadzu									
AOC9 Autosampler									
Hamilton									
Microliter Syringe - Removable Needle									
701	10 µL	2/51	26s	0.47	Bevel	80330	1	**20697**	**19131-U**
SGE									
Removable Needle									
0.5BR-S(9)-0.47	5 µL	1.97/50	26	0.47	Cone	000435	1	**509752**	Inquire
0.5BR-S(9)-0.63	10 µL	1.97/50	26	0.47	Cone	002885	1	**509760**	Inquire
Fixed Needle - Flexible Plunger									
10FX	10 µL	1.97/50	26	0.47	Bevel	002130	6	**23966**	---
Removable Needle - Flexible Plunger									
10RX	10 µL	1.97/50	26	0.47	Bevel	002180	6	**23967**	**24437**
AOC 14, AOC 17, and AOC 20 GC Autosamplers									
SGE									
Removable Needle									
10R-S-0.47	10 µL	1.65/42	26	0.47	Cone	002897	1	**24418**	---
10R-S-0.63	10 µL	1.65/42	23	0.63	Cone	002898	1	**24419**	**24442**
Thermo Finnigan Autosamplers									
Hamilton									
Microliter Syringes - Fixed Needle									
701	10 µL	2/51	26s	0.47	Bevel	80300	1	**20734**	---
701	10 µL	2/51	26s	0.47	Bevel	80366	6	**20779**	---
701	10 µL	2/51	26s	0.47	Cone tip, Side-port	80339	1	**24532**	---
Microliter Syringes - Removable Needle									
701	10 µL	2/51	26s	0.47	Bevel	80338	1	**21357**	**19131-U**
Varian Autosamplers									
SGE									
Varian 8000 GC Autosamplers - Removable Needle									
10R-VA8O-11	10 µL	1.97/50	25	0.5	Dome	002926	1	**24420-U**	**24443**
Varian 8035, 8100, and 8200 GC Autosamplers - Removable Needle									
1BR-VA8X	1 µL	2/51	26	0.47	Cone	000655	1	**24410-U**	Inquire
10R-VA8X-11	10 µL	2.09/53	25	0.5	Cone tip, Side-port	002924	1	**24421**	**24445**
SGE Replacement Needles and Plungers for Varian Syringes									
for Varian 8035	---	2.09/53	25	0.5	Bevel	037776	2	**24444**	---
for Varian 8035	---	4.13/105	On-Column	0.17	Dome	037778	2	**24446**	---
for Varian 8100	---	2.09/53	25	0.5	Cone tip, Side-port	037777	1	**24445**	---
Replacement plunger for Varian 10 µL syringes	---	---	---	---	---	031218	1	**21924**	---

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Gas/Liquid Manual Syringes

Supelco offers Hamilton, SGE and VICI Precision Sampling gas/liquid manual injection syringes. Many different styles are available to meet your specific application requirement.

For more information about a particular syringe model, please refer to pages 8-14.

Hamilton

Gastight 1000 Series

Hamilton 1000 Series, Fixed Needle



P001087

Hamilton 1000 TLL Series



P001089

Manufacturer Model Number	Volume	Needle Length in./mm	Gauge	OD mm	Point Style	Manufacturer Part No.	Pkg. Size	Cat. No.	Replacement Needle Cat. No.
Removable Needle									
1001RN	1 mL	2/51	22	0.72	Bevel (2)	81330	1	**22192-U**	**19137-U**
1002RN	2.5 mL	2/51	22	0.72	Bevel (2)	81430	1	**22193-U**	**19137-U**
1005RN	5 mL	2/51	22	0.72	Bevel (2)	81530	1	**22194-U**	**19137-U**
1010RN	10 mL	2/51	22s	0.72	Bevel (2)	81630	1	**22195**	**19137-U**
*Luer Tip**									
1001LT	1 mL	Order needle separately			Luer Tip	81301	1	**20720**	**21746 or 21747**
1001.25LT	1.25 mL	Order needle separately			Luer Tip	82001	1	**24588**	**21746 or 21747**
1002LT	2.5 mL	Order needle separately			Luer Tip	81401	1	**20721**	**21746 or 21747**
1005LT	5 mL	Order needle separately			Luer Tip	81501	1	**20722**	**21746 or 21747**
1010LT	10 mL	Order needle separately			Luer Tip	81601	1	**20723**	**21746 or 21747**
Fixed Needle									
Luer Tip									
1001LTN	1 mL	2/51	22	0.72	Bevel (2)	81317	1	**20740-U**	---
1001.25LTN	1.25 mL	2/51	22	0.72	Bevel (2)	82017	1	**24589**	---
1002LTN	2.5 mL	2/51	22	0.72	Bevel (2)	81417	1	**20691**	---
1005LTN	5 mL	2/51	22	0.72	Bevel (2)	81517	1	**20692**	---
1010LTN	10 mL	2/51	22	0.72	Bevel (2)	81617	1	**20693**	---
1001LTN	1 mL	2/51	22	0.72	Side-Port (5)	81343	1	**20709**	---
1002LT	2.5 mL	2/51	22	0.72	Side-Port (5)	81443	1	**20710-U**	---
1005LT	5 mL	2/51	22	0.72	Side-Port (5)	81543	1	**24590**	---
1010LT	10 mL	2/51	22	0.72	Side-Port (5)	81643	1	**24591**	---
Teflon Luer-Lok*									
1001TLL	1 mL	Order needle separately			Luer-Lok	81320	1	**20997**	**21746 or 21747**
1002TLL	2.5 mL	Order needle separately			Luer-Lok	81420	1	**20998**	**21746 or 21747**
1005TLL	5 mL	Order needle separately			Luer-Lok	81520	1	**20999**	**21746 or 21747**
1010TLL	10 mL	Order needle separately			Luer-Lok	81620	1	**21000-U**	**21746 or 21747**
1025TLL	25 mL	Order needle separately			Luer-Lok	82520	1	**20683**	**21746 or 21747**
1050TLL	50 mL	Order needle separately			Luer-Lok	85020	1	**20707**	**21746 or 21747**
1100TLL	100 mL	Order needle separately			Luer-Lok	86020	1	**21967**	**21746 or 21747**
With Slots									
1001TLL	1 mL	Order needle separately			Luer-Lok	81327	1	**26208**	**21746 or 21747**
1002TLL	2.5 mL	Order needle separately			Luer-Lok	81427	1	**26209**	**21746 or 21747**
1005TLL	5 mL	Order needle separately			Luer-Lok	81527	1	**26210-U**	**21746 or 21747**
1010TLL	10 mL	Order needle separately			Luer-Lok	81627	1	**26211-U**	**21746 or 21747**
1025TLL	25 mL	Order needle separately			Luer-Lok	82527	1	**26212**	**21746 or 21747**
1050TLL	50 mL	Order needle separately			Luer-Lok	85027	1	**26213**	**21746 or 21747**

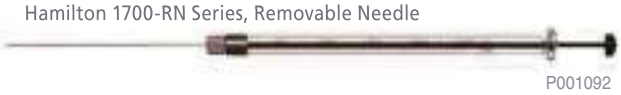
*Needle not included. Choose between Cat. No. 21746 (with metal hub) or Cat. No. 21747 (with Kel-F hub).

Syringe Tip: *For Samples with Particulate Matter, Use a Gastight Syringe.*

A Gastight syringe should be selected when analyzing dirty samples. A Gastight syringe stops particulate matter from getting between the plunger and barrel by effectively wiping the barrel ID during the plunger stroke.

Gastight 1700 Series

Hamilton 1700-RN Series, Removable Needle



P001092

Hamilton 1700-N Series, Fixed Needle



P001082

Hamilton 1700-LT Series, Luer Tip



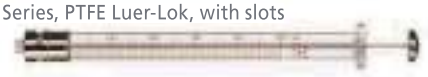
P001084

Hamilton 1700 TLL Series, PTFE Luer-Lok



P001081

Hamilton 1700 TLL Series, PTFE Luer-Lok, with slots



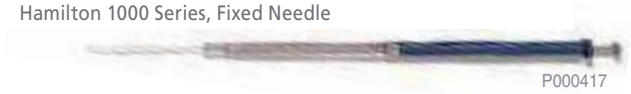
P001083

Manufacturer Model Number	Volume	Needle Length in./mm	Gauge	OD mm	Point Style	Manufacturer Part No.	Pkg. Size	Cat. No.	Replacement Needle Cat. No.
Fixed Needle									
1701N	10 µL	2/51	26s	0.47	Bevel (2)	80000	1	**20972**	---
1702N	25 µL	2/51	22s	0.72	Bevel (2)	80200	1	**20973**	---
1705N	50 µL	2/51	22s	0.72	Bevel (2)	80900	1	**20687**	---
1710N	100 µL	2/51	22s	0.72	Bevel (2)	81000	1	**20688**	---
1725N	250 µL	2/51	22s	0.72	Bevel (2)	81100	1	**20689**	---
1750N	500 µL	2/51	22	0.72	Side-Port (5)	81243	1	**20708**	---
Luer Tip									
1750LTN	500 µL	2/51	22	0.72	Bevel (2)	81217	1	**20690-U**	---
With Chaney Adapter									
1701NCH	10 µL	2/51	26s	0.47	Bevel (2)	80004	1	**20974**	---
Removable Needle									
1701RN	10 µL	2/51	26s	0.47	Bevel (2)	80030	1	**20780-U**	**19131-U**
1702RN	25 µL	2/51	22s	0.72	Bevel (2)	80230	1	**20781**	**19133-U**
1705RN	50 µL	2/51	22s	0.72	Bevel (2)	80930	1	**20782**	**19133-U**
1710RN	100 µL	2/51	22s	0.72	Bevel (2)	81030	1	**20783**	**19133-U**
1725RN	250 µL	2/51	22s	0.72	Bevel (2)	81130	1	**20784**	**19136-U**
1750RN	500 µL	2/51	22	0.72	Bevel (2)	81230	1	**20785-U**	**19137-U**
For Rheodyne, Valco VISF-2, Altex and SSI Injection Valves									
1701RNR	10 µL	2/51	22s	0.72	Blunt (3)	80065	1	**20885**	**19139-U**
1702RNR	25 µL	2/51	22s	0.72	Blunt (3)	80265	1	**20886**	**19139-U**
1705RNR	50 µL	2/51	22s	0.72	Blunt (3)	80965	1	**20887**	**19139-U**
1710RNR	100 µL	2/51	22s	0.72	Blunt (3)	81065	1	**20888**	**19139-U**
1725RNR	250 µL	2/51	22	0.72	Blunt (3)	81165	1	**20889**	**19143-U**
1750RNR	500 µL	2/51	22	0.72	Blunt (3)	81265	1	**20890-U**	**19143-U**
Luer Tip*									
1701LT	10 µL	Order needle separately			Luer Tip	80001	1	**20976**	---
1702LT	25 µL	Order needle separately			Luer Tip	80201	1	**20977**	---
1705LT	50 µL	Order needle separately			Luer Tip	80901	1	**20715**	---
1710LT	100 µL	Order needle separately			Luer Tip	81001	1	**20716**	---
1725LT	250 µL	Order needle separately			Luer Tip	81101	1	**20717**	---
1750LT	500 µL	Order needle separately			Luer Tip	81201	1	**20714**	---
Teflon Luer-Lok*									
1705TLL	50 µL	Order needle separately			Luer Tip	80920	1	**26202**	---
1710TLL	100 µL	Order needle separately			Luer Tip	81020	1	**26203**	---
1725TLL	250 µL	Order needle separately			Luer Tip	81120	1	**20915**	---
1750TLL	500 µL	Order needle separately			Luer Tip	81220	1	**20916**	---
Teflon Luer-Lok*, with slots									
1705TLL	50 µL	Order needle separately			Luer Tip	80927	1	**26204**	---
1710TLL	100 µL	Order needle separately			Luer Tip	81027	1	**26205**	---
1725TLL	250 µL	Order needle separately			Luer Tip	81127	1	**26206**	---
1750TLL	500 µL	Order needle separately			Luer Tip	81227	1	**26207**	---

*Needle not included.

Gastight 1800 Series

Hamilton 1000 Series, Fixed Needle



P000417

Hamilton 1000 TLL Series



P001976

Manufacturer Model Number	Volume	Needle Length in./mm	Gauge	OD mm	Point Style	Manufacturer Part No.	Pkg. Size	Cat. No.	Replacement Needle Cat. No.
Fixed Needle									
1801N	10 µL	2/51	26s	0.47	Bevel (2)	84875	1	**21390**	---
1802N	25 µL	2/51	22s	0.72	Bevel (2)	84878	1	**21391**	---
1805N	50 µL	2/51	22s	0.72	Bevel (2)	84881	1	**21392**	---
1810N	100 µL	2/51	22s	0.72	Bevel (2)	84684	1	**21393**	---
1825N	250 µL	2/51	22s	0.72	Bevel (2)	84887	1	**21394**	---
Removable Needle									
1801RN	10 µL	2/51	26s	0.47	Bevel (2)	84877	1	**21395**	**19131-U**
1802RN	25 µL	2/51	22s	0.72	Bevel (2)	84880	1	**21396**	**19133-U**
1805RN	50 µL	2/51	22s	0.72	Bevel (2)	84883	1	**21397**	**19133-U**
1810RN	100 µL	2/51	22s	0.72	Bevel (2)	84886	1	**21398**	**19133-U**
1825RN	250 µL	2/51	22s	0.72	Bevel (2)	84889	1	**21399**	**19133-U**

ordering: 800-247-6628 (US only) / 814-359-3441 technical service: 800-359-3041 (US and Canada only) / 814-359-3041
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SampleLock Syringes

- Twist valve locks the sample in the syringe
- Positive rear plunger stop eliminates sample loss and plunger blowout at high pressures (not applicable to 1705 and 1710 models)
- Connects to either male or female Luer fittings
- Internal standards can be added through the valve port into the sample contained in the syringe



Manufacturer Model Number	Volume	Needle Length in/mm	Gauge	OD mm	Point Style	Manufacturer Part No.	Pkg. Size	Cat. No.	Replacement Needle Cat. No.	Plunger Assembly Cat. No.
Removable Needle										
1705SL**	50 µL	2/51	22s	0.72	Bevel (2)	80956	1	**26280-U**	**19136-U**	**26152-U**
1710SL**	100 µL	2/51	22s	0.72	Bevel (2)	81056	1	**26281**	**19136-U**	**26154**
1725SL	250 µL	2/51	22s	0.72	Bevel (2)	81156	1	**26282**	**19136-U**	Inquire
1750SL	500 µL	2/51	22s	0.72	Bevel (2)	81256	1	**26283**	**19137-U**	Inquire
1001SL	1.0 mL	2/51	22s	0.72	Bevel (2)	81356	1	**26284**	**19137-U**	Inquire
1002SL	2.5 mL	2/51	22s	0.72	Bevel (2)	81456	1	**26285**	**19137-U**	Inquire
1005SL	5 mL	2/51	22s	0.72	Bevel (2)	81556	1	**26286**	**19137-U**	Inquire
1010SL	10 mL	2/51	22s	0.72	Bevel (2)	81656	1	**26287**	**19137-U**	Inquire
1025SL	25 mL	2/51	22s	0.72	Bevel (2)	86326	1	**26288**	**19137-U**	Inquire
1050SL	50 mL	2/51	22s	0.72	Bevel (2)	86336	1	**26289**	**19137-U**	Inquire
1100SL	100 mL	2/51	22s	0.72	Bevel (2)	86346	1	**26290-U**	**19137-U**	Inquire

**Plunger assembly for 1705SL is 26152-U. Plunger assembly for 1710SL is 26154.

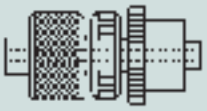
Luer Fittings for SampleLock Syringes

Description	Cat. No.
Male Luer/Removable Needle Hub	**26292**
Male Luer-Lok/Removable Needle Hub	**26293**

26292 - Accepts female luer



26293 - Accepts female luer or female Luer-lok



Syringe Tip: *For Purge & Trap, Use a SampleLock Syringe.*

SampleLock syringes are ideal for purge & trap applications because you can easily remove the syringe plunger and load water samples into the syringe barrel. You can add an internal standard or surrogate sample directly to your sample through the twist valve with a 10 µL syringe. Or, you can connect the sample syringe directly to the purge and trap valve via the integral male luer fitting.

Valco VICI Precision Sampling Syringes

Series A, C, D, and Magnum

Series A



P000433A

Series A-2



P000433B

Series C



P000433C

Series C-120



E000804

Series C-160



E000819

Series CG-130



P000434C

Series D



P000433D

Series D-140



P000434D

Magnum Series



9130435

Manufacturer Model Number	Volume	Needle Length in./mm	Gauge	OD mm	Point Style	Manufacturer Part No.	Pkg. Size	Cat. No.	Replacement Needle Cat. No.
Removable Needle									
Series A	0.1 mL	2.25/57	0.029	0.012	Bevel (2)	010025	1	**22261**	**20996**
Series A	0.25 mL	2.25/57	0.029	0.012	Bevel (2)	010031	1	**22262**	**20996**
Series A	0.5 mL	2.25/57	0.029	0.012	Bevel (2)	010032	1	**22263**	**20996**
Series A	1 mL	2.25/57	0.029	0.012	Bevel (2)	010033	1	**22264**	**20996**
Series A	2 mL	2.25/57	0.029	0.012	Bevel (2)	010034	1	**22265**	**20996**
Series A	5 mL	2.25/57	0.029	0.012	Bevel (2)	010035	1	**22266**	**20996**
Series A	10 mL	2.25/57	0.029	0.012	Bevel (2)	010036	1	**22267**	**20996**
Note: Replacement needle is available with side port to fit the above. Order catalog number 22288.									
Series A-2	25 µL	2/51	0.028	0.005	Bevel (2)	050023	1	**22268**	**22298-U**
Series A-2	50 µL	2/51	0.028	0.005	Bevel (2)	050024	1	**22269-U**	**22298-U**
Series A-2	100 µL	2/51	0.028	0.005	Bevel (2)	050025	1	**22270-U**	**22298-U**
Series A-2	250 µL	2/51	0.029	0.012	Bevel (2)	050031	1	**22271**	**22299**
Series A-2	500 µL	2/51	0.029	0.012	Bevel (2)	050032	1	**22272**	**22299**
Series A-2	1 mL	2/51	0.029	0.012	Bevel (2)	050033	1	**22273**	**22299**
Series A-2	2 mL	2/51	0.029	0.012	Bevel (2)	050034	1	**22274**	**22299**
Series A-2	5 mL	2/51	0.029	0.012	Bevel (2)	050035	1	**22275**	**22299**
Series A-2	10 mL	2/51	0.029	0.012	Bevel (2)	050036	1	**22276**	**22299**
Note: Replacement needle is available with side port to fit the 250 µL-10 mL. Order catalog number 22289.									
Series C	0.1 mL	2/51	0.029	0.012	Bevel (2)	030025	1	**22277**	**22299**
Series C	1 mL	2/51	0.029	0.012	Bevel (2)	030033	1	**22280**	**22299**
Series C	2 mL	2/51	0.029	0.012	Bevel (2)	030034	1	**22281**	**22299**
Series C	5 mL	2/51	0.029	0.012	Bevel (2)	030035	1	**22282**	**22299**
Series C-120	5 µL	2/51	0.019	0.005	Bevel (2)	120021	1	**20960-U**	---
Series C-120	10 µL	2/51	0.019	0.005	Bevel (2)	120022	1	**20961**	---
Series C-120	25 µL	2/51	0.019	0.005	Bevel (2)	120023	1	**20962**	---
Series C-120	100 µL	2/51	0.019	0.005	Bevel (2)	120025	1	**20964**	---
Series CG-130	5 µL	2.25/57	0.019	0.005	Bevel (2)	130221	1	**20956-U**	**20949**
Series CG-130	10 µL	2.25/57	0.019	0.005	Bevel (2)	130222	1	**20957-U**	**20949**
Series D	2 mL	2/51	0.029	0.012	Bevel (2)	040034	1	**22295**	**22299**
Series D-140	0-2 mL	2.5/57	0.019	0.008	Blunt (3)	140012	1	**20985**	Inquire
Magnum	50 mL	2/51	0.035	0.023	Bevel (2)	060039	1	**21735**	**21740-U**
Magnum	100 mL	2/51	0.035	0.023	Bevel (2)	060040	1	**21736**	**21740-U**
Magnum	500 mL	2/51	0.035	0.023	Bevel (2)	060042	1	**21738**	**21740-U**
Fixed Needle									
Series C-160	10 µL	2/51	0.019	0.005	Bevel (2)	160022	1	**20950-U**	---
Series C-160	10 µL	2/51	0.019	0.005	Bevel (2)	821012	6	**22213**	---
Series C-160	25 µL	2/51	0.019	0.005	Bevel (2)	160023	1	**20951-U**	---
Series C-160	50 µL	2/51	0.019	0.005	Bevel (2)	160024	1	**20952-U**	---
Series C-160	100 µL	2/51	0.019	0.005	Bevel (2)	160025	1	**20953**	---
Series CG-130	5 µL	2/51	0.019	0.005	Bevel (2)	130021	1	**20954**	---
Series CG-130	10 µL	2/51	0.019	0.005	Bevel (2)	130022	1	**20955-U**	---

Note: Mininert syringe valves are available for Series C and D syringes to store samples at up to 250 psi. The valve body is all PTFE with a stainless steel stem. Order catalog number 22284. Mininert syringe valves are available for Luer-tip syringes from any manufacture and accept traditional Luer needles. Order catalog number 22285.

ordering: 800-247-6628 (US only) / 814-359-3441 technical service: 800-359-3041 (US and Canada only) / 814-359-3041
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SGE

Gas Tight Syringes


9100523

Manufacturer Model Number	Volume	Needle Length in./mm	Gauge	OD mm	Point Style	Manufacturer Part No.	Pkg. Size	Cat. No.	Replacement Needle Cat. No.
Fixed Needle									
10F-GT	10 µL	1.97/50	26	0.47	Bevel (2)	002200	1	**26256**	---
25F-GT	25 µL	1.97/50	26	0.50	Bevel (2)	003200	1	**26257**	---
50F-GT	50 µL	1.97/50	25	0.50	Bevel (2)	004200	1	**26258-U**	---
100F-GT	100 µL	1.97/50	25	0.50	Bevel (2)	005200	1	**26259**	---
250F-GT	250 µL	1.97/50	25	0.50	Bevel (2)	006200	1	**26260-U**	---
500F-GT	500 µL	1.97/50	25	0.50	Bevel (2)	007200	1	**26261**	---
Removable Needle									
10R-GT	10 µL	1.97/50	26	0.47	Bevel (2)	002250	1	**26237**	**24437**
25R-GT	25 µL	2.75/70	25	0.50	Bevel (2)	003250	1	**26262**	**24447**
50R-GT	50 µL	1.97/50	25	0.50	Bevel (2)	004250	1	**26263**	**24447**
100R-GT	100 µL	1.97/50	25	0.50	Bevel (2)	005250	1	**26264**	**24447**
250R-GT	250 µL	1.97/50	25	0.50	Bevel (2)	006250	1	**26265**	**24447**
500R-GT	500 µL	1.97/50	25	0.50	Bevel (2)	007250	1	**26266**	**24447**
1MR-GT	1 mL	1.97/50	23	0.63	Bevel (2)	008100	1	**509388**	Inquire
2.5MDR-GT	2.5 mL	1.97/50	23	0.63	Bevel (2)	008500	1	**509396**	Inquire
5MDR-GT	5 mL	1.97/50	23	0.63	Bevel (2)	008700	1	**509418**	Inquire
10MDR-GT	10 mL	1.97/50	23	0.63	Bevel (2)	008900	1	**509426**	Inquire
Fixed Luer-Lok*									
1MDF-LL-GT	1 mL	Order needle separately			---	008025	1	**21964**	---
2.5MDF-LL-GT	2.5 mL	Order needle separately			---	008425	1	**509493**	---
Removable Luer-Lok*									
5MDR-LL-GT	5 mL	Order needle separately			---	008760	1	**21965-U**	---
10MDR-LL-GT	10 mL	Order needle separately			---	008960	1	**509507**	---
25MDR-LL-GT	25 mL	Order needle separately			---	009462	1	**509515**	---
50MAX-LL-GT	50 mL	Order needle separately			---	009660	1	**21532**	---
100MR-LL-GT	100 mL	Order needle separately			---	009760	1	**21533**	---

*Needle not included.

SGE Luer-Lok Needles for SGE Gas Tight Syringes

Needle Length in./mm	Gauge	OD mm	Point Style	Manufacturer Part No.	Pkg. Size	Cat. No.	Replacement Needle Cat. No.
1.97/50	23	0.63	Bevel (2)	039802	5	---	**26270-U**
1.97/50	23	0.63	Side hole/dome	039803	2	---	**26271**
2/51	22	0.71	Blunt (3)	039895	2	---	**26274**
2.75/70	23	0.63	Bevel (2)	039807	5	---	**26272**
4.53/115	23	0.63	Bevel (2)	039811	5	---	**26273-U**

Syringe Tip: *Syringe Certification - Calibration Services*

SGE and Hamilton Company offer calibration services for laboratories involved in GLP, ISO, GMP, ANSI, or National Standards Protocol. This syringe certificate satisfies protocol requirements for syringes and provides the traceability back to N.I.S.T. (National Institute of Standards and Technology). If you are interested in a calibration syringe, simply contact our Technical Service Department who will begin the process for you.

Liquid Manual Syringes

Supelco offers Hamilton and SGE liquid manual injection syringes. Many different styles are available to meet your specific application requirement.

For more information about a particular syringe model, please consult the Overview sections in the beginning of this brochure.

Hamilton

Microliter 600 Series

Removable Needle



Manufacturer Model Number	Volume	Needle Length in./mm	Gauge	OD mm	Point Style	Manufacturer Part No.	Pkg. Size	Cat. No.	Replacement Needle Cat. No.
Removable Needle									
62RNR	2.5 µL	2/51	22s	0.72	Blunt (3)	87942	1	**26702**	---
62RNR	5 µL	2/51	22s	0.72	Blunt (3)	87943	1	**26703**	---

Microliter 700 Series

Fixed Tip Needle



Retractable Needle



Luer Tip Needle



Fixed Needle									
75N	5 µL	2/51	26s	0.47	Bevel (2)	87900	1	**26200-U**	---
701N	10 µL	2/51	26s	0.47	Bevel (2)	80300	1	**20734**	---
701N	10 µL	2/51	26s	0.47	Bevel (2)	80366	6	**20779**	---
702N	25 µL	2/51	22s	0.72	Bevel (2)	80400	1	**20735**	---
705N	50 µL	2/51	22s	0.72	Bevel (2)	80500	1	**20736**	---
710N	100 µL	2/51	22s	0.72	Bevel (2)	80600	1	**20737**	---
725N	250 µL	2/51	22s	0.72	Bevel (2)	80700	1	**20738**	---
750N	500 µL	2/51	22	0.72	Bevel (2)	80800	1	**20739**	---
Special Needle									
701SN	10 µL	2/51	26s	0.47	Blunt (3)	80383	1	**20682**	---
701SN	10 µL	3/76	26s	0.47	Bevel (2)	80384	1	**21572**	---
701SN	10 µL	4/101	26s	0.47	Bevel (2)	80382	1	**20693**	---
701SN	10 µL	6/152	26s	0.47	Bevel (2)	80385	1	**21574**	---
For Rheodyne Injectors									
701SNR	10 µL	2/51	22s	0.72	Blunt (3)	80365	1	**58380-U**	---
702SNR	25 µL	2/51	22s	0.72	Blunt (3)	80465	1	**58381**	---
705SNR	50 µL	2/51	22s	0.72	Blunt (3)	80565	1	**58382**	---
710SNR	100 µL	2/51	22s	0.72	Blunt (3)	80665	1	**58383**	---
725SNR	250 µL	2/51	22	0.72	Blunt (3)	80765	1	**58384**	---
750SNR	500 µL	2/51	22	0.72	Blunt (3)	80865	1	**26222-U**	---
For Merlin Microseal, Manual Injection									
701SN	10 µL	2/51	23s	0.64	Cone (1)	80395	1	**26228**	---
With Guide									
701NWG	10 µL	2/51	26s	0.47	Bevel (2)	80307	1	**20753**	---
702NWG	25 µL	2/51	22s	0.72	Bevel (2)	80407	1	**20754**	---
With Chaney Adapter									
701NCH	10 µL	2/51	26s	0.47	Bevel (2)	80304	1	**20747**	---
710NCH	100 µL	2/51	22s	0.72	Bevel (2)	80605	1	**24541-U**	---
Removable Needle									
75RN	5 µL	2/51	26s	0.47	Bevel (2)	87930	1	**20919**	**19131-U**
701RN	10 µL	2/51	26s	0.47	Bevel (2)	80330	1	**20697**	**19131-U**
701RN	10 µL	2/51	26s	0.47	Bevel (2)	80336	6	**20793**	**19131-U**
702RN	25 µL	2/51	22s	0.72	Bevel (2)	80430	1	**20787**	**19133-U**
705RN	50 µL	2/51	22s	0.72	Bevel (2)	80530	1	**20788**	**19133-U**
710RN	100 µL	2/51	22s	0.72	Bevel (2)	80630	1	**20790-U**	**19133-U**
725RN	250 µL	2/51	22s	0.72	Bevel (2)	80730	1	**24538-U**	**19136-U**
750RN	500 µL	2/51	22	0.72	Bevel (2)	80830	1	**24539**	**19137-U**
With Guide									
701RNWG	10 µL	2/51	26s	0.47	Bevel (2)	80337	1	**20698**	**19131-U**
With Chaney Adapter									
701RNCH	10 µL	2/51	26s	0.47	Bevel (2)	80334	1	**20699**	**19131-U**
Luer Tip									
701LT	10 µL	Order needle separately			---	80301	1	**24530**	---
702LT	25 µL	Order needle separately			---	80401	1	**24531**	---
705LT	50 µL	Order needle separately			---	80501	1	**20701**	---
710LT	100 µL	Order needle separately			---	80601	1	**20702**	---
725LT	250 µL	Order needle separately			---	80701	1	**20703**	---

ordering: 800-247-6628 (US only) / 814-359-3441 technical service: 800-359-3041 (US and Canada only) / 814-359-3041

Microliter 800 Series

Fixed Needle



P001078

Replaceable Needle



P001079

Manufacturer Model Number	Volume	Needle Length in./mm	Gauge	OD mm	Point Style	Manufacturer Part No.	Pkg. Size	Cat. No.	Replacement Needle Cat. No.
Fixed Needle									
85N	5 µL	2/51	26s	0.47	Bevel (2)	84850	1	**20835-U**	---
801N	10 µL	2/51	26s	0.47	Bevel (2)	84852	1	**20795-U**	---
802N	25 µL	2/51	22s	0.72	Bevel (2)	84854	1	**21492**	---
805N	50 µL	2/51	22s	0.72	Bevel (2)	84856	1	**24544**	---
810N	100 µL	2/51	22s	0.72	Bevel (2)	84858	1	**21497-U**	---
Removable Needle									
85RN	5 µL	2/51	26s	0.47	Bevel (2)	84851	1	**26201**	**19131-U**
801RN	10 µL	2/51	26s	0.47	Bevel (2)	84853	1	**20797**	**19131-U**
802RN	25 µL	2/51	22s	0.72	Bevel (2)	84855	1	**21493**	**19133-U**
805RN	50 µL	2/51	22s	0.72	Bevel (2)	84857	1	**21496**	**19133-U**
810RN	100 µL	2/51	22s	0.72	Bevel (2)	84859	1	**21498**	**19133-U**
825RN	250 µL	2/51	22s	0.72	Bevel (2)	84861	1	**24546**	**19136-U**
For Waters									
801RNW	10 µL	1.97/50	25s	0.51	Blunt (3)	84815	1	**58390-U**	**5-8398**
802RNW	25 µL	1.97/50	25s	0.51	Blunt (3)	84816	1	**58391**	**5-8398**
805RNW	50 µL	1.97/50	25s	0.51	Blunt (3)	84817	1	**58392**	**5-8398**
810RNW	100 µL	1.97/50	25s	0.51	Blunt (3)	84818	1	**58393**	**5-8398**
825RNW	250 µL	1.97/50	25s	0.51	Blunt (3)	84819	1	**20693**	**5-8398**

Microliter 900 Series

Fixed and Replaceable Needle



P000419

Fixed Needle									
95N	5 µL	2/51	26s	0.47	Bevel (2)	87920	1	**20906-U**	---
901N	10 µL	2/51	26s	0.47	Bevel (2)	80360	1	**20908-U**	---
Removable Needle									
95RN	5 µL	2/51	26s	0.47	Bevel (2)	87925	1	**20907-U**	**19131-U**
901RN	10 µL	2/51	26s	0.47	Bevel (2)	80370	1	**20909-U**	**19131-U**

Microliter 7000 Series

Removable Needle



P001093

Removable Needle									
With Knurled Hub									
7000.5	0.5 µL	2.75/70	25	0.51	Bevel (2)	86259	1	**22185-U**	Inquire
7001	1.0 µL	2.75/70	25s	0.51	Bevel (2)	80135	1	**20750**	**26733**
7101	1.0 µL	2.75/70	22s	0.72	Bevel (2)	86211	1	**20979**	**26736**
7002	2.0 µL	2.75/70	25	0.51	Bevel (2)	88411	1	**20751**	**26739**
7102	2.0 µL	2.75/70	23	0.64	Bevel (2)	88511	1	**24592**	Inquire
7105	5.0 µL	2.75/70	24	0.57	Bevel (2)	88011	1	**20980-U**	**26745-U**
7000.5	0.5 µL	2.75/70	25	0.51	Blunt (3)	86250	1	**22184-U**	**26729**
7001	1.0 µL	2.75/70	25s	0.51	Blunt (3)	80100	1	**20731**	**26732-U**
7101	1.0 µL	2.75/70	22s	0.72	Blunt (3)	86200	1	**20733**	**26735-U**
7002	2.0 µL	2.75/70	25	0.51	Blunt (3)	88400	1	**20732**	Inquire
7102	2.0 µL	2.75/70	23	0.64	Blunt (3)	88500	1	**24593**	Inquire
7105	5.0 µL	2.75/70	24	0.57	Blunt (3)	88000	1	**20728**	Inquire
With Guide									
7000.5	0.5 µL	2.75/70	25	0.51	Blunt (3)	86254	1	**24596**	**26729**
7001	1.0 µL	2.75/70	25s	0.51	Blunt (3)	80107	1	**20944**	**26732-U**
7101	1.0 µL	2.75/70	22s	0.72	Blunt (3)	86207	1	**20726**	**26735-U**
7002	2.0 µL	2.75/70	25	0.51	Blunt (3)	88407	1	**20693**	Inquire
7102	2.0 µL	2.75/70	23	0.64	Blunt (3)	88507	1	**24597**	Inquire
7105	5.0 µL	2.75/70	24	0.57	Blunt (3)	88007	1	**24598**	
With Chaney Adapter									
7000.5	0.5 µL	2.75/70	25	0.51	Blunt (3)	86252	1	**24594**	**26729**
7001	1.0 µL	2.75/70	25s	0.51	Blunt (3)	80104	1	**20743**	**26732-U**
7101	1.0 µL	2.75/70	22s	0.72	Blunt (3)	86204	1	**24595**	**26735-U**
7105	5.0 µL	2.75/70	24	0.57	Blunt (3)	88004	1	**20755**	Inquire

SGE

Microvolume Plunger Protection

Manufacturer Model Number	Volume	Needle Length in./mm	Gauge	OD mm	Point Style	Manufacturer Part No.	Pkg. Size	Cat. No.	Replacement Needle Cat. No.
Fixed Needle									
5F	5 µL	1.97/50	26	0.47	Bevel (2)	001000	1	**26235-U**	---
10F	10 µL	1.97/50	26	0.47	Bevel (2)	002000	1	**21933-U**	---
SK-10F	10 µL	1.97/50	26	0.47	Bevel (2)	002030	6	**21934-U**	---
VPK-10F	10 µL	1.97/50	26	0.47	Bevel (2)	002033	10	**26239**	---
Removable Needle									
5R	5 µL	1.97/50	26	0.47	Bevel (2)	001050	1	**26236**	**24436**
10R	10 µL	1.97/50	26	0.47	Bevel (2)	002050	1	**24413**	**24437**

Microvolume Flexible Plunger

Fixed Needle									
5FX	5 µL	1.97/50	26	0.47	Bevel (2)	001100	1	**23950-U**	---
5FX-5C	5 µL	1.97/50	26	0.47	Cone (1)	001105	1	**26242**	---
10FX	10 µL	1.97/50	26	0.47	Bevel (2)	002100	1	**23944**	---
SK-10FX	10 µL	1.97/50	26	0.47	Bevel (2)	002130	6	**23966**	---
10FX-5C	10 µL	1.97/50	26	0.47	Cone (1)	002105	1	**26243**	---
10FX-5/0.63C	10 µL	1.97/50	23	0.63	Cone (1)	002108	1	**26244**	---
SK-10FX-5/0.63C	10 µL	1.97/50	23	0.63	Cone (1)	002135	6	**26247**	---
Removable Needle									
5RX	5 µL	1.97/50	26	0.47	Bevel (2)	001150	1	**23953-U**	**24436**
10RX	10 µL	1.97/50	26	0.47	Bevel (2)	002150	1	**23947**	**24437**
SK-10RX	10 µL	1.97/50	26	0.47	Bevel (2)	002180	6	**23967**	**24437**

Microvolume Standard Plunger

Fixed Needle									
25F	25 µL	1.97/50	25	0.5	Bevel (2)	003000	1	**26248**	---
50F	50 µL	1.97/50	25	0.5	Bevel (2)	004000	1	**26249-U**	---
100F	100 µL	1.97/50	25	0.5	Bevel (2)	005000	1	**26250-U**	---
250F	250 µL	1.97/50	25	0.5		006000	1	**26251-U**	---
500F	500 µL	1.97/50	25	0.5	Bevel (2)	007000	1	**26253-U**	---
Removable Needle									
25R	25 µL	1.97/50	25	0.5	Bevel (2)	003050	1	**24422-U**	**24447**
50R	50 µL	1.97/50	25	0.5	Bevel (2)	004050	1	**26253-U**	**24447**
100R	100 µL	1.97/50	25	0.5	Bevel (2)	005050	1	**24423**	**24447**
250R	250 µL	1.97/50	25	0.5	Bevel (2)	006050	1	---	**24447**
500R	500 µL	1.97/50	25	0.5	Bevel (2)	007050	1	---	**24447**

Microvolume Plunger-in-Needle Syringe

0.5BNR-5	0.5 µL	1.97/50	23	0.63	Cone (1)	000300	1	**24400**	**24424**
0.5BNR-5BV	0.5 µL	1.97/50	23	0.63	Bevel (2)	000301	1	**509140**	Inquire
0.5BNR-5/0.47	0.5 µL	1.97/50	26	0.47	Cone (1)	000303	1	**509167**	**509175**
0.5BR-7	0.5 µL	2.75/70	23	0.63	Cone (1)	000310	1	**24401**	**24425**
1BR-5	1 µL	1.97/50	23	0.63	Cone (1)	000500	1	**509221**	**509248**
1BR-7	1 µL	2.75/70	23	0.63	Cone (1)	000505	1	**24408**	**24432**
1BR-7BV	1 µL	2.75/70	23	0.63	Bevel (2)	000506	1	**509256**	**509264**
1BR-7/0.47	1 µL	2.75/70	26	0.47	Cone (1)	000570	1	**509272**	**509280**
5BR-7	5 µL	2.75/70	23	0.63	Cone (1)	000802	1	**24411**	**24435**
5BR-7BV	5 µL	2.75/70	23	0.63	Bevel (2)	000803	1	**509310**	Inquire

Microvolume Guided Plunger

Fixed Needle									
5F-GP	5 µL	1.97/50	26	0.47	Bevel (2)	001400	1	**21521**	---
10F-GP	10 µL	1.97/50	26	0.47	Bevel (2)	002400	1	**26240-U**	---
Removable Needle									
5R-GP	5 µL	1.97/50	26	0.47	Bevel (2)	001450	1	**24412**	**24436**
10R-GP	10 µL	1.97/50	26	0.47	Bevel (2)	002450	1	**24414**	**24437**

ordering: 800-247-6628 (US only) / 814-359-3441 technical service: 800-359-3041 (US and Canada only) / 814-359-3041

HPLC Injection Valves

Waters U6K Loop Injector

Hamilton 800 Series

Manufacturer Model Number	Volume	Needle Length in./mm	Gauge	OD mm	Point Style	Manufacturer Part No.	Pkg. Size	Cat. No.	Replacement Needle Cat. No.
Removable Needle									
801RNW	10 µL	1.97/50	25s	0.51	Blunt (3)	84815	1	**58390-U**	**58398**
802RNW	25 µL	1.97/50	25s	0.51	Blunt (3)	84816	1	**58391**	**58398**
805RNW	50 µL	1.97/50	25s	0.51	Blunt (3)	84817	1	**58392**	**58398**
810RNW	100 µL	1.97/50	25s	0.51	Blunt (3)	84818	1	**58393**	**58398**
825RNW	250 µL	1.97/50	25s	0.51	Blunt (3)	84819	1	**58394**	**58399**

Rheodyne, Valco VISF-2, Altex and SSI Valves

Hamilton 1700 Series LC Gastight Syringes

Removable Needle									
1701RNR	10 µL	2/51	22s	0.72	Blunt (3)	80065	1	**20885**	**19139-U**
1702RNR	25 µL	2/51	22s	0.72	Blunt (3)	80265	1	**20886**	**19139-U**
1705RNR	50 µL	2/51	22s	0.72	Blunt (3)	80965	1	**20887**	**19139-U**
1710RNR	100 µL	2/51	22s	0.72	Blunt (3)	81065	1	**20888**	**19139-U**
1725RNR	250 µL	2/51	22	0.72	Blunt (3)	81165	1	**20889**	**19143-U**
1750RNR	500 µL	2/51	22	0.72	Blunt (3)	81265	1	**20890-U**	**19143-U**

Hamilton 600 Series

Removable Needle									
62RNR	2.5 µL	2/51	22s	0.72	Blunt (3)	87942	1	**26702**	---
62RNR	5 µL	2/51	22s	0.72	Blunt (3)	87943	1	**26703**	---

Hamilton 700 Series

Fixed Needle									
701SNR	10 µL	2/51	22s	0.72	Blunt (3)	80365	1	**58380-U**	---
702SNR	25 µL	2/51	22s	0.72	Blunt (3)	80465	1	**58381**	---
705SNR	50 µL	2/51	22s	0.72	Blunt (3)	80565	1	**58382**	---
710SNR	100 µL	2/51	22s	0.72	Blunt (3)	80665	1	**58383**	---
725SNR	250 µL	2/51	22	0.72	Blunt (3)	80765	1	**58384**	---
750SNR	500 µL	2/51	22	0.72	Blunt (3)	80865	1	**26222-U**	---

SGE Microvolume Syringes for HPLC Valves


P001077

Fixed Needle									
5F-LC	5 µL	2/51	22	0.72	Blunt (3)	001301	1	**509779**	---
10F-LC	10 µL	2/51	22	0.72	Blunt (3)	002301	1	**509787**	---
25F-LC	25 µL	2/51	22	0.72	Blunt (3)	003300	1	**509795**	---
100F-LC	100 µL	2/51	22	0.72	Blunt (3)	005300	1	**509817**	---
250F-LC	250 µL	2/51	22	0.72	Blunt (3)	006300	1	**509825**	---
500F-LC	500 µL	2/51	22	0.72	Blunt (3)	007300	1	**509833**	---
Removable Needle									
5R-LC	5 µL	2/51	22	0.72	Blunt (3)	001310	1	**509841**	**23975**
10R-LC	10 µL	2/51	22	0.72	Blunt (3)	002310	1	**509868**	**24438-U**
25R-LC	25 µL	2/51	22	0.72	Blunt (3)	003310	1	**509876**	**509949**
50R-LC	50 µL	2/51	22	0.72	Blunt (3)	004310	1	**509884**	**509949**
100R-LC	100 µL	2/51	22	0.72	Blunt (3)	005310	1	**509892**	**509949**
250R-LC	250 µL	2/51	22	0.72	Blunt (3)	006310	1	**509906**	**509949**
500R-LC	500 µL	2/51	22	0.72	Blunt (3)	007310	1	**509914**	**509949**
1MR-LC-GT	1 mL	2/51	22	0.72	Blunt (3)	008105	1	**509922**	**509957**
2.5MDR-LC-GT	2.5 mL	2/51	22	0.72	Blunt (3)	008505	1	**509930**	**509957**

SGE SuperFlex Syringes for HPLC Valves

Fixed Needle									
10FX-LC	10 µL	2/51	22	0.72	Blunt (3)	002300	1	**23946**	Inquire
Removable Needle									
10RX-LC	10 µL	2/51	22	0.72	Blunt (3)	002350	1	**23948**	**24438-U**

Multipaks

Hamilton

Hamilton MULTI-PAKS provide an excellent opportunity to reduce cost, packaging waste, ordering frequency, and delays in replacing damaged or worn syringes.



700 Series Six Packs

Manufacturer Model Number	Volume	Needle Length in/mm	Gauge	OD mm	Point Style	Manufacturer Part No.	Pkg. Size	Cat. No.	Replacement Needle Cat. No.
Fixed Needle, N (Cemented Needle)									
701N	10 µL	2/51	26s	0.47	Bevel (2)	80366	6	**20779**	---
RN (Removable Needle)									
701RN	10 µL	2/51	26s	0.47	Bevel (2)	80336	6	**20793**	**19131-U**

For Agilent 7673-7683 Autosamplers

Microliter Syringes - Fixed Needle									
75ASN	5 µL	1.71/43	23s	0.64	Cone	87990	6	**21315**	---
75ASN	5 µL	1.71/43	26s	0.47	Cone	87989	6	**21314**	---
75ASN	5 µL	1.71/43	23s-26s	0.64-0.47	Cone	87994	6	**24571**	---
701ASN	10 µL	1.71/43	23s	0.64	Cone	80390	6	**21317**	---
701ASN	10 µL	1.71/43	26s	0.47	Cone	80389	6	**21316**	---
701ASN	10 µL	1.71/43	23s-26s	0.64-0.47	Cone	80391	6	**24574**	---
Gastight Syringes - Fixed Needle									
175	5 µL	1.71/43	23s	0.64	Cone	80090	6	**26700-U**	---
175	5 µL	1.71/43	23s-26s	0.64-0.47	Cone	80092	6	**24577**	---
1701	10 µL	1.71/43	23s	0.64	Cone	80094	6	**26701**	---
1701	10 µL	1.71/43	23s-26s	0.64-0.47	Cone	80096	6	**24580**	---

800 Series MULTI-PAK™

- Designed for Waters U6K injection valve
- Includes one each of 10, 25, 50, 100, & 250 µL volume syringes
- Contains one handle and a selection of syringe plunger/barrel combinations
- Removable needles (RNW)
- Reinforced plunger
- Needle length: 50 mm (1.97 in.)

800 Series MULTI-PAK	---	---	---	---	---	84890		**1Z109681-1SGT**	---

GC Syringe Pack

Designed for GC capillary use. The most popular Hamilton syringes are available in a convenient package of three different syringes: 701N, 1702N, 7001KH.

GC Syringe Pack	---	---	---	---	---	80380	3	**21353**	---
701N	10 µL	2/51	26s	0.47	Bevel (2)	80300			
1702N	25 µL	2/51	22s	0.72	Bevel (1)	80200			
7001KH	1 µL	2.75/70	25s	0.51	Blunt (3)	80100			

SGE

Fixed Needle, Plunger Protection									
SK-10F	10 µL	1.97/50	26	0.47	Bevel (2)	002030	6	**21934-U**	---
VPK-10F	10 µL	1.97/50	26	0.47	Bevel (2)	002030	10	**26239**	---

Autosampler Syringes for Agilent 7673-7683 Autosamplers

Fixed Needle									
SK-5F-HP-0.47	5 µL	1.65/42	26	0.47	Cone	001804	6	**21910**	---
SK-5F-HP-0.63	5 µL	1.65/42	23	0.63	Cone	001814	6	**21911**	---
SK-10F-HP-0.47	10 µL	1.65/42	26	0.47	Cone	002804	6	**21912**	---
SK-10F-HP-0.63	10 µL	1.65/42	23	0.63	Cone	002814	6	**21544**	---
Fixed Needle - Dual Gauge									
5F-HP-0.63/0.47	5 µL	1.65/42	23-26	0.63/0.47	Cone	001822	6	**26887-U**	---
10F-HP-0.63/0.47	10 µL	1.65/42	23-26	0.63/0.47	Cone	002822	6	**26889-U**	---
Gas Tight - Fixed Needle, Dual Gauge									
SK-10F-HP-GT-0.63/0.47	10 µL	1.65/42	23-26	0.63/0.47	Cone	002827	6	**26891-U**	---

ordering: 800-247-6628 (US only) / 814-359-3441 technical service: 800-359-3041 (US and Canada only) / 814-359-3041

Special Purpose Syringes

Hamilton

On-Column Injection Syringe

Stainless steel fixed needle design minimizes dead volume. Use fixed needle syringes with 0.32 mm ID or larger columns.

Use the 701RNFS syringes with liquid samples. PTFE plunger tip makes the 1701RNFS gas tight. Comes with a replaceable fused silica needle. Use these with 0.20 mm ID or larger columns.

The 7000.5KHOC Hamilton sample-in-needle syringe has a 0.5 µL sample capacity. Replaceable stainless steel needle/plunger assembly. Use with 0.25 mm ID or larger columns. This syringe is for liquid samples only.

Manufacturer Model Number	Volume	Needle Length in./mm	Gauge	OD mm	Point Style	Manufacturer Part No.	Pkg. Size	Cat. No.
Fixed Needle								
701SN for Agilent	10 µL	4.92/125	32	0.24	Blunt (3)	80308	1	**21352**
701SN for Carlo Erba	10 µL	2.95/75	32	0.24	Blunt (3)	80351	1	**21351**
Removable Needle								
701RNFS	10 µL	3.94/100	---	0.17	Blunt (3)	87402	1	**21359**
1701RNFS	10 µL	3.94/100	---	0.17	Blunt (3)	87404	1	**21360-U**
1801RNFS	10 µL	3.94/100	---	0.17	Blunt (3)	87405	1	**26720-U**
70005.KHOC	0.5 µL	3.94/100	---	0.23	Blunt (3)	86257	1	**21366**

Digital Syringe

The only N.I.S.T. traceable, calibrated syringe available. This syringe provides constant injection rate. Volume is dispensed within +/- 0.5% of the syringe volume. The syringe is included as part of the product.


P000415

701N	10 µL	2/51	26s	0.47	Bevel (2)	DS80300	1	**24452**
1701RN	10 µL	2/51	26s	0.47	Bevel (2)	DS80030	1	**Z261173-1EA**
1702RN	25 µL	2/51	22s	0.72	Bevel (2)	DS80230	1	**Z261181-1EA**
1750RN	50 µL	2/51	22s	0.72	Bevel (2)	DS81230	1	**Z261246-1EA**

Constant Rate Syringe

This syringe eliminates injection variability. A spring-driven plunger delivers the sample at the same injection rate, regardless of the operator.
A micrometer dials the desired volume. It has a stainless steel plunger and a PTFE sealing tip. Repeatable and resetable at an accurracy of +/- 1%.


P000418

CR700-50	2-50 µL	2/51	22s	0.72	Blunt (3)	84303	1	20713

Purge and Trap Syringe

This purge and trap version of the SampleLock syringe is designed for analyzing drinking water samples according to US EPA purge and trap concentration techniques (EPA Methods 502.1, 502.2, 503.1, 524.1, and 524.2)


P001088

1005SLPT	5 µL	---	---	---	---	81570	1	**26294**
1005 TLL	5 µL	---	---	---	---	81520	1	**20999**

TLC Syringe

- PTFE-coated needle tip (3/4") for reproducible sample spotting
- Removable needles


P001090

1701TLC	10 µL	2/51	26s	---	TLC	80050	1	**Z264385-1EA**
1702TLC	25 µL	2/51	22s	---	TLC	80250	1	**Z264393-1EA**
1705TLC	50 µL	2/51	22	---	TLC	80950	1	**Z264407-1EA**
1710TLC	100 µL	2/51	22	---	TLC	81050	1	**Z264415-1EA**

SGE

Headspace/Soil Gas Syringes

- Fitted with valve and special Luer probe with side hole
- Needle valve in hub allows gas samples to be stored in syringe during transfer to lab
- Recommended for soil headspace extraction
- Probe is removable and replaced with needle during injection in GC



Description	Volume	Needle Length in./mm	Gauge	OD mm	Point Style	Manufacturer Part No.	Pkg. Size	Cat. No.
Gas Tight Headspace syringe	5 mL					008775	1	**23984**
Replacement probe	—					031571	1	**23985**
Replacement needles	—					039802	5	**26270-U**

Pre-Fitted with Removable Needle and Valve



100 µL	1.97/50	23	0.63	Cone	005279	1	**509531**
250 µL	1.97/50	23	0.63	Cone	006279	1	**509558**

Pre-Fitted with Luer-Lok Valve

Needles for this syringe style are found on Page 34.



1 mL	—	—	—	—	008160	1	**509590**
5 mL	—	—	—	—	008770	1	**509612**
10 mL	—	—	—	—	008970	1	**509620**
25 mL	—	—	—	—	009472	1	**509639**
100 mL	—	—	—	—	009770	1	**509655**

Syringe Tip: *Routine Syringe Inspection Improves Performance*

Syringes should be routinely checked for damage to the barrel and needle. Look for hairline cracks in the barrel. Needles should also be checked for burrs and rough surfaces which may cause tearing and excessive wear on the septum.

ordering: 800-247-6628 (US only) / 814-359-3441 technical service: 800-359-3041 (US and Canada only) / 814-359-3041

Replacement Parts

Hamilton

Standard Needle



P000407a

Metal Hub



P001074

KEL-F Hub



P001075

Plunger Assembly



P000408a

Syringe Barrel



P000402a

Standard Needles for Autosampler Syringes

Description	Volume	Needle Length in./mm	Gauge	OD mm	Point Style	Manufacturer Part No.	Pkg. Size	Cat. No.
	5-10 µL	1.71/43	23s	0.63	Cone (1)	80457	6	**21327-U**
	5-10 µL	1.71/43	26s	0.47	Cone (1)	80458	6	**21326**
	5-10 µL	1.71/43	23s-26s	0.47-0.63	Cone (1)	80460	6	**24582**

Standard Needles for Manual Syringes

	2.5-100 µL	2/51	26s	0.47	Bevel (2)	7758-02	6	**19131-U**
	2.5-100 µL	2/51	26	0.46	Bevel (2)	7758-04	6	**19132-U**
	2.5-100 µL	2/51	22s	0.72	Bevel (2)	7758-03	6	**19133-U**
	2.5-100 µL	2/51	22	0.72	Bevel (2)	7758-01	6	**Z288993-1PAK**
	2.5-100 µL	3/76	22	0.72	Bevel (2)	7804-01	6	**Z118117-6EA**
	2.5-100 µL	4/101.5	26s	0.47	Bevel (2)	7804-04	6	**Z121401-6EA**
	2.5-100 µL	4/101.5	22	0.72	Bevel (2)	7804-01	6	**Z118125-6EA**
	250-10000 µL	2/51	26s	0.47	Bevel (2)	7779-02	6	**19134-U**
	250-10000 µL	2/51	26	0.46	Bevel (2)	7779-04	6	**19135-U**
	250-10000 µL	2/51	22s	0.72	Bevel (2)	7779-03	6	**19136-U**
	250-10000 µL	2/51	22	0.72	Bevel (2)	7779-01	6	**19137-U**
	250-10000 µL	4/101.5	22	0.72	Bevel (2)	7804-01	6	**Z118109-6EA**
	2.5-100 µL	2/51	26s	0.47	Blunt (3)	7768-01	6	**19138-U**
	2.5-100 µL	1.97/50	25s	0.51	Blunt (3)	80426	6	**58398**
	2.5-100 µL	2/51	22s	0.72	Blunt (3)	7770-01	6	**19139-U**
	250-10000 µL	2/51	26s	0.47	Blunt (3)	7780-01	6	**19140-U**
	250-10000 µL	2/51	26	0.47	Blunt (3)	7780-02	1	**19141-U**
	250-10000 µL	1.97/50	25s	0.51	Blunt (3)	80726	6	**58399**
	250-10000 µL	2/51	22s	0.72	Blunt (3)	7780-03	6	**19142-U**
	250-10000 µL	2/51	22	0.72	Blunt (3)	7780-04	6	**19143-U**
	250-10000 µL	2/51	16	1.52	Blunt (3)	80780	6	**26710-U**
	2.5-100 µL	2/51	26s	0.47	Side-Port (5)	7784-07	6	**19144-U**
	2.5-100 µL	2/51	22s	0.72	Side-Port (5)	7784-05	6	**19146-U**
	250-10000 µL	2/51	26s	0.47	Side-Port (5)	7784-03	6	**19147-U**
	250-10000 µL	2/51	26	0.46	Side-Port (5)	7784-04	6	**19148-U**
	250-10000 µL	4/101.5	26	0.46	Side-Port (5)	7784-04	6	**Z121401-6EA**
	250-10000 µL	2/51	22s	0.72	Side-Port (5)	7784-01	6	**19151-U**
	250-10000 µL	2/51	22	0.72	Side-Port (5)	7784-02	6	**19154-U**

Description	Volume	Needle Length in./mm	Gauge	OD mm	Point Style	Manufacturer Part No.	Pkg. Size	Cat. No.
Metal Hub and KEL-F Hub Needles for LT and TLL Syringes								
Metal hub		2/51	28	0.36	Bevel (2)	90028	6	**20757**
Metal hub		2/51	22	0.72	Bevel (2)	90022	6	**21746**
Metal hub		2/51	22s	0.72	Bevel (2)	90038	6	**21748-U**
KEL-F hub		2/51	28	0.36	Bevel (2)	90128	6	**20756**
KEL-F hub		2/51	22s	0.72	Bevel (2)	90138	6	**21749**
KEL-F hub		2/51	22	0.72	Bevel (2)	90122	6	**21747**
Metal hub		2/51	22	0.72	Blunt (3)	91022	6	**21741**
KEL-F hub		2/51	22	0.72	Blunt (3)	90134	6	**21744**
KEL-F hub		2/51	22s	0.72	Blunt (3)	90534	6	**Z288977-1PAK**
Metal hub		2/51	22	0.72	Side-Port (5)	90222	6	**20803**
KEL-F hub		2/51	22s	0.72	Side-Port (5)	90438	6	**21743**
KEL-F hub		2/51	22	0.72	Side-Port (5)	90422	6	**21742-U**
Replacement Barrel Assemblies								
85N	5 µL					32150	1	**20836**
801N	10 µL					32151	1	**20837**
801RN	10 µL					32129	1	**20838-U**
1801RN w/o Needle	10 µL					32187	1	**21375-U**
Gastight 1000 Luer tip Syringe	1.0 mL					1418-01	1	**Z26,734-1**
	5 mL					10123	1	**Z26,736-8**
	10 mL					10124	1	**Z26,737-6**
Plunger Assemblies with Tips for Hamilton Series 1000, 1700, and 1800								
1001 - T-N-LTN-RN-TLL-TLL /slots	1 mL					1359-01	1	**26159**
1002 - LT-LTN-RN-TLL	2 mL					1360-01	1	**26161**
1005 - all styles	5 mL					13230	1	**26162**
1010 - LT-LTN-RN-TLL	10 mL					13231	1	**26163**
1025 - LT-LTN-RN-TLL	25 mL					13271	1	**26164**
1701 - all styles	25 µL					13205	1	**21343**
1702 - C-LT-N-RN	25 µL					1122-01	1	**26150**
1705 - LT-RN-TLL	50 µL					1162-01	1	**26152-U**
1710 - C-LT-N-RN-TLL	100 µL					1162-02	1	**26154**
1725 - LT-N-RN-TLL	250 µL					1162-03	1	**26156**
1750 - LT-LTN-RN-TLL	500 µL					1169-01	1	**26158-U**
1801 - N-RN	10 µL					32193	1	**27383**
1802 - N-RN	25 µL					1160-01	1	**26151**
1805 - N-RN	50 µL					1161-01	1	**26153**
1810 - N-RN	100 µL					1161-02	1	**26155-U**
Replacement Plungers for All CTC Syringes								
1701CTC	10 µL					203229	1	**28641-U**
1702CTC	25 µL					203045	1	**28642-U**
1710CTC	100 µL					203096	1	**28643-U**
1725CTC	250 µL					203098	1	**28644-U**
1750CTC	500 µL					203061	1	**28645-U**
1001CTC	1 mL					203255	1	**28646-U**
1002CTC	2.5 mL					203256	1	**28647-U**
1005CTC	5 mL					203066	1	**28648-U**

ordering: 800-247-6628 (US only) / 814-359-3441 technical service: 800-359-3041 (US and Canada only) / 814-359-3041

SGE

Standard Needles for Autosampler Syringes

Description	Volume	Needle Length in./mm	Gauge	OD mm	Point Style	Manufacturer Part No.	Pkg. Size	Cat. No.
Agilent Technologies - 7673, 7683 and 6850 ALS								
	0.5 mL	1.65/42	26	0.47	Cone	033708	1	**24426**
	0.5 mL	1.65/42	23	0.63	Cone	033715	1	**24427**
	5 mL	1.65/42	26	0.47	Cone	036710	1	**23977**
	10 mL	1.65/42	26	0.47	Cone	037715	2	**24440-U**
	10 mL	1.65/42	23	0.63	Cone	037717	2	**24439**
	25 mL	1.65/42	23	0.63	Cone	038717	2	**509728**
PerkinElmer - Autosystem and Clarus 500								
	0.5 mL	70	23	0.63	Cone	033765	1	**24431**
Shimadzu - AOC 14, 17, 20 and 201								
	0.5 mL	1.65/42	23	0.63	Cone	033745	1	**24429**
	10 mL	1.65/42	23	0.63	Cone	037747	1	**24442**
Varian - 8000								
	10 mL	1.97/50	25	0.5	Dome	037775	2	**24443**
Varian - 8035, 8100 and 8200 Series								
	10 mL	1.97/50	26	0.47	Bevel	037777	1	**24445**
Standard Needles for Manual Syringes								
	5 mL	1.97/50	26	0.47	Cone	036010	2	**23980**
		1.97/50	26	0.47	Bevel	036110	5	**24436**
		2/51	22	0.71	Blunt	036250	5	**23975**
		1.97/50	26	0.47	Side Hole/Dome	036410	2	**23981**
	10 mL	1.97/50	26	0.47	Cone	037010	2	**23982**
		1.97/50	23	0.63	Cone	037011	2	**26246**
		1.97/50	26	0.47	Bevel	037110	5	**24437**
		2/51	22	0.71	Blunt	037250	5	**24438-U**
	25-500 mL	1.97/50	25	0.5	Bevel	038110	5	**24447**
		2/51	22	0.71	Blunt	038250	5	**509949**
	1-2.5 mL	2/51	22	0.71	Blunt	039250	5	**509957**
		1.97/50	25	0.5	Blunt	039260	5	**23976**
Luer-Lok Needles								
		1.97/50	23	0.63	Bevel	039802	2	**26270-U**
		1.97/50	23	0.63	Side Hole/Dome	039803	2	**26271**
		2/51	22	0.71	Blunt	039895	2	**26274**
		2.75/70	23	0.63	Bevel	039807	5	**26272**
		4.53/115	23	0.63	Bevel	039811	5	**26273-U**

Replacement Kits for Plunger-in-Needle Microvolume Syringes

6.5 mm OD Barrel								
	0.5 mL	1.97/50	23	0.63	Cone	033010	1	**24424**
	0.5 mL	1.97/50	26	0.047	Cone	033012	1	**509175**
8 mm OD Barrel								
	0.5 mL	2.75/70	23	0.63	Cone	033057	1	**24425**
	1 mL	1.97/50	23	0.63	Cone	034055	1	**509248**
	1 mL	2.75/70	23	0.63	Cone	034057	1	**24432**
	1 mL	2.75/70	23	0.63	Bevel	034060	1	**509264**
	1 mL	2.75/70	26	0.47	Cone	034610	1	**509280**
	5 mL	2.75/70	23	0.63	Cone	035057	1	**24435**

Valco VICI Precision Sampling

Replacement Plunger Tips for Series A, A-2, C and D

500 µL	013932	2	**21950**
1 mL	013933	2	**21951**
2 mL	013934	2	**21952-U**
5 mL	013935	2	**21953-U**

Description	Volume	Needle Length in./mm	ID (mm/inch)	OD (mm/inch)	Point Style	VICI PIN	Pkg. Size	Cat. No.
Replacement Needles								
Series A								
	100 µL-10 mL	57 (2.25)	0.30 (0.012)	0.74 (0.029)	Bevel, Open End	913050	3	**20996**
	100 µL-10 mL	57 (2.25)	0.30 (0.012)	0.74 (0.029)	Side Hole, Taper	913050	3	**22288**
Series A-2, C, D								
	25 µL-100 µL	51 (2.0)	0.13 (0.005)	0.71 (0.028)	Bevel, Open End	943050	3	**22298-U**
	100 µL-10 mL	51 (2.0)	0.30 (0.012)	0.71 (0.028)	Bevel, Open End	943051	3	**22299**
	100 µL-10 mL	51 (2.0)	0.30 (0.012)	0.71 (0.028)	Side Hole, Taper	943052	3	**22289**
Magnum								
	50 mL-500 mL	51 (2.0)	0.58 (0.023)	0.89 (0.035)	Bevel, Open End	953050	3	**21740-U**

Accessories

Cleaning Tools

Syringe Cleaner

Cleans Hamilton syringes and other syringes with needles up to 18 gauge (0.049" OD). Just connect the unit to your water aspirator or other vacuum source, insert the needle through the septum and, in 10-30 seconds, you're ready for a new sample. A combination of heat (250 °C) and vacuum vaporizes and removes contaminating volatiles in a single operation. No liquids are required with Hamilton Series 7000 syringes. For series 700 and other conventional syringes, use a rheostat to lower the temperature (to 50 °C or below) and maintain a flow of solvent through the barrel and needle. Instructions are included.


P000895

Description	*Cat. No.*
Hamilton Syringe Cleaner, 120 V	**20770-U**
Replacement Septa, 5mm, pk. of 100	**20712**

Needle Cleaning Kit

Formulated specifically for cleaning syringes. Kit includes 70 cc bottle (makes 700 cc of cleaning solution), ten wires in each of five sizes (0.0035" to 0.01207"), and instructions.


P000284

Description	*Cat. No.*
Needle Cleaning Kit	**21578**
Replacement Syringe Cleaning Solution	**20742**

Valves

Miniature Two-Way Inlet Valve

This miniature valve is durable, dependable, and easy to use. The inert plastic components (CTFE body and female Luer connectors, PTFE core) will not interact with ultrapure or corrosive fluids. Its size (2 inches^3/33 cm^3) and weight (1 oz/28 g) make it unobtrusive. A 0.059" internal passage minimizes sample hold-up. When used with a Hamilton PTFE Luer-Lok (TLL) syringe, the valve is particularly useful for transporting gaseous or liquid samples (e.g., environmental analyses of air or water). Use the valve with the Hamilton fittings included, or with any standard ¼" x 28 threaded fittings. This has an aluminum housing, and a stainless steel driver stem. The operating range is from 10 °C to 100 °C at pressures to 100 psi/7 kg/cm^2. This meets the requirements for US EPA Method 602 for purgeable aromatic compounds.


P000432


E000805

Description	*Tekmar Equivalent*	*Cat. No.*
Valve with Male and Female Connectors		**20940**
Sample Valve for Tekmar concentrators (order Luer connector separately)	14-0036-050	**20971**
Male Luer Connector	14-0122-016	**20941**
Female Luer Connector	14-0216-016	**20942-U**

ordering: 800-247-6628 (US only) / 814-359-3441 technical service: 800-359-3041 (US and Canada only) / 814-359-3041

PTFE Body Two-Way Valve

- Lever-actuated on/off valve for storing and transporting samples
- Hamilton Gastight TLL syringe
- KEL-F hub needles attach to the valve
- Pressure tested to 100 psig; autoclavable
- Bore ID, 0.39"


P000432

Description	*Cat. No.*
PTFE Body Two-Way Valve	**20926**

Push Button Valve

This Mininert valve will attach to your syringe and provide sample storing capability. It features push-button operation and an all-PTFE body with a stainless steel miniature valve stem.


P000432

Description	*Cat. No.*
Push Button Valve for TLL syringes (Hamilton/SGE)	**22285**
Push Button Valve for VICI Series C and D syringes	**22284**

SGE Syringe Valve

Description	*Volume*	*Needle Length in./mm*	*Gauge*	*OD (mm)*	*SGE Part No.*	*Point Style*	*Pkg. Size*	*Cat. No.*
Push-Pull with Removable Needle								
	25 µL - 2.5 mL	1.97/50	23	0.63	031905	Cone	1	**509337**
Push-Pull with KEL-F Male Luer-Lok Termination								
	25 µL - 2.5 mL	—	—	—	031907	—	1	**509345**
Push Button with KEL-F Male Luer-Lok Termination								
	5 mL - 2 L	—	—	—	031910	—	1	**509353**
Push Button with KEL-F Male Luer-Lok Termination and Luer Tip								
	50 µL - 2 L	—	—	—	031915	—	1	**509361**

509337 - Push-Pull with Removable 0.63 mm OD x 50 mm Cone Tip Needle



509345 - Push-Pull with KEL-F Male Luer-Lok Termination



509353 - Push-Button with KEL-F Male Luer-Lok Termination



509361 - Push-Button with KEL-F Male Luer-Lok Termination and Luer Tip


P000431

Miscellaneous

Luer Fittings for SampleLock Syringes

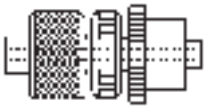
Description	*Cat. No*
Male Luer/Removable Needle Hub	**26292**
Male Luer-Lok/Removable Needle Hub	**26293**

26292 - Accepts female luer



795-0469

26293 - Accepts female luer or female Luer-Lok



795-0470

Plunger Guide and Chaney Adapter

Plunger guides are recommended for consistent, reproducible injections. Chaney adapters are recommended for sample reproducibility.

Description	*Cat. No.*
Plunger Guide for 75 and 701 syringes (Hamilton)	**20765**
Plunger Guide for 702, 705, 750, 1702, 1705, 1710, 1725, 1750, and 7000 syringes	**26707**
Chaney Adapter for 75, 701, and 1701 syringes	**26704**
Chaney Adapter for 702, 705, 750, 1702, 1705	**21350-U**
1710, 1725, 1750, and 7000 syringes with round thumb button	



E000827

Repeating Dispenser

This device accurately divides the sample. It discharges 1/50th of the syringe's capacity at each push of the button. This fits all 10 µL-2.5 mL Hamilton syringes. Order the syringe separately.



9100192

Description	*Cat. No.*
Pb600-1	**20943**

PTFE Syringe Tubing with KEL-F Luer Hub Assembly

For use with LT or TLL Hamilton syringes and connectors; KEL-F hub maximum temperature is 200 °C. PTFE tubing maximum temperature is 260 °C.

To pass PTFE tubing through a septum, first puncture the septum with a stainless steel (SS) hollow needle and leave the needle in place. Next, thread the PTFE syringe tubing through the center of the hollow needle. Then, withdraw the SS needle and allow the septum to seal around the PTFE tubing.

We recommend using a 14 ga. SS hollow needle to puncture the septum in order to insert 20 ga. PTFE tubing, a 13 ga. SS hollow needle for inserting 18 ga. PTFE tubing, and a 12 ga. SS hollow needle for inserting 16 or 14 ga. PTFE tubing.

PTFE Syringe Tubing

Length (in.)	*Size (Gauge)*	*Cat No.*
12	20	**Z117315**
	18	**Z117323**
	16	**Z117331**
	14	**Z117358**
	12	**Z117366**
24	20	**Z117374**
	18	**Z117382**
	16	**Z117390**
	14	**Z117404**
	12	**Z117412**
36	20	**Z113653**
	18	**Z113688**
	16	**Z113696**
	14	**Z113718**
	12	**Z113726**

SS Hollow Needles

	14	**Z126756**
	13	**Z126764**
	12	**Z126722**

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Care & Cleaning of Syringes

Syringe Care

Syringes are precision instruments. The care you take in using, handling and storing them will dictate their accuracy, reproducibility and lifetime, and the quality of the resulting chromatogram.

Routinely inspect the syringe for damage including hairline cracks. Discard any syringe with a potentially unsafe barrel. The needle's tip must be free of barbs which will tear the septum, producing particles that will clog the needle, lodge in the injection port and otherwise damage the chromatographic system.

If your syringe contains a PTFE tip, be sure to replace the plunger and tip assembly immediately if any metal is exposed. The exposed metal scrapes the glass of the syringe barrel, producing glass fragments that cut grooves in the PTFE tip. These groves allow sample to leak past the tip.

Caustic samples or cleaning solutions that seep under the PTFE tip destroy the sharp barb that holds the tip onto the plunger. The tip, so loosened, could slip off during sample aspiration.

Between samples, the syringe should be flushed 5 – 10 times its total capacity to eliminate carryover. Draw and expel the first several flushes of waste to avoid contamination of the sample.

Never store a syringe without cleaning it and wiping dry all external surfaces.



P000284

Recommended Cleaning Procedure:

1. Appropriate solvents are those that dissolve the contaminating substances. Methanol, methylene chloride, acetone and acetonitrile are common. For storage, the final rinsing should be with deionized water followed by acetone.
2. Do not immerse the entire syringe in the solvent; this may damage the adhesives holding parts of the syringe together.
3. To unblock a needle, remove the plunger and fill the barrel with solvent using another syringe. Insert the plunger and push solvent through the needle.
4. Heating will remove semivolatile substances. Remove the plunger before heating. Fixed needle syringes can be heated to 70 °C. Removable needle syringes can be heated to 120 °C. Please refer to the syringe's specific instructions.
5. A needle cleaning kit (Cat. No. 21578) and syringe cleaning solution (Cat. No. 20742) are available from Supelco. The Hamilton syringe cleaner (Cat. No. 20770-U) uses heat and vacuum to clean and restore performance. All of these products are described in the Accessories section of this brochure.

Tips to Assure Accuracy and Precision

Grasp the syringe only by the flange and plunger button. By doing so, variations in liquid measurement due to body heat are avoided.

Pump the plunger with the syringe needle immersed in the fluid to be transferred to expel any trapped air in the needle and syringe.

If the plunger is accidentally removed from the syringe barrel, wipe it carefully with a lint-free tissue. Reinsert the plunger into the barrel and pump deionized water or acetone through the needle and syringe. In the case of plungers with PTFE tips (like Hamilton's Gastight syringes), re-wet the PTFE plunger tip prior to reinserting it into the barrel.

Avoid touching the exposed plunger since any abrasions, scratches, or oil from one's fingers will often interfere with proper plunger operation.

Syringe Lubrication

A clean syringe does not require any lubricating grease. Grease may cause a variety of problems including: sample cross contamination, seizing of the plunger in the barrel or barrel damage.

Minimize the use of a dry syringe.

Ordering Information

Custom Syringes

Because of our long-term relationship with our syringe supplier, we can obtain any of their syringes not listed in this brochure as a custom item. The typical delivery time is two to six weeks, depending on what is ordered. If the custom part number is a stock item for one of the manufacturers (SGE, Hamilton, Valco), expect delivery in only one to two weeks. If you are requesting a custom part number that has a special needle gauge or length, then expect longer delivery time.

Volume Discounts

Supelco offers a large selection of syringes in Multipaks for your convenience and cost-savings. Many are in stock and ready for immediate delivery. The benefits of Multi-paks include:

- Economy
- Reduced packaging disposal
- Less lab storage space
- Reduced purchase order placement

Our current syringe MULTIPAK offering is found on page 29.

Calibration Services

Hamilton Company offers a calibration service for their precision and Digital Syringes. With the service, Hamilton provides a Certificate of Calibration with the syringe. The calibration procedure is performed with an unbroken chain of calibrations traceable to N.I.S.T. Calibrated precision syringes are available only at the time of purchase. Supelco can offer this service through Hamilton to our customers. At the time of ordering, specify you want a calibrated syringe, which we will obtain from Hamilton by simply adding the prefix "CAL" to the beginning of Hamilton's part number. Hamilton Digital Syringes are automatically calibrated prior to shipment. A recalibration service is available for the Digital Syringe. Only return the digital unit without the syringe. There is a charge for the calibration plus the cost of a syringe.

If you are interested in a calibrated Hamilton syringe, simply contact our Technical Service Department who will begin the process for you.

The Service You Deserve...from the Company You Trust

Easy Ordering

Supelco offers many ways to easily place your order or inquire about an existing order. You can call, fax, or visit our web site 24 hours a day, 7 days a week.

Please contact us at

USA and Canada:

Phone: 800-247-6628 / 800-325-3010 / 814-359-3441
Fax: 800-325-5052 / 814-359-5459
Web: sigma-aldrich.com/supelco

Europe/International: See back cover for contact details

For more information, visit sigma-aldrich.com

Ready to order products? Searching for Material Safety Data Sheets or other product information? Need a new catalog? Go to sigma-aldrich.com/supelco to search for products, check up-to-the-minute availability, place orders, check order status, or directly trace your order with a tracking number that is hot linked to the carrier's web site. You can check the status and trace an order in two clicks!

On-Time Delivery

Still waiting for syringes that you ordered last week or last month? Not getting responsive customer service? Get the service you deserve today with products that meet your performance demands and are delivered when you need them.

Superior Support

When you want additional information about a product, or help with a problem, our knowledgeable Technical Service chemists and our extensive library of free technical literature are just a telephone call, fax message, or email away. We are always ready to respond to your questions, suggestions, criticisms, and changing needs.

In the USA and Canada, please contact us at the following telephone numbers Monday - Thursday (8AM - 8PM Eastern Time) and Friday (8AM - 6PM Eastern Time).

USA and Canada:

Phone: 800-359-3041 / 814-359-3041
Fax: 800-359-3044 / 814-359-5468
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Tel: 43 1 605 81 10
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Belgium
SIGMA-ALDRICH NV/SA.
Free Tel: 0800-14747
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Fatty Acid/FAME Application Guide

Analysis of Foods for Nutritional Needs

SUPELCO Analytical



Free Fatty Acid Analysis

FAME Preparation

FAME Analysis

SIGMA-ALDRICH®



Fatty Acid / FAME Application Guide

Analysis of Foods for Nutritional Needs

We are cognizant of the impact our products play in nearly every aspect of modern life, from protection of the environment to the safety of consumer products in all market categories. However, it is rewarding when our products can be directly applied to topics of great interest to the general population. One area currently of public interest is nutrition. Obesity, diabetes, and cardiovascular disease, along with their related costs, are increasing in America, Europe, and in other parts of the world. Although heredity contributes, a clear link between diet and these maladies has been firmly established. (1-4)

One measure of the nutritional and health value of a food is its fat content. It is not only total fat, but also the type of fat that must be considered. Some 'good fats' are required for biochemical processes or necessary for dissolving fat-soluble vitamins. Other 'bad fats' interfere with biochemical processes or accumulate in the cardiovascular system, potentially leading to health problems. Currently, there is an increase in research into the safety and health effects of fatty acids and toward understanding their fundamental biochemistry.

For the food chemist, determining the fatty acid composition of a product may be difficult because foods can contain a complex mixture of saturated, monounsaturated, and polyunsaturated fatty acids, each with a variety of carbon chain lengths.

This brochure was assembled to provide food chemists with a valuable resource to assist in identifying the proper products for the GC analysis of fatty acids, either as free fatty acids or as fatty acid methyl esters. Many of these specialized products, such as GC columns, SPE tubes, reagents, and chemical standards, were specifically developed for use in the qualitative and quantitative identification of fatty acids. Details of each of these products are included throughout this brochure, which is arranged by analytical application. The diverse analytical applications, chromatograms, and product listings that are attached within this brochure were selected with the chromatographer in mind, to help them ensure accurate and reproducible analyses.

Want additional information beyond what this brochure provides? Page 23 lists product literature and also recommended reading written by experts and researchers. Another resource is the Sigma-Aldrich/Supelco FAME web site: *sigma-aldrich.com/fame*, where product listings, technical literature detailing how to use these products, chromatograms with peak IDs and conditions, and peer-reviewed literature references can be easily found. Supelco Technical Service chemists are also invaluable sources for providing guidance with the selection and use of applicable products. Supelco Technical Service chemists can be reached at 800-359-3041 (US and Canada only), 814-359-3041, or at *techservice@sial.com*

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Free Fatty Acids

Short chain, volatile fatty acids are typically analyzed in the free form using specialized columns. This group of compounds may be referred to as free fatty acids (FFAs), volatile fatty acids (VFA), or carboxylic acids. The analysis of fatty acids in the free form instead of as fatty acid methyl esters results in easier and quicker sample preparation. Additionally, artifact formation that may result from a derivatization procedure, is eliminated.

This section (pages 3-4) focuses on the analysis of free fatty acids. Details on the preparation (pages 5-6) and analysis (pages 7-20) of fatty acid methyl esters can be found in other sections.

GC Column Choices

For the GC analysis of free fatty acids, a specialized column that will not allow the adsorption of active carboxyl groups is required. The Nukol, with its acidic characteristic, is well-suited for this application, allowing chromatography with excellent peak shapes. For application, USP code, polymer, and temperature limit information, as well as catalog numbers, please refer to page 21.

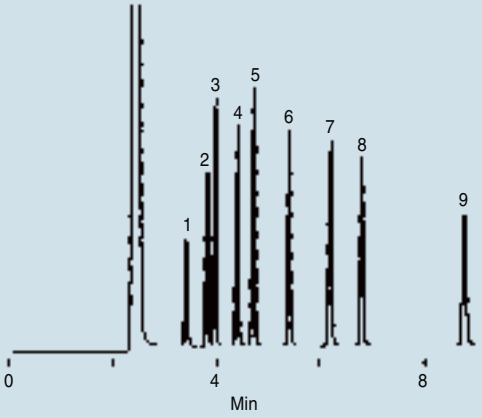
Chromatograms

The following selected chromatograms for this application are presented to assist the chromatographer in establishing analytical conditions. For assistance, contact Supelco Technical Service at 800-359-3041 (US and Canada only), 814-359-3041, or at *techservice@sial.com*

Figure 1. Short Chain Free Fatty Acids on the Nukol

column: Nukol, 30 m x 0.25 mm I.D., 0.25 µm (24107)
oven: 185 °C
det.: FID
carrier gas: helium, 20 cm/sec
injection: 1 µL, 100:1 split
sample: Volatile Free Acid Mix (46975-U), each analyte at 10 mM in deionized water

1. Acetic acid
2. Propionic acid
3. Isobutyric acid
4. Butyric acid
5. Isovaleric acid
6. Valeric acid
7. Isocaproic acid
8. Caproic acid
9. Heptanoic acid

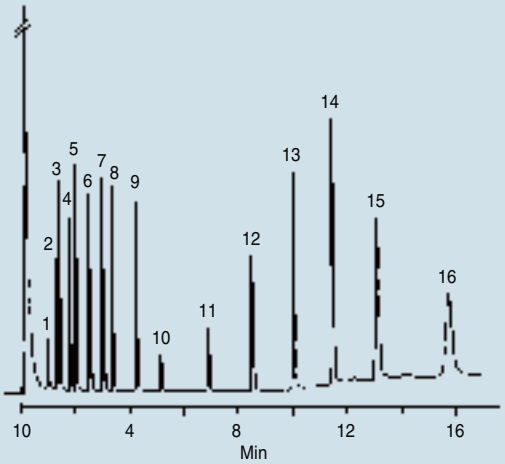


794-0479

Figure 2. Short and Long Chain Free Fatty Acids on the Nukol

column: Nukol, 15 m x 0.53 mm I.D., 0.50 µm (25326)
oven: 100 °C, 10 °C/min. to 220 °C
det.: FID
carrier gas: helium, 30 mL/min.
injection: 0.5 µL, direct injection
sample: 16 analytes, at various concentrations from 50 to 800 µg/mL

1. Acetic acid
2. Propionic acid
3. Isobutyric acid
4. Butyric acid
5. Isovaleric acid
6. Valeric acid
7. Isocaproic acid
8. Caproic acid
9. Heptanoic acid
10. Octanoic acid
11. Decanoic acid
12. Dodecanoic acid
13. Tetradecanoic acid
14. Hexadecanoic acid
15. Octadecanoic acid
16. Eicosanoic acid



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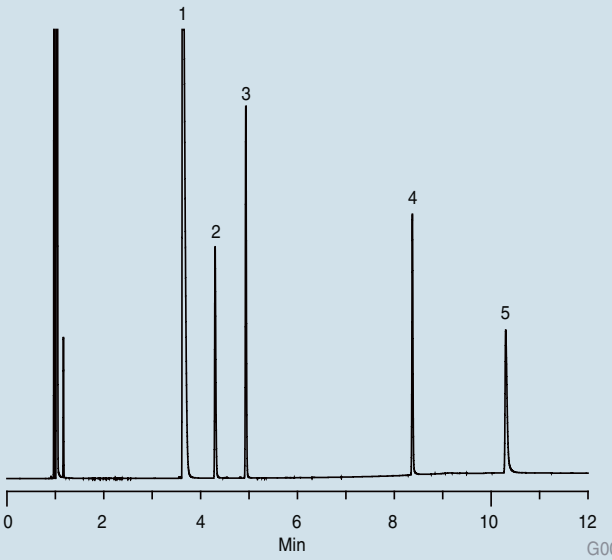


Free Fatty Acids

Figure 3. Organic Acids on the Nukol

column: Nukol, 15 m x 0.32 mm I.D., 0.25 µm (24130)
oven: 80 °C (1 min.), 15 °C/min. to 200 °C (3 min.)
inj.: 250 °C
det.: FID, 250 °C
carrier gas: helium, 2 mL/min. constant
injection: 1 µL, 100:1 split
liner: 4 mm I.D., split, cup design
sample: 5 analytes, at concentrations indicated in 1 M H_3PO_4

1. Acetic acid, 8%
2. Propionic acid, 0.7%
3. Butyric acid, 0.7%
4. Sorbic acid, 0.7%
5. Benzoic acid, 0.7%



Chemical Standards

Standards for the determination of free fatty acids should be purchased from a chemical manufacturer with knowledge in the preparation, handling, storage, and shipment of volatile analytes. Sigma-Aldrich, with over 40 years in chemical standard manufacturing through the Supelco brand, offers the following standards.

Description			Cat. No.
Water Soluble Fatty Acid Mix 2 (WSFA-2) Each analyte at 0.1 wt. % in deionized water, 5 mL			47056
Acetic acid	*Isobutyric acid*	*Propionic acid*	
Butyric acid	*Isovaleric acid*	*Valeric acid*	
Water Soluble Fatty Acid Mix 4 (WSFA-4) Each analyte at 0.1 wt. % in deionized water, 5 mL			47058
Acetic acid	*Isovaleric acid*	*Propionic acid*	
Butyric acid	*2-Methylbutyric acid*	*Valeric acid*	
Isobutyric acid			
Volatile Free Acid Mix Each analyte at 10 mM in deionized water, 100 mL			46975-U
Acetic acid	*Hexanoic acid*	*4-Methylvaleric acid*	
Butyric acid	*Isobutyric acid*	*Propionic acid*	
Formic acid	*Isovaleric acid*	*Valeric acid*	
Heptanoic acid			
Non-Volatile Acid Standard Mix Each analyte at 0.01 meq/mL in deionized water, 100 mL			46985-U
Fumaric acid	*Methylmalonic acid*	*Pyruvic acid*	
Lactic acid	*Oxalacetic acid*	*Succinic acid*	
Malonic acid	*Oxalic acid*		

Solvents

All CHROMASOLV® solvents are prepared with unsurpassed attention to quality, and are designed for meeting stringent purity standards.

Description	Pkg. Size	Cat. No.
Chloroform, >=99.8%,amylene stabilized	100 mL 1 L	34854-100ML 34854-1L
Dichloromethane, >=99.8%, amylene stabilized	100 mL 1 L	34856-100ML 34856-1L
Hexane, >=95%	100 mL 1 L	270504-100ML 270504-1L
Heptane, >=99%	100 mL 1 L	34873-100ML 34873-1L
Toluene, 99.9%	100 mL 1 L	34866-100ML 34866-1L



Fatty Acid Methyl Ester (FAME) Preparation

GC can be used to analyze fatty acids either as free fatty acids or as fatty acid methyl esters. Details on the analysis of free fatty acids can be found on pages 3-4.

The primary reasons to analyze fatty acids as fatty acid methyl esters include:

- In their free, underivatized form, fatty acids may be difficult to analyze because these highly polar compounds tend to form hydrogen bonds, leading to adsorption issues. Reducing their polarity may make them more amenable for analysis.
- To distinguish between the very slight differences exhibited by unsaturated fatty acids, the polar carboxyl functional groups must first be neutralized. This then allows column chemistry to perform separations by boiling point elution (pages 7-9), and also by degree of unsaturation (pages 10-12), position of unsaturation (pages 13-15), and even the cis vs. trans configuration of unsaturation (pages 16-20).

The esterification of fatty acids to fatty acid methyl esters is performed using an alkylation derivatization reagent. Methyl esters offer excellent stability, and provide quick and quantitative samples for GC analysis. As shown in Figure 4, the esterification reaction involves the condensation of the carboxyl group of an acid and the hydroxyl group of an alcohol. Esterification is best done in the presence of a catalyst (such as boron trichloride). The catalyst protonates an oxygen atom of the carboxyl group, making the acid much more reactive. An alcohol then combines with the protonated acid to yield an ester with the loss of water. The catalyst is removed with the water. The alcohol that is used determines the alkyl chain length of the resulting esters (the use of methanol will result in the formation of methyl esters whereas the use of ethanol will result in ethyl esters).

Figure 4. Esterification Reaction

$$R\text{-}COOH + CH_3OH \xrightarrow{BCl_3} R\text{-}COO\text{-}CH_3 + H_2O$$

The following typical esterification procedure (using BCl_3-methanol) is intended as a guideline. It may need to be altered to meet the needs of a specific application.

1. Samples can be derivatized neat or after dissolving in solvent. If appropriate, dissolve sample in a non-polar solvent (such as hexane, heptane, or toluene). If the sample is in an aqueous solvent, first evaporate to dryness then use neat or dissolved in an organic, non-polar solvent.
2. Weigh 1-25 mg of sample into a 5-10 mL micro reaction vessel.
3. Add 2 mL BCl_3-methanol, 12% w/w. A water scavenger (such as 2,2-dimethoxypropane) can be added at this point.
4. Heat at 60 °C for 5-10 minutes. Derivatization times may vary, depending on the specific compound(s) being derivatized.
5. Cool, then add 1 mL water and 1 mL hexane.
6. Shake the reaction vessel (it is critical to get the esters into the non-polar solvent).
7. After allowing the layers to settle, carefully transfer the upper (organic) layer to a clean vial. Dry the organic layer by either:
   a. *Passing through a bed of anhydrous sodium sulfate during the transfer step to the clean vial.*
   b. *Adding anhydrous sodium sulfate to the clean vial then shaking.*
8. To determine the proper derivatization time, analyze aliquots of a representative sample using different derivatization times. Plot peak area (y-axis) vs derivatization time (x-axis). The minimum time to use is when no further increase in peak area is observed with increasing derivatization time (where the curve becomes flat).
9. If it is suspected that complete derivatization is never achieved, use additional reagent or re-evaluate temperature.
10. It is important to prepare a reagent blank, along with the samples, to identify any issues that may arise.

It is important to use only high quality derivatization reagents, to ensure that no artifacts are present during analysis. Additionally, only derivatization reagents with low moisture should be used, as the esterification reaction will be hindered by the presence of water. The storage conditions of derivatization reagents should be strictly adhered to, as some are susceptible to degradation during long-term storage. (5-6)

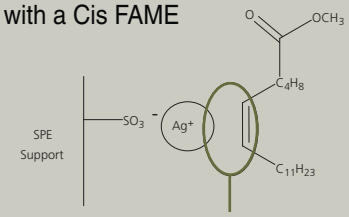
Description	Pkg. Size	Cat. No.
Derivatization Reagents		
BCl_3-Methanol, 12% w/w	20 x 1 mL	33353
BCl_3-Methanol, 12% w/w	20 x 2 mL	33089-U
BCl_3-Methanol, 12% w/w	400 mL	33033
BF_3-Methanol, 10% w/w	20 × 1 mL	33356
BF_3-Methanol, 10% w/w	19 × 2 mL	33020-U
BF_3-Methanol, 10% w/w	10 × 5 mL	33040-U
BF_3-Methanol, 10% w/w	400 mL	33021
BF_3-Butanol, 10% w/w	10 × 5 mL	33126-U
BF_3-Butanol, 10% w/w	100 mL	33125-U
Methanolic Base, 0.5 N	30 mL	33352
Methanolic Base, 0.5 N	100 mL	33080
Methanolic HCl, 0.5 N	20 × 1 mL	33354
Methanolic HCl, 0.5 N	10 × 5 mL	33095
Methanolic HCl, 3 N	20 × 1 mL	33355
Methanolic HCl, 3 N	10 × 3 mL	33051
Methanolic HCl, 3 N	400 mL	33050-U
Methanolic H_2SO_4, 10% v/v	6 × 5 mL	506516
Micro Reaction Vessels and Caps		
5 mL Clear, with Hole Caps	12 ea	33299
5 mL Clear, with Solid Caps	12 ea	27039
5 mL Amber, with Hole Caps	12 ea	27478-U
10 mL Clear, with Hole Caps	12 ea	27479
Water Scavenger		
2,2-Dimethoxypropane, 98%	25 mL	D136808-25ML
Sodium Sulfate, Anhydrous, >=99.0%		
Granular	500 g	239313-500G
Granular	1 Kg	239313-1KG
Granular	2.5 Kg	239313-2.5KG



FAME Fractionation Using Silver-Ion SPE Tubes

Discovery® Ag-Ion SPE tubes are based on silver-ion chromatography work first pioneered in 1966. As depicted in Figure 5, when silver ions are anchored onto SCX SPE functional group as counter-ions through electrostatic interaction, they have the ability to form polar complexes with the double bonds of unsaturated FAMEs under normal-phase conditions. More specifically, pi electrons of the FAME double bonds act as electron donors and silver-ions act as electron acceptors.

Figure 5. Schematic Representation of Ag-Ion SPE Interacting with a Cis FAME



Charge-transfer complex between Ag+ and unsaturated bond

G003513

The strength of the interactions between FAMEs and the silver counter-ions varies depending on the structure of the FAME:

- Saturated FAMEs (no double bonds) have no interactions. Therefore, they are poorly retained.
- Cis double bonds offer more steric accessibility than their trans counter part, and therefore form stronger polar complexes. As a result, cis fatty acids are more strongly retained than trans fatty acids.
- FAMEs with a greater number of double bonds have stronger interactions than those with fewer double bonds. Trienes are retained stronger than dienes, which are retained stronger than monoenes.

The differences in the strengths of these polar complexes between classes of FAMEs and the silver counter-ions can be exploited, allowing for fractionation of cis and trans isomers by adjusting the elution solvent strength. Figure 6 shows GC analyses of microwave popcorn fatty acids as FAMEs, without SPE and also with SPE fractionation. As observed, changes in the strength of the elution solvent result in 'cleaner' chromatograms of FAME classes, useful for the detailed analysis of geometric isomers.

The recovery distribution of selected C18 FAMEs in each fraction, shown in Table 1, indicates the effectiveness of Discovery Ag-Ion SPE tubes for the fractionation of cis/trans FAMEs (strength of the interaction is greater for cis FAMEs than for trans FAMEs) and also for the fractionation of FAMEs by degree of unsaturation (strength of the interaction increases with increasing number of double bonds).

Figure 6. GC Analysis of Microwave Popcorn FAMEs

sample/matrix: 1.0 g of oil scraped from a popped bag of microwave popcorn was mixed with 8 mL DI water, liquid-liquid extracted with petroleum ether, methylated with BF_3-methanol, liquid-liquid extracted with hexane, concentrated to 5 mL, then dried with sodium sulfate (complete procedure can be found in T406062 IRV)
SPE tube: Discovery Ag-Ion, 750 mg/6 mL
conditioning: 4 mL acetone followed by 4 mL hexane
sample addition: 1 mL of extract in hexane
elution: (fraction 1): 6 mL hexane:acetone (96:4)
elution: (fraction 2): 4 mL hexane:acetone (90:10)
elution: (fraction 3): 4 mL acetone
column: SP-2560, 75 m x 0.18 mm I.D., 0.14 µm (23348-U)
oven: 180 °C
inj.: 220 °C
det.: FID, 220 °C
carrier gas: hydrogen, 40 cm/sec
injection: 0.5 µL, 100:1 split
liner: 4 mm I.D., split, cup design

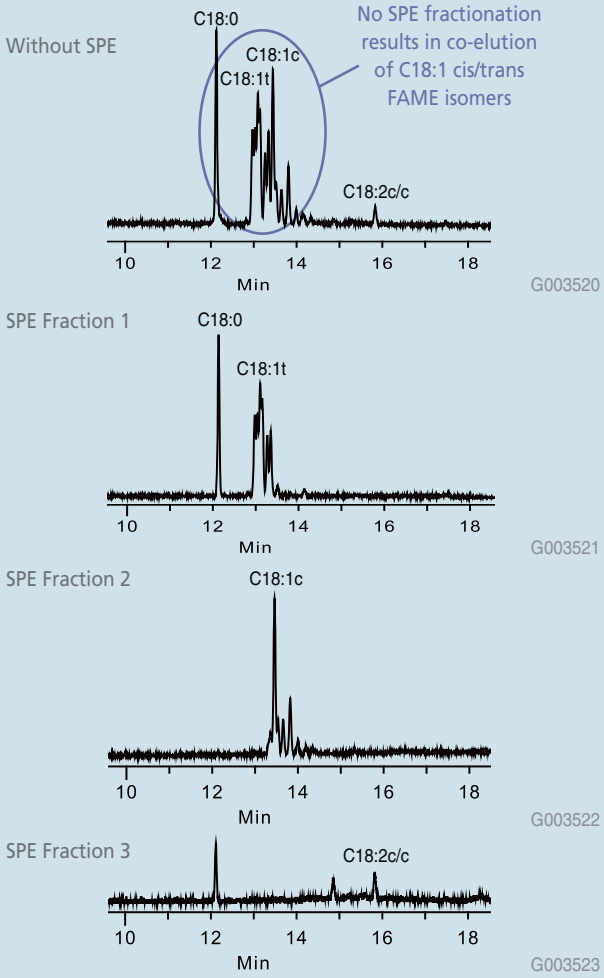


Table 1. Recovery Distribution of Selected C18 FAMEs by Fraction

Fraction	C18:0	C18:1 Trans	C18:1 Cis	C18:2 Cis/Cis
1	100%	100%	2%	----
2	----	----	98%	----
3	----	----	----	100%

Description	Pkg. Size	Cat. No.
750 mg/6mL SPE Tube	30	**54225-U**
750 mg/1mL Rezorian™ Cartridge	10	**54226-U**



FAMEs by Boiling Point Elution

The analysis of FAMEs by boiling point elution is used for pattern recognition. This technique is useful for:

- Determining the source of fatty acids when compared to patterns/profiles from known references, each with a unique fatty acid distribution. Qualitative and quantitative analysis is fundamental to food manufacturers for quality control, purity determination, and for the detection of adulterants.
- Observing subtle differences from sample to sample, which allows the effects on fatty acid metabolism, caused by either external or internal influences, to be detected. This growing area of research is commonly referred to as metabolomics, and extends to compound classes beyond fatty acids.

GC Column Choices

The separation of analytes in a boiling point elution requires the use of a non-polar GC column. The Equity-1, a rugged non-polar column, can be used for this application with great success. For application, USP code, polymer, and temperature limit information, as well as catalog numbers, please refer to page 21.

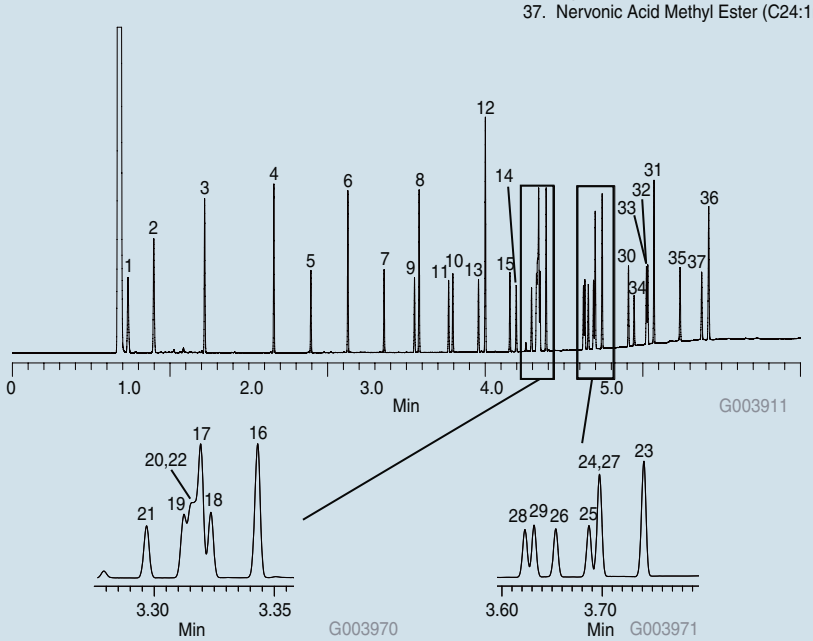
Chromatograms

The following selected chromatograms for this application are presented here to assist the chromatographer in establishing analytical conditions. For assistance, contact Supelco Technical Service at 800-359-3041 (US and Canada only), 814-359-3041, or at *techservice@sial.com*

Figure 7. 37-Component FAME Mix on the Equity-1

column: Equity-1, 15 m x 0.10 mm I.D., 0.10 µm (28039-U)
oven: 100 °C, 50 °C/min. to 300 °C (1 min.)
inj.: 250 °C
det.: FID, 300 °C
carrier gas: hydrogen, 50 cm/sec constant
injection: 0.2 µL, 200:1 split
liner: 4 mm I.D., split, cup design
sample: Supelco 37-Component FAME Mix (47885-U), analytes at concentrations indicated in methylene chloride

1. Butyric Acid Methyl Ester (C4:0) at 4 wt %
2. Caproic Acid Methyl Ester (C6:0) at 4 wt %
3. Caprylic Acid Methyl Ester (C8:0) at 4 wt %
4. Capric Acid Methyl Ester (C10:0) at 4 wt %
5. Undecanoic Acid Methyl Ester (C11:0) at 2 wt %
6. Lauric Acid Methyl Ester (C12:0) at 4 wt %
7. Tridecanoic Acid Methyl Ester (C13:0) at 2 wt %
8. Myristic Acid Methyl Ester (C14:0) at 4 wt %
9. Myristoleic Acid Methyl Ester (C14:1) at 2 wt %
10. Pentadecanoic Acid Methyl Ester (C15:0) at 2 wt %
11. cis-10-Pentadecenoic Acid Methyl Ester (C15:1) at 2 wt %
12. Palmitic Acid Methyl Ester (C16:0) at 6 wt %
13. Palmitoleic Acid Methyl Ester (C16:1) at 2 wt %
14. Heptadecanoic Acid Methyl Ester (C17:0) at 2 wt %
15. cis-10-Heptadecenoic Acid Methyl Ester (C17:1) at 2 wt %
16. Stearic Acid Methyl Ester (C18:0) at 4 wt %
17. Oleic Acid Methyl Ester (C18:1n9c) at 4 wt %
18. Elaidic Acid Methyl Ester (C18:1n9t) at 2 wt %
19. Linoleic Acid Methyl Ester (C18:2n6c) at 2 wt %
20. Linolelaidic Acid Methyl Ester (C18:2n6t) at 2 wt %
21. γ-Linolenic Acid Methyl Ester (C18:3n6) at 2 wt %
22. α-Linolenic Acid Methyl Ester (C18:3n3) at 2 wt %
23. Arachidic Acid Methyl Ester (C20:0) at 4 wt %
24. cis-11-Eicosenoic Acid Methyl Ester (C20:1n9) at 2 wt %
25. cis-11,14-Eicosadienoic Acid Methyl Ester (C20:2) at 2 wt %
26. cis-8,11,14-Eicosatrienoic Acid Methyl Ester (C20:3n6) at 2 wt %
27. cis-11,14,17-Eicosatrienoic Acid Methyl Ester (C20:3n3) at 2 wt %
28. Arachidonic Acid Methyl Ester (C20:4n6) at 2 wt %
29. cis-5,8,11,14,17-Eicosapentaenoic Acid Methyl Ester (C20:5n3) at 2 wt %
30. Heneicosanoic Acid Methyl Ester (C21:0) at 2 wt %
31. Behenic Acid Methyl Ester (C22:0) at 4 wt %
32. Erucic Acid Methyl Ester (C22:1n9) at 2 wt %
33. cis-13,16-Docosadienoic Acid Methyl Ester (C22:2) at 2 wt %
34. cis-4,7,10,13,16,19-Docosahexaenoic Acid Methyl Ester (C22:6n3) at 2 wt %
35. Tricosanoic Acid Methyl Ester (C23:0) at 2 wt %
36. Lignoceric Acid Methyl Ester (C24:0) at 4 wt %
37. Nervonic Acid Methyl Ester (C24:1n9) at 2 wt %



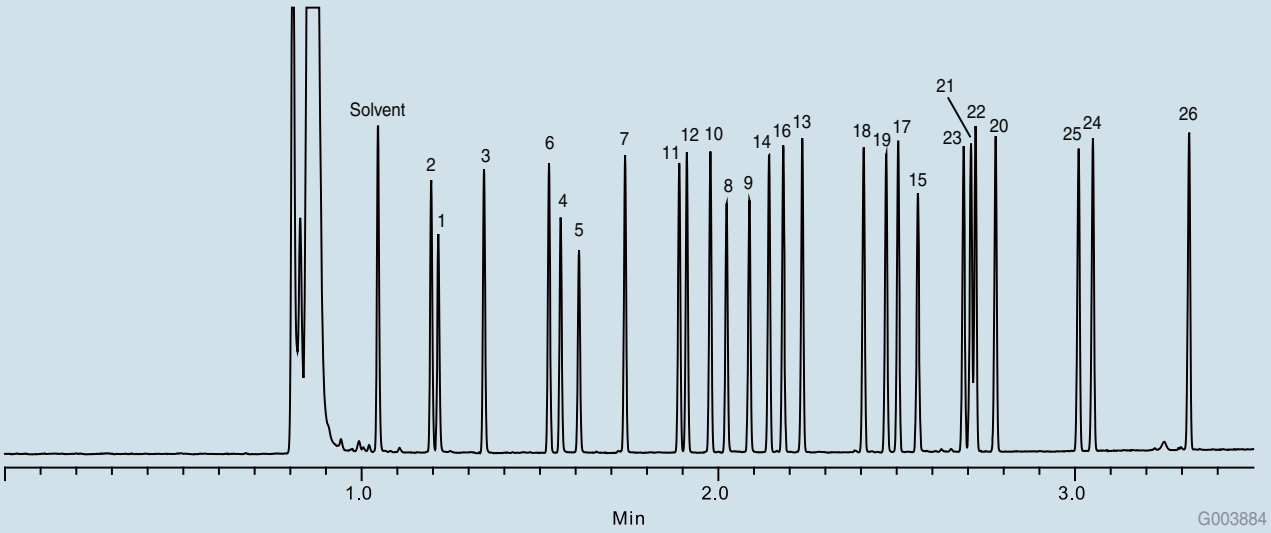


FAMEs by Boiling Point Elution

Figure 8. Bacterial Acid Methyl Esters (BAMEs) on the Equity-1

column: Equity-1, 15 m x 0.10 mm I.D., 0.10 µm (28039-U)
oven: 175 °C, 30 °C/min. to 275 °C (1 min.)
inj.: 280 °C
det.: FID, 280 °C
carrier gas: hydrogen, 45 cm/sec constant
injection: 0.5 µL, 200:1 split
liner: 4 mm I.D., split, cup design
sample: Bacterial Acid Methyl Ester (BAME) Mix (47080-U), methyl ester derivatives total concentration of 10 mg/mL in methyl caproate

1. Methyl 2-hydroxydecanoate (2-OH-C10:0)
2. Methyl undecanoate (C11:0)
3. Methyl dodecanoate (C12:0)
4. Methyl 2-hydroxydodecanoate (2-OH-C12:0)
5. Methyl 3-hydroxydodecanoate (3-OH-C12:0)
6. Methyl tridecanoate (C13:0)
7. Methyl tetradecanoate (C14:0)
8. Methyl 2-hydroxytetradecanoate (2-OH-C14:0)
9. Methyl 3-hydroxytetradecanoate (3-OH-C14:0)
10. Methyl pentadecanoate (C15:0)
11. Methyl 13-methyltetradecanoate (i-C15:0)
12. Methyl 12-methyltetradecanoate (α-C15:0)
13. Methyl hexadecanoate (C16:0)
14. Methyl 14-methylpentadecanoate (i-C16:0)
15. Methyl-2-hydroxyhexadeanoate (2-OH-C16:0)
16. Methyl cis-9-hexadecenoate ($C16:1^{9}$)
17. Methyl heptadecanoate (C17:0)
18. Methyl 15-methylhexadecanoate (i-C17:0)
19. Methyl cis-9,10-methylenehexadecanoate ($C17:0^{\Delta}$)
20. Methyl octadecanoate (C18:0)
21. Methyl cis-9-octadecenoate ($C18:1^{9}$)
22. Methyl trans-9-octadecenoate ($C18:1^{9}$) and Methyl cis-11-octadecanoate ($C18:1^{11}$)
23. Methyl cis-9,12-octadecadienoate ($C18:2^{9,12}$)
24. Methyl nonadecanoate (C19:0)
25. Methyl cis-9,10-methyleneoctadecanoate ($C19:0^{\Delta}$)
26. Methyl eicosanoate (C20:0)





Chemical Standards

To assign identification when performing the boiling point elution of fatty acid methyl esters for pattern recognition, standards of known reference must be used. To assist in confirming identification, Sigma-Aldrich offers the following chemical standards. One standard is the Supelco 37-Component FAME Mix (47885-U). This standard contains methyl esters of fatty acids ranging from C4 to C24, including key monounsaturated and polyunsaturated fatty acids, making this standard very useful to food analysts since it can be used to identify fatty acids in many different types of foods.

Characterized Reference Oils are offered that can be used as controls or check samples, providing an excellent means of standardizing applications and comparing results to others. AOCS Animal and Vegetable Reference Mixes are also available. Each quantitative mix is similar to the fatty acid distribution of certain oils, as specified in Table 2, and conforms to the requirements of AOCS Method Ce 1-62. (7)

Table 2. AOCS Animal and Vegetable Reference Mixes

Mix	Oils with Similar Fatty Acid Distribution
AOCS No. 1	Corn, cottonseed, kapok, poppyseed, rice, safflower, sesame, soybean, sunflower, and walnut
AOCS No. 2	Hempseed, linseed, perilla, and rubberseed
AOCS No. 3	Mustard seed, peanut, and rapeseed
AOCS No. 4	Neatsfoot, olive, and teaseed
AOCS No. 5	Babassu, coconut, ouri-curi, and palm kernel
AOCS No. 6	Lard, beef tallow, mutton tallow, and palm

Description	Cat. No.
Supelco 37-Component FAME Mix 10 mg/mL (total wt.) in methylene chloride, 1 mL See Figure 7 for list of analytes and concentrations	47885-U
Bacterial Acid Methyl Ester (BAME) Mix 10 mg/mL (total wt.) in methyl caproate, 1 mL qualitative standard (individual wt. % not available) See Figure 8 for a representative distribution	47080-U
Characterized Reference Oils	
Canola Oil, 1 g	46961
Coconut Oil, 1 g	46949
Corn Oil, 1 g	47112-U
Cottonseed Oil, 1 g	47113
Lard Oil, 1 g	47115-U
Linseed (Flaxseed) Oil, 1 g	47559-U
Menhaden Fish Oil, 1 g	47116
Olive Oil, 1 g	47118
Palm Oil, 1 g	46962
Peanut Oil, 1 g	47119
Safflower Oil, 1 g	47120-U
Soybean Oil, 1 g	47122
Sunflower Seed Oil, 1 g	47123
AOCS Animal and Vegetable Reference Mixes	
AOCS No.1, 100 mg	O7006-1AMP
AOCS No.2, 100 mg	O7131-1AMP
AOCS No.3, 100 mg	O7256-1AMP
Rapeseed Oil Reference Mix, 100 mg *Modern low erucic acid oil*	O7756-1AMP
AOCS No.4, 100 mg	O7381-1AMP
AOCS No.5, 100 mg	O7506-1AMP
AOCS No.6, 100 mg	O7631-1AMP

	Methyl Ester (% composition by weight)														
Description	C8:0 (caprylate)	C10:0 (caprate)	C12:0 (laurate)	C14:0 (myristate)	C16:0 (palmitate)	C16:1 (palmitoleate)	C18:0 (stearate)	C18:1 (oleate)	C18:2 (linoleate)	C18:3 (linolenate)	C20:0 (arachidate)	C20:1 (eicosenoate)	C22:0 (behenate)	C22:1 (erucate)	C24:0 (lignocerate)
AOCS No. 1					6.0		3.0	35.0	50.0	3.0	3.0				
AOCS No. 2					7.0		5.0	18.0	36.0	34.0					
AOCS No. 3				1.0	4.0		3.0	45.0	15.0	3.0	3.0		3.0	20.0	3.0
AOCS No. 4					11.0		3.0	80.0	6.0						
AOCS No. 5	7.0	5.0	48.0	15.0	7.0		3.0	12.0	3.0						
AOCS No. 6				2.0	30.0	3.0	14.0	41.0	7.0	3.0					
AOCS for Low Erucic Rapeseed Oil				1.0	4.0		3.0	60.0	12.0	5.0	3.0	1.0	3.0	5.0	3.0



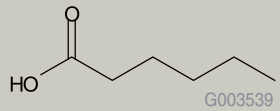
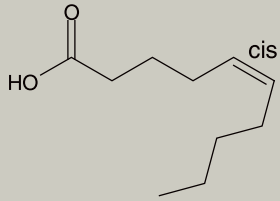
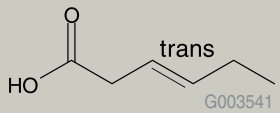
FAMEs by Degree of Unsaturation

Saturated, monounsaturated, polyunsaturated, and cis/trans configuration all refer to the structure of fatty acid moieties. Some of these structures are shown in Table 3, along with common sources and potential health effects. Because of this, it is important for food manufacturers to measure and report their levels so consumers have the chance to establish healthy dietary strategies.

Nutritionally, saturated fats are of particular concern, because an excess in the diet leads to their accumulation in the cardiovascular system, resulting in several health-related problems. Due to this, food manufacturers typically report the saturated fat vs. unsaturated fat content on the nutritional panel, allowing consumers wishing to have a healthier diet to make food choices with less saturated fat.

This section (pages 10-12) focuses on applications to determine the degree of unsaturation. Applications to determine the position of unsaturation are covered on pages 13-15. Applications to determine the cis/trans configuration of unsaturation are covered on pages 16-20.

Table 3. Types of Fatty Acids

Structure	Common Sources	Health Effects
Saturated Fatty Acids (no double bonds)  G003539	Palm kernel, Palm oil, Coconut (tropical oils), Butter, Hydrogenated Oils and Shortenings	Raise LDL cholesterol and increase risk of cardiovascular disease
Mono and Polyunsaturated Cis Fatty Acids (≥ 1 cis double bond)  G003540	Fluid/Liquid oils such as Soybean, Canola, Olive, Sunflower, and Corn	Lower LDL cholesterol, associated with reduced risk of cardiovascular disease
Mono and Polyunsaturated Trans Fatty Acids (≥ 1 trans double bond)  G003541	Partially Hydrogenated Oils, Shortenings and Margarines	Raise LDL cholesterol, like saturated fat, may also lower HDL. Associated with increased cardiovascular disease and possible type II diabetes

GC Column Choices

Determining the degree of fatty acid unsaturation of a product is difficult because foods can contain a complex mixture of saturated, monounsaturated, and polyunsaturated fatty acids with a variety of carbon chain lengths.

- Milk and butter contain saturated C4 to C20, monounsaturated C16 and C18, and polyunsaturated C18 fatty acids.
- Vegetable oils contain saturated C6 to C24, monounsaturated C16, and monounsaturated cis C18, C20, and C22 fatty acids.
- Margarines contain the same fatty acids as vegetable oils plus monounsaturated trans C18, C20, and C22, and polyunsaturated C18 fatty acids.
- Fish and meat typically contain saturated and monounsaturated C12 to C24+ fatty acids, plus polyunsaturated omega 3 C18, C20, and C22, and polyunsaturated omega 6 C18 and C20 fatty acids.
- Fish tends to be richer in the polyunsaturated omega 3 fatty acids, whereas meats are richer in the polyunsaturated omega 6 fatty acids.

To confirm identification, very efficient capillary GC columns with the ability to resolve a large number of peaks are required.

- Omegawax columns provide highly reproducible analyses, being specially tested for reproducibility of FAME equivalent chain length (ECL) values and resolution of key components.
- The SLB-IL100 column exhibits one of the highest polarities of any GC phase, providing an alternative selectivity for FAME applications typically performed on Omegawax columns.

For application, USP code, polymer, and temperature limit information, as well as catalog numbers, please refer to page 22.



Chromatograms

The following selected chromatograms for this application are presented here to assist the chromatographer in establishing analytical conditions. For assistance, contact Supelco Technical Service at 800-359-3041 (US and Canada only), 814-359-3041, or at ***techservice@sial.com***

Figure 9. 37-Component FAME Mix on the Omegawax 100

column: Omegawax 100, 15 m x 0.10 mm I.D., 0.10 µm (23399-U)
oven: 140 °C, 40 °C/min. to 280 °C (2 min.)
inj.: 250 °C
det.: FID, 260 °C
carrier gas: hydrogen, 50 cm/sec constant
injection: 0.2 µL, 200:1 split
liner: 4 mm I.D., split, cup design
sample: Supelco 37-Component FAME Mix (47885-U), analytes at concentrations indicated in methylene chloride

See Figure 7 for list of analytes and concentrations

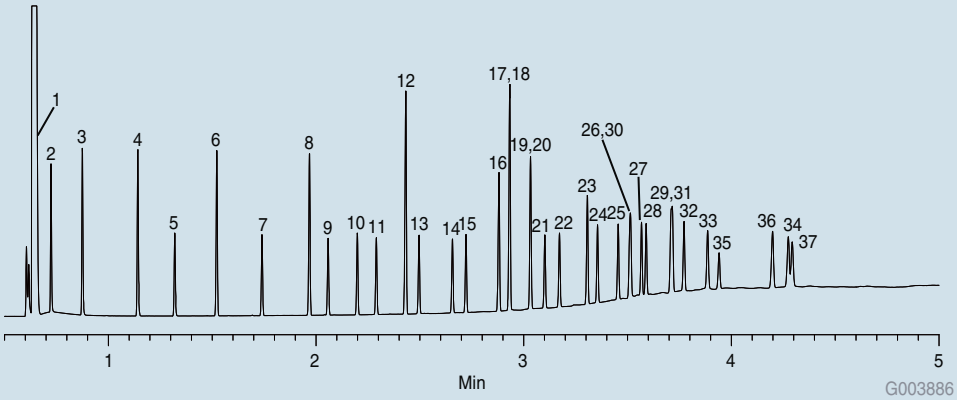


Figure 10. 37-Component FAME Mix on the Omegawax 250

column: Omegawax 250, 30 m x 0.25 mm I.D., 0.25 µm (24136)
oven: 50 °C (2 min.), 4 °C/min. to 220 °C (15 min.)
inj.: 250 °C
det.: FID, 260 °C
carrier gas: helium, 30 cm/sec @ 205 °C
injection: 1 µL, 100:1 split
sample: Supelco 37-Component FAME Mix (47885-U), analytes at concentrations indicated in methylene chloride

See Figure 7 for list of analytes and concentrations

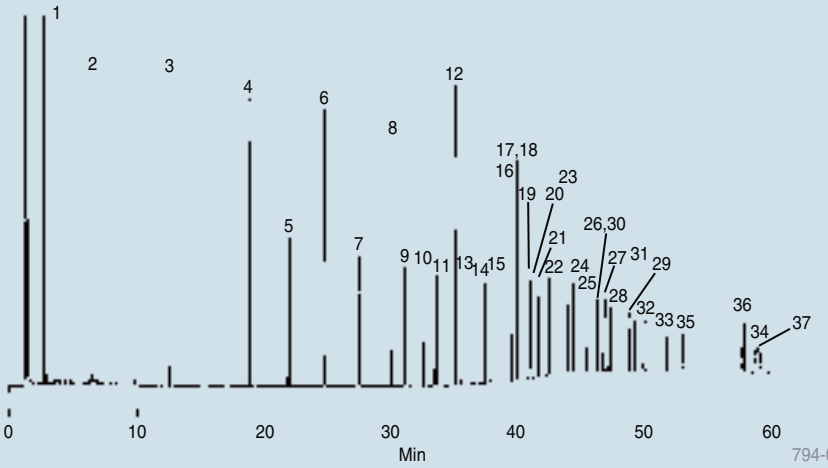
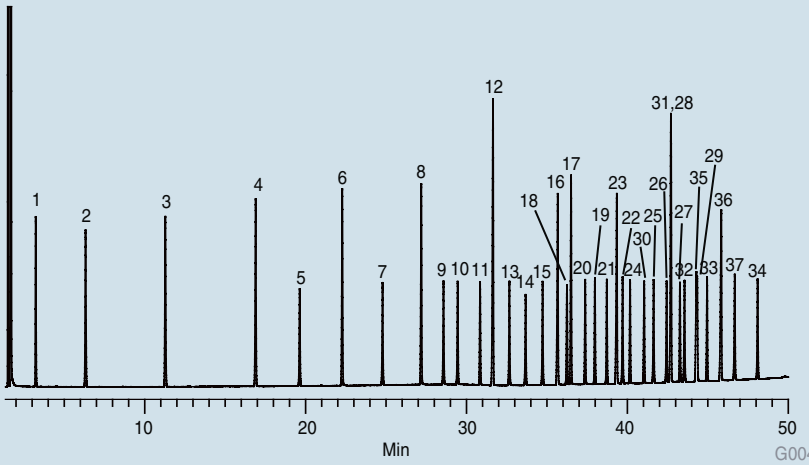


Figure 11. 37-Component FAME Mix on the 30 m SLB-IL100

Chromatogram courtesy of Prof. Luigi Mondello (Univ. of Messina, Italy)

column: SLB-IL100, 30 m x 0.25 mm I.D., 0.20 µm (28884-U)
oven: 50 °C, 3.0 °C/min. to 240 °C
inj.: 240 °C
det.: FID, 240 °C
carrier gas: helium, 40 cm/sec constant
injection: 1 µL, 50:1 split
sample: Supelco 37-Component FAME Mix (47885-U), analytes at concentrations indicated in methylene chloride

See Figure 7 for list of analytes and concentrations



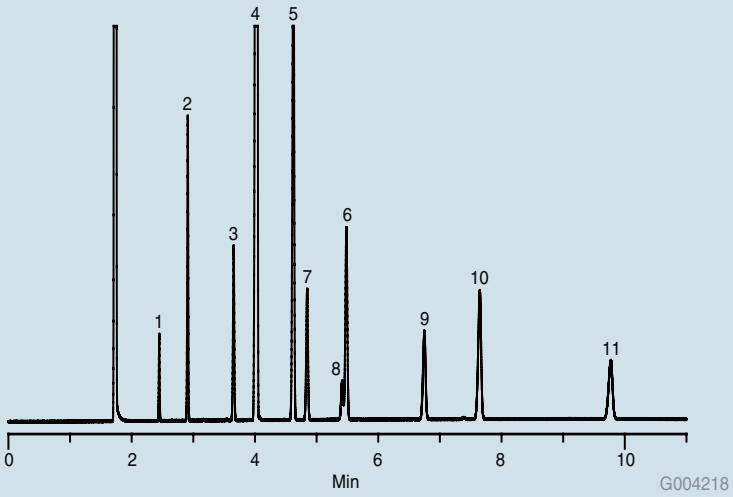


FAMEs by Degree of Unsaturation

Figure 12. Rapeseed Oil FAMEs on the SLB-IL100

column: SLB-IL100, 30 m x 0.25 mm I.D., 0.20 µm (28884-U)
oven: 180 °C
inj.: 250 °C
det.: FID, 250 °C
carrier gas: helium, 30 cm/sec @ 180 °C
injection: 1 µL, 100:1 split
liner: 4 mm I.D., split, cup
sample: Rapeseed oil FAME mix, 5 mg/mL total FAMEs in methylene chloride

1. C14:0
2. C16:0
3. C18:0
4. C18:1n9c
5. C18:2
6. C18:3
7. C20:0
8. C20:1
9. C22:0
10. C22:1
11. C24:0



Chemical Standards

To assist in assigning identifications based on degree of unsaturation, Sigma-Aldrich offers the following standards. One standard is the Supelco 37-Component FAME Mix (47885-U). This standard contains methyl esters of fatty acids ranging from C4 to C24, including key monounsaturated and polyunsaturated fatty acids, making this standard very useful to food analysts since it can be used to identify fatty acids in many different types of foods.

Several convenient kits of either derivatized FAMEs or underivatized fatty acids are also offered, so analysts can formulate their own mixes. These kits contain each individual analyte in a separate vial, with all vials contained in a sturdy storage box.

Description			Cat. No.
Supelco 37-Component FAME Mix 10 mg/mL (total wt.) in methylene chloride, 1 mL *See Figure 7 for list of analytes and concentrations*			47885-U
C6-C24, Even Carbon Number, Saturated FAMEs Kit 10 individual vials, one analyte per vial *Caproic Acid Methyl Ester (C6:0), 1 g* *Caprylic Acid Methyl Ester (C8:0), 1 g* *Capric Acid Methyl Ester (C10:0), 1 g* *Lauric Acid Methyl Ester (C12:0), 1 g*	*Myristic Acid Methyl Ester (C14:0), 1 g* *Palmitic Acid Methyl Ester (C16:0), 1 g* *Stearic Acid Methyl Ester (C18:0), 1 g*	*Arachidic Acid Methyl Ester (C20:0), 1 g* *Behenic Acid Methyl Ester (C22:0), 1 g* *Lignoceric Acid Methyl Ester (C24:0), 1 g*	ME10-1KT
C6-C24, Even Carbon Number, Saturated Fatty Acid Kit 10 individual vials, one analyte per vial *Caproic Acid (C6:0), 10 mL* *Caprylic Acid (C8:0), 10 mL* *Capric Acid (C10:0), 10 g* *Lauric Acid (C12:0), 10 g*	*Myristic Acid (C14:0), 10 g* *Palmitic Acid (C16:0), 10 g* *Stearic Acid (C18:0), 10 g*	*Arachidic Acid (C20:0), 10 g* *Behenic Acid (C22:0), 10 g* *Lignoceric Acid (C24:0), 10 g*	EC10-1KT
C6-C24 Saturated FAMEs Kit 19 individual vials, one analyte per vial *Caproic Acid Methyl Ester (C6:0), 1 g* *Heptanoic Acid Methyl Ester (C7:0), 1 g* *Caprylic Acid Methyl Ester (C8:0), 1 g* *Nonanoic Acid Methyl Ester (C9:0), 1 g* *Capric Acid Methyl Ester (C10:0), 1 g* *Undecanoic Acid Methyl Ester (C11:0), 1 g* *Lauric Acid Methyl Ester (C12:0), 1 g*	*Tridecanoic Acid Methyl Ester (C13:0), 1 g* *Myristic Acid Methyl Ester (C14:0), 1 g* *Pentadecanoic Acid Methyl Ester (C15:0), 1 g* *Palmitic Acid Methyl Ester (C16:0), 1 g* *Heptadecanoic Acid Methyl Ester (C17:0), 1 g* *Stearic Acid Methyl Ester (C18:0), 1 g*	*Nonadecanoic Acid Methyl Ester (C19:0), 1 g* *Arachidic Acid Methyl Ester (C20:0), 1 g* *Heneicosanoic Acid Methyl Ester (C21:0), 1 g* *Behenic Acid Methyl Ester (C22:0), 1 g* *Tricosanoic Acid Methyl Ester (C23:0), 1 g* *Lignoceric Acid Methyl Ester (C24:0), 1 g*	ME19-1KT
C24-C31 Saturated FAMEs Kit 7 individual vials, one analyte per vial *Lignoceric Acid Methyl Ester (C24:0), 1 g* *Pentacosanoic Acid Methyl Ester (C25:0), 1 g* *Hexacosanoic Acid Methyl Ester (C26:0), 100 mg* *Heptacosanoic Acid Methyl Ester (C27:0), 100 mg*	*Octocosanoic Acid Methyl Ester (C28:0), 100 mg* *Triacontanoic Acid Methyl Ester (C30:0), 100 mg* *Hentriacontanoic Acid Methyl Ester (C31:0), 100 mg*		ME7-1KT



Omega 3 and Omega 6 Fatty Acids as FAMEs

Essential fats are nutrients that must be obtained from the diet because humans lack the anabolic processes for their synthesis. Essential fats serve multiple purposes in the body including:

- Production of eicosanoids, which affect inflammation and cellular function.
- Production of lipoxins and resolvins, which affect inflammation.
- Production of endogenous cannabinoids, which affect mood and behavior.
- Influencing cell signaling.
- Regulation of blood pressure, blood clotting, lipid levels, immune response, and gene expression.

There are two closely related groups of essential fats, the omega 3 and omega 6 fatty acids. Both are unsaturated fatty acids, with the initial double bond located directly after the third (omega 3) or the sixth (omega 6) carbon atom as measured from the methyl end. Omega 3 fatty acids are found in fish oils and some nut oils. Seed oils are the primary dietary source of omega 6 fatty acids.

Before the advent of agriculture, human diets were thought to have consisted of an equal amount of omega 3 and omega 6 fatty acids. In contrast, the current western diet has a 1:7 ratio of omega 3 to omega 6 fatty acids. Low levels of omega 3 fatty acids, or an altered ratio of omega 3 to omega 6 fatty acids, may play a key role in a number of human diseases:

- Increased consumption of omega 3 fatty acids has been linked with reducing coronary heart disease.
- An excess of omega 6 fatty acids can interfere with the health benefits of omega 3 fatty acids, and has also been linked with several detrimental health conditions.

As a result of consumers' desire to have 'healthier fat' in the diet, the analysis of the omega 3 and omega 6 fatty acid content of food products has become a very active area of research for many food companies.

GC Column Choices

The omega 3 and omega 6 FAMEs may have very similar physical (such as boiling point) and chemical (such as chain length) properties as other FAMEs that may be present in the sample. Therefore, specialized GC columns with the ability to resolve these specific FAMEs are required for proper identification.

- Omegawax columns provide highly reproducible analyses, being specially tested for reproducibility of FAME equivalent chain length (ECL) values and resolution of key components, specifically the omega 3 and omega 6 FAMEs. This column is specified in AOAC Method 991.39 and AOCS Method Ce 1b-89. (8-9)
- The SLB-IL100 column exhibits one of the highest polarities of any GC phase, providing an alternative selectivity for FAME applications typically performed on Omegawax columns.

For application, USP code, polymer, and temperature limit information, as well as catalog numbers, please refer to page 22.

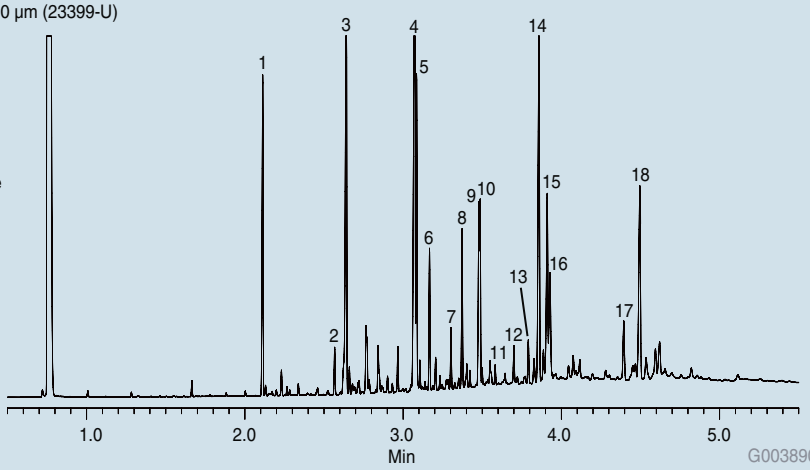
Chromatograms

The following selected chromatograms for this application are presented here to assist the chromatographer in establishing analytical conditions. For assistance, contact Supelco Technical Service at 800-359-3041 (US and Canada only), 814-359-3041, or at ***techservice@sial.com***

Figure 13. Marine Source FAMEs on the Omegawax 100

column: Omegawax 100, 15 m x 0.10 mm I.D., 0.10 µm (23399-U)
oven: 140 °C, 40 °C/min. to 280 °C (2 min.)
inj.: 250 °C
det.: FID, 280 °C
carrier gas: hydrogen, 50 cm/sec constant
injection: 0.2 µL, 200:1 split
liner: 4 mm I.D., split, cup design
sample: PUFA No. I - Marine Source (47033), diluted to 50 mg/mL in methylene chloride

1. C14:0
2. C16:0
3. C16:1n7
4. C18:1n9
5. C18:1n7
6. C18:2n6
7. C18:3n3
8. C18:4n3
9. C20:1n11
10. C20:1n9
11. C20:1n7
12. C20:4n6
13. C20:4n3
14. C20:5n3
15. C22:1n11
16. C22:1n9
17. C22:5n3
18. C22:6n3





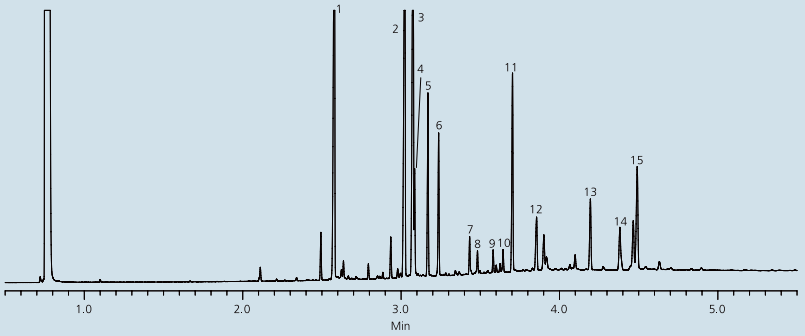
Omega 3 and Omega 6 Fatty Acids as FAMEs

Chromatograms

Figure 14. Animal Source FAMEs on the Omegawax 100

column: Omegawax 100, 15 m x 0.10 mm I.D., 0.10 µm (23399-U)
oven: 140 °C, 40 °C/min. to 280 °C (2 min.)
inj.: 250 °C
det.: FID, 280 °C
carrier gas: hydrogen, 50 cm/sec constant
injection: 0.2 µL, 200:1 split
liner: 4 mm I.D., split, cup design
sample: PUFA No. II – Animal Source (47015-U), diluted to 50 mg/mL in methylene chloride

1. C16:0
2. C18:0
3. C18:1n9
4. C18:1n7
5. C18:2n6
6. C18:3n6
7. C20:0
8. C20:1n9
9. C20:2n9
10. C20:3n6
11. C20:4n6
12. C20:5n3
13. C22:5n6
14. C22:5n3
15. C22:6n3

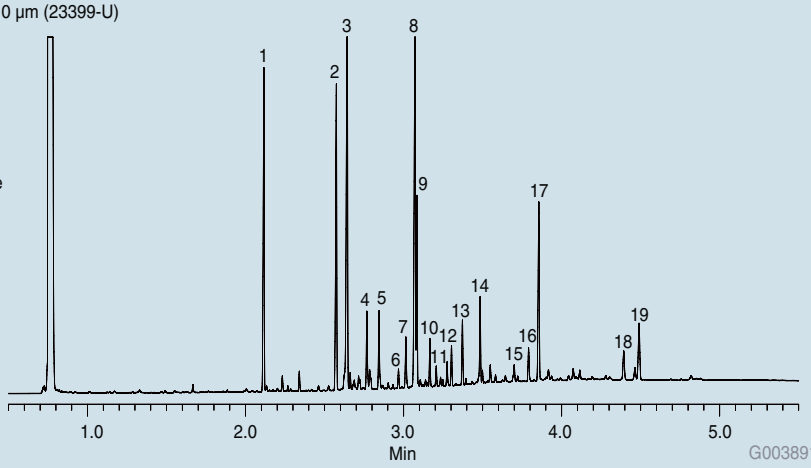


G003892

Figure 15. Menhaden Oil FAMEs on the Omegawax 100

column: Omegawax 100, 15 m x 0.10 mm I.D., 0.10 µm (23399-U)
oven: 140 °C, 40 °C/min. to 280 °C (2 min.)
inj.: 250 °C
det.: FID, 280 °C
carrier gas: hydrogen, 50 cm/sec constant
injection: 0.2 µL, 200:1 split
liner: 4 mm I.D., split, cup design
sample: PUFA No. III – Menhaden Oil (47085-U), diluted to 50 mg/mL in methylene chloride

1. C14:0
2. C16:0
3. C16:1n7
4. C16:2n4
5. C16:3n4
6. C16:4n1
7. C18:0
8. C18:1n9
9. C18:1n7
10. C18:2n6
11. C18:3n4
12. C18:3n3
13. C18:4n3
14. C20:1n9
15. C20:4n6
16. C20:4n3
17. C20:5n3
18. C22:5n3
19. C22:6n3



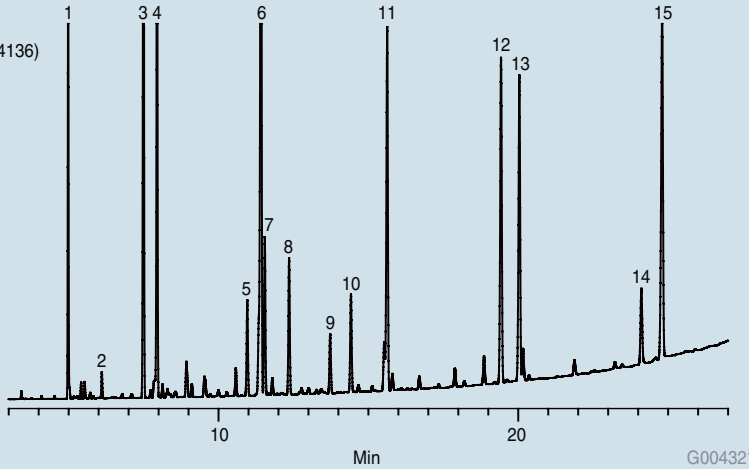
G003891

Figure 16. Cod Liver Oil FAMEs on the Omegawax 250

Chromatogram courtesy of Prof. Luigi Mondello (Univ. of Messina, Italy)

column: Omegawax 250, 30 m x 0.25 mm I.D., 0.25 µm (24136)
oven: 180 °C, 3.0 °C/min. to 270 °C
inj.: 250 °C
det.: FID, 270 °C
carrier gas: hydrogen, 35 cm/sec constant
injection: 1 µL, 50:1 split
sample: cod liver oil FAMEs

1. C14:0
2. C15:0
3. C16:0
4. C16:1n7
5. C18:0
6. C18:1n9
7. C18:1n7
8. C18:2n6
9. C18:3n3
10. C18:4n3
11. C20:1n9
12. C20:5n3
13. C22:1n9
14. C22:5n3
15. C22:6n3



G004321

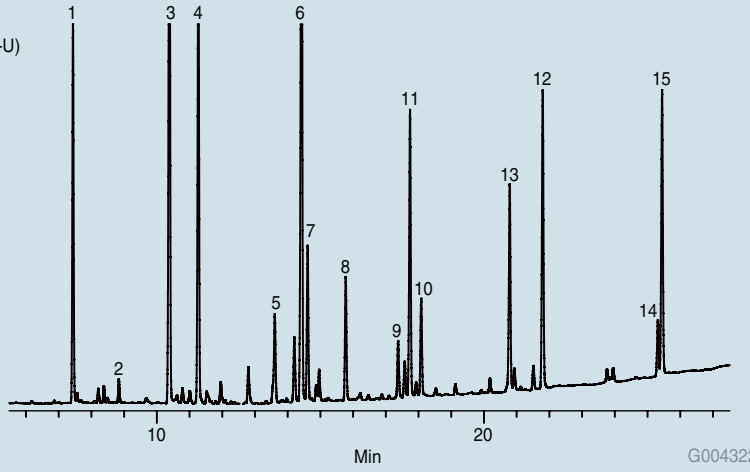


Figure 17. Cod Liver Oil FAMEs on the SLB-IL100

Chromatogram courtesy of Prof. Luigi Mondello (Univ. of Messina, Italy)

column: SLB-IL100, 30 m x 0.25 mm I.D., 0.20 µm (28884-U)
oven: 120 °C, 3.0 °C/min. to 240 °C
inj.: 240 °C
det.: FID, 240 °C
carrier gas: hydrogen, 35 cm/sec constant
injection: 1 µL, 50:1 split
sample: cod liver oil FAMEs

Same Peak IDs as Figure 16



Chemical Standards

To assist in confirming omega 3 and omega 6 identifications, Sigma-Aldrich offers the following standards. One standard is the Supelco 37-Component FAME Mix (47885-U). This standard contains methyl esters of fatty acids ranging from C4 to C24, including key monounsaturated and polyunsaturated fatty acids, making this standard very useful to food analysts since it can be used to identify fatty acids in many different types of foods.

The PUFA (polyunsaturated fatty acid) methyl ester mixes are complex qualitative standard mixtures, which can be used to verify the presence of omega 3 and omega 6 FAMEs. Because they are extracted from natural materials, relative peak sizes and compositions may vary from lot to lot.

Many omega 3 and omega 6 fatty acids and FAMEs are also available as individual compounds or standards. Each product comes with a Certificate of Analysis that includes a purity determination. Standards are prepared gravimetrically using NIST traceable weights. The availability of small package sizes eliminates the need to buy bulk material as standards.

Description	Cat. No.
Supelco 37-Component FAME Mix 10 mg/mL (total wt.) in methylene chloride, 1 mL *See Figure 7 for list of analytes and concentrations*	47885-U
PUFA No. I (Marine Source) 100 mg (total wt.) qualitative standard (individual wt. % not available) *See Figure 13 for a representative distribution*	47033
PUFA No. II (Animal Source) 100 mg (total wt.) qualitative standard (individual wt. % not available) *See Figure 14 for a representative distribution*	47015-U
PUFA No. III (from Menhaden Oil) 100 mg (total wt.) qualitative standard (individual wt. % not available) *See Figure 15 for a representative distribution*	47085-U
Individual Essential Fatty Acids and FAMEs	
Linoleic Acid (C18:2n6) , 5 mL or 25 mL	62230
α-Linolenic Acid (C18:3n3), 1 mL or 5 mL	62160
γ-Linolenic Acid (C18:3n6), 100 mg or 500 mg	62174
Methyl Stearidonate Solution (C18:4n3), 100 mg/mL in ethanol	56463
cis-11,14-Eicosadienoic Acid (C20:2n6), 25 mg or 100 mg	E3127
cis-5,8,11,14-Eicosatetraenoate Acid Methyl Ester (C20:4n6), 1 mL	47572-U
Arachidonic acid, (C20:4n6), 10 mg, 50 mg, 100 mg, 500 mg, 1g	A9673
cis-5,8,11,14,17-Eicosapentaenoic Acid Methyl Ester (C20:5n3), 100 mg	17266
cis-7,10,13,16-Docosatetraenoic Acid (C22:4n6), 10 mg	49557
cis-7,10,13,16,19-Docosapentaenoic Acid Methyl Ester (C22:5n3), 50 mg	17269
cis-4,7,10,13,16-Docosapentaenoic Acid (C22:5n6), 10 mg	18566

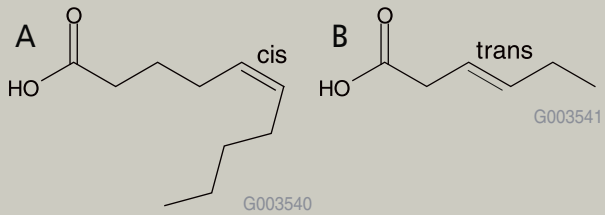


Cis/Trans Fatty Acid Isomers as FAMEs

Fatty acids in the cis configuration (Figure 18A) are the dominant form in nature. Correspondingly, enzymes have evolved to efficiently digest and metabolize them with a high degree of specificity. Conversely, trans fatty acids (Figure 18B) are relatively rare in nature. However, because they can increase the shelf life and flavor stability of foods containing them, they have become predominant synthetic additives to processed foods, especially fried foods and baked goods.

Unfortunately, trans fatty acids, formed by partial hydrogenation of vegetable oil, interfere with natural metabolic process, resulting in an imbalance of the LDL:HDL ratio, and also increasing lipoprotein(a) levels. Studies have linked their nutritional contribution to be similar to that of saturated fatty acids, possibly playing a role in the heightened risk of coronary artery disease.

Figure 18. Structures of Cis and Trans Fatty Acids



Because trans fatty acids have adverse health consequences and no known nutritional benefits over other fats, consumer groups have pressured manufacturers and restaurants for their elimination. Many regulatory agencies worldwide now require content labeling to inform buyers of 'trans fat' levels of foods and some dietary supplements.

GC Column Choices

Because the differences between cis isomer FAMEs and trans isomer FAMEs of the same carbon length and degree of unsaturation are very small, very efficient capillary GC columns with highly polar phases are required.

- The high polarity of the SP-2380 column allows the separation of geometric (cis/trans) isomers as a group. The phase is stabilized, providing a maximum temperature slightly higher than the popular SP-2560 column.
- The very polar SP-2560 column was specifically designed for the separation of geometric-positional (cis/trans) isomers of FAMEs, and is extremely effective for special FAME applications including the separation of FAMEs in hydrogenated vegetable oil samples. This column is specified in AOAC Method 996.06 and AOCS Method Ce 1h-05. (10-11)
- The SLB-IL100 column exhibits one of the highest polarities of any GC phase, providing an alternative selectivity for FAME applications typically performed on SP-2380 and SP-2560 columns.

For application, USP code, polymer, and temperature limit information, as well as catalog numbers, please refer to page 22.

Chromatograms

The following selected chromatograms for this application are presented here to assist the chromatographer in establishing analytical conditions. For assistance, contact Supelco Technical Service at 800-359-3041 (US and Canada only), 814-359-3041, or at ***techservice@sial.com***

Figure 19. 37-Component FAME Mix on the 30 m SP-2380

column: SP-2380, 30 m x 0.25 mm I.D., 0.20 µm (24110)
oven: 50 °C (2 min.), 4 °C/min. to 250 °C (15 min.)
inj.: 250 °C
det.: FID, 260 °C
carrier gas: helium, 20 cm/sec @ 150 °C
injection: 1 µL, 100:1 split
sample: Supelco 37-Component FAME Mix (47885-U), analytes at concentrations indicated in methylene chloride

See Figure 7 for list of analytes and concentrations

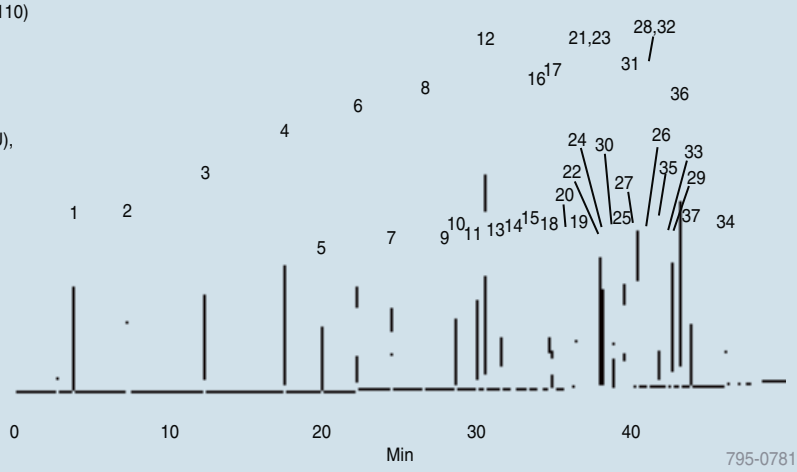




Figure 20. 37-Component FAME Mix on the 75 m SP-2560

column: SP-2560, 75 m x 0.18 mm I.D., 0.14 µm (23348-U)
oven: 140 °C (5 min.), 4 °C/min. to 240 °C (2 min.)
inj.: 250 °C
det.: FID, 250 °C
carrier gas: hydrogen, 40 cm/sec @ 175 °C
injection: 1 µL, 100:1 split
liner: 4 mm I.D, split, cup design
sample: Supelco 37-Component FAME Mix (47885-U), analytes at concentrations indicated in methylene chloride

See Figure 7 for list of analytes and concentrations

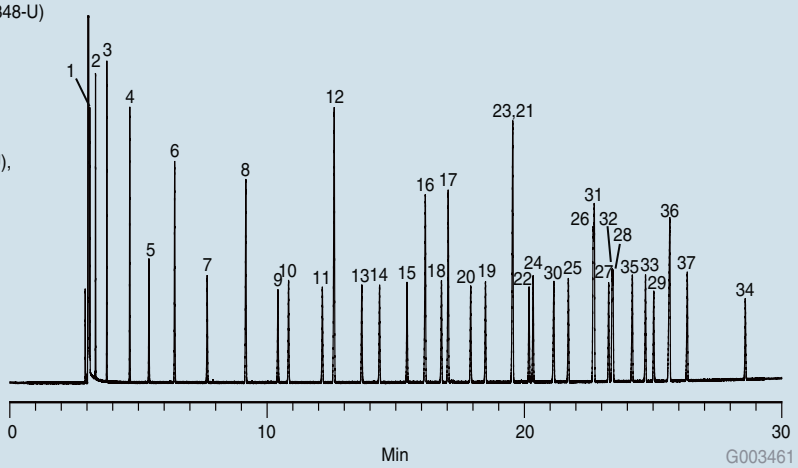


Figure 21. 37-Component FAME Mix on the 100 m SP-2560

column: SP-2560, 100 m x 0.25 mm I.D., 0.20 µm (24056)
oven: 140 °C (5 min.), 4 °C/min. to 240 °C (15 min.)
inj.: 250 °C
det.: FID, 260 °C
carrier gas: helium, 20 cm/sec @ 175 °C
injection: 1 µL, 100:1 split
sample: Supelco 37-Component FAME Mix (47885-U), analytes at concentrations indicated in methylene chloride

See Figure 7 for list of analytes and concentrations

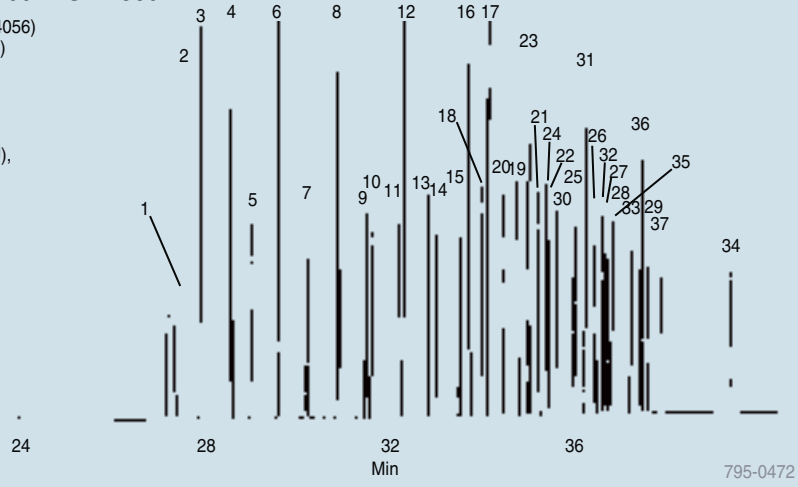
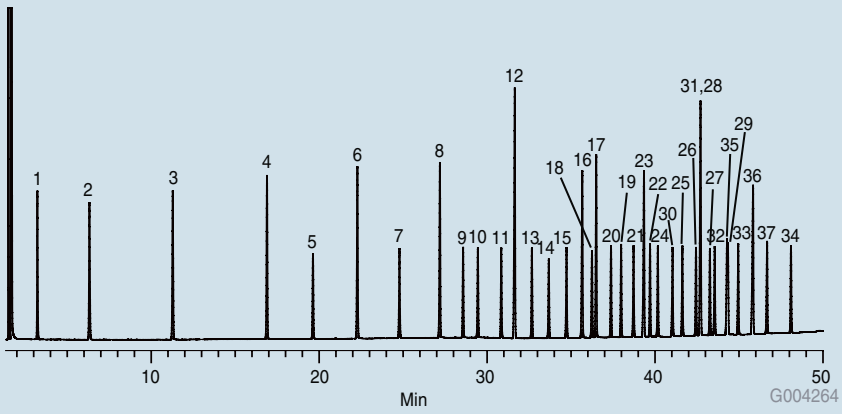


Figure 22. 37-Component FAME Mix on the 30 m SLB-IL100

Chromatogram courtesy of Prof. Luigi Mondello (Univ. of Messina, Italy)

column: SLB-IL100, 30 m x 0.25 mm I.D., 0.20 µm (28884-U)
oven: 50 °C, 3.0 °C/min. to 240 °C
inj.: 240 °C
det.: FID, 240 °C
carrier gas: helium, 40 cm/sec constant
injection: 1 µL, 50:1 split
sample: Supelco 37-Component FAME Mix (47885-U), analytes at concentrations indicated in methylene chloride

See Figure 7 for list of analytes and concentrations





Cis/Trans Fatty Acid Isomers as FAMEs

Figure 23. Detailed Analysis of cis/trans C18 FAME Isomers on the 75 m SP-2560

column: SP-2560, 75 m x 0.18 mm I.D., 0.14 µm (23348-U)
oven: 180 °C
inj.: 220 °C
det.: FID, 220 °C
carrier gas: hydrogen, 25 cm/sec @ 180 °C
injection: 0.5 µL, 100:1 split
liner: 4 mm I.D., split, cup design
sample: Mixture of C18:1, C18:2, and C18:3 FAMEs in methylene chloride

1. C18:1 Δ 6t
2. C18:1 Δ 6c
3. C18:1 Δ 7t
4. C18:1 Δ 7c
5. C18:1 Δ 9t
6. C18:1 Δ 9c
7. C18:1 Δ 11t
8. C18:1 Δ 11c
9. C18:1 Δ 12t
10. C18:1 Δ 12c
11. C18:1 Δ 13t
12. C18:1 Δ 13c
13. C18:2 Δ 9t,12t
14. C18:2 Δ 9c,12t
15. C18:2 Δ 9t,12c
16. C18:2 Δ 9c,12c
17. C18:3 Δ 9t,12t,15t
18. C18:3 Δ 9t,12t,15c
19. C18:3 Δ 9t,12c,15t
20. C18:3 Δ 9c,12c,15t
21. C18:3 Δ 9c,12t,15t
22. C18:3 Δ 9c,12t,15c
23. C18:3 Δ 9t,12c,15c
24. C18:3 Δ 9c,12c,15c

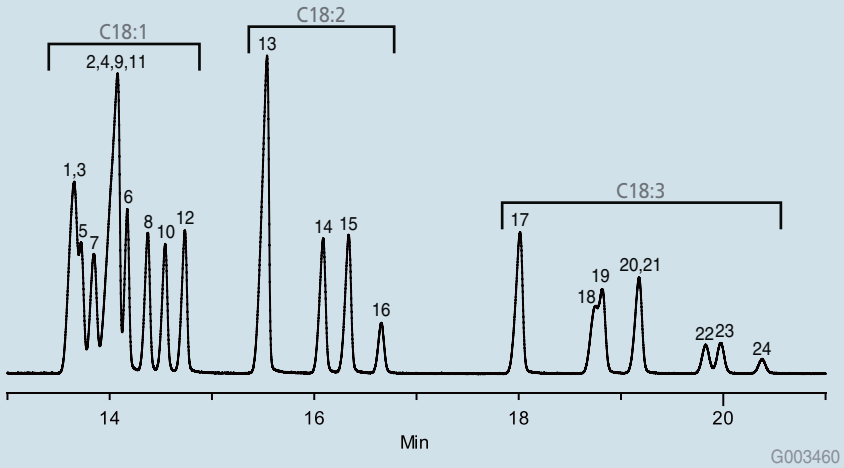


Figure 24. Detailed Analysis of cis/trans C18 FAME Isomers on the 100 m SP-2560

column: SP-2560, 100 m x 0.25 mm I.D., 0.20 µm (24056)
oven: 175 °C
inj.: 210 °C
det.: FID, 250 °C
carrier gas: helium, 20 cm/sec @ 175 °C
injection: 1.0 µL, 100:1 split
sample: Mixture of C18:1, C18:2, and C18:3 FAMEs in methylene chloride

Same Peak IDs as Figure 23

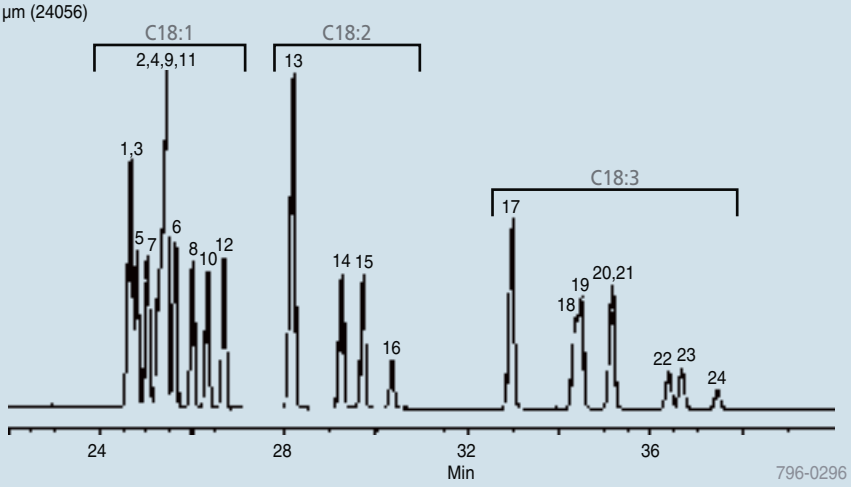
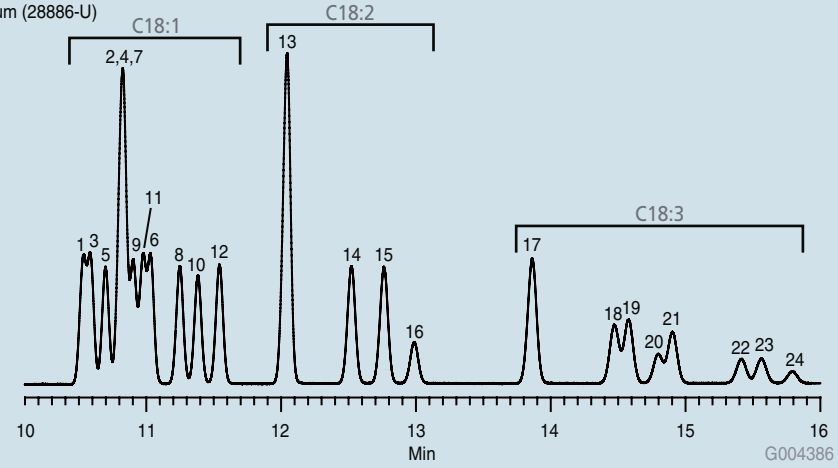


Figure 25. Detailed Analysis of cis/trans C18 FAME Isomers on the 60 m SLB-IL100

column: SLB-IL100, 60 m x 0.25 mm I.D., 0.20 µm (28886-U)
oven: 170 °C
inj.: 250 °C
det.: FID, 250 °C
carrier gas: helium, 30 cm/sec
injection: 1 µL, 50:1 split
liner: 4 mm I.D., split, cup design
sample: Mixture of C18:1, C18:2, and C18:3 FAMEs in methylene chloride

Same Peak IDs as Figure 23





Chemical Standards

To assist in confirming cis/trans identifications, Sigma-Aldrich offers the following standards. One standard is the Supelco 37-Component FAME Mix (47885-U). This standard contains methyl esters of fatty acids ranging from C4 to C24, including key monounsaturated and polyunsaturated fatty acids, making this standard very useful to food analysts since it can be used to identify fatty acids in many different types of foods.

Description	Cat. No.
trans-9-Tetradecenoic Acid Methyl Ester (C14:1n9t), 100 mg	70055
trans-9-Hexadecenoic Acid Methyl Ester (C16:1n9t), 100 mg	76117
cis-6-Octadecenoic Acid Methyl Ester (C18:1n6c), 10 mg/mL in heptane, 1 mL	47198
trans-6-Octadecenoic Acid Methyl Ester (C18:1n6t), 10 mg/mL in heptane, 1 mL	47199
cis-9-Octadecenoic Acid Methyl Ester (C18:1n9c), 10 mg/mL in heptane, 1 mL	46902-U
trans-9-Octadecenoic Acid Methyl Ester (C18:1n9t), 10 mg/mL in heptane, 1 mL	46903
cis-11-Octadecenoic Acid Methyl Ester (C18:1n11c), 10 mg/mL in heptane, 1 mL	46904
trans-11-Octadecenoic Acid Methyl Ester (C18:1n11t), 10 mg/mL in heptane, 1 mL	46905-U
Methyl cis-12-Octadecenoate, (C18:1n12c), 50 mg	02817
Linoleic Acid Methyl Ester (C18:2) Isomer Mix 10 mg/mL (total wt.) in methylene chloride, 1 mL *cis-9,cis-12-Octadecadienoic Acid Methyl Ester (C18:2Δ9c,12c), ~10% w/w* *cis-9,trans-12-Octadecadienoic Acid Methyl Ester (C18:2Δ9c,12t), ~20% w/w* *trans-9,cis-12-Octadecadienoic Acid Methyl Ester (C18:2Δ9t,12c), ~20% w/w* *trans-9,trans-12-Octadecadienoic Acid Methyl Ester (C18:2Δ9t,12t), ~50% w/w*	47791
Linolenic Acid Methyl Ester (C18:3) Isomer Mix 10 mg/mL (total wt.) in methylene chloride, 1 mL *cis-9,cis-12,cis-15-Octadecatrienoic Acid Methyl Ester (C18:3Δ9c,12c,15c), ~3% w/w* *cis-9,cis-12,trans-15-Octadecatrienoic Acid Methyl Ester (C18:3Δ9c,12c,15t), ~7% w/w* *cis-9,trans-12,cis-15-Octadecatrienoic Acid Methyl Ester (C18:3Δ9c,12t,15c), ~7% w/w* *cis-9,trans-12,trans-15-Octadecatrienoic Acid Methyl Ester (C18:3Δ9c,12t,15t), ~15% w/w* *trans-9,cis-12,cis-15-Octadecatrienoic Acid Methyl Ester (C18:3Δ9t,12c,15c), ~7% w/w* *trans-9,cis-12,trans-15-Octadecatrienoic Acid Methyl Ester (C18:3Δ9t,12c,15t), ~15% w/w* *trans-9,trans-12,cis-15-Octadecatrienoic Acid Methyl Ester (C18:3Δ9t,12t,15c), ~15% w/w* *trans-9,trans-12,trans-15-Octadecatrienoic Acid Methyl Ester (C18:3Δ9t,12t,15t), ~30% w/w*	47792
Supelco 37-Component FAME Mix 10 mg/mL (total wt.) in methylene chloride, 1 mL *See Figure 7 for list of analytes and concentrations*	47885-U

C4-C24 FAME Mix — 18919-1AMP

Neat mixture of 37 analytes, 100 mg total wt.

Butyric Acid Methyl Ester (C4:0) at 4 wt %
Caproic Acid Methyl Ester (C6:0) at 4 wt %
Caprylic Acid Methyl Ester (C8:0) at 4 wt %
Capric Acid Methyl Ester (C10:0) at 4 wt %
Undecanoic Acid Methyl Ester (C11:0) at 2 wt %
Lauric Acid Methyl Ester (C12:0) at 4 wt %
Tridecanoic Acid Methyl Ester (C13:0) at 2 wt %
Myristic Acid Methyl Ester (C14:0) at 4 wt %
Myristoleic Acid Methyl Ester (C14:1) at 2 wt %
Pentadecanoic Acid Methyl Ester (C15:0) at 2 wt %
cis-10-Pentadecenoic Acid Methyl Ester (C15:1) at 2 wt %
Palmitic Acid Methyl Ester (C16:0) at 6 wt %
Palmitoleic Acid Methyl Ester (C16:1) at 2 wt %
Heptadecanoic Acid Methyl Ester (C17:0) at 2 wt %
cis-10-Heptadecenoic Acid Methyl Ester (C17:1) at 2 wt %
Stearic Acid Methyl Ester (C18:0) at 4 wt %
Oleic Acid Methyl Ester (C18:1n9c) at 4 wt %
Elaidic Acid Methyl Ester (C18:1n9t) at 2 wt %
Linoleic Acid Methyl Ester (C18:2n6c) at 2 wt %
Linolelaidic Acid Methyl Ester (C18:2n6t) at 2 wt %
γ-Linolenic Acid Methyl Ester (C18:3n6) at 2 wt %
α-Linolenic Acid Methyl Ester (C18:3n3) at 2 wt %
Arachidic Acid Methyl Ester (C20:0) at 4 wt %
cis-11-Eicosenoic Acid Methyl Ester (C20:1n9) at 2 wt %
cis-11,14-Eicosadienoic Acid Methyl Ester (C20:2) at 2 wt %
cis-8,11,14-Eicosatrienoic Acid Methyl Ester (C20:3n6) at 2 wt %
cis-11,14,17-Eicosatrienoic Acid Methyl Ester (C20:3n3) at 2 wt %
Arachidonic Acid Methyl Ester (C20:4n6) at 2 wt %
cis-5,8,11,14,17-Eicosapentaenoic Acid Methyl Ester (C20:5n3) at 2 wt %
Heneicosanoic Acid Methyl Ester (C21:0) at 2 wt %
Behenic Acid Methyl Ester (C22:0) at 4 wt %
Erucic Acid Methyl Ester (C22:1n9) at 2 wt %
cis-13,16-Docosadienoic Acid Methyl Ester (C22:2) at 2 wt %
cis-4,7,10,13,16,19-Docosahexaenoic Acid Methyl Ester (C22:6n3) at 2 wt %
Tricosanoic Acid Methyl Ester (C23:0) at 2 wt %
Lignoceric Acid Methyl Ester (C24:0) at 4 wt %
Nervonic Acid Methyl Ester (C24:1n9) at 2 wt %

C8-C22 FAME Mix — 18920-1AMP

Neat mixture of 19 analytes, 100 mg total wt.

Caprylic Acid Methyl Ester (C8:0) at 1.9 wt %
Capric Acid Methyl Ester (C10:0) at 3.2 wt %
Lauric Acid Methyl Ester (C12:0) at 6.4 wt %
Tridecanoic Acid Methyl Ester (C13:0) at 3.2 wt %
Myristic Acid Methyl Ester (C14:0) at 3.2 wt %
Myristoleic Acid Methyl Ester (C14:1) at 1.9 wt %
Pentadecanoic Acid Methyl Ester (C15:0) at 1.9 wt %
Palmitic Acid Methyl Ester (C16:0) at 13 wt %
Palmitoleic Acid Methyl Ester (C16:1) at 6.4 wt %
Heptadecanoic Acid Methyl Ester (C17:0) at 3.2 wt %
Stearic Acid Methyl Ester (C18:0) at 6.5 wt %
Oleic Acid Methyl Ester (C18:1n9c) at 19.6 wt %
Elaidic Acid Methyl Ester (C18:1n9t) at 2.6 wt %
Linoleic Acid Methyl Ester (C18:2n6c) at 13 wt %
Linolenic Acid Methyl Ester (C18:3) at 6.4wt %
Arachidic Acid Methyl Ester (C20:0) at 1.9 wt %
cis-11-Eicosenoic Acid Methyl Ester (C20:1n9) at 1.9 wt %
Behenic Acid Methyl Ester (C22:0) at 1.9 wt %
cis-13-Docosanoic Acid Methyl Ester (C22:1) at 1.9 wt %

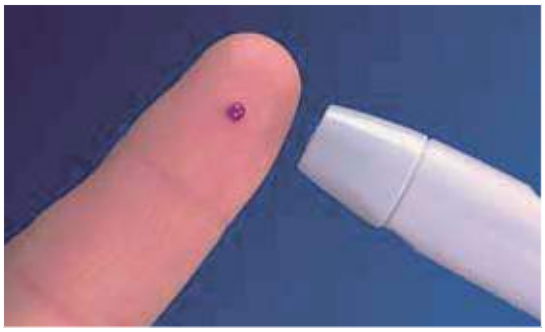


Chemical Standards (Contd.)

Description	Cat. No.
C14-C22 FAME Mix Neat mixture of 10 analytes, 100 mg total wt. *Myristic Acid Methyl Ester (C14:0), 4% w/w* *Palmitic Acid Methyl Ester (C16:0), 10% w/w* *Stearic Acid Methyl Ester (C18:0), 6% w/w* *Oleic Acid Methyl Ester (C18:1n9c), 25% w/w* *Elaidic Acid Methyl Ester (C18:1n9t), 10% w/w* *Linoleic Acid Methyl Ester (C18:2n6c), 34% w/w* *Linolelaidic Acid Methyl Ester (C18:2n6t), 2% w/w* *Linolenic Acid Methyl Ester (C18:3), 5% w/w* *Arachidic Acid Methyl Ester (C20:0), 2% w/w* *Behenic Acid Methyl Ester (C22:0), 2% w/w*	18917-1AMP
C18-C20 FAME Mix Neat mixture of 6 analytes, 100 mg total wt. *Stearic Acid Methyl Ester (C18:0), 10% w/w* *Oleic Acid Methyl Ester (C18:1n9c), 20% w/w* *Elaidic Acid Methyl Ester (C18:1n9t), 20% w/w* *Linoleic Acid Methyl Ester (C18:2n6c), 20% w/w* *Linolelaidic Acid Methyl Ester (C18:2n6t), 20% w/w* *Arachidic Acid Methyl Ester (C20:0), 10% w/w*	18916-1AMP
Grain Fatty Acid Methyl Ester Mix 10 mg/mL (total wt.) in methylene chloride, 1 mL *Caprylic Acid Methyl Ester (C8:0), 1.9 wt. %* *Capric Acid Methyl Ester (C10:0), 3.2 wt. %* *Lauric Acid Methyl Ester (C12:0), 6.4 wt. %* *Tridecanoic Acid Methyl Ester (C13:0), 3.2 wt. %* *Myristic Acid Methyl Ester (C14:0), 3.2 wt. %* *Myristoleic Acid Methyl Ester (C14:1n9c), 1.9 wt. %* *Pentadecanoic Acid Methyl Ester (C15:0), 1.9 wt. %* *Palmitic Acid Methyl Ester (C16:0), 13.0 wt. %* *Palmitoleic Acid Methyl Ester (C16:1n9c), 6.4 wt. %* *Heptadecanoic Acid Methyl Ester (C17:0), 3.2 wt. %* *Stearic Acid Methyl Ester (C18:0), 6.5 wt. %* *Oleic Acid Methyl Ester (C18:1n9c), 19.6 wt. %* *Elaidic Acid Methyl Ester (C18:1n9t), 2.6 wt. %* *Linoleic Acid Methyl Ester (C18:2n6c), 13.0 wt. %* *α-Linolenic Acid Methyl Ester (C18:3n3), 6.4 wt. %* *Arachidic Acid Methyl Ester (C20:0), 1.9 wt. %* *cis-11-Eicosenoic Acid Methyl Ester (C20:1c), 1.9 wt. %* *Behenic Acid Methyl Ester (C22:0), 1.9 wt. %* *Erucic Acid Methyl Ester (C22:1n9), 1.9 wt. %*	47801

Blood Assessment Kits

Monitoring a patient's fatty acid profile is an important step in accurately managing wellness, allowing the health provider to verify the adherence to and effectiveness of a dietary strategy. Quick and accurate results are desirable so that any necessary changes to the dietary strategy can be made in a timely manner. It has been shown that blood samples collected as a small drop from the fingertip can be analyzed to provide sufficient data for such as assessment. (13)



Sigma-Aldrich offers convenient kits for the collection of blood drops, their storage/shipment, and processing to prepare samples for fatty acid analysis via gas chromatography. One kit is designed for collection and subsequent storage/shipment. The other kit is designed for derivatization of the fatty acids in the blood prior to GC analysis. Combined, these kits allow efficient sample collection and processing for quick compilation of analytical information on the fatty acid content in blood samples. They are tools that care providers can use in the development and application of adequate dietary strategies for their patients.

The Blood Collection Kit includes blood collection dipsticks, desiccant packs, foil-barrier ziplock bags, 50 mL BHT solution, and complete instructions. The Derivatization Kit includes a 1.25 M methanolic HCl solution, a saturated KCl solution, distilled water, and a working instruction sheet.

Description	Cat. No.
Blood Collection Kit, enough supplies for 100 tests	11312
Derivatization Kit, enough supplies for 100 tests	05904



GC Columns by Phase

Looking for information or specifications for a particular phase? This section provides application, USP code, polymer, and temperature limit information in addition to catalog numbers. (12) Where two maximum temperatures are listed (such as 200/220 °C), the first is for isothermal oven analyses, whereas the second is for oven temperature programmed analyses. Where only one maximum temperature is listed, it can be used for either isothermal or temperature programmed oven analyses.

This section is organized primarily in order of increasing phase polarity to assist in phase selection when performing method development. To learn more about any phases listed, or to inquire about a phase not listed, contact Technical Service at 800-359-3041 (US and Canada only), 814-359-3041, or at ***techservice@sial.com***

Equity-1

- **Application:** This column is designed for applications where a non-polar column is required. Analytes will be separated primarily according to boiling point.
- **USP Code:** This column meets USP G1, G2, and G9 requirements.
- **Polymer:** Bonded; poly(dimethylsiloxane)
- **Temperature Limits:**
  -60 °C to 325/350 °C for 0.10 - 0.32 mm I.D.
  -60 °C to 300/320 °C for 0.53 mm I.D. (≤1.5 µm)
  -60 °C to 260/280 °C for 0.53mm I.D. (>1.5 µm)

Description	Cat. No.
15 m x 0.10 mm I.D., 0.10 µm	28039-U
12 m x 0.20 mm I.D., 0.33 µm	28041-U
25 m x 0.20 mm I.D., 0.33 µm	28042-U
10 m x 0.20 mm I.D., 1.20 µm	28043-U
30 m x 0.25 mm I.D., 0.10 µm	28044-U
15 m x 0.25 mm I.D., 0.25 µm	28045-U
30 m x 0.25 mm I.D., 0.25 µm	28046-U
60 m x 0.25 mm I.D., 0.25 µm	28047-U
15 m x 0.25 mm I.D., 1.00 µm	28048-U
30 m x 0.25 mm I.D., 1.00 µm	28049-U
60 m x 0.25 mm I.D., 1.00 µm	28050-U
100 m x 0.25 mm I.D., 1.00 µm	28052-U
30 m x 0.32 mm I.D., 0.10 µm	28053-U
15 m x 0.32 mm I.D., 0.25 µm	28054-U
30 m x 0.32 mm I.D., 0.25 µm	28055-U
60 m x 0.32 mm I.D., 0.25 µm	28056-U
30 m x 0.32 mm I.D., 1.00 µm	28057-U
60 m x 0.32 mm I.D., 1.00 µm	28058-U
100 m x 0.32 mm I.D., 1.00 µm	28060-U
30 m x 0.32 mm I.D., 2.00 µm	28061-U
30 m x 0.32 mm I.D., 5.00 µm	28062-U
60 m x 0.32 mm I.D., 5.00 µm	28063-U
15 m x 0.53 mm I.D., 0.10 µm	28064-U
30 m x 0.53 mm I.D., 0.10 µm	28065-U
15 m x 0.53 mm I.D., 0.50 µm	28067-U
30 m x 0.53 mm I.D., 0.50 µm	28068-U
15 m x 0.53 mm I.D., 1.00 µm	28069-U
30 m x 0.53 mm I.D., 1.00 µm	28071-U
15 m x 0.53 mm I.D., 1.50 µm	28072-U
30 m x 0.53 mm I.D., 1.50 µm	28073-U
60 m x 0.53 mm I.D., 1.50 µm	28074-U
15 m x 0.53 mm I.D., 3.00 µm	28075-U
30 m x 0.53 mm I.D., 3.00 µm	28076-U
60 m x 0.53 mm I.D., 3.00 µm	28077-U
15 m x 0.53 mm I.D., 5.00 µm	28079-U
30 m x 0.53 mm I.D., 5.00 µm	28081-U
60 m x 0.53 mm I.D., 5.00 µm	28082-U

Nukol

- **Application:** The incorporation of acid functional groups into the phase lends an acidic character to this column, useful for analyses of volatile acidic compounds. Difficult to analyze carboxylic acids (free fatty acids) can be analyzed with excellent peak shape and minimal adsorption.
- **USP Code:** This column meets USP G25 and G35 requirements.
- **Polymer:** Bonded; acid-modified poly(ethylene glycol)
- **Temperature Limits:**
  60 °C to 200/220 °C

Description	Cat. No.
15 m x 0.25 mm I.D., 0.25 µm	24106-U
30 m x 0.25 mm I.D., 0.25 µm	24107
60 m x 0.25 mm I.D., 0.25 µm	24108
15 m x 0.32 mm I.D., 0.25 µm	24130
30 m x 0.32 mm I.D., 0.25 µm	24131
60 m x 0.32 mm I.D., 0.25 µm	24132
15 m x 0.32 mm I.D., 1.00 µm	24206-U
30 m x 0.32 mm I.D., 1.00 µm	24207
60 m x 0.32 mm I.D., 1.00 µm	24208
15 m x 0.53 mm I.D., 0.50 µm	25326
30 m x 0.53 mm I.D., 0.50 µm	25327
60 m x 0.53 mm I.D., 0.50 µm	25386
30 m x 0.53 mm I.D., 1.00 µm	25357



Omegawax

- **Application:** This column allows highly reproducible analyses of fatty acid methyl esters (FAMEs), specifically omega 3 and omega 6 groups. It is tested to ensure reproducible FAME equivalent chain length (ECL) values and resolution of key components. This column is specified in AOAC Method 991.39 and AOCS Method Ce 1b-89.
- **USP Code:** This column meets USP G16 requirements.
- **Polymer:** Bonded; poly(ethylene glycol)
- **Temperature Limits:**
  50 °C to 280 °C

Description	Cat. No.
15 m x 0.10 mm I.D., 0.10 µm	23399-U
30 m x 0.25 mm I.D., 0.25 µm	24136
30 m x 0.32 mm I.D., 0.25 µm	24152
30 m x 0.53 mm I.D., 0.50 µm	25374

SP-2380

- **Application:** A highly polar cyanosiloxane column commonly used for separation of geometric (cis/trans) fatty acid methyl ester (FAME) isomers as a group. Also useful when a highly polar general purpose column with good thermal stability is required.
- **USP Code:** This column meets USP G48 requirements.
- **Polymer:** Stabilized; poly(90% biscyanopropyl/10% cyanopropylphenyl siloxane)
- **Temperature Limits:**
  Subambient to 275 °C

Description	Cat. No.
15 m x 0.25 mm I.D., 0.20 µm	24109
30 m x 0.25 mm I.D., 0.20 µm	24110-U
60 m x 0.25 mm I.D., 0.20 µm	24111
100 m x 0.25 mm I.D., 0.20 µm	24317
30 m x 0.32 mm I.D., 0.20 µm	24116-U
60 m x 0.32 mm I.D., 0.20 µm	24117
30 m x 0.53 mm I.D., 0.20 µm	25319

SP-2560

- **Application:** This highly polar biscyanopropyl column was specifically designed for the detailed separation of geometric (cis/trans) isomers of fatty acid methyl esters (FAMEs). It is extremely effective for FAME isomer applications. This column is specified in AOAC Method 996.06 and AOCS Method Ce 1h-05.
- **USP Code:** This column meets USP G5 requirements.
- **Polymer:** Non-bonded; poly(biscyanopropyl siloxane)
- **Temperature Limits:**
  Subambient to 250 °C

Description	Cat. No.
75 m x 0.18 mm I.D., 0.14 µm	23348-U
100 m x 0.25 mm I.D., 0.20 µm	24056
100 m x 0.25 mm I.D., 0.20 µm*	23362-U

* Wound onto a 5" cage to fit an Agilent® 6850 GC.

SLB-IL100

- **Application:** This ionic liquid phase has a polarity/selectivity roughly equivalent to that of the TCEP phase, higher than any of the polysiloxane polymer and polyethylene glycol phases. The combination of high polarity/selectivity, low bleed, and a maximum temperature of 230 °C results in a column very effective for analyses of FAMEs, aromatics, and PCB congeners.
- **USP Code:** None.
- **Polymer:** Non-bonded; 1,9-di(3-vinyl-imidazolium) nonane bis(trifluoromethyl) sulfonyl imidate
- **Temperature Limits:**
  Subambient to 230 °C

Description	Cat. No.
15 m x 0.10 mm I.D., 0.08 µm	28882-U
20 m x 0.18 mm I.D., 0.14 µm	28883-U
30 m x 0.25 mm I.D., 0.20 µm	28884-U
60 m x 0.25 mm I.D., 0.20 µm	28886-U
30 m x 0.32 mm I.D., 0.26 µm	28887-U
60 m x 0.32 mm I.D., 0.26 µm	28888-U

References

1. A. Ascherio, W. Willett, "Health Effects of Trans Fatty Acids" Am. J. Clin. Nutr. (1997) 66 (supplement), 1006S-1010S.
2. S. Stender, J. Dyerberg, "Influence of Trans Fatty Acids on Health" Annals of Nutrition and Metabolism (2004) 48 (2), 61-66.
3. American Heart Association Web Page, http://www.americanheart.org/presenter.jhtml?identifier= 1728 (accessed Jan. 4, 2006).
4. 21 CFR Part 101, "Food Labeling: Trans Fatty Acids in Nutrition Labeling" Federal Register (July 11, 2003) Volume 68, Number 133, http://www.cfsan.fda.gov/~lrd/fr03711a.html (accessed Jan. 4, 2006).
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7. AOCS Method Ce 1-62, "Fatty Acid Composition by Gas Chromatography" AOCS Official Methods (2005) American Oil Chemists Society.
8. AOAC Method 991.39, "Fatty Acids in Encapsulated Fish Oils and Fish Oil Methyl and Ethyl Esters" Official Methods of Analysis, 18th Edition (on-line) Association of Official Analytical Chemists, Inc.
9. AOCS Method Ce 1b-89, "Fatty Acid Composition by GLC Marine Oils" AOCS Official Methods (2005) American Oil Chemists Society.
10. AOAC Method 996.06, "Fat (Total, Saturated, and Unsaturated) in Foods" Official Methods of Analysis, 18th Edition (on-line) Association of Official Analytical Chemists, Inc.
11. AOCS Method Ce 1h-05, "Determination of cis-, trans-, Saturated, Monounsaturated and Polyunsaturated Fatty Acids in Vegetable or Non-ruminant Animal Oils and Fats by Capillary GLC" AOCS Official Methods (2005) American Oil Chemists Society.
12. USP, "Chromatographic Reagents" United States Pharmacopeia 31 / National Formulary 26, First Supplement (August 1, 2008) 3596-3598.
13. F. Marangoni, C. Colombo, C. Galli, "A Method for the Direct Evaluation of the Fatty Acid Status in a Drop of Blood from a Fingertip in Humans: Applicability to Nutritional and Epidemiological Studies" Anal. Biochem. (2004) 326, 267-272.



Product Literature

The following list of Sigma-Aldrich/Supelco literature provides additional product information than what is presented in this brochure. To obtain any of these literature pieces at no-charge, either visit our web site at *sigma-aldrich.com* or contact Supelco Technical Service: 800-359-3041 (US and Canada only), 814-359-3041, or at ***techservice@sial.com***

Title	Identification
GC Columns	
GC Column Selection Guide	T407133 KCX
Analyzing Fatty Acids by Capillary GC	T110855 AYC
37-Component FAME Mix on Four Capillary Columns	T196907 AZC
Fast GC Brochure	T407096 JTW
Capillary GC Troubleshooting Guide	T112853 AIP
GC-Related	
GC Accessories and Gas Purification/Management	T407103 JWE
Molded Thermogreen™ LB-2 Septa	T407082 JQV
Selecting the Appropriate Inlet Liner (Poster)	T404081 HCH
Gas Management Systems for GC	T196898 AYW
Gas Generators Brochure	T407110 JXP
Syringes Brochure	T406108 JCS
Vials Brochure	IXH
Chemical Standards	
Fluka Analytical Reagents & Standards Catalog	003
SPE Tubes	
Discovery Ag-Ion SPE for cis/trans FAME Fractionation	T406062 IRV
Supelco Solid Phase Extraction Products	T402150 FEB
Derivatization Reagents	
Derivatization Reagents Brochure	T407138 KDI
BCl_3-Methanol (12% w/w)	T496123 BAX
BF_3-Methanol (10% w/w)	T496125 BAZ
BF_3-Butanol (10% w/w)	T496124 BAY
Methanolic Base (0.5N)	T497007 BEG
Methanolic HCl (0.5N and 3N)	T497099 BIV
Methanolic H_2SO_4 (10% v/v)	T497018 BDO

Additional Reading

Consult these references, written by experts and researchers, to learn more about the many facets of fatty acids, FAMEs, and their analysis.

1. William W. Christie, "Lipid Analysis: Isolation, Separation, Identification and Structural Analysis of Lipids" Third Edition (2003) The Oily Press, ISBN 0-9531949-5-7.
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4. Daniel R. Knapp, "Handbook of Analytical Derivatization Reactions" (1979) Wiley, ISBN 978-0-471-03469-8.
5. Karl Blau and John M. Halket, "Handbook of Derivatives for Chromatography" Second Edition (1993) Wiley, ISBN 978-0-471-92699-3.
6. Harold McNair and James Miller, "Basic Gas Chromatography" (1998) Wiley, ISBN 0-471-17261-8.
7. David Grant, "Capillary Gas Chromatography" (1996) Wiley, ISBN 0-471-95377-6.
8. Robert L. Grob and Eugene F. Barry, "Modern Practices of Gas Chromatography" Fourth Edition (2004) Wiley, ISBN 0-471-22983-0.
9. Eugene F. Barry and Robert L. Grob, "Columns for Gas Chromatography: Performance and Selection" (2007) Wiley, ISBN 978-0-471-74043-8.
10. Konrad Grob, "Split and Splitless Injection in Capillary GC" (1993) Hüthig, ISBN 3-7785-2151-9.
11. Dean Rood, "A Practical Guide to the Care, Maintenance, and Troubleshooting of Capillary Gas Chromatographic Systems" (1991) Hüthig, ISBN 3-7785-1898-4.

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T408126

Food and Beverage Standards
Vitamins

Vitamins

For use in HPLC, GC, and other traditional wet chemistry analyses.
All compounds have been thoroughly evaluated to ensure the utmost quality.

Vitamins – neat, unless otherwise noted.

DESCRIPTION	CAS NO.	QTY.	CAT. NO.	PRICE
WATER SOLUBLE VITAMINS				
Thiamine hydrochloride (B1)	67-03-8	1g	47858	
Riboflavin (B2)	83-88-5	1g	47861	
Pyridoxine hydrochloride (B6)	58-56-0	1g	47862	
L-Ascorbic acid	50-81-7	1g	47863	
Nicotinic acid	59-67-6	1g	47864	
Nicotinamide	98-92-0	1g	47865-U	
Folic acid	75708-92-8	500mg	47866	
Pantothenic acid (hemicalcium salt)	137-08-6	1g	47867	
D-Biotin	58-85-5	100mg	47868	
Cyanocobalamin (B12)	68-19-9	100mg	47869	
FAT SOLUBLE VITAMINS				
Retinol acetate	127-47-9	100mg	46958	
Retinol palmitate	79-81-2	100mg	46959-U	
D-α-Tocopherol succinate	4345-03-3	100mg	47782	
DL-α-Tocopherol	10191-41-0	100mg	47783	
rac-β-Tocopherol (50mg/mL in hexane)	148-03-8	1mL	46401-U	
δ-Tocopherol	119-13-1	100mg	47784	
γ-Tocopherol	54-28-4	10mg	47785	
DL-α-Tocopherol acetate	7695-91-2	100mg	47786	
Cholecalciferol (D3)	67-97-0	100mg	47763	
Ergocalciferol (D2)	50-14-6	100mg	47768	
Phylloquinone (K1)	84-80-0	100mg	47773	
Menaquinone (K2)	110232-49-8	100mg	47774	
Menadione (K3)	58-27-5	1000mg	47775	

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Mycotoxins

Our mycotoxin standards are specifically designed for use according to the Official Methods of the Association of Official Analytical Chemists (AOAC). We test all products by spectroscopy and/or HPLC against known standards and previous lots to ensure precision and uniformity, assuring that you are obtaining the finest mycotoxin standards available.

Ordering Note: Due to recent changes in U.S. and international laws, you could need a license to order aflatoxin standards. A company representative will notify you if a license is necessary.

Caution: Mycotoxins may be carcinogenic and, therefore, should be handled only by qualified personnel.

DESCRIPTION	CONCENTRATION/SOLVENT	QTY.	CAT. NO.	PRICE
AFLATOXIN STANDARDS – QUANTITATIVE STANDARDS DESIGNED FOR USE IN ACCORDANCE WITH AOAC METHOD 970.44.				
Aflatoxin B and Aflatoxin G Mixes				
Each ampul contains 1µg B_1, 1µg G_1, 0.3µg B_2, and 0.3µg G_2.	Benzene:acetonitrile (98:2)	5 x 1mL	46300-U■	
	Methanol	5 x 1mL	46304-U	
	Methanol	5mL	46303	
Single Component Aflatoxin Standards				
Aflatoxin B_1 [1162-65-8]	3µg/mL in benzene:acetonitrile (98:2)	1mL	46323-U	
Aflatoxin B_2 [7220-81-7]	3µg/mL in benzene:acetonitrile (98:2)	1mL	46324-U	
Aflatoxin G_1 [1165-39-5]	3µg/mL in benzene:acetonitrile (98:2)	1mL	46325-U	
Aflatoxin G_2 [7241-98-7]	3µg/mL in benzene:acetonitrile (98:2)	1mL	46326-U	
Aflatoxin M_1 [6795-23-9]	10µg/mL in acetonitrile	1mL	46319-U	
Aflatoxin M_2 [6885-57-0]	1µg/mL in acetonitrile	1mL	46910-U	
OTHER MYCOTOXINS				
Deoxynivalenol (DON) [51481-10-8]	200µg/mL in ethyl acetate:methanol (95:5) For use in AOAC Methods 986.17 and 986.16	1mL	46911	
Ochratoxin A [303-47-9]	50µg/mL in benzene:acetic acid (99:1)	1mL	46912	
Ochratoxin B [4825-86-9]	50µg/mL in benzene:acetic acid (99:1) Ochratoxin A and B solutions have been produced according to the guidelines in AOAC Method 973.37	1mL	46913-U	
Patulin [149-29-1]	100µg/mL in chloroform Prepared for use with AOAC Method 974.18	1mL	46914-U	
Zearalenone [17924-92-4]	50µg/mL in acetonitrile AOAC Method 976.22 contains methodology for detecting zearalenone in corn. Method 985.18 lists a method for detecting and quantifying zearalenone and α-zearalenol in corn.	1mL	46916-U	

■ Intended for use in accordance with AOAC Method 971.22.

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Chemical Standards

SUPELCO

Food and Beverage Standards
Carbohydrates/Organic Acids/Sugar Alcohols

Carbohydrates/Organic Acids/Sugar Alcohols

Prepared, tested, and packaged using rigorous manufacturing procedures.

NAME OF KIT	DESCRIPTION			CAT. NO.	PRICE
Monosaccharides Kit				47267	
	Analyte	CAS No.	Quantity		
	D-(-)Arabinose	28697-53-2	500mg		
	D-(+)Galactose	59-23-4	500mg		
	D-(+)Glucose (mixed anomers)	50-99-7	500mg		
	D-(+)Mannose (mixed anomers)	3458-28-4	500mg		
	D-Psicose (mixed anomers)	551-68-8	100mg		
	D-(-)Ribose	50-69-1	500mg		
	D-(+)Xylose	58-86-6	500mg		
Disaccharides Kit				47268-U	
	Analyte	CAS No.	Quantity		
	Isomaltose (mixed anomers)	499-40-1	100mg		
	α-Lactose	5989-81-1	500mg		
	Maltose	6363-53-7	500mg		
	Sucrose	57-50-1	500mg		
Oligosaccharides Kit				47265	
	Analyte	CAS No.	Quantity		
	Maltoheptaose (Dp7)	34620-78-5	100mg		
	Maltohexaose (Dp6)	34620-77-4	100mg		
	Maltopentaose (Dp5)	34620-76-3	100mg		
	Maltotetraose (Dp4)	34612-38-9	100mg		
	Stachyose (Dp4)	10094-58-3	100mg		
	Maltotriose (Dp3)	1109-28-0	100mg		
	D-(+)Melezitose (Dp3)	10030-67-8	100mg		
	D-(+)Raffinose (Dp3)	17629-30-0	100mg		
	Isomaltotriose (Dp3)	3371-50-4	100mg		
Organic Acids Kit				47264	
	Analyte	CAS No.	Quantity		
	Acetic acid	64-19-7	500mg		
	Adipic acid	124-04-9	500mg		
	L-Ascorbic acid	50-81-7	500mg		
	Benzoic acid	65-85-0	500mg		
	Butyric acid	107-92-6	500mg		
	Citric acid	77-92-9	500mg		
	Formic acid	64-18-6	500mg		
	Fumaric acid	110-17-8	500mg		
	Isobutyric acid	79-31-2	500mg		
	DL-Isocitric acid	1637-73-6	100mg		
	L-(+)Lactic acid	79-33-4	100mg		
	Maleic acid	110-16-7	500mg		
	D-Malic acid	636-61-3	100mg		
	Malonic acid	141-82-2	500mg		
	Oxalic acid	144-62-7	500mg		
	Phytic acid	123408-98-0	500mg		
	Propionic acid	79-09-4	500mg		
	(-)Quinic acid	77-95-2	500mg		
	Shikimic acid	138-59-0	100mg		
	Succinic acid	110-15-6	500mg		
	D-Tartaric acid	147-71-7	500mg		
Sugar Alcohols Kit				47266	
	Analyte	CAS No.	Quantity		
	D-(+)Arabitol	488-82-4	500mg		
	Dulcitol (Galactitol)	608-66-2	500mg		
	iso-Erythritol	149-32-6	500mg		
	Glycerol	56-81-5	500mg		
	Maltitol	585-88-6	500mg		
	D-Mannitol	69-65-8	500mg		
	Ribitol (Adonitol)	488-81-3	500mg		
	D-Sorbitol	50-70-4	500mg		

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Food and Beverage Standards
Alditol Acetates, Sweeteners, Antimicrobials

Alditol Acetates

These are quantitative standards. Concentrations of each component are selected to give a relatively uniform chromatogram for TLC, GC, or HPLC analysis.

MIX	COMPONENTS	QTY.	CAT. NO.	PRICE
Alditol Acetate Mix 1		1mL	47880-U	
	4 components, 50mg/mL total in chloroform			
	Rhamnitol acetate (25%) Ribitol acetate (25%)			
	Fucitol acetate (25%) Arabinitol acetate (25%)			
Alditol Acetate Mix 2		1mL	47881	
	4 components, 50mg/mL total in chloroform			
	Mannitol acetate (25%) Glucitol acetate (25%)			
	Galactitol acetate (25%) Inositol acetate (25%)			

Sweeteners

Sweeteners are classified into two main groups — caloric (nutritive) and non-caloric (non-nutritive). Nutritive sweeteners are metabolized by the body to provide energy. Non-nutritive sweetners are not metabolized by the body and are unchanged before excretion. The nutritive sweeteners are carbohydrates, or derivatives of carbohydrates, such as sugar alcohols.

The study of sweeteners is increasing, due to the dietary requirements of diabetics and concerns about obesity. We offer a variety of sweeteners that the food industry either is using or is evaluating for potential use. We have evaluated these standards to provide the highest quality for your analytical needs.

COMPOUND	CAS NO.	QTY.	CAT. NO.	PRICE
Acesulfame K	55589-62-3	1g	47134	
Aspartame	22839-47-0	500mg	47135	
Sodium cyclamate	139-05-9	1g	47827	
D-(+)Glucose	50-99-7	1g	47829	
Sodium saccharin	82385-42-0	1g	47839	
Saccharin (hemicalcium)	6381-91-5	1g	47840	
D-Sorbitol	50-70-4	1g	47841	
Xylitol	87-99-0	1g	47844	

Antimicrobials/Preservatives

These neat preservative standards have been evaluated to ensure that they are of the highest quality. We offer these standards in small quantities; there is no need to purchase a large quantity of chemicals, only to pay expensive disposal charges later.

Neat, each 1g.

COMPOUND	CAS NO.	QTY.	CAT. NO.	PRICE
Benzoic acid	65-85-0	1g	47849	
Sodium benzoate	532-32-1	1g	47850	
Methyl paraben	99-76-3	1g	47889	
Sorbic acid	110-44-1	1g	47845	
Potassium sorbate	590-00-1	1g	47848	

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Food and Beverage Standards
Lipids

Lipid Standards

Fatty Acid Methyl Esters (FAMEs)

A Word on Nomenclature - Common names are used in this catalog where brevity does not sacrifice clarity. Geneva names are used where possible.

Saturated and unsaturated fatty acids are named according to the number of carbon atoms of the parent hydrocarbon chain. Saturated fatty acids are named according to the modified Geneva system, by replacing the terminal "e" of the parent hydrocarbon with the suffix "oic" (e.g., decane to decanoic). The common names of most of these fatty acids are also listed.

Unsaturated fatty acids are named by replacing the "e" of the corresponding unsaturated hydrocarbon with the suffix "enoic" (e.g. decene to decenoic). The number of multiple double bonds is indicated by adding dienoic, and so on to the hydrocarbon name. For example, the 18 carbon chain acid with three double bonds is named octadecatrienoic.

Double bonds are also designated by position and geometric configuration. Naturally occurring fatty acids are usually of the *cis*-configuration, unless stated as *trans*. Octadecenoic acid with the double bond in the nine position has both *cis* (common name, oleic acid) and *trans* (elaidic acid) forms. The simplest way to name double-bond positions is to count carbons, starting with the carboxyl carbon, until you reach the double bond. Thus, oleic acid named by the Geneva system is *cis*-9-octadecenoic acid:

$$CH_3(CH_2)_7CH = \overset{9}{C}H(CH_2)_7\overset{1}{C}OOH,$$

and linoleic acid is *cis*-9,12-octadecadienoic acid:

$$CH_3(CH_2)_4CH = \overset{12}{C}HCH_2CH = \overset{9}{C}H(CH_2)_7\overset{1}{C}OOH.$$

In the product descriptions for lipid mixes, chain length, followed by the number of double bonds, is indicated in parentheses after the component names. For example, linolenic acid, which has a chain length of 18 and 3 double bonds, is listed as:

Linolenic acid (18:3)

C18 FAME Isomer Mix

MIX	COMPONENTS	WT. %	QTY.	CAT. NO.	PRICE
Linoleic Acid Methyl Ester cis/trans Isomer Mix	4 components, 10mg/mL in methylene chloride		1mL	47791	
	trans-9,trans-12-Octadecadienoic acid methyl ester	50			
	cis-9,trans-12-Octadecadienoic acid methyl ester	20			
	trans-9,cis-12-Octadecadienoic acid methyl ester	20			
	cis-9,cis-12-Octadecadienoic acid methyl ester	10			

C18 cis/trans Fatty Acids/FAMEs

10mg/mL in heptane.

DESCRIPTION	CAS NO.	QTY.	CAT. NO.	PRICE
cis-6-Octadecenoic methyl ester (Petroselinic)	2777-58-4	1mL	47198	
trans-6-Octadecenoic methyl ester (Petroselaidic)	–	1mL	47199	
cis-7-Octadecenoic methyl ester	2278-59-3	1mL	46900-U	
cis-9-Octadecenoic methyl ester (Oleic)	112-62-9	1mL	46902-U	
trans-9-Octadecenoic methyl ester (Elaidic)	2462-84-2	1mL	46903	
cis-11-Octadecenoic methyl ester (cis-Vaccenic)	1937-63-9	1mL	46904	
trans-11-Octadecenoic methyl ester (trans-Vaccenic)	6198-58-9	1mL	46905-U	
cis-12-Octadecenoic methyl ester	2733-86-0	1mL	46906	
trans-12-Octadecenoic methyl ester	20221-23-2	1mL	46907-U	
trans-13-Octadecenoic methyl ester	42199-38-2	1mL	46909	
cis-15-Octadecenoic methyl ester	10411-39-9	1mL	46953	
cis-9,12-Octadecedienoic methyl ester	112-63-0	1mL	46950-U	
trans-9,12-Octadecedienoic methyl ester	2566-97-4	1mL	46951-U	
cis-5,8,11,14,17-Eicosapentaenoic methyl ester	2734-47-6	1mL	47571-U	
cis-4,7,10,13,16,19-Docosahexaenoic methyl ester	301-01-9	1mL	47570-U	
cis-7,10,13,16,19-Docosapentaenoic methyl ester	108698-02-8	1mL	47563-U	

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Highly Characterized Reference Oils

We offer highly characterized common reference oil samples for use as controls or check samples for fatty acid methyl ester (FAME) analyses. These samples provide an excellent means of standardizing your lipid procedures and comparing your results to others. A Certificate of Analysis is provided with each oil sample.

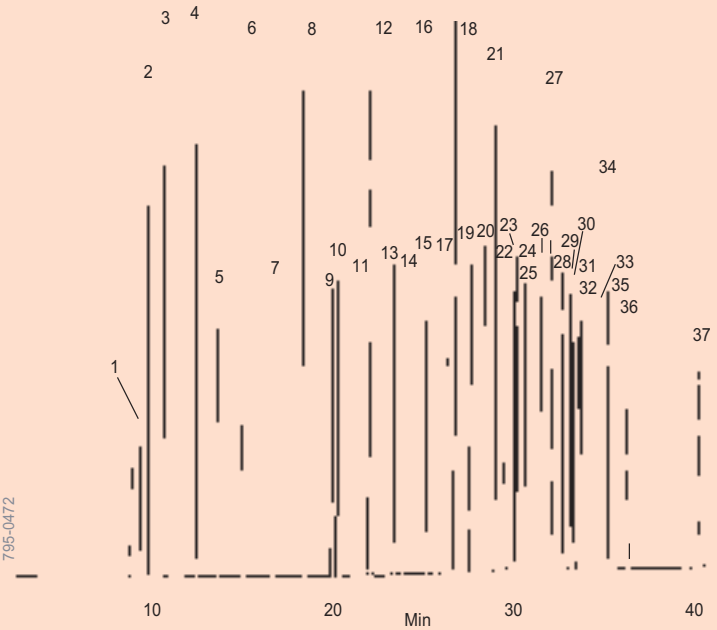
1g, packed in amber ampul under nitrogen.

DESCRIPTION	CAS NO.	WT.	CAT. NO.	PRICE
Canola oil	120962-03-0	1g	46961	
Coconut oil	8001-31-8	1g	46949	
Corn oil	8001-30-7	1g	47112-U	
Cottonseed oil	8001-29-4	1g	47113	
Flaxseed oil	8001-26-1	1g	47559-U	
Lard oil	8016-28-2	1g	47115-U	
Menhaden fish oil	8002-50-4	1g	47116	
Menhaden fish oil, partially hydrogenated (PHMO)	—	1g	47117	
Olive oil – refined	8001-25-0	1g	47118	
Palm oil	8002-75-3	1g	46962	
Peanut oil	8002-03-7	1g	47119	
Safflower oil	8001-23-8	1g	47120-U	
Soybean oil	8001-22-7	1g	47122	
Sunflower seed oil	8001-21-6	1g	47123	

Supelco 37 Component FAME Mix

This fatty acid methyl ester (FAME) reference standard is carefully prepared by weight. The weight percentage of each component is indicated. Each ampul contains 10mg/mL of the FAME reference standard mix in methylene chloride.

DESCRIPTION	QTY.	CAT. NO.	PRICE
Supelco 37 Component FAME Mix	1mL	47885-U	



Component FAME	Wt. %
1. Butyric (C4:0)	4
2. Caproic (C6:0)	4
3. Caprylic (C8:0)	4
4. Capric (C10:0)	4
5. Undecanoic (C11:0)	2
6. Lauric (C12:0)	4
7. Tridecanoic (C13:0)	2
8. Myristic (C14:0)	4
9. Myristoleic (C14:1)	2
10. Pentadecanoic (C15:0)	2
11. cis-10-Pentadecenoic (C15:1)	2
12. Palmitic (C16:0)	6
13. Palmitoleic (C16:1)	2
14. Heptadecanoic (C17:0)	2
15. cis-10-Heptadecenoic (C17:1)	2
16. Stearic (C18:0)	4
17. Elaidic (C18:1n9t)	2
18. Oleic (C18:1n9c)	4
19. Linolelaidic (C18:2n6t)	2
20. Linoleic (C18:2n6c)	2
21. Arachidic (C20:0)	4
22. γ-Linolenic (C18:3n6)	2
23. cis-11-Eicosenoic (C20:1)	2
24. Linolenic (C18:3n3)	2
25. Heneicosanoic (C21:0)	2
26. cis-11,14-Eicosadienoic (C20:2)	2
27. Behenic (C22:0)	4
28. cis-8,11,14-Eicosatrienoic (C20:3n6)	2
29. Erucic (C22:1n9)	2
30. cis-11,14,17-Eicosatrienoic (C20:3n3)	2
31. Arachidonic (C20:4n6)	2
32. Tricosanoic (C23:0)	2
33. cis-13,16-Docosadienoic (C22:2)	2
34. Lignoceric (C24:0)	4
35. cis-5,8,11,14,17-Eicosapentaenoic (C20:5n3)	2
36. Nervonic (C24:1)	2
37. cis-4,7,10,13,16,19-Docosahexaenoic (C22:6n3)	2

Column: SP-2560, 100m x 0.25mm ID, 0.20µm film
Cat. No.: 24056
Oven: 140°C (5 min) to 240°C at 4°C/min
Carrier: helium, 20cm/sec
Det.: FID, 260°C
Inj.: 1µL Cat. No. 47885-U, split 100:1, 260°C

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Chemical Standards
SUPELCO

Food and Beverage Standards
Lipids

AOCS Animal and Vegetable Reference Mixes

The quantitative mixes listed here conform to the requirements of American Oil Chemists' Society (AOCS) Method Ce 1-62. The composition of each mix is similar to the fatty acid distribution of certain oils (see Table 1).

RM-1 – Corn, cottonseed, kapok, poppyseed, rice, safflower, sesame, soybean, sunflower, and walnut oils

RM-2 – Hempseed, linseed, perilla, and rubberseed oils

RM-3 – Mustard seed, peanut, and rapeseed oils

Rapeseed Oil Reference Mix – Modern low erucic acid oils

RM-4 – Neatsfoot, olive, and teaseed oils

RM-5 – Babassu, coconut, ouri-curi, and palm kernel oils

RM-6 – Lard, beef tallow, mutton tallow, and palm oil

NHI/NIH Fatty Acid Methyl Ester Reference Mixes

Quantitative standards, identical in composition to those developed and distributed for several years by the National Institutes of Health (Horning, E.C.,et al.,J. Lipid Research, 5:20-27, 1964). Each mix (see Table 1) was designed to test part of the chromatographic system to ensure its reliability for quantitative analyses.

GLC Standard Mixes

These quantitative mixes are useful for determining relative retention times and approximating response factors.

Table 1. Specifications for Quantitative Products
Each mix is carefully prepared by weight percent.

MIX	CAT. NO.	METHYL ESTER (% COMPOSITION BY WEIGHT)																			
Qty.: 100mg each, neat Storage Temp.: -0 C		C8:0 (caprylate)	C9:0 (nonanoate)	C10:0 (caprate)	C11:0 (undecanoate)	C12:0 (laurate)	C13:0 (tridecanoate)	C14:0 (myristate)	C15:0 (pentadecanoate)	C16:0 (palmitate)	C16:1 (palmitoleate)	C17:0 (heptadecanoate)	C18:0 (stearate)	C18:1 (oleate)	C18:2 (linoleate)	C18:3 (linolenate)**	C19:0 (nonadecanoate)	C20:0 (arachidate)	C20:1 (eicosenoate)	C21:0 (heneicosanoate)	C22:0 (behenate)	C22:1 (erucate)	C24:0 (lignocerate)
PRICE																							
RM-1	O7006-1AMP									6.0			3.0	35.0	50.0	3.0		3.0					
RM-2	O7131-1AMP									7.0			5.0	18.0	36.0	34.0							
RM-3	O7256-1AMP							1.0		4.0			3.0	45.0	15.0	3.0		3.0			3.0	20.0	3.0
Rapeseed	O7756-1AMP							1.0		4.0			3.0	60.0	12.0	5.0		3.0	1.0		3.0	5.0	3.0
RM-4	O7381-1AMP									11.0			3.0	80.0	6.0								
RM-5	O7506-1AMP	7.0		5.0		48.0		15.0		7.0			3.0	12.0	3.0								
RM-6	O7631-1AMP							2.0		30.0	3.0		14.0	41.0	7.0	3.0							
PRICE																							
NHI-C	O8256-1AMP	1.5		3.0		6.0		12.0		19.4			24.9					33.2					
NHI-D	O8381-1AMP							11.8		23.6	6.9		13.1	44.6									
NHI-F	O8631-1AMP							2.5		4.2			7.3					13.6			25.4		47.0
NHI-A	O7881-1AMP							25.0		10.0			65.0										
NHI-B	O8131-1AMP							4.0		40.0			56.0										
NHI-E	O8506-1AMP	6.3		9.1		12.1		23.3		49.2													
PRICE																							
GLC-10	1891-1AMP									20.0			20.0	20.0	20.0	20.0							
GLC-20	1892-1AMP									20.0			20.0	20.0		20.0		20.0					
GLC-30	1893-1AMP	20.0		20.0		20.0		20.0		20.0													
GLC-40	1895-1AMP									25.0			25.0					25.0			25.0		
GLC-50	1894-1AMP										25.0			25.0					25.0			25.0	
GLC-70	1897-1AMP	20.0	20.0	20.0	20.0	20.0																	
GLC-80	1898-1AMP						20.0	20.0	20.0	20.0		20.0											
GLC-90	1896-1AMP						20.0		20.0			20.0					20.0			20.0			
GLC-100	1899-1AMP												20.0				20.0	20.0		20.0	20.0		

**Stability problems arise with international shipment of mixtures containing linolenate. When ordering such mixtures from outs ide the continental US or central Europe, please check with your local dealer regarding ordering practices.

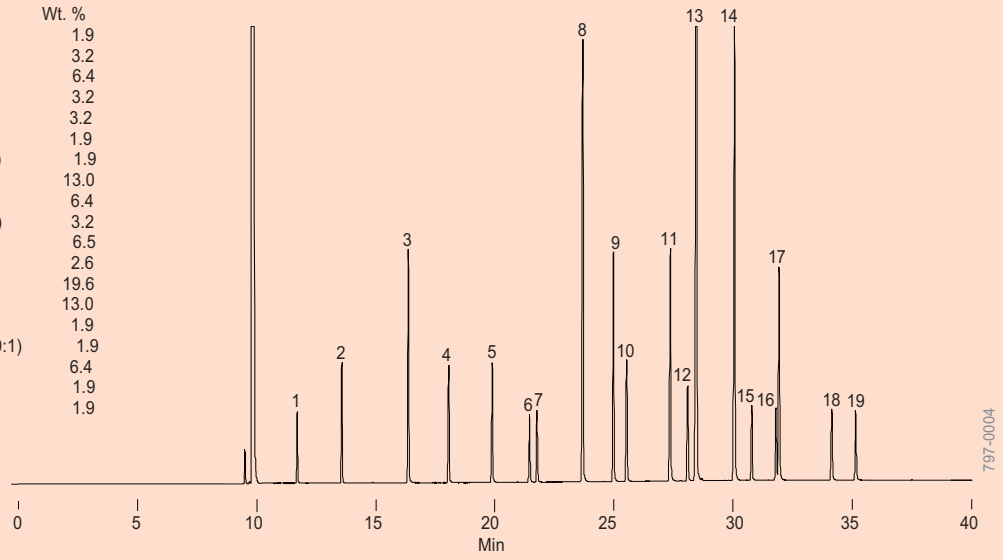
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Grain Fatty Acid Methyl Ester Mix

This fatty acid methyl ester (FAME) mixture is carefully prepared by weight. The weight percentage of each component is indicat
Each ampul contains 10mg/mL of the FAME reference standard mix in methylene chloride.

DESCRIPTION	QTY.	CAT. NO.	PRICE
Grain Fatty Acid Methyl Ester Mix	1mL	47801	

	Component FAME	Wt. %
1.	Caprylic (C8:0)	1.9
2.	Capric (C10:0)	3.2
3.	Lauric (C12:0)	6.4
4.	Tridecanoic (C13:0)	3.2
5.	Myristic (C14:0)	3.2
6.	Myristoleic (C14:1n9c)	1.9
7.	Pentadecanoic (C15:0)	1.9
8.	Palmitic (C16:0)	13.0
9.	Palmitoleic (C16:1n9c)	6.4
10.	Heptadecanoic (C17:0)	3.2
11.	Stearic (C18:0)	6.5
12.	Elaidic (C18:1n9t)	2.6
13.	Oleic (C18:1n9c)	19.6
14.	Linoleic (C18:2n6c)	13.0
15.	Arachidic (C20:0)	1.9
16.	cis-11-Eicosenoic (C20:1)	1.9
17.	Linolenic (C18:3n3)	6.4
18.	Behenic (C22:0)	1.9
19.	Erucic (C22:1n9)	1.9



Column: SP-2560, 100m x 0.25mm ID, 0.20µm film
Cat. No.: 24056
Oven: 140°C (5 min) to 240°C at 4°C/min
Carrier: helium, 20cm/sec
Det.: FID, 260°C
Inj.: 1µL, 260°C, split 100:1

Polyunsaturated Fatty Acid (PUFA) Methyl Esters

These are complex qualitative standard mixtures. Because they are extracted from natural materials, relative peak sizes and com
may vary from lot to lot.

DESCRIPTION	QTY.	CAT. NO.	PRICE
PUFA NO. 1			
Marine Source	100mg	47033	
Typically contains each FAME listed			
C14:0, C16:0, C16:1 ω7, C18:1 ω9, C18:1 ω7, C18:2 ω6, C18:4 ω3, C20:1 ω9, C20:5 ω3, C22:1 ω11, C22:1 ω9, C22:5 ω3, C22:6 ω3			
PUFA NO. 2			
Animal Source	100mg	47015-U	
Typically contains each FAME listed			
C14:0, C16:0, C16:1 ω7, C18:0, C18:1 ω9, C18:1 ω7, C18:2 ω6, C18:3 ω6, C18:3 ω3, C20:3 ω6, C20:4 ω6, C20:5 ω3, C22:4 ω6, C22:5 ω3, C22:6 ω3			
PUFA NO. 3			
From Menhaden Oil	100mg	47085-U	
Typically contains each FAME listed			
C14:0, C16:0, C16:1 ω7, C16:2 ω4, C16:4 ω1, C18:0, C18:1 ω9, C18:1 ω7, C18:2 ω6, C18:2 ω4, C18:3 ω4, C18:3 ω3, C18:4 ω3, C20:1 ω9, C20:4 ω6, C20:4 ω3, C20:5 ω3, C22:5 ω3, C22:6 ω3			

Note: In the ω-x classification, carbon atoms are numbered from the terminal methyl group to the first carbon of the ethylenic bond.
X denotes the position at the double bond closest to the terminal methyl group.

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Qualitative Methyl Ester Mixes

These mixes are prepared from unsaturated medium-chain fatty acids. They are useful for establishing retention times and for pe identification. All components are 99% pure by GLC and/or TLC, unless otherwise stated.

MIXES AND SOLUTIONS	COMPONENTS	QTY.	CAT. NO.	PRICE
SATURATED FAMES				
Fatty Acid Methyl Esters, Saturated Straight Chains Kit	10 individually packaged FAMEs, each 1g Caproic (6:0) Caprylic (8:0) Capric (10:0) Lauric (12:0) Myristic (14:0) Palmitic (16:0) Stearic (18:0) Arachidic (20:0) Behenic (22:0) Lignoceric (24:0)		ME10-1KT	
Fatty Acid Methyl Esters, Saturated Straight Chains Kit	19 individually packaged FAMEs, each 1g Caproic (6:0) Heptanoic (7:0) Caprylic (8:0) Nonanoic (9:0) Capric (10:0) Undecanoic (11:0) Lauric (12:0) Tridecanoic (13:0) Myristic (14:0) Pentadecanoic (15:0) Palmitic (16:0) Heptadecanoic (17:0) Stearic (18:0) Nonadecanoic (19:0) Arachidic (20:0) Heneicosanoic (21:0) Behenic (22:0) Tricosanoic (23:0) Lignoceric (24:0)		ME19-1KT	
Fatty Acid Methyl Esters, Saturated Straight Chains Kit	7 individually packaged FAMEs, each 100mg Pentacosanoic (25:0) Hexacosanoic (26:0) Heptacosanoic (27:0) Octacosanoic (28:0) Nonacosanoic (29:0) Triacontanoic (30:0) Hentriacontanoic (31:0), approx. 98% pure		ME7-1KT	
UNSATURATED FAMES				
Fatty Acid Methyl Esters, Unsaturated Kit	14 individually packaged FAMEs in the amounts indicated Myristoleic (14:1), 100mg Palmitoleic (16:1), 100mg Petroselinic (18:1), 100mg Oleic (18:1), 1g Elaidic (18:1), 500mg cis-Vaccenic (18:1,cis), 100mg Linoleic (18:2), 1g Linolelaidic (18:2), 100mg Linolenic (18:3, trans), 100mg cis-11-Eicosenoic (20:1), 100mg Arachidonic (20:4), 100mg Erucic (22.1), 100mg cis-4,7,10,13,16,19-Docosa-hexaenoic (22:6), 100mg Nervonic (24:1), 100mg		ME14-1KT	
Fatty Acid Methyl Ester Mix	4 components, approx. 10mg each 11-Eicosenoic (20:1) 11,14-Eicosadienoic (20:2) (98% pure) Arachidonic (20:4) 5,8,11,14,17-Eicosapentaenoic (20:5)	40mg	18912-1AMP	
Fatty Acid Methyl Ester Mix	5 components, approx. 10mg each 11-Eicosenoic (20:1) 11,14-Eicosadienoic (20:2) (98% pure) 11,14,17-Eicosatriaenoic (20:3) (97-99% pure) Arachidonic (20:4) 5,8,11,14,17-Eicosapentaenoic (20:5)	50mg	18913-1AMP	

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MIXES AND SOLUTIONS	COMPONENTS	QTY.	CAT. NO.	PRICE
UNSATURATED FAMES (CONTD.)				
Fatty Acid Methyl Ester Mix	6 components, total of 100mg neat mixture weight percentages indicated Stearic acid m.e. (C18:0), 10% Oleic acid m.e. (C18:1, cis-9), 20% Elaidic acid m.e. (C18:1, trans-9), 20% Linoleic acid m.e. (C18:2 cis-9,12), 20% Linolelaidic acid m.e. (C18:2, trans-9,12), 20% Arachidic acid m.e. (C20:0), 10%	100mg	18916-1AMP	
Fatty Acid Methyl Ester Mix	10 components, total of 100mg neat mixture weight percentages indicated Myristic acid m.e. (C14:0), 4% Palmitic acid m.e. (C16:0), 10% Stearic acid m.e. (C18:0), 6% Oleic acid m.e. (C18:1, cis-9), 25% Elaidic acid m.e. (C18:1, trans-9), 10% Linoleic acid m.e. (C18:2 cis-9,12), 34% Linolelaidic acid m.e. (C18:2, trans-9,12), 2% Linolenic acid m.e. (C18:3, cis-9,12,15), 5% Arachidic acid m.e. (C20:0), 2% Behenic acid m.e. (C22:0), 2%	100mg	18917-1AMP	
Fatty Acid Methyl Ester Mix R: 36/37/38 S: 26-36	14 components, total of 100mg neat mixture weight percentages indicated Caprylic acid m.e. (C8:0), 8% Capric acid m.e. (C10:0), 8% Lauric acid m.e. (C12:0), 8% Myristic acid m.e. (C14:0), 8% Palmitic acid m.e. (C16:0), 11% Palmitoleic acid m.e. (C16:1, cis-9), 5% Stearic acid m.e. (C18:0), 8% Oleic acid m.e. (C18:1, cis-9), 5% Linoleic acid m.e. (C18:2 cis-9,12), 5% Linolenic acid m.e. (C18:3, cis-9,12,15), 5% Arachidic acid m.e. (C20:0), 8% Behenic acid m.e. (C22:0), 8% Erucic acid m.e. (C22:1, cis-13), 5% Lignoceric acid m.e. (C24:0), 8%	100mg	18918-1AMP	
Fatty Acid Methyl Ester Mix R: 36/37/038 S: 26-36	37 components, total of 100mg neat mixture weight percentages indicated Butyric acid m.e. (C4:0), 4% Caproic acid m.e. (C6:0), 4% Caprylic acid m.e. (C8:0), 4% Capric acid m.e. (C10:0), 4% Undecanoic acid m.e. (C11:0), 2% Lauric acid m.e. (C12:0), 4% Tridecanoic acid m.e. (C13:0), 2% Myristic acid m.e. (C14:0), 4% Myristoleic acid m.e. (C14:0, cis-9), 2% Pentadecanoic acid m.e. (C15:0), 2% cis-10 Pentadecenoic acid m.e. (C15:1) (approx. 98%), 2% Palmitic acid m.e. (C16:0), 6% Palmitoleic acid m.e. (C16:1, cis-9), 2% Heptadecanoic acid m.e. (C17:0), 2% cis-10 Heptadecenoic acid m.e. (C17:1), 2% Stearic acid m.e. (C18:0), 4% Oleic acid m.e. (C18:1, cis-9), 4% Elaidic acid m.e. (C18:1, trans-9), 2% Linoleic acid m.e. (C18:2 cis-9,12), 2% Linolelaidic acid m.e. (C18:2, trans-9,12), 2% Linolenic acid m.e. (C18:3, cis-9,12,15), 2% g-Linolenic acid m.e. (C18:3, cis-6,9,12), 2% Arachidic acid m.e. (C20:0), 4% cis-11-Eicosenoic acid m.e. (C20:1), 2% cis-11,14-Eicosadienoic acid m.e. (C20:2), (98%), 2% cis-11,14,17-Eicosatrienoic acid m.e. (C20:3) (97-99%), 2% cis-8,11,14-Eicosatrienoic acid m.e. (C20:3), 2% Arachidonic acid m.e. (C20:4, cis-5,8,11,14), 2% cis-5,8,11,14,17-Eicosapentaenoic acid m.e. (C20:5), 2% Heneicosanoic acid m.e. (C21:0), 2% Behenic acid m.e. (C22:0), 4% Erucic acid m.e. (C22:1, cis-13), 2% cis-13,16-Docosadienoic acid m.e. (C22:2), 2% cis-4,7,10,13,16,19-Docosahexaenoic acid m.e. (C22:6), 2% Tricosanoic acid m.e. (C23:0), 2% Lignoceric acid m.e. (C24:0), 4% Nervonic acid m.e. (C24:1, cis-15), 2%	100mg	18919-1AMP	
Fatty Acid Methyl Ester Mix	19 components, total of 100mg neat mixture weight percentages indicated Caprylic acid m.e. (C8:0), 1.9% Capric acid m.e. (C10:0), 3.2% Lauric acid m.e. (C12:0), 6.4% Tridecanoic acid m.e. (C13:0), 3.2% Myristic acid m.e. (C14:0), 3.2% Myristoleic acid m.e. (C14:0, cis-9), 1.9% Pentadecanoic acid m.e. (C15:0), 1.9% Palmitic acid m.e. (C16:0), 13.0% Palmitoleic acid m.e. (C16:1, cis-9), 6.4% Heptadecanoic acid m.e. (C17:0), 3.2% Stearic acid m.e. (C18:0), 6.5% Oleic acid m.e. (C18:1, cis-9), 19.6% Elaidic acid m.e. (C18:1, trans-9), 2.6% Linoleic acid m.e. (C18:2 cis-9,12), 13.0% Linolenic acid m.e. (C18:3, cis-9,12,15), 6.4% Arachidic acid m.e. (C20:0), 1.9% cis-11-Eicosenoic acid m.e. (C20:1), 1.9% Behenic acid m.e. (C22:0), 1.9% Erucic acid m.e. (C22:1, cis-13), 1.9%	100mg	18920-1AMP	

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Lipids

Qualitative Fatty Acid Mixes

These mixes are prepared from unsaturated medium-chain fatty acids. They are useful for establishing retention times and for peak identification. All components are 99% pure by GLC and/or TLC, unless otherwise stated.

MIXES AND SOLUTIONS	COMPONENTS	QTY.	CAT. NO.	PRICE
SATURATED FATTY ACIDS				
Fatty Acids, Even Carbon Straight Chains Kit	10 individually packaged fatty acids in the amounts indicated Caproic acid (C6:0), 10mL; Caprylic acid (C8:0), 10mL; Capric acid (C10:0), 10g; Lauric acid (C12:0), 10g; Myristic acid (C14:0), 10g; Palmitic acid (C16:0), 10g; Stearic acid (C18:0), 10g; Arachidic acid (C20:0), 10g; Behenic acid (C22:0), 10g; Lignoceric acid (C24:0), 10g		EC10-1KT	
Fatty Acids, Even Carbon Straight Chains Kit	10 individually packaged fatty acids in the amounts indicated Caproic acid (C6:0), 10mL; Caprylic acid (C8:0), 10mL; Capric acid (C10:0), 10g; Lauric acid (C12:0), 10g; Myristic acid (C14:0), 10g; Palmitic acid (C16:0), 10g; Stearic acid (C18:0), 5g; Arachidic acid (C20:0), 5g; Behenic acid (C22:0), 5g; Lignoceric acid (C24:0), 1g		EC10A-1KT	
Fatty Acids, Odd Carbon Straight Chains Kit	9 individually packaged fatty acids, 1g each Heptanoic acid (C7:0) (approx. 98% pure); Nonanoic acid (C9:0) (97-99% pure); Undecanoic acid (C11:0); Tridecanoic acid (C13:0); Pentadecanoic acid (C15:0); Heptadecanoic acid (C17:0); Nonadecanoic acid (C19:0); Heneicosanoic acid (C21:0); Tricosanoic acid (C23:0)		OC9-1KT	
Volatile Acid Standard Mix	10 components, 10mM each in 100mL deionized water Formic acid; Acetic acid; Propionic acid; Isobutyric acid; Butyric acid; Isovaleric acid; n-Valeric acid; Isocaproic acid (4-Methyl-n-valeric acid); Hexanoic acid (n-Caproic acid); Heptanoic acid	100mL	46975-U	
UNSATURATED FATTY ACIDS				
Fatty Acid Mix	4 fatty acids, approx. 10mg each 6,9,12,15-Octadecatetraenoic acid (18:4) (90% pure) Arachidonic acid (20:4) 5,8,11,14,17-Eicosapentaenoic acid (20:5) 4,7,10,13,16,19-Docosahexaenoic acid (22:6)	40mg	17824-1AMP	
Fatty Acids, Unsaturated Kit	10 individually packaged fatty acids, 100mg each Palmitoleic acid (16:1); Elaidic acid (18:1, trans); Oleic acid (18:1); Petroselinic acid (18:1); Linoleic acid (18:2); Linolenic acid, ~98% (18:3); Arachidonic acid (20:4); Erucic acid (22:1); Docosahexaenoic acid (22:6); Nervonic acid (24:1)		UN10-1KT	

Mono-, Di-, and Triglycerides

These standards are approximately equal weight mixtures. They are qualitative standards, useful in determining relative retention times and establishing approximate response factors.

Each mix is prepared by weight, and the composition verified by gas and/or thin layer liquid chromatography. The weight percent of each component is indicated. Each product contains 100mg total weight of lipid unless otherwise indicated.

MIXES AND SOLUTIONS	COMPONENTS	QTY.	CAT. NO.	PRICE
QUALITATIVE MIXES				
Triglyceride Mix	5 components, approx. 20mg each Tricaprylin (8:0); Tricaprin (10:0); Trilaurin (12:0); Trimyristin (14:0); Tripalmitin (16:0)	100mg	17811-1AMP	
Triglyceride Mix	3 components, approx. 33 1/3 mg each Triolein (18:1, cis-9); Trielaidin (18:1, trans-9); Tripetroselinin (18:1, cis-6)	100mg	17818-1AMP	
Olive Oil Standard Mix▲	5 components at the concentrations indicated Trilinolein (18:2), 2% 1,2-Dilinoleoyl-3-oleoyl-rac-glycerol (18:2, 18:2, 18:1), 4% Triolein (18:1), 60% 1,2-Dioleoyl-3-palmitoyl-rac-glycerol (18:1, 18:1, 16:0), 30% 1,2-Dioleoyl-3-stearoyl-rac-glycerol (18:1, 18:1, 18:0), 4%	50mg	TRI5-1AMP	
Mono-, Di-, and Triglyceride Mix	4 components, approx. 10mg each Monoolein (18:1); 1,2-Diolein (18:1); 1,3-Diolein (18:1); Triolein (18:1)	40mg	1787-1AMP	

▲ Component percentages are target values. Actual composition may vary from lot to lot. Lot specific analysis is available upon request from our Technical Service department.

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MIXES AND SOLUTIONS	COMPONENTS	CAT. NO.	PRICE
QUALITATIVE MIXES (CONTD.)			
Triglycerides Kit	10 individually packaged triglycerides, 50mg each Trilaurin (C12:0) 1,2-Dilauroyl-3-myristoyl-rac-glycerol (C12:0/C12:0/C14:0) 1,2-Dimyristoyl-3-lauroyl-rac-glycerol (C14:0/C14:0/C12:0) Trimyristin (C14:0) 1,2-Dimyristoyl-3-palm itoyl-rac-glycerol (C14:0/C14:0/C16:0) 1,2-Dipalmitoyl-3-myristoyl-rac-glycerol (C16:0/C16:0/C14:0) Tri palmitin (C16:0) 1,2-Distearoyl-3-myristoyl-rac-glycerol (C18:0/C18:0/C14:0) 1,2-Distearoyl-3-palmitoyl-rac-glycerol (C18:0/C18:0/C16:0) T ristearin (C18:0)	TRI10-1KT	
Triglycerides Kit	19 individually packaged triglycerides in quantities indicated Shipped in dry ice. Triacetin (C2:0), 100mg Tributyrin (C4:0), 100mg Tricaproin (C6:0), 1mL Tricaprylin (C8:0), 0.5mL Tricaprin (C10:0), 100mg Trilaurin (C12:0), 100mg Trimyristin (C14:0), 1g Tripalmitin (C16:0), 100mg Tripalmitolein (C16:1, cis-9), approx. 98%, 100mg Tripetroselinin (C18:1, cis-6), 100mg Tristearin (C18:0), 100mg Triolein (C18:1, cis-9), 100mg Trielaidin (C18:1, trans-9), 100mg Trilinolein (C18:2, cis-9,12), 100mg Trilinolenin (C18:3, cis-9,12,15), approx. 98%, 100mg Triarachidin (C20:0), 100mg Tri-cis-11-eicosenoin (C20:1), 100mg Tribehenin (C22:0), 100mg Trierucin (C22:1, cis-13), 100mg	TRI19-1KT	
Triglycerides, Saturated, Even Carbon Chains Kit	11 individually packaged triglycerides in quantities indicated Triacetin (2:0), 100mg Tributyrin (4:0), 100mg Tricaproin (6:0), 1mL Tricaprylin (8:0), 1mL Tricaprin (10:0), 100mg Trilaurin (12:0), 100mg Trimyristin (14:0), 100mg Tripalmitin (16:0), 100mg Tristearin (18:0), 100mg Triarachidin (20:0), 100mg Tribehenin (22:0), 100mg	TRI11-1KT	
Mono-, Di-, and Triglycerides Kit	12 individually packaged glycerides, 100mg each 1-Monolauroyl-rac-glycerol (12:0) Dilaurin (12:0) Trilaurin (12:0) 1-Monomyristoyl-rac-glycerol (14:0) Dimyristin (14:0) Trimyristin (14:0) 1-Monopalmitoyl-rac-glycerol (16:0) Dipalmitin (16:0) Tripalmitin (16:0) 1-Monostearoyl-rac-glycerol (18:0) Distearin (18:0) Tristearin (18:0)	MDT12-1KT	
Phospholipid Mixture for HPLC R: 45-46-23/24/25-36/37/38 S: 45-26-36/37/39-23	4 components in 2.0mL of a chloroform solution L- α-Phosphatidylcholine, 1.5mg/mL L- α-Phosphatidylethanolamine, 1.2mg/mL L- α-Phosphatidylinositol, ammonium salt, 0.9mg/mL L- α-Lysophosphatidylcholine, 0.3mg/mL	P3817-1VL	

Sterols

Sterols make up the majority of the unsaponifiable matter in vegetable and animal fats. Animal fats contain mostly cholesterol, most vegetable fats contain only traces of this sterol. Plant sterols are collectively called phytosterols.

These standards are not corrected for purity. Packed in amber ampul under nitrogen.

DESCRIPTION	CAS NO.	CONCENTRATION	QTY.	CAT. NO.	PRICE
5-α-Cholestane	481-21-0	10mg/mL in chloroform	1mL	47124	
Campesterol	474-62-4	100µg/mL in chloroform	1mL	47126	
Cholesterol	57-88-5	10mg/mL in chloroform	1mL	47127-U	
Dihydrocholesterol	80-97-7	10mg/mL in chloroform	1mL	47129	
Ergosterol	57-87-4	10mg/mL in chloroform	1mL	47130-U	
Stigmasterol	83-48-7	10mg/mL in chloroform	1mL	47132	
β-Sitosterol	83-46-5	100µg/mL in chloroform	1mL	47133	

*Purity approx. 60%.

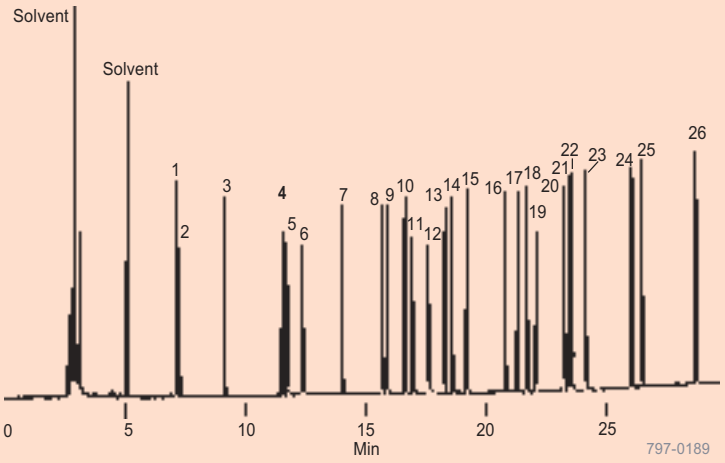
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Bacterial Identification Standards
Lipids

Standard for Bacteria Identification

This is a qualitative standard of bacterial acid methyl esters in methyl caproate (10mg/mL total concentration).

DESCRIPTION	QTY.	CAT. NO.	PRICE
Bacterial Acid Methyl Ester (BAME)	1mL	47080-U	



1. 11:0 Me. undecanoate
2. 2-OH 10:0 Me. 2-hydroxydecanoate
3. 12:0 Me. dodecanoate
4. 13:0 Me. tridecanoate
5. 2-OH 12:0 Me. 2-hydroxydodecanoate
6. 3-OH 12:0 Me. 3-hydroxydodecanoate
7. 14:0 Me. tetradecanoate
8. i-15:0 Me. 13-methyltetradecanoate
9. a-15:0 Me. 12-methyltetradecanoate
10. 15:0 Me. pentadecanoate
11. 2-OH 14:0 Me. 2-hydroxytetradecanoate
12. 3-OH 14:0 Me. 3-hydroxytetradecanoate
13. i-16:0 Me. 14-methylpentadecanoate
14. $16:1^{9}$ Me. cis-9-hexadecenoate
15. 16:0 Me. hexadecanoate
16. i-17:0 Me. 15-methylhexadecanoate
17. $17:0^{\Delta}$ Me. cis-9,10- methylenehexadecanoate
18. 17:0 Me. heptadecanoate
19. 2-OH 16:0 Me. 2-hydroxyhexadecanoate
20. $18:2^{9,12}$ Me. cis-9,12-octadecadienoate
21. $18:1^{9}$ Me. cis-9-octadecenoate
22. $18:1^{9}$ Me. trans-9-octadecenoate
23. 18:0 Me. o ctadecanoate
24. $19:0^{\Delta}$ Me. cis-9,10- methyleneoctadecanoate
25. 19:0 Me. nonadecanoate
26. 20:0 Me. eicosanoate

Column: SPB-1, 30m x 0.25mm ID, 0.25µm film
Cat. No.: 24028
Oven: 150°C (4 min) to 250°C (5 min) at 4°C/min
Carrier: helium, 20cm/sec (150°C)
Det.: FID
Inj.: 1µL

Water Soluble Fatty Acid (WSFA) Mixes

MIXES AND SOLUTIONS	COMPONENTS	QTY.	CAT. NO.	PRICE
WSFA-2	0.1% of each fatty acid in water (weight percent) Acetic acid (C2) Propionic acid (C3) Butyric acid (C4) Isobutyric acid (iC4) Valeric acid (C5) Isovaleric acid (iC5)	5mL	47056	
WSFA-4	0.1% of each fatty acid in water (weight percent) Acetic acid (C2) Propionic acid (C3) Butyric acid (C4) Isobutyric acid (iC4) Valeric acid (C5) 2-Methylbutyric acid (2-methyl C4) Isovaleric acid (iC5)	5mL	47058	

Other Qualitative Standards

MIXES AND SOLUTIONS	COMPONENTS	QTY.	CAT. NO.	PRICE
Volatile Acid Standard Mix	10 components, 10mM each in deionized water Formic acid Acetic acid Propionic acid Isobutyric acid Butyric acid n-Valeric acid Isocaproic acid (4-Methyl-n-valeric acid) Hexanoic acid (n-Caproic acid) Isovaleric acid Heptanoic acid	100mL	46975-U	
Nonvolatile Acid Standard Mix	8 components, 1 meq of each in deionized water Pyruvic acid Lactic acid Oxalacetic acid Oxalic acid Methyl malonic acid Malonic acid Fumaric acid Succinic acid	100mL	46985-U	

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All chemicals listed in this catalog are for investigational use only. They are not intended for human consumption or to be used in food or food additives. None are for general drug or medicinal use on humans. We believe the information in this catalog, offered in good faith, is accurate.

Limited Warranty: All Matreya Products, except those specifically exempted, are warranted (for 90 days) to be free of defects in materials and workmanship, if properly stored. Any replacements required as a result of such defects will be made without charge provided that such defective products are returned with a written explanation. Please request a Returned Goods Authorization before returning products under this warranty.

Technical Service

Our technical service department may be contacted by telephone at 800.342.3595, or by e-mail to techservice@matreya.com.

Note that there are excellent resources for general information on lipid nomenclature, distribution and biochemistry available on the internet. One such source is www.lipidlibrary.co.uk maintained by W.W. Christie and colleagues. Another source for detailed discussion on isolation and purification protocols is www.cyberlipid.org. This site also maintains discussion groups for lipid researchers.

Natural Products

Some of our glycolipids are extracted from natural sources. These products have a normal heterogeneity in their lipid components, particularly in the fatty acids. Variations include carbon chain length as well as the presence or absence of 2-hydroxy fatty acids. Products based on sphingosine may contain longer chain sphingoid bases as well as chains with multiple double bonds. This heterogeneity may result in additional spots showing on TLC plates or multiple peaks in LC analyses. We have listed the typical fatty acid compositions of our natural products in the appendix.

Storage

Catalog items in unopened containers are stable for at least one year when stored under the conditions indicated in the catalog listing. Items containing unsaturated fatty acids are subject to oxidation and should be stored in solution in organic solvents or under argon. Glycolipids and phospholipids should not be stored in aqueous solutions due to potential hydrolysis.

Sphingolipid Structures and Pathways

In a clear and straightforward manner, this wall chart indicates the structures and relationships between most commonly discussed sphingolipids. A one-page thumbnail version of the chart is shown on page 95. Full size copies (approximately 35 x 26 inches) are available on request to customer service.

Package Weight

Unless otherwise specified, the package will contain at least the indicated amount and usually slightly more. The user is cautioned to always measure the required amount from the container.

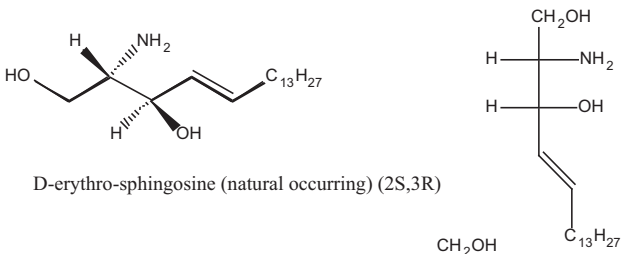
Sphingoid bases, sphingolipids and glycosphingolipids.

Sphingoid bases such as sphingosine are the characteristic structural unit of the sphingolipids . The bases are long chain aliphatic amines, containing two or three hydroxyl groups, and typically a *trans*-double bond at C4. In animal tissues most abundant base is sphingosine with a C18 aliphatic chain containing a double bond in position 4 . The saturated analogue is dihydrosphingosine or sphinganine. In plants the common long chain base is the 4 hydroxy saturated base phytosphingosine.

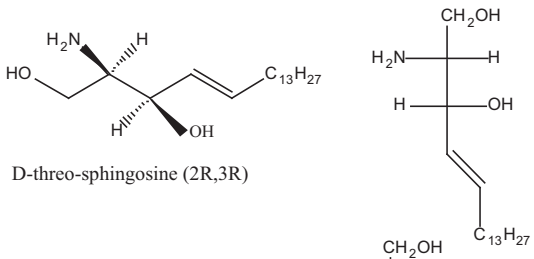
Sphingolipids are widely distributed in animal tissues, particularly cell membranes. Sphingoid bases linked to fatty acids via an amide bond at C2 are ceramides and are present in trace amounts in most tissues. Glycosphingolipids (ceramides having various mono- and oligosaccharides on the OH group at C1) are neutral glycosphingolipids (i.e., cerebrosides and globosides). Those with sialic acid derivatized sugars are acidic glycolipids (i.e., gangliosides). They are amphiphilic and can be solubilized in buffers via sonication and micelle formation.

Gangliosides are present in substantial amounts in nerve cell membranes, and together with globosides are found in the membranes of white and red blood cells. These plus the glycosphingolipids of the lacto- and neolacto-series are involved in cell recognition (e.g. blood group determinants). Glycolipid expression on the surface of cells determines their antigenicity as well as their status, i.e. differentiated vs. undifferentiated (embryonic), normal vs. malignant, etc. (1). The ganglioside GM1 stimulates nerve growth (2,3) and has been reported to have a curative effect on experimental Parkinsonism (4). For an overview see (5). Gangliosides are also being investigated as potential anti-tumor vaccines (57). Glycosphingolipids are also essential for the correct functioning of cell surface receptors (6). Matreya is your best source for many sphingolipids. Most of Matreya's sphingosines and ceramides are fully synthetic and as such 98%+ pure. Others, particularly the glycosphingolipids are highly purified natural products (98%+), and can be used either as standards or biochemical reagents without further purification.

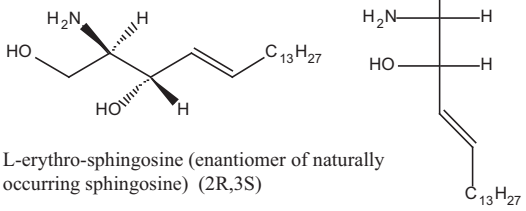
Through total synthesis, all four isomers of sphingosine are available as well as a number of sphingosines with other than 18 carbons and a number of ceramides (for details in using ceramides in cell culture see Hauser et al. [9]). Fluorescent labeled ceramides, glycosphingolipids and sphingomyelins are also available for study. D. N. Brindley and his group have been exploring the interaction of ceramides,sphingosine and sphingosine 1-phosphate in regulating DNA synthesis and phospholipase D activity (10). **See Literature References on page 96.**



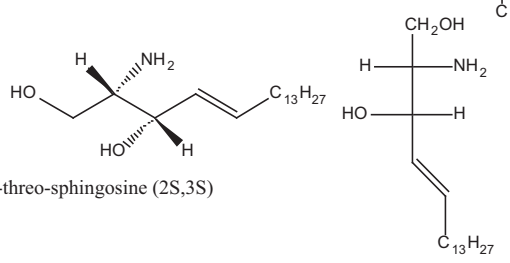
D-erythro-sphingosine (natural occurring) (2S,3R)



D-threo-sphingosine (2R,3R)



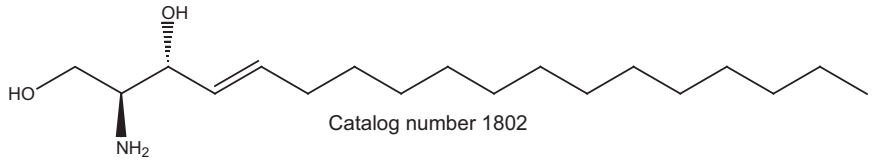
L-erythro-sphingosine (enantiomer of naturally occurring sphingosine) (2R,3S)



L-threo-sphingosine (2S,3S)

Sphingosines

Synthetic sphingosines with C18 sphingoid base



Catalog number 1802

1802 **D-erythro-Sphingosine** **25 mg**
Sphingosine, C18 chain $C_{18}H_{37}NO_2$ **CAS#:** 123-78-4

Source: synthetic **Mol. Wt.:** 299 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** alcohols, chloroform, DMSO **Storage:** –20°C

Selective inhibitor of phosphokinase C

References:
Y. Hannun et al., Science, **235**, 670, *1987*
S. Spiegel et al., *Proc. Intern. Conf. Biol. Function Glycosphingolipids*, Santa Barbara, CA *1990*

1806 **L-threo-Sphingosine** **10 mg**
L-threo-Sphingosine, C18 chain $C_{18}H_{37}NO_2$

Source: synthetic **Mol. Wt.:** 299 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol, DMSO **Storage:** –20°C

1826 **L-erythro-Sphingosine** **5 mg**
L-erythro-Sphingosine, C18 chain $C_{18}H_{37}NO_2$ **CAS#:** 6036-75-5

Source: synthetic **Mol. Wt.:** 299 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol, DMSO **Storage:** –20°C

1827 **D-threo-Sphingosine** **5 mg**
D-threo-Sphingosine, C18 chain $C_{18}H_{37}NO_2$ **CAS#:** 6036-85-7

Source: synthetic **Mol. Wt.:** 299 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol, DMSO **Storage:** –20°C

1304 **Sphingosine** **10 mg**
D-erythro-Sphingosine $C_{18}H_{37}NO_2$ **CAS#:** 123-78-4

Source: semi-synthetic, bovine **Mol. Wt.:** 299 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** alcohol, chloroform **Storage:** –20°C

Synthetic sphingosines with sphingoid bases other than C18

Varying chain lengths allow the study of translocation effects of sphingosines and ceramides into cells.

1833 **D-erythro-C14-Sphingosine** **5 mg**
Sphingosine with C14 chain $C_{14}H_{29}NO_2$

Source: synthetic **Mol. Wt.:** 243 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol, DMSO **Storage:** –20°C

1835 **D-erythro-C16-Sphingosine** **5 mg**
Sphingosine with C16 chain $C_{16}H_{33}NO_2$

Source: synthetic **Mol. Wt.:** 271 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol **Storage:** –20°C

1837 **D-erythro-C10-Sphingosine** **5 mg/ml, 1 ml**
Sphingosine with C10 chain $C_{10}H_{21}NO_2$

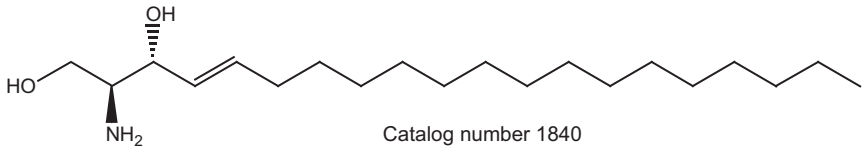
Source: synthetic **Mol. Wt.:** 187 **Purity:** 98+% by TLC, GC **Appearance:** liquid **Solvent:** ethanol **Solubility:** ethanol **Storage:** –20°C

1838 **D-erythro-C12-Sphingosine** **5 mg**
Sphingosine with C12 chain $C_{12}H_{25}NO_2$ CAS#: 6918-49-6

Source: synthetic **Mol. Wt.:** 215 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol **Storage:** –20°C

1840 **D-erythro-C20-Sphingosine** **5 mg**
Sphingosine with C20 chain $C_{20}H_{41}NO_2$

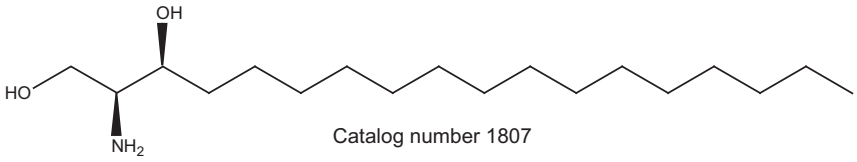
Source: synthetic **Mol. Wt.:** 328 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol, DMSO **Storage:** –20°C



Catalog number 1840

Synthetic dihydrosphingosines

D,L-*threo*- Dihydrosphingosine has also been found to be a significant inhibitor of sphingosine kinase (11). The D,L-*erythro*-isomer has been used as an inactive control. We now offer all four isomers in pure form making detailed studies possible. Safingol, the L-*threo*-isomer is a potent inhibitor of PKC and as such is capable of reversing multi-drug resistance in cancer cells (12). **See Literature References on page 96.**



Catalog number 1807

1807 **L-threo-Dihydrosphingosine (Safingol)** **5 mg**
1807-025 L-threo-Sphinganine, C18 chain $C_{18}H_{39}NO_2$ **CAS#:** 15639-50-6 **25 mg**

Source: synthetic **Mol. Wt.:** 301 **Melting Point (°C):** 103-114 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol
Storage: –20°C
References:
C.W. Sachs et al., ibid., **270**, 26639, *1995*
G.K. Schwartz et al., J. Natl. Cancer Inst., **87**, 1394, *1995*

1831 **D-erythro-Dihydrosphingosine** **25 mg**
1831-1 D-erythro-Sphinganine, C18 chain $C_{18}H_{39}NO_2$ **CAS#:** 764-22-7 **1 g**

Source: synthetic **Mol. Wt.:** 301 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol, DMSO **Storage:** –20°C
Inhibitor of PLA_2 and PLD

References:
D.I. Yule et al., ibid, **268**, 12353, *1993*
B. M. Buehrer, R.M. Bell, Adv. in Lipid Res., **26**, 59, *1993*
C. W. Sachs et al., J. Biol. Chem., **270**, 26639, *1995*

1846 **L-erythro-Dihydrosphingosine** **1 mg**
L-erythro-Sphinganine, C18 chain $C_{18}H_{39}NO_2$

Source: synthetic **Mol. Wt.:** 301 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol, DMSO **Storage:** –20°C

References:
D.I. Yule et al., ibid, **268**, 12353, *1993*
B. M. Buehrer, R.M. Bell, Adv. in Lipid Res., **26**, 59, *1993*
C. W. Sachs et al., J. Biol. Chem., **270**, 26639, *1995*

1851 **D-threo-Dihydrosphingosine** **1 mg**
D-threo-Sphinganine, C18 chain $C_{18}H_{39}NO_2$ **CAS#:** 6036-86-8

Source: synthetic **Mol. Wt.:** 301 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol, DMSO **Storage:** –20°C

References:
D.I. Yule et al., ibid, **268**, 12353, *1993*
B. M. Buehrer, R.M. Bell, Adv. in Lipid Res., **26**, 59, *1993*
C. W. Sachs et al., J. Biol. Chem., **270**, 26639, *1995*

1324 **D,L-erythro-Dihydrosphingosine** **25 mg**
D,L-erythro-Sphinganine, C18 chain $C_{18}H_{39}NO_2$ **CAS#:** 3102-56-5

Source: synthetic **Mol. Wt.:** 301 **Purity:** erythro 77%; threo 23% by TLC, GC
Appearance: white solid **Solubility:** chloroform, ethanol, methanol, DMSO
Storage: –20°C
Inhibitor of sphingosine kinase

References:
D.I. Yule et al., ibid, **268**, 12353, *1993*
B. M. Buehrer, R.M. Bell, Adv. in Lipid Res., **26**, 59, *1993*
C. W. Sachs et al., J. Biol. Chem., **270**, 26639, *1995*

1326 **D,L-C16-Dihydrosphingosine (mixed isomers)** **10 mg**
D,L-Sphinganine with C16 chain $C_{16}H_{35}NO_2$

Source: synthetic **Mol. Wt.:** 273 **Purity:** erythro 90%, threo 10% by TLC, GC
Appearance: white solid **Solubility:** chloroform, ethanol, methanol, DMSO
Storage: –20°C

References:
D.I. Yule et al., ibid, **268**, 12353, *1993*
B. M. Buehrer, R.M. Bell, Adv. in Lipid Res., **26**, 59, *1993*
C. W. Sachs et al., J. Biol. Chem., **270**, 26639, *1995*

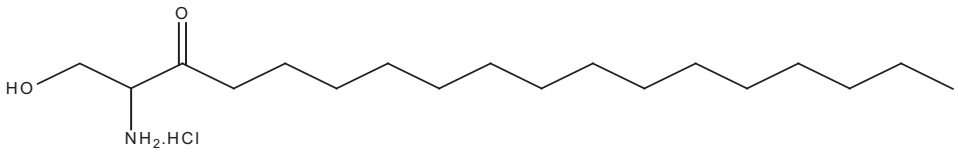
1845 **D-erythro-C20-Dihydrosphingosine** **5 mg**
D-erythro-Sphinganine, C20 chain $C_{20}H_{43}NO_2$ **CAS#:** 24006-62-0

Source: synthetic **Mol. Wt.:** 330 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform/methanol 5:1, warm ethanol **Storage:** –20°C

1839 **D,L-erythro-C20-Dihydrosphingosine** **10 mg**
D,L-erythro-Sphinganine, C20 chain $C_{20}H_{43}NO_2$

Source: synthetic **Mol. Wt.:** 330 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform/methanol 5:1, warm ethanol **Storage:** –20°C

3-keto-Dihydrosphingosines



Catalog number 1876

1876 **3-keto-Dihydrosphingosine•HCl** **10 mg**
3-keto-Sphinganine hydrochloride $C_{18}H_{37}NO_2$•HCl **CAS#:** 18944-28-0

Source: synthetic **Mol. Wt.:** 336 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol **Storage:** –20°C

1891 **3-keto-C6-Dihydrosphingosine•HCl** **10 mg**
1-Hydroxy-2-amino-3-keto-hexane • HCl $C_6H_{13}NO_2 \cdot HCl$

Source: synthetic **Mol. Wt.:** 168 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** ethanol, methanol, DI water **Storage:** –20°C

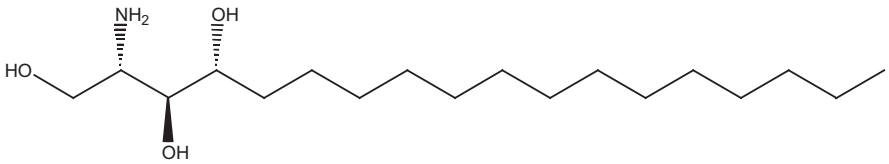
1892 **3-keto-C8-Dihydrosphingosine•HCl** **10 mg**
1-Hydroxy-2-amino-3-keto-octane • HCl $C_8H_{17}NO_2 \cdot HCl$

Source: synthetic **Mol. Wt.:** 196 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol, DI water **Storage:** –20°C

1893 **3-keto-C12-Dihydrosphingosine•HCl** **10 mg**
1-Hydroxy-2-amino-3-keto-dodecane • HCl $C_{12}H_{25}NO_2 \cdot HCl$

Source: synthetic **Mol. Wt.:** 252 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol **Storage:** –20°C

Phytosphingosines



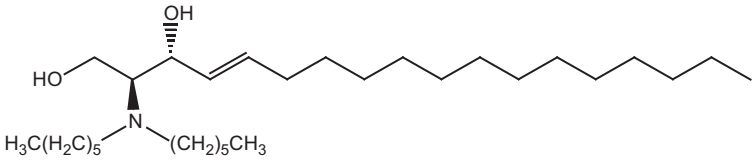
Catalog number 1330

1330 **Phytosphingosine** **50 mg**
1330-1 4-Hydroxysphinganine $C_{18}H_{39}NO_3$ **CAS#** 554-62-1 **1 g**

Source: natural, yeast (Pichia ciferri) **Mol. Wt.:** 318 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** ethanol, methanol, chloroform/methanol 2:1 (warm) **Storage:** –20°C

Reference:
Keliu, Xiping Zhang, Robert L. Lester, and Robert C. Dickson. J. Biol. Chem., **280**, Issue 24, 22679-22687, *June 17, 2005*

Other sphingosine derivatives and precursors



Catalog number 1896

1320 **N,N-Dimethyl-D-erythro-sphingosine** **5 mg/ml, 1 ml**
$C_{20}H_{41}NO_2$ **CAS#:** 119567-63-4

Source: synthetic **Mol. Wt.:** 328 **Purity:** 98+% by TLC **Appearance:** liquid
Solvent: isopropanol **Solubility:** chloroform, ethanol, isopropanol, methanol
Storage: –20°C

Inhibitor of phosphokinase C

Reference:
B. Felding-Habermann et al., Biochemistry, **29**, 6314, *1990*

1896 **N,N-Dihexyl-D-erythro-sphingosine** **5 mg/ml, 1 ml**
Sphingosine with tertiary amine group $C_{30}H_{61}NO_2$

Source: synthetic **Mol. Wt.:** 468 **Purity:** 95% by TLC **Appearance:** liquid
Solvent: ethanol **Solubility:** chloroform, ethanol, methanol **Storage:** –20°C

1805 **N-Palmitoyl serinol** **10 mg**
$C_{19}H_{39}NO_3$ **CAS#:** 126127-31-9

Source: synthetic **Mol. Wt.:** 329 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, methanol, ethanol **Storage:** –20°C

Sphingosine precursor

Ceramides

Ceramide is a fatty acid amide of sphingosine. It may be formed by dehydrogenation of dihydroceramide; by hydrolysis of sphingomyelin or glycosphingolipids; or by acylation of free sphingosine. Ceramide functions as a precursor in the synthesis of sphingomyelin (by an exchange reaction with phosphatidylcholine and phosphatidylethanolamine); of glycosphingolipids (by glycosylation with UDP-hexose); and of free sphingosine and fatty acid by hydrolysis. The sphingosine can be phosphorylated by a kinase to form sphingosine-1-phosphate, which may undergo further hydrolysis or cleavage.

Control of sphingolipid metabolism maintains vital balance points in cell physiology. Two of ceramide's metabolites, sphingosine-1-phosphate and glucosylceramide, produce cell proliferation. Sphingosine-1-phosphate is also a highly active regulator of angiogenesis, vascular maturation, cardiac development, immunity, and directed cell movement. Sphingosine, the free base, is a potent inhibitor of protein kinase C and is involved in intracellaular calcium regulation.

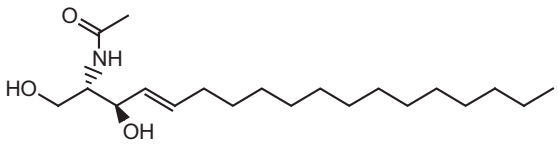
Sphingolipid enzymes seem to be particularly active in cancers, so modifying their activities by exogenous action may provide alternatives to chemical therapies. These enzymes are controlled by many known agents, such as 1,25-dihdroxy-vitamin D_3, tumor necrosis factor-α, nerve growth factor, interleukin 1, endothelial growth factor, glutathione, arachidonic acid, dexamethasone, many anticancer drugs, therapeutic radiation, and activators of the FAS receptor.

Ceramide exerts numerous biological effects, including induction of cell maturation, cell cycle arrest, terminal cell differentiation, cell senescence, and cell death. Other effects include producing reactive oxygen in mitochondria (followed by apoptosis) and stimulating phosphorylation of certain proteins (especially mitogen activated protein). It also stimulates some protein phosphatases (especially protein phosphatase 2A). Thus ceramide is an important controller of protein activity

It is apparent from these relationships that ceramide exists at the crux of several enzyme reaction cycles and that experiments involving sphingolipid function call for control of all of the cycles and their branch-off points. Matreya is the major supplier of these lipids, which can be used as standards for analysis of tissues (a much needed part of modern research) and identification of major sphingolipids.

Ceramides with short side chains have been shown to enter easily into cells where they are biologically active. Ceramides with longer side chains, however, also enter cells if dissolved in dodecane-isopropanol first. Fluorescent labeled ceramides and sphingomyelin made from fluorescent labeled acids instead of plain fatty acids are also available for the study of the localization and metabolism of sphingolipids in the cell. Matreya now offers all four isomers of C2, C4, C6 and C18 ceramides. The corresponding dihydroceramides are being used as inactive controls

In three major reviews, Radin (54-56) has discussed the biochemistry and chemistry of ceramide and outlined many potential approaches to cancer therapy using ceramides and related compounds as generators of apoptosis.
See Literature References on page 96.



Catalog number 1901

Synthetic ceramides derived from C18-sphingosine

1901 **N-Acetyl-D-erythro-sphingosine** **10 mg**
N-C2:0-D-erythro-Ceramide $C_{20}H_{39}NO_3$ **CAS#:** 3102-57-6

Source: synthetic **Mol. Wt.:** 342 **Purity:** 98+ by TLC, GC **Appearance:** white solid
Solubility: chloroform, ethanol, methanol, DMSO, (up to 5 mg/ml) **Storage:** –20°C

Reference:
J. M. L. Hauser et al., J. Biol. Chem. **269**, 6803, *1994*

1829 **N-Acetyl-L-threo-sphingosine** **1 mg**
N-C2:0-L-threo-Ceramide $C_{20}H_{39}NO_3$

Source: synthetic **Mol. Wt.:** 342 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol, DMSO, DMF (up to 5 mg/ml) **Storage:** –20°C

Reference:
J. M. L. Hauser et al., J. Biol. Chem. **269**, 6803, *1994*

1847 **N-Acetyl-L-erythro-sphingosine** **1 mg**
N-C2:0-L-erythro-Ceramide $C_{20}H_{39}NO_3$

Source: synthetic **Mol. Wt.:** 342 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol, DMSO, DMF (up to 5 mg/ml) **Storage:** –20°C

Reference:
J. M. L. Hauser et al., J. Biol. Chem. **269**, 6803, *1994*

1900 **N-Hexanoyl-D-erythro-sphingosine** **10 mg**
N-C6:0-D-erythro-Ceramide $C_{24}H_{47}NO_3$ **CAS#:** 124753-97-5

Source: synthetic **Mol. Wt.:** 398 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol. DMSO (up to 5 mg/ml) **Storage:** –20°C

Reference:
J. M. L. Hauser et al., J. Biol. Chem. **269**, 6803, *1994*

1828 **N-Hexanoyl-L-threo-sphingosine** **1 mg**
N-C6:0-L-threo-Ceramide $C_{24}H_{47}NO_3$

Source: synthetic **Mol. Wt.:** 398 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, DMSO, DMF (up to 5mg/ml) **Storage:** –20°C

Reference:
J. M. L. Hauser et al., J. Biol. Chem. **269**, 6803, *1994*

1848 **N-Hexanoyl-L-erythro-sphingosine** **1 mg**
N-C6:0-L-erythro-Ceramide $C_{24}H_{47}NO_3$

Source: synthetic **Mol. Wt.:** 398 **Purity:** 98+% by TLC; GC **Appearance:** white solid **Solubility:** chloroform, ethanol, DMSO, DMF (up to 5mg/ml) **Storage:** –20°C

Reference:
J. M. L. Hauser et al., J. Biol. Chem. **269**, 6803, *1994*

1809 **N-Hexanoyl-D-threo-sphingosine** **1 mg**
N-C6:0-D-threo-Ceramide $C_{24}H_{47}NO_3$

Source: synthetic **Mol. Wt.:** 398 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, methanol, DMSO (up to 5 mg/ml) **Storage:** –20°C

Reference:
J. M. L. Hauser et al., J. Biol. Chem. **269**, 6803, *1994*

1903 **N-Octanoyl-D-erythro-sphingosine** **10 mg**
N-C8:0-D-erythro-Ceramide $C_{26}H_{51}NO_3$ **CAS#:** 74713-59-0

Source: synthetic **Mol. Wt.:** 426 **Purity:** 98+ by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol, DMSO (up to 5 mg/ml) **Storage:** –20°C

Reference:
J. M. L. Hauser et al., J. Biol. Chem. **269**, 6803, *1994*

1830 **N-Octanoyl-L-threo-sphingosine** **1 mg**
N-C8:0-L-threo-Ceramide $C_{26}H_{51}NO_3$

Source: synthetic **Mol. Wt.:** 426 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, DMSO, DMF (up to 5 mg/ml) **Storage:** –20°C

Reference:
J. M. L. Hauser et al., J. Biol. Chem. **269**, 6803, *1994*

1810 **N-Octanoyl-D-threo-sphingosine** **1 mg**
N-C8:0-D-threo-Ceramide $C_{26}H_{51}NO_3$

Source: synthetic **Mol. Wt.:** 426 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, DMSO, DMF (up to 5mg/ml) **Storage:** –20°C

Reference:
J. M. L. Hauser et al., J. Biol. Chem. **269**, 6803, *1994*

1333 **N-Decanoyl-D-erythro-sphingosine** **10 mg**
N-C10:0-D-erythro-Ceramide $C_{28}H_{55}NO_3$

Source: synthetic **Mol. Wt.:** 454 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol, DMSO, (up to 5mg/ml)
Storage: –20°C

2037 **N-Pentadecanoyl-D-erythro-sphingosine** **10 mg**
N-C15:0-D-erythro-Ceramide $C_{33}H_{65}NO_3$

Source: synthetic **Mol. Wt.:** 524 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, warm ethanol, warm methanol **Storage:** –20°C

1915 **N-Hexadecanoyl-D-erythro-sphingosine** **10 mg**

N-C16:0-D-erythro-Ceramide $C_{34}H_{67}NO_3$ **CAS#:** 24696-26-2

Source: synthetic **Mol. Wt.:** 538 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, warm ethanol, warm methanol **Storage:** –20°C

Reference:
Yosuke Osawa, Hiroshi Uchinami, Jacek Bielawski, Robert F. Schwabe, Yusuf A. Hannun, and David A. Brenner. J. Biol. Chem., **280**, Issue 30, 27879-27887, *July 29, 2005*

2038 **N-Heptadecanoyl-D-erythro-sphingosine** **10 mg**
N-C17:0-D-erythro-Ceramide $C_{35}H_{69}NO_3$ **CAS#:** 24696-26-2

Source: synthetic **Mol. Wt.:** 552 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, warm ethanol, warm methanol **Storage:** –20°C

1832 **N-Octadecanoyl-D-erythro-sphingosine** **10 mg**
N-C18:0-D-erythro-Ceramide $C_{36}H_{71}NO_3$ **CAS#:** 2304-81-6

Source: synthetic **Mol. Wt.:** 566 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, hot ethanol, chloroform/methanol 2:1 (up to 5mg/ml)
Storage: –20°C

Reference:
J. M. L. Hauser et al., J. Biol. Chem. **269**, 6803, *1994*

2039 **N-Nonadecanoyl-D-erythro-sphingosine** **10 mg**
N-C19:0-D-erythro-Ceramide $C_{37}H_{73}NO_3$

Source: synthetic **Mol. Wt.:** 580 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, warm ethanol, warm methanol **Storage:** –20°C

1843 **N-Octadecanoyl-L-threo-sphingosine** **1 mg**
N-C18:0-L-threo-Ceramide $C_{36}H_{71}NO_3$

Source: synthetic **Mol. Wt.:** 566 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, DMSO, DMF (up to 5mg/ml) **Storage:** –20°C

Reference:
J. M. L. Hauser et al., J. Biol. Chem. **269**, 6803, *1994*

1850 **N-Octadecanoyl-L-erythro-sphingosine** **1 mg**
N-C18:0-L-erythro-Ceramide $C_{36}H_{71}NO_3$

Source: synthetic **Mol. Wt.:** 566 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, DMSO, DMF (up tp 5mg/ml) **Storage:** –20°C

Reference:
J. M. L. Hauser et al., J. Biol. Chem. **269**, 6803, *1994*

1855 **N-Octadecanoyl-D-threo-sphingosine** **1 mg**
N-C18:0-D-threo-Ceramide $C_{36}H_{71}NO_3$

Source: synthetic **Mol. Wt.:** 566 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, DMSO, DMF (up to 5mg/ml) **Storage:** –20°C

1916 **N-Tetracosanoyl-D-erythro-sphingosine** **5 mg**
N-C24:0-D-erythro-Ceramide $C_{42}H_{83}NO_3$ **CAS#:** 34435-05-7

Source: synthetic **Mol. Wt.:** 650 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform **Storage:** –20°C

2-Hydroxy ceramides

2042 **N-(R,S)-alpha-Hydroxydodecanoyl-D-erythro-sphingosine** **5 mg**
N-(R,S)-alpha-Hydroxy-C12:0-D-erythro-ceramide $C_{30}H_{59}NO_4$

Source: synthetic **Mol. Wt.:** 498 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, methanol, ethanol, DMSO **Storage:** –20°C

2044 **N-(R,S)-alpha-Hydroxyoctadecanoyl-D-erythro-sphingosine** **5 mg**
N-(R,S)-alpha-Hydroxy-C18:0-D-erythro-ceramide $C_{36}H_{71}NO_4$

Source: synthetic **Mol. Wt.:** 582 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform/methanol/water, 2:1:0.5 **Storage:** –20°C

Ceramide made from sphingosines with sphingoid bases other than C18

1842 **N-Acetyl-D-erythro-sphingosine (C14 sphingoid base)** **5 mg**
N-C2:0 Ceramide of D-erythro-C14-sphingosine $C_{16}H_{31}NO_2$

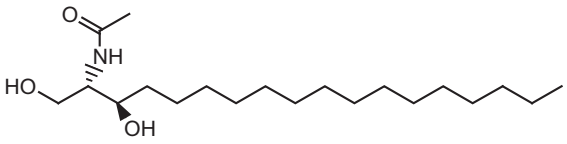
Source: synthetic **Mol. Wt.:** 285 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, DMSO, DMF (up to 5 mg/ml) **Storage:** –20°C

Reference:
J. M. L. Hauser et al., J. Biol. Chem. **269**, 6803, *1994*

1856 **N-Hexanoyl-D-erythro-sphingosine (C8 sphingoid base)** **1 mg**
N-C6:0 Ceramide of D-erythro-C8-sphingosine $C_{14}H_{27}NO_2$

Source: synthetic **Mol. Wt.:** 257 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol **Storage:** –20°C

Dihydroceramides



Catalog number 1834

1834 **N-Acetyl-D-erythro-dihydrosphingosine** **1 mg**
N-C2:0-D-erythro-Dihydroceramide; N-Acetyl-D-erythro-sphinganine
$C_{20}H_{41}NO_3$

Source: synthetic **Mol. Wt.:** 344 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol **Storage:** –20°C

Reference:
J. M. L. Hauser et al., J. Biol. Chem. **269**, 6803, *1994*

1910 **N-Hexanoyl-D-erythro-dihydrosphingosine** **1 mg**
N-C6:0-D-erythro-Dihydroceramide; N-Hexanoyl-D-erythro-sphinganine
$C_{24}H_{49}NO_3$

Source: synthetic **Mol. Wt.:** 400 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol, DMSO **Storage:** –20°C

Reference:
J. M. L. Hauser et al., J. Biol. Chem. **269**, 6803, *1994*

1854 **N-Octanoyl-D-erythro-dihydrosphingosine** **1 mg**
N-C8:0-D-erythro-Dihydroceramide; N-Octanoyl-D-erythro-sphinganine
$C_{26}H_{53}NO_3$

Source: synthetic **Mol. Wt.:** 428 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, DMSO **Storage:** –20°C

Reference:
J. M. L. Hauser et al., J. Biol. Chem. **269**, 6803, *1994*

2041 **N-Octadecanoyl-D-erythro-dihydrospingosine** **10 mg**
N-C18:0-D-erythro-Dihydroceramide; N-Octadecanoyl-D-erythro-sphinganine
$C_{36}H_{73}NO_3$

Source: synthetic **Mol. Wt.:** 568 **Purity:** 98% by TLC **Appearance:** white solid **Solubility:** warm chloroform/methanol, 5:1; hot ethanol, DMSO **Storage:** –20°C

2-Hydroxy dihydroceramides

2043 **N-(R,S)-alpha-Hydroxydodecanoyl-D-erythro-dihydrosphingosine** **5 mg**
N-(R,S)-alpha-Hydroxy-C12:0-D-erythro-dihydroceramide $C_{30}H_{61}NO_4$

Source: synthetic **Mol. Wt.:** 500 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform/methanol/water, 2:1:0.5 **Storage:** –20°C

2045 **N-(R,S)-alpha-Hydroxyoctadecanoyl-D-erythro-dihydrosphingosine** **5 mg**
N-(R,S)-alpha-Hydroxy-C18:0-D-erythro-dihydroceramide $C_{36}H_{73}NO_4$

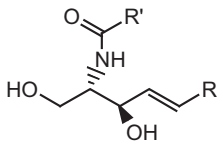
Source: synthetic **Mol. Wt.:** 584 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform/methanol/water, 2:1:0.5 **Storage:** –20°C

2047 **N-(R,S)-alpha-Hydroxyhexadecanoyl-D-erythro-dihydrosphingosine** **5 mg**

N-(R,S)-alpha-Hydroxy-C16:0-D-erythro-dihydroceramide $C_{34}H_{69}NO_4$

Source: synthetic **Mol. Wt.:** 556 **Purity:** 98+% by TLC **Appearance:** solid
Solubility: chloroform/methanol/water, 2:1:0.5 **Storage:** –20°C

Ceramides from natural sources



General ceramide structure

1056 **Ceramides** **25 mg**

Ceramides with hydroxy and non-hydroxy acyl groups
$C_{42}H_{83}NO_4$ **CAS#:** 104404-17-13

Source: natural, bovine **Mol. Wt.:** 666(2-hydroxy-lignoceroyl) **Purity:** 98+% by TLC **Appearance:** off-white solid **Solubility:** chloroform/methanol 2:1
Storage: –20°C

Reference:
J. M. L. Hauser et al., J. Biol. Chem. **269**, 6803, *1994*

1322 **Ceramides** **10 mg**
1322-05 Ceramides with mostly non-hydroxy acyl groups $C_{36}H_{71}NO_3$ **50 mg**

Source: natural, bovine **Mol. Wt.:** 566 (stearoyl) **Purity:** 98+% by TLC
Appearance: white solid **Solubility:** chloroform/methanol 2:1, ethanol
Storage: –20°C

Reference:
J. M. L. Hauser et al., J. Biol. Chem. **269**, 6803, *1994*

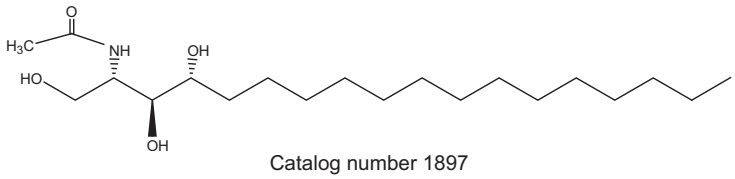
1323 **Ceramides** **10 mg**
1323-05 Ceramides with mostly hydroxy acyl groups $C_{36}H_{71}NO_4$ **50 mg**

Source: natural, bovine **Mol. Wt.:** 582 (2-hydroxy-stearoyl) **Purity:** 98+% by TLC
Appearance: white solid **Solubility:** chloroform/methanol 2:1, methanol
Storage: –20°C

Reference:
J. M. L. Hauser et al., J. Biol. Chem. **269**, 6803, *1994*

See Table III in Appendix for typical fatty acid content of products prepared from natural sources.

Phytoceramides



Catalog number 1897

1897 **N-Acetyl-phytosphingosine** **5 mg**
N-C2:0-Phytoceramide $C_{20}H_{41}NO_4$

Source: semi-synthetic, yeast (Pichia ciferri) **Mol. Wt.:** 360 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** ethanol, methanol, chloroform/methanol 1:1 (warm), warm DMSO **Storage:** –20°C

1895 **N-Hexanoyl-phytosphingosine** **5 mg**
N-C6:0-Phytoceramide $C_{24}H_{49}NO_4$

Source: semi-synthetic, yeast (Pichia ciferri) **Mol. Wt.:** 416 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** ethanol, methanol, chloroform/methanol 1:1 (warm) **Storage:** –20°C

1894 **N-Octanoyl-phytosphingosine** **5 mg**
N-C8:0-Phytoceramide $C_{26}H_{53}NO_4$

Source: semi-synthetic, yeast (Pichia ciferri) **Mol. Wt.:** 444 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** ethanol, methanol, chloroform/methanol 1:1 (warm) **Storage:** –20°C

2035 **N-Hexadecanoyl-phytosphingosine** **5 mg**
N-C16:0-Phytoceramide $C_{34}H_{69}NO_4$

Source: semi-synthetic, yeast (Pichia ciferri) **Mol. Wt.:** 556 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform/methanol 5:1 **Storage:** –20°C

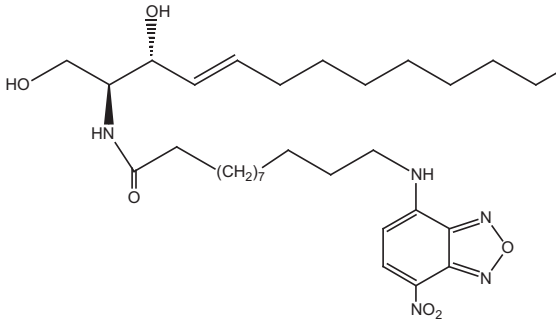
2034 **N-Stearoyl-phytosphingosine** **5 mg**
N-C18:0-Phytoceramide $C_{36}H_{73}NO_4$

Source: semi-synthetic, yeast (Pichia ciferri) **Mol. Wt.:** 584 **Purity:** 98+% by TLC-MS **Appearance:** white solid **Solubility:** chloroform/methanol 1:1 (warm) **Storage:** –20°C

2036 **N-Tetracosanoyl-phytosphingosine** **5 mg**
N-C24:0-Phytoceramide $C_{42}H_{85}NO_4$

Source: semi-synthetic, yeast (Pichia ciferri) **Mol. Wt.:** 668 **Purity:** 98+% by TLC-MS **Appearance:** white solid **Solubility:** chloroform/methanol 5:1 **Storage:** –20°C

Fluorescent ceramides



Catalog number 1618

Excitation: 460 nm
Emission: 535 nm

1841 **N-Hexanoyl-NBD-D-erythro-sphingosine** **100 µg**
1841-001 N-C6:0-NBD-ceramide; N-C6:0-NBD-D-erythro-sphingosine, fluorescent; N-(NBD-aminocaproyl)-D-erythro-sphingosine $C_{30}H_{49}N_5O_6$ **CAS#:** 86701-10-2 **1 mg**

Source: synthetic **Mol. Wt.:** 575 **Melting Point (°C):** 85.7-87.9 **Purity:** 98+% by TLC **Appearance:** orange film, vacuum dried **Solubility:** chloroform, ethanol, methanol **Storage:** –20°C

Reference:
J. M. L. Hauser et al., J. Biol. Chem. **269**, 6803, *1994*

1618 **N-Dodecanoyl-NBD-D-erythro-sphingosine** **100 ug**
1618-001 N-C12:0-NBD ceramide; N-C12:0-NBD-D-erythro-sphingosine, fluorescent; N-(NBD-aminolauroyl)-D-erythro-sphingosine $C_{36}H_{61}N_5O_6$ **1 mg**

Source: synthetic **Mol. Wt.:** 660 **Purity:** 98+% by TLC **Appearance:** orange solid **Solubility:** chloroform/methanol 2:1, methanol **Storage:** –20°C

1857 **N-Hexanoyl-NBD-L-threo-sphingosine** **100 µg**
1857-001 N-C6:0-NBD-ceramide; N-C6:0-NBD-L-threo-sphingosine, fluorescent; N-(NBD-aminocaproyl)-L-threo-sphingosine $C_{30}H_{49}N_5O_6$ **1 mg**

Source: synthetic **Mol. Wt.:** 575 **Purity:** 98+% by TLC **Appearance:** red-orange solid **Solubility:** chloroform, ethanol, methanol **Storage:** –20°C

Reference:
J. M. L. Hauser et al., J. Biol. Chem. **269**, 6803, *1994*

1620 **N-Dodecanoyl-NBD-L-threo-sphingosine** **100 µg**
1620-001 N-C12:0-NBD-ceramide; N-C12:0-NBD-L-threo-sphingosine, fluorescent; N-(NBD-aminolauroyl)-L-threo-sphingosine $C_{36}H_{61}N_5O_6$ **1 mg**

Source: synthetic **Mol. Wt.:** 660 **Purity:** 98+% by TLC **Appearance:** orange solid **Solubility:** chloroform/methanol 2:1, methanol **Storage:** –20°C

1624 **N-Hexanoyl-NBD-L-threo-dihydrosphingosine** **100 µg**
1624-001 N-C6:0-NBD-dihydroceramide; N-C6:0-NBD-L-threo-dihydrosphingosine, fluorescent; N-(NBD-aminocaproyl)-L-threo-dihydrosphingosine $C_{30}H_{51}N_5O_6$ **1 mg**

Source: synthetic **Mol. Wt.:** 578 **Purity:** 98+% by TLC **Appearance:** orange solid **Solubility:** chloroform/methanol 2:1, methanol **Storage:** –20°C

1623 **N-Dodecanoyl-NBD-L-threo-dihydrosphingosine** **100 µg**
1623-001 N-C12:0-NBD-dihydroceramide; N-C12:0-NBD-L-threo-dihydrosphingosine, fluorescent; N-(NBD-aminolauroyl)-L-threo-dihydrosphingosine $C_{36}H_{63}N_5O_6$ **1 mg**

Source: synthetic **Mol. Wt.:** 662 **Purity:** 98+% by TLC **Appearance:** orange solid **Solubility:** chloroform/methanol 2:1, methanol **Storage:** –20°C

1626 **N-Hexanoyl-NBD-D-erythro-dihydrosphingosine** **100 µg**
1626-001 N-C6:0-NBD-dihydroceramide; N-C6:0-NBD-D-erythro-dihydrosphingosine, fluorescent; N-(NBD-aminocaproyl)-D-erythro-dihydrosphingosine **1 mg**
$C_{30}H_{51}N_5O_6$

Source: synthetic **Mol. Wt.:** 578 **Purity:** 98+% by TLC **Appearance:** orange solid
Solubility: chloroform/methanol 2:1, methanol **Storage:** –20°C

1625 **N-Dodecanoyl-NBD-D-erythro-dihydrosphingosine** **100 µg**
1625-001 N-C12:0-NBD-dihydroceramide; N-C12:0-NBD-D-erythro-dihydrosphingosine, fluorescent; N-(NBD-aminolauroyl)-D-erythro-dihydrosphingosine $C_{36}H_{63}N_5O_6$ **1 mg**

Source: synthetic **Mol. Wt.:** 662 **Purity:** 98+% by TLC **Appearance:** orange solid
Solubility: chloroform/methanol 2:1, methanol **Storage:** –20°C

1628 **N-Hexanoyl-NBD-phytosphingosine** **100 µg**
1628-001 N-C6:0-NBD-phytoceramide; N-C6:0-NBD-phytosphingosine, fluorescent; N-(NBD-aminocaproyl)-phytosphingosine $C_{30}H_{51}N_5O_7$ **1 mg**

Source: semi-synthetic, bacteria **Mol. Wt.:** 594 **Purity:** 98+% by TLC **Appearance:** orange solid **Solubility:** chloroform/methanol 2:1, methanol **Storage:** –20°C

1627 **N-Dodecanoyl-NBD-phytosphingosine** **100 µg**
1627-001 N-C12:0-NBD-phytoceramide; N-C12:0-NBD-phytosphingosine, fluorescent; N-(NBD-aminolauroyl)-phytosphingosine $C_{36}H_{63}N_5O_7$ **1 mg**

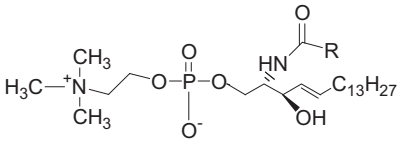
Source: semi-synthetic, bacteria **Mol. Wt.:** 678 **Purity:** 98+% by TLC **Appearance:** orange solid **Solubility:** chloroform/methanol 2:1, methanol **Storage:** –20°C

See Biochemicals and Reagents section (page 85) for additional fluorescent labeled products.

Compounds with fluorescent labels other than NBD are available on custom basis. Contact Technical Service for more information.

Phosphosphingolipids

Sphingomyelins



Catalog number 1051

1051 **Sphingomyelin** **25 mg**
1051-1 SPM; ceramide-1-phosphorylcholine $C_{41}H_{83}N_2O_6P$ **CAS#:** 85187-10-6 **1 g**

Source: natural, bovine **Mol. Wt.:** 731 (stearoyl) **Purity:** 98+% by TLC
Appearance: white solid **Solubility:** chloroform, ethanol, methanol **Storage:** –20°C

Predominately C18:0 and C24:1 fatty acids

1328 **Sphingomyelin** **25 mg**
SPM; ceramide-1-phosphorylcholine $C_{47}H_{95}N_2O_6P$ **CAS#:** 85187-10-6

Source: natural, porcine **Mol. Wt.:** 815 (lignoceroyl) **Purity:** 98+% by TLC
Appearance: white solid **Solubility:** chloroform, ethanol **Storage:** –20°C

Predominately C16:0 and C24:0 fatty acids

1329 **Sphingomyelin** **25 mg**
SPM; ceramide-1-phosphorylcholine $C_{46}H_{93}N_2O_6P$ **CAS#:** 85187-10-6

Source: natural, bovine buttermilk **Mol. Wt.:** 801 (tricosanoyl) **Purity:** 98+% by TLC **Appearance:** off white solid **Solubility:** chloroform, ethanol **Storage:** –20°C

Approximately equal amounts of C16:0, C22:0, C23:0, and C24:0 fatty acids

1332 **Sphingomyelin** **25 mg**
1332-1 Ceramide-1-phosphorylcholine $C_{39}H_{79}N_2O_6P$ **1 gram**

Source: natural, egg yolk, chicken **Mol. Wt.:** 703 (palmitate) **Purity:** 98+% by TLC
Appearance: white solid **Solubility:** chloroform, methanol, warm ethanol
Storage: –20°C

1907 **N-Acetyl-sphingosylphosphorylcholine** **5 mg**
Sphingomyelin with C2:0 fatty acid $C_{25}H_{51}N_2O_6P$

Source: semi-synthetic, bovine buttermilk **Mol. Wt.:** 506 **Purity:** 98+% by TLC
Appearance: vacuum dried **Solubility:** ethanol, chloroform/methanol 2:1
Storage: –20°C

Mixture of D-erythro and L-threo isomers

1909 **N-Hexanoyl-sphingosylphosphorylcholine** **5 mg**
Sphingomyelin with C6:0 fatty acid $C_{29}H_{59}N_2O_6P$

Source: semi-synthetic, bovine buttermilk **Mol. Wt.:** 563 **Purity:** 98+% by TLC
Appearance: solid, vacuum dried **Solubility:** ethanol, chloroform/methanol 2:1
Storage: –20°C

Mixture of D-erythro and L-threo isomers

1911 **N-Octadecanoyl-sphingosylphosphorylcholine** **5 mg**
Sphingomyelin with C18:0 fatty acid $C_{41}H_{83}N_2O_6P$

Source: semi-synthetic, bovine buttermilk **Mol. Wt.:** 731 **Purity:** 98+% by TLC
Appearance: white solid **Solubility:** chloroform, ethanol, methanol **Storage:** –20°C

Mixture of D-erythro and L-threo isomers

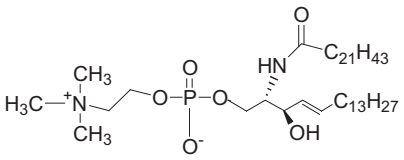
1890 **N-Heptadecanoyl-sphingosylphosphorylcholine** **5 mg**
Sphingomyelin with C17:0 fatty acid $C_{40}H_{81}N_2O_6P$

Source: semi-synthetic, bovine buttermilk **Mol. Wt.:** 717 **Purity:** 98+% by TLC
Appearance: white solid **Solubility:** chloroform, ethanol, methanol **Storage:** –20°C

Mixture of D-erythro and L-threo isomers

1917 **N-Eicosanoyl-D-erythro-sphingosylphosphorylcholine** **0.5 mg**
Sphingomyelin with C20:0 fatty acid $C_{43}H_{87}N_2O_6P$

Source: semi-synthetic, bovine buttermilk **Mol. Wt.:** 759 **Purity:** 98+% by TLC
Appearance: solid, vacuum dried **Solubility:** chloroform/methanol 14:1, ethanol, methanol **Storage:** –20°C



Catalog number 1918

1918 **N-Docosanoyl-D-erythro-sphingosylphosphorylcholine** **0.5 mg**
Sphingomyelin with C22:0 fatty acid $C_{45}H_{91}N_2O_6P$

Source: semi-synthetic, bovine buttermilk **Mol. Wt.:** 787 **Purity:** 98+% by TLC **Appearance:** solid, vacuum dried **Solubility:** chloroform/methanol 14:1, ethanol, methanol **Storage:** –20°C

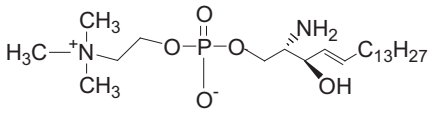
2200 **N-1-^{13}C-Palmitoyl-sphingosylphosphorylcholine** **1mg**
D-erythro-Sphingomyelin with 1-^{13}C-palmitic acid; SPM with ^{13}C labeled fatty acid $^{12}C_{38}{}^{13}CH_{79}N_2O_6P$

Source: semi-synthetic, bovine **Mol. Wt.:** 703 **Purity:** 98+% by TLC **Appearance:** waxy solid **Solubility:** chloroform, ethanol, methanol **Storage:** –20°C

1327 **N-Acetyl-sphingosylphosphorylethanolamine** **5 mg**
Sphingosylphosphorylethanolamine with C2:0 fatty acid side chain (D-erythro) $C_{38}H_{77}N_2O_6P$

Source: semi-synthetic, bovine buttermilk **Mol. Wt.:** 689 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform/methanol 2:1 **Storage:** –20°C

Sphingosylphosphorylcholines (SPC)



Catalog number 1318

1318 **D-erythro-Sphingosylphosphorylcholine** **5 mg**
D-erythro-SPC $C_{23}H_{49}N_2O_5P$

Source: semi-synthetic, bovine buttermilk **Mol. Wt.:** 464 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform/methanol 2:1 **Storage:** –20°C

1319 **L-threo-Sphingosylphosphorylcholine** **5 mg**
L-threo-SPC $C_{23}H_{49}N_2O_5P$

Source: semi-synthetic, bovine buttermilk **Mol. Wt.:** 464 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform/methanol 2:1 **Storage:** –20°C

1321 **Sphingosylphosphorylcholine** **10 mg**
1321-05 lyso-Sphingomyelin; SPC (mixture of D-erythro and L-threo isomers) **50 mg**
$C_{23}H_{49}N_2O_5P$ **CAS#:** 82970-80-7

Source: semi-synthetic, bovine buttermilk **Mol. Wt.:** 466 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform/methanol 2:1 **Storage:** –20°C

1913 **lyso-Dihydrosphingomyelin** **1 mg**
Dihydrosphingosylphosphorylcholine (mixture of D-erythro and L-threo isomers) $C_{23}H_{52}N_2O_5P$

Source: semi-synthetic, bovine buttermilk **Mol. Wt.:** 485 **Purity:** 98+% by TLC
Appearance: white solid **Solubility:** chloroform/methanol 2:1 **Storage:** –20°C

Sphingosine phosphates

1803 **D-erythro-Sphingosine-1-phosphate** **5 mg**
S-1-P, S-P-A $C_{18}H_{38}NO_5P$ **CAS#:** 26993-30-6

Source: synthetic **Mol. Wt.:** 380 **Purity:** 98+% by TLC **Appearance:** white solid
Solubility: warm acetic acid **Storage:** –20°C

References:
T.K. Ghosh et al., J. Biol. Chem., **269**, 22628, *1994*
L.Kindman et al., ibid, **269**, 13088, *1994*
A. Olivera et al., ibid, **269**, 17924, *1994*
M. Mattie, et. al., J. Biol. Chem. **269**:3181, *1994*
Yosuke Osawa, Hiroshi Uchinami, Jacek Bielawski, Robert F. Schwabe, Yusuf A. Hannun, and David A. Brenner. J. Biol. Chem., **280**, Issue 30, 27879-27887, *July 29, 2005*

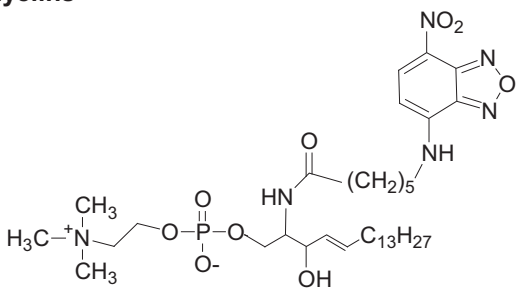
1852 **D-erythro-Dihydrosphingosine-1-phosphate** **5 mg**
$C_{18}H_{40}NO_5P$ **CAS#:** 19794-97-9

Source: synthetic **Mol. Wt.:** 382 **Purity:** 98+% by TLC **Appearance:** white solid
Solubility: warm acetic acid **Storage:** –20°C

2046 **N-Hexadecanoyl-D-erythro-sphingosine-1-phosphate, NH_4^+salt** **5 mg**
N-C16:0-Ceramide-1-phosphate $C_{34}H_{68}NO_6P$

Source: synthetic **Mol. Wt.:** 618 **Purity:** 98+% by TLC **Appearance:** white solid
Solubility: chloroform/methanol/acetic acid, 60:15:25 **Storage:** –20°C

Fluorescent sphingomyelins



Catalog number 1912

Excitation: 460 nm
Emission: 535 nm

1912 **N-Hexanoyl-NBD-sphingosylphosphorylcholine** **100 µg**
1912-001 N-C6:0-NBD-sphingomyelin, fluorescent; N-C6:0-NBD-sphingosylphosphorylcholine; fluorescent sphingomyelin; N-(NBD-aminocaproyl)-sphingomyelin **1 mg**
$C_{35}H_{61}N_6O_9P$ **CAS#:** 94885-04-8

Source: semi-synthetic, bovine buttermilk **Mol. Wt.:** 740 **Purity:** 98+% by TLC
Appearance: red-brown solid **Solubility:** chloroform, ethanol, methanol
Storage: –20°C

Mixture of D-erythro and L-threo isomers

1619	**N-Dodecanoyl-NBD-sphingosylphosphorylcholine**	**100 µg**
1619-001	N-C12:0-NBD-sphingomyelin, fluorescent; N-C12:0-NBD-sphingosylphosphorylcholine; fluorescent sphingomyelin; N-(NBD-aminolauroyl)-sphingomyelin $C_{41}H_{73}N_6O_4P$	**1 mg**

Source: semi-synthetic, bovine buttermilk **Mol. Wt.:** 825 **Purity:** 98+% by TLC
Appearance: orange solid **Solubility:** chloroform/methanol 2:1, methanol
Storage: –20°C

Mixture of D-erythro and L-threo isomers

See Biochemicals and Reagents section (page 85) for additional fluorescent labeled products.

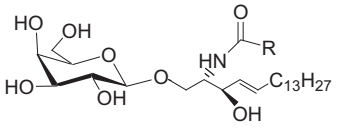
Compounds with fluorescent labels other than NBD are available on custom basis. Contact Technical Service for more information.

Glycosphingolipids

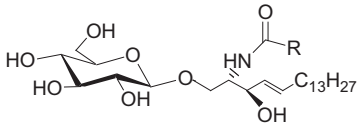
Glycosphingolipids are widely distributed in animal and plant tissues. They consist of a ceramide (Cer) bound in glycosidic linkage through the primary hydroxyl to a mono- or oligosaccharide which may contain substituents such as a sulfate, acetate, or phosphate group. They are amphiphilic and the less glycosylated compounds can be dispersed in buffers by dissolving them in a detergent or organic solvent (EtOH, DMSO, isoPrOH) and mixing by sonication.

Galactosphingolipids, mainly GalCer (cerebrosides) and its sulfate ester, occur in large amounts in the nervous system. Glucosphingolipids, the simplest of which is GlcCer (glucocerebrosides), are very widely distributed, particularly in nerve cell membranes. GlcCer is isolated from a variety of natural sources including human, bovine, and plant. Each of these sources has a heterogeneity in the fatty acid content of the ceramide as well as an occasional variation in the sphingoid chain. Globosides (containing both glucose and galactose) are a prominent group of glycosphingolipids, they contain an α-linked galactose moiety and are typically located in blood cell membranes. Gangliosides are another prominent group of glycosphingolipids; they are acidic because of substitution with sialic (neuraminic) acid. The glycosphingolipids function in a wide range of enzyme and structural interactions, such as immunological or membrane recognition phenomena, binding of microbial pathogens, hormone and growth factor actions, cancer cell growth and malignancy, atheroscerosis, genetic disease errors, blood group determinants, etc. Tissues change in glycosphingolipid composition during embryogenesis, maturation, aging, and other vital physiological processes. Some glycosphingolipids stimulate cell proliferation, others induce apoptosis, effects of great significance to cancer therapy and maturational development. Marked differences in glycosphingolipid composition are seen in normal and cancerous cells. See references 41-53.
See Literature References on page 96.

Galactosylceramides and glucosylceramides



Galactosylceramide



Glucosylceramide

1050 **Cerebrosides** **50 mg**
Galactosylceramide, ceramide beta-D-galactoside
$C_{48}H_{93}NO_8$ **CAS#:** 85305-88-0

Source: natural, bovine **Mol. Wt.:** 812 (lignoceryl form) **Purity:** 98+% by TLC
Appearance: white solid **Solubility:** chloroform/methanol 2:1 **Storage:** –20°C

Contains both hydroxy and non-hydroxy fatty acid side chains

1066 **Cerebroside, Kerasin (top spot)** **10 mg**
Galactosylceramide with mostly non-hydroxy fatty acid side chain
$C_{42}H_{81}NO_8$ **CAS#:** 536-13-0

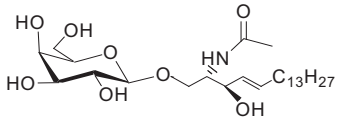
Source: natural, bovine **Mol. Wt.:** 728 (stearoyl) **Purity:** 98+% by TLC
Appearance: white solid **Solubility:** chloroform/methanol/water 2:1:0.5
Storage: –20°C

1138 **Cerebroside, Phrenosin (bottom spot)** **10 mg**
Galactosylceramide with mostly 2-hydroxy fatty acid side chains
$C_{42}H_{81}NO_9$ **CAS#:** 37211-11-3

Source: natural, bovine **Mol. Wt.:** 743 (2-hydroxystearoyl) **Purity:** 98+% by TLC
Appearance: white solid **Solubility:** chloroform/methanol/water 2:1:0.5
Storage: –20°C

1305 **Psychosine, (in free amine form)** **10 mg**
lyso-Cerebroside; 1-beta-D-galactosylsphingosine
$C_{24}H_{47}NO_7$ **CAS#:** 2238-90-6

Source: semi-synthetic, bovine **Mol. Wt.:** 461 **Purity:** 98+% by TLC **Appearance:** off-white solid **Solubility:** ethanol, chloroform/methanol 5:1 **Storage:** –20°C



Catalog number 1325

1325 **N-Acetyl-psychosine** **10 mg**
N-C2:0-Cerebroside; cerebroside with C2:0 fatty acid $C_{26}H_{49}NO_8$

Source: semi-synthetic, bovine **Mol. Wt.:** 503 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol **Storage:** –20°C

1335 **N-Pentadecanoyl-psychosine** **5 mg**
N-C15:0-Cerebroside $C_{39}H_{75}NO_8$

Source: semi-synthetic, bovine **Mol. Wt.:** 685 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform/ methanol, 2:1 **Storage:** –20°C

1334 **N-Octanoyl-β-D-galactosylceramide** **10 mg**
1334-50 N-C8:0-Galactosylceramide $C_{32}H_{61}NO_8$ **50 mg**

Source: semi-synthetic, bovine **Mol. Wt.:** 588 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform/ methanol, 9:1, ethanol, methanol **Storage:** –20°C

1621 **N-Hexanoyl-NBD-galactosylceramide** **100 µg**
1621-001 N-C6:0-NBD-beta-D-galactosylsphingosine; N-C6:0-NBD-cerebroside; N-C6:0-NBD-galactosylceramide, fluorescent; N-(NBD-aminocaproyl)-galactosylsphingosine $C_{36}H_{59}N_5O_{11}$ **1 mg**

Source: semi-synthetic, bovine **Mol. Wt.:** 738 **Purity:** 98+% by TLC **Appearance:** orange solid **Solubility:** chloroform/ methanol, 5:1, methanol **Storage:** –20°C

1057 **Glucocerebrosides** **5 mg**
Glucosylceramide; ceramide beta-D-glucoside
$C_{46}H_{93}NO_8$ **CAS#:** 85305-87-9

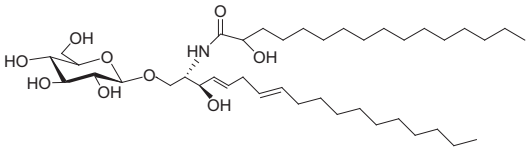
Source: natural, human **Mol. Wt.:** 812 (lignoceroyl) **Purity:** 98+% by TLC **Appearance:** white to an off white solid **Solubility:** chloroform/methanol 2:1 **Storage:** –20°C

Contains 24:1 fatty acid side chain. See Table III (p 90-94) for other fatty acid content

1521 **Glucocerebrosides** **5 mg**
1521-50 Glucosylceramide; ceramide beta-D-glucoside $C_{46}H_{89}NO_8$ **50 mg**

Source: natural, bovine buttermilk **Mol. Wt.:** 784 (docosanoyl) **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform/methanol 2:1 **Storage:** –20°C

See Table III (p 90-94) for side chain variants



Catalog number 1522

1522 **Glucocerebrosides, plant** **5 mg**
1522-100 Glucosylceramide; ceramide beta-D-glucoside $C_{40}H_{75}NO_9$ **100 mg**

Source: natural, plant **Mol. Wt.:** 714 (2-hydroxyhexadecanoyl) **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform/methanol 2:1 **Storage:** –20°C

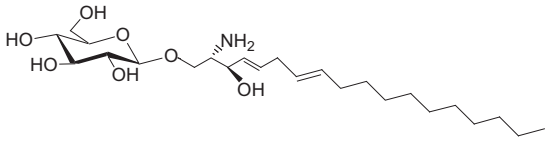
Sphingoid backbone is >95% 4,8-sphingadiene (C18:2 t,t-4,8) and most of the fatty acids are of the 2-hydroxy type. See Table III page 90-94.

1622 **N-Hexanoyl-NBD-glucosylceramide** **100 µg**
1622-001 N-C6:0-NBD-beta-D-glucosylsphingosine; N-C6:0-NBD-glucosylceramide, fluorescent $C_{36}H_{59}N_5O_{11}$ **1 mg**

Source: semi-synthetic, bovine **Mol. Wt.:** 738 **Purity:** 98+% by TLC **Appearance:** orange solid **Solubility:** chloroform/methanol 5:1, methanol **Storage:** –20°C

1306 **Glucopsychosine** **5 mg**
Glucosylsphingosine; lyso-glucocerebroside; 1-beta-D-glucosylsphingosine
$C_{24}H_{47}NO_7$ **CAS#:** 52050-17-6

Source: semi-synthetic, bovine **Mol. Wt.:** 461 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** ethanol, methanol, chloroform/methanol 2:1 **Storage:** –20°C



Catalog number 1310

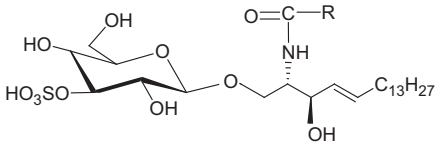
1310 **Glucopsychosine** **5 mg**
Glucosylsphingosine; lyso-glucocerebroside; 1-beta-D-glucosylsphingosine
$C_{24}H_{45}NO_7$ **CAS#:** 52050-17-6

Source: natural, plant **Mol. Wt.:** 459 **Purity:** 98+% by TLC
Appearance: off white solid **Solubility:** chloroform/methanol 4:1 **Storage:** –20°C

Sphingoid backbone is >95% 4,8-sphingadiene (C18:2 t,t-4, 8)

1531 **N-Docosanoyl-glucopsychosine** **1 mg**
Glucocerebroside with C22:0 fatty acid side chain; N-Docosanoyl-β-glucosylsphingosine $C_{46}H_{89}NO_8$

Source: semi-synthetic, bovine **Mol. Wt.:** 784 **Purity:** 98+% by TLC
Appearance: white solid **Solubility:** chloroform **Storage:** –20°C



Catalog number 1049

1049 **Sulfatides** **50 mg**
Ceramide-galactoside-3-sulfate; cerebroside sulfate $C_{42}H_{81}NO_{11}S$
CAS#: 85496-63-5

Source: natural, bovine **Mol. Wt.:** 830 (stearoyl) Na Salt **Purity:** 98+% by TLC
Appearance: white solid **Solubility:** chloroform/methanol/water 2:1:0.1 (if needed, a few drops of acetic acid) **Storage:** –20°C

1904 **lyso-Sulfatide (NH_4^+ salt)** **1 mg**
Sphingosine-1-galactoside-3-sulfate $C_{24}H_{47}NO_{10}S$ **CAS#:** 38621-58-8

Source: semi-synthetic, bovine **Mol. Wt.:** 542 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform/methanol 2:1 **Storage:** –20°C

2076 **N-Acetyl-sulfatide** **1 mg**
N-C2:0-sulfatide; N-acetyl-sphingosyl-beta-D-galactoside-3-sulfatide
$C_{26}H_{49}NO_{11}S$

Source: semi-synthetic, bovine **Mol. Wt.:** 584 **Purity:** 98+% by TLC **Appearance:** solid **Solubility:** chloroform/methanol 1:1, ethanol, methanol **Storage:** –20°C

1875 **N-Palmitoyl-sulfatide** **1 mg**
Sulfatide with C16:0 fatty acid side chain; N-palmitoyl-sphingosyl-beta-D-galactoside-3-sulfate $C_{40}H_{76}NO_{11}S$

Source: semi-synthetic, bovine **Mol. Wt.:** 780 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform/methanol 2:1 **Storage:** –20°C

1888 **N-Tetracosanoyl-sulfatide** **1 mg**
N-C24:0-Sulfatide; N-tetracosanoyl-sphingosyl-beta-D-galactoside-3-sulfate
$C_{48}H_{93}NO_{11}S$

Source: semi-synthetic, bovine **Mol. Wt.:** 892 **Purity:** 98+% by TLC
Appearance: solid **Solubility:** chloroform/methanol 5:1 **Storage:** –20°C

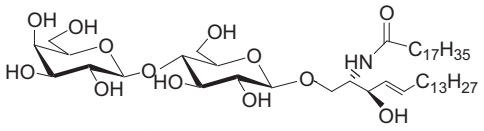
1536 **N-Octadecanoyl-D_3-sulfatide** **1 mg**
N-C18:0-D_3-Sulfatide $C_{42}H_{78}D_3NO_{11}S$

Source: semi-synthetic, bovine **Mol. Wt.:** 833 **Purity:** 98+% by TLC
Appearance: off-white solid **Solubility:** chloroform/methanol/DI water 2:1:0.1
Storage: –20°C

1632 **N-Dodecanoyl-NBD-sulfatide** **100 µg**
1632-001 N-C12:0-NBD-sulfatide; N-Dodecanoyl-NBD-lyso-sulfatide; N-Dodecanoyl-NBD-sphingosyl-beta-D-galactoside-3-sulfate $C_{42}H_{71}N_5O_{14}S$ **1 mg**

Source: semi-synthetic, bovine **Mol. Wt.:** 901 **Purity:** 98+% by TLC
Appearance: red-orange solid **Solubility:** chloroform/methanol 2:1 **Storage:** –20°C

Lactosylceramides



Catalog number 1500

1500 **Lactosylceramide** **1 mg**
LC, lactocerebrosides; CDH, ceramide beta-lactoside
$C_{48}H_{91}NO_{13}$ **CAS#:** 4682-48-8

Source: natural, porcine **Mol. Wt.:** 890 (stearoyl) **Purity:** 98+% by TLC
Appearance: white solid **Solubility:** chloroform/methanol/water 5:1:0.1, DMSO
Storage: –20°C

Contains 2-hydroxy fatty acids (See Table I)

1507 **Lactosylceramide** **5 mg**
1507-50 LC; lactocerebrosides; CDH, ceramide beta-lactoside $C_{53}H_{101}NO_{13}$ **50 mg**
CAS#: 4682-48-8

Source: natural, bovine buttermilk **Mol. Wt.:** 960 (tricosanoyl) **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform/methanol/water 5:1:0.1
Storage: –20°C

1517 **lyso-Lactosylceramide** **1 mg**
Lactosylsphingosine; lyso-LC $C_{30}H_{57}NO_{12}$

Source: semi-synthetic, bovine buttermilk **Mol. Wt.:** 623 **Purity:** 98+% by TLC
Appearance: white solid **Solubility:** chloroform/methanol/water 2:1:0.1
Storage: –20°C

1532 **N-Palmitoyl-lactosylceramide** **1 mg**
Lactosylceramide with C16:0 fatty acid side chain $C_{46}H_{87}NO_{13}$

Source: semi-synthetic, bovine buttermilk **Mol. Wt.:** 862 **Purity:** 98+% by TLC
Appearance: white solid **Solubility:** chloroform/methanol/water 2:1:0.1
Storage: –20°C

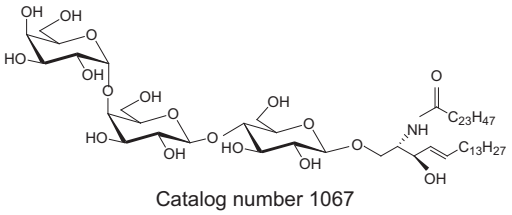
1629 **N-Hexanoyl-NBD-lactosylceramide** **50 ug**
1629-001 N-Hexanoyl-NBD-beta-D-lactosylsphingosine; N-C6:0-NBD-beta-D-lactosylsphingosine; N-C6:0-NBD-lactosylceramide, fluorescent; fluorescent LC; N-(NBD-aminocaproyl)-lactosylsphingosine $C_{42}H_{69}N_5O_{16}$ **1 mg**

Source: semi-synthetic, bovine buttermilk **Mol. Wt.:** 900 **Purity:** 98+% by TLC
Appearance: orange solid **Solubility:** chloroform/methanol 2:1 **Storage:** –20°C

1630 **N-Dodecanoyl-NBD-lactosylceramide** **50 µg**
1630-001 N-Dodecanoyl-NBD-beta-D-lactosylsphingosine; N-C12:0-NBD-beta-D-lactosylsphingosine; N-C12:0-NBD-lactosylceramide, fluorescent; fluorescent LC; N-(NBD-aminolauroyl)-lactosylsphingosine $C_{48}H_{81}N_5O_{16}$ **1 mg**

Source: semi-synthetic, bovine buttermilk **Mol. Wt.:** 984 **Purity:** 98+% by TLC
Appearance: orange solid **Solubility:** chloroform/methanol 2:1 **Storage:** –20°C

Ceramide trihexosides



Catalog number 1067

1067 **Ceramide trihexosides** **1 mg**
1067-10 CTH; Gb3; globotriaosylceramide $C_{60}H_{103}NO_{18}$ **CAS#:** 71965-57-6 **10 mg**

Source: natural, porcine **Mol. Wt.:** 1126 (tetracosanoyl) **Purity:** 98+% by TLC
Appearance: off white solid **Solubility:** chloroform/methanol 2:1, DMSO, hot methanol **Storage:** –20°C

Contains hydroxy and non-hydroxy fatty acid side chains

1513 **Ceramide trihexosides (top spot)** **0.5 mg**
CTH with non-hydroxy fatty acid side chain $C_{54}H_{101}NO_{18}$

Source: natural, porcine **Mol. Wt.:** 1052 (stearoyl) **Purity:** 98+% by TLC
Appearance: off white solid **Solubility:** chloroform/methanol 2:1 **Storage:** –20°C

1514 **Ceramide trihexosides (bottom spot)** **0.5 mg**
CTH with hydroxy fatty acid side chain $C_{54}H_{101}NO_{19}$

Source: natural, porcine **Mol. Wt.:** 1068 (hydroxystearoyl) **Purity:** 98+% by TLC
Appearance: white solid **Solubility:** chloroform/methanol 1:1, DMSO, hot methanol
Storage: –20°C

References:
S. Ashkenazi, T. C. Cleary, J. Clin. Microbiol., **27**, 1145, *1989*
J. Ghislain et al., J. of Immunol., **153**, 3655, *1995*

1520 **lyso-Ceramide trihexoside** **1 mg**
lyso-CTH; lyso-globotriosylsphingosine $C_{36}H_{67}NO_{17}$ **CAS#** 126550-86-5

Source: semi-synthetic, porcine **Mol. Wt.:** 786 **Purity:** 98+% by TLC **Appearance:** film, vacuum dried **Solubility:** chloroform/methanol/water 2:1:0.1 **Storage:** –20°C

1523 **N-Heptadecanoyl ceramide trihexoside** **0.5 mg**
N-C17:0-Ceramide trihexoside; N-heptadecanoyl globotriaosylceramide
$C_{53}H_{99}NO_{18}$

Source: semi-synthetic, porcine **Mol. Wt.:** 1038 **Purity:** 98+% by TLC
Appearance: solid **Solubility:** chloroform/methanol 2:1:, DMSO, hot methanol
Storage: –20°C

1524 **N-Tricosanoyl ceramide trihexoside** **0.5 mg**
N-C23:0-Ceramide trihexoside; N-tricosanoyl globotriaosylceramide
$C_{59}H_{111}NO_{18}$

Source: semi-synthetic, porcine **Mol. Wt.:** 1122 **Purity:** 98+% by TLC
Appearance: solid **Solubility:** chloroform/methanol 2:1:, DMSO, hot methanol
Storage: –20°C

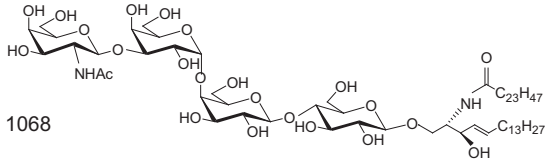
1631 **N-Dodecanoyl-NBD-ceramide trihexoside** **100 µg**
1631-001 N-C12:0-NBD-CTH; N-C12:0-NBD-globotriaosylceramide; N-(NBD-aminolauroyl) ceramide trihexoside $C_{54}H_{91}N_5O_{21}$ **1 mg**

Source: semi-synthetic, porcine **Mol. Wt.:** 1145 **Purity:** 98+% by TLC
Appearance: red-orange solid **Solubility:** chloroform/methanol 2:1: DMSO; hot methanol **Storage:** –20°C

1537 **N-Octadecanoyl-D_3-ceramide trihexoside** **0.5 mg**
C18:0-D_3-CTH; C18:0-D_3-Gb3; N-Octadecanoyl-D_3-globotriaosylceramide
$C_{54}H_{98}D_3NO_{18}$

Source: semi-synthetic, porcine **Mol. Wt.:** 1059 **Purity:** 98+% by TLC
Appearance: off-white solid **Solubility:** chloroform/methanol 2:1:, DMSO
Storage: –20°C

Globosides



Catalog number 1068

1068 **Globosides** **5 mg**
Gb4; globotetrahexosylceramide $C_{62}H_{114}N_2O_{23}$ **CAS#:** 11034-93-8

Source: natural, porcine **Mol. Wt.:** 1254 (tetracosanoyl) **Purity:** 98+% by TLC
Appearance: white solid **Solubility:** chloroform/methanol 2:1, DMSO, hot methanol
Storage: –20°C

Labeled glycolipids

Stable isotopes

1914 **N-Stearoyl-D_{35}-psychosine, perdeuterated** **5 mg**
Cerebrosides with N-C18:0-D_{35} fatty acid side chain $C_{42}H_{46}D_{35}NO_8$

Source: semi-synthetic, bovine **Mol. Wt.:** 762 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform, hot ethanol, chloroform/methanol 2:1
Storage: –20°C

Deuterium labeled stearoyl-sidechain

1533 **N-Palmitoyl-D_3-glucopsychosine, deuterated** **1 mg**
N-C16:0-D_3-Glucopsychosine; glucocerebroside with C16:0-D_3 fatty acid side chain $C_{40}H_{74}D_3NO_8$

Source: semi-synthetic, bovine buttermilk **Mol. Wt.:** 703 **Purity:** 98+% by TLC
Appearance: white solid **Solubility:** chloroform/methanol 2:1 **Storage:** –20°C

1534 **N-Palmitoyl-D_3-lactosylceramide, deuterated** **1 mg**

N-C16:0-D_3-Lactosylceramide; lactosylceramide with C16:0-D_3 fatty acid side chain $C_{46}H_{84}D_3NO_{13}$

Source: semi-synthetic, bovine buttermilk **Mol. Wt.:** 864 **Purity:** 98+% by TLC
Appearance: white solid **Solubility:** chloroform/methanol/water 5:1:0.1
Storage: –20°C

1536 **N-Octadecanoyl-D_3-sulfatide** **1 mg**

N-C18:0-D_3-Sulfatide $C_{42}H_{78}D_3NO_{11}S$

Source: semi-synthetic, bovine **Mol. Wt.:** 833 **Purity:** 98+% by TLC
Appearance: off-white solid **Solubility:** chloroform/methanol/DI water 2:1:0.1
Storage: –20°C

1537 **N-Octadecanoyl-D_3-ceramide trihexoside** **0.5 mg**

C18:0-D_3-CTH; C18:0-D_3-Gb3; N-Octadecanoyl-D_3-globotriaosylceramide $C_{54}H_{98}D_3NO_{18}$

Source: semi-synthetic, porcine **Mol. Wt.:** 1059 **Purity:** 98+% by TLC
Appearance: off-white solid **Solubility:** chloroform/methanol 2:1:, DMSO
Storage: –20°C

Fluorescent compounds

1621 **N-Hexanoyl-NBD-galactosylceramide** **100 µg**
1621-001 **1 mg**

N-C6:0-NBD-beta-D-galactosylsphingosine; N-C6:0-NBD-cerebroside; N-C6:0-NBD-galactosylceramide, fluorescent; N-(NBD-aminocaproyl)-beta-D-galactosylsphingosine $C_{36}H_{59}N_5O_{11}$

Source: semi-synthetic, bovine **Mol. Wt.:** 738 **Purity:** 98+% by TLC **Appearance:** orange solid **Solubility:** chloroform/methanol 5:1, methanol
Storage: –20°C

1622 **N-Hexanoyl-NBD-glucosylceramide** **100 µg**
1622-001 **1 mg**

N-C6:0-NBD-beta-D-glucosylsphingosine; N-C6:0-NBD-glucosylceramide, fluorescent; N-(NBD-aminocaproyl)-beta-D-glucosylsphingosine $C_{36}H_{59}N_5O_{11}$

Source: semi-synthetic, bovine **Mol. Wt.:** 738 **Purity:** 98+% by TLC **Appearance:** orange solid **Solubility:** chloroform/methanol 5:1, methanol
Storage: –20°C

1629 **N-Hexanoyl-NBD-lactosylceramide** **50 ug**
1629-001 **1 mg**

N-Hexanoyl-NBD-beta-D-lactosylsphingosine; N-C6:0-NBD-beta-D-lactosylsphingosine; N-C6:0-NBD-lactosylceramide, fluorescent: fluorescent LC; N-(NBD-aminocaproyl)-beta-D-lactosylsphingosine $C_{42}H_{69}N_5O_{16}$

Source: semi-synthetic, bovine buttermilk **Mol. Wt.:** 900 **Purity:** 98+% by TLC
Appearance: orange solid **Solubility:** chloroform/methanol 2:1 **Storage:** –20°C

1630 **N-Dodecanoyl-NBD-lactosylceramide** **50 µg**
1630-001 **1 mg**

N-Dodecanoyl-NBD-beta-D-lactosylsphingosine; N-C12:0-NBD-beta-D-lactosylsphingosine; N-C12:0-NBD-lactosylceramide, fluorescent; fluorescent LC; N-(NBD-aminolauroyl)-beta-D-lactosylsphingosine $C_{48}H_{81}N_5O_{16}$

Source: semi-synthetic, bovine buttermilk **Mol. Wt.:** 984 **Purity:** 98+% by TLC
Appearance: orange solid **Solubility:** chloroform/methanol 2:1 **Storage:** –20°C

1631	**N-Dodecanoyl-NBD-ceramide trihexoside**	**100 µg**
1631-001	N-C12:0-NBD-CTH; N-C12:0-NBD-globotriaosylceramide; N-(NBD-aminolauroyl) ceramide trihexoside $C_{54}H_{91}N_5O_{21}$	**1 mg**

Source: semi-synthetic, porcine **Mol. Wt.:** 1145 **Purity:** 98+% by TLC
Appearance: red-orange solid **Solubility:** chloroform/methanol 2:1: DMSO; hot methanol **Storage:** –20°C

1632	**N-Dodecanoyl-NBD-sulfatide**	**100 µg**
1632-001	N-C12:0-NBD-sulfatide; N-Dodecanoyl-NBD-lyso-sulfatide; N-Dodecanoyl-NBD-sphingosyl-beta-D-galactoside-3-sulfate; N-(NBD-amniolauroyl) sulfatide $C_{42}H_{71}N_5O_{14}S$	**1 mg**

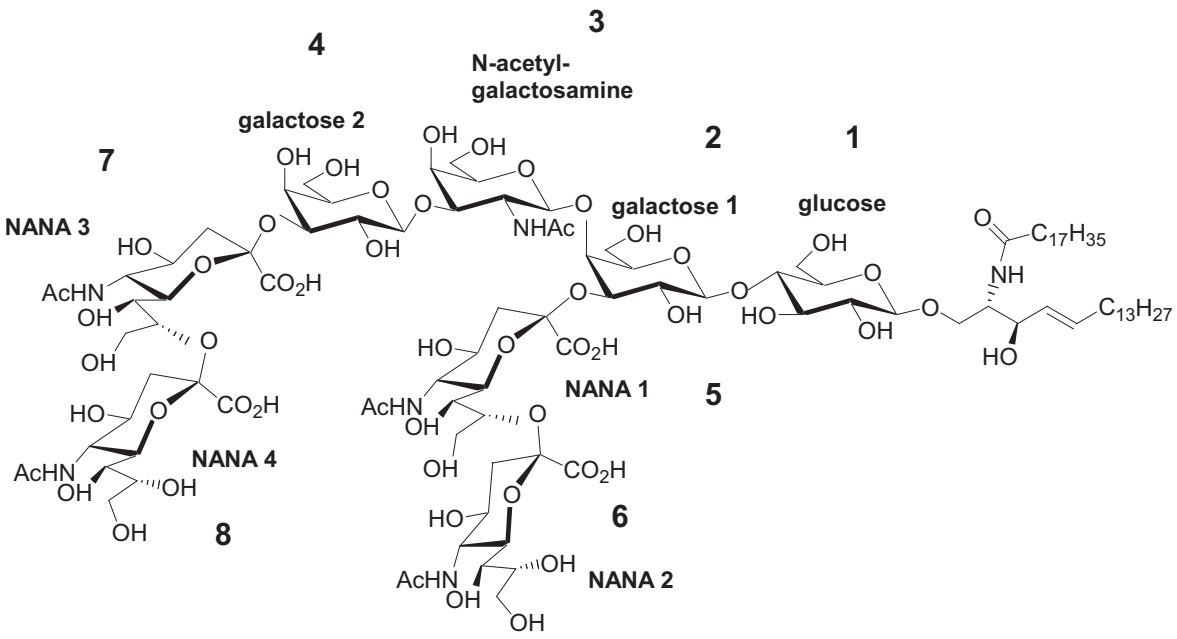
Source: semi-synthetic, bovine **Mol. Wt.:** 901 **Purity:** 98+% by TLC
Appearance: red-orange solid **Solubility:** chloroform/methanol 2:1 **Storage:** –20°C

See Biochemicals and Reagents section (page 85) for additional fluorescent labeled products.

Compounds with fluorescent labels other than NBD are available on custom basis. Contact Technical service for more information.

Gangliosides

The diagram below can be used with the general formulas given in the ganglioside descriptions to construct the individual structures.



1064 **Gangliotetraosylceramide** **1 mg**
Asialo GM_1; Gg4 $C_{62}H_{116}N_2O_{23}$ **CAS#:** 71012-19-6

Source: semi-synthetic, bovine **Mol. Wt.:** 1240 (stearoyl) **Purity:** 98+% by TLC
Appearance: white solid **Solubility:** chloroform/methanol/water 2:1:0.1, forms micellar solution in water **Storage:** –20°C

General formula: 1,2,3,4

1512 **Gangliotriosylceramide** **100 µg**
Asialo-GM_2; Gg3 $C_{56}H_{104}N_2O_{18}$

Source: semi-synthetic, human **Mol. Wt.:** 1078 (stearoyl) **Purity:** 98+% by TLC
Appearance: white solid **Solubility:** chloroform/methanol/water 2:1:0.1, forms micellar solution in water **Storage:** –20°C

General formula: 1,2,3

1061 **Monosialoganglioside GM_1 (NH_4^+ salt)** **5 mg**
1061-50 GM_1 $C_{73}H_{131}N_3O_{31}$ **CAS#:** 37758-47-7 **50 mg**

Source: natural, bovine **Mol. Wt.:** 1545 (stearoyl) **Purity:** 98+% by TLC
Appearance: white solid, **Solubility:** chloroform/methanol/water 2:1:0.1, forms micellar solution in water **Storage:** –20°C

General formula: 1,2,3,4,5

References:
Qing Zhang, Keiko Furukawa, Ho-Hsiang Chen, Takumi Sakakibara, Takeshi, and Koichi Furukawa. J. Biol. Chem., **281**, Issue 26, 18145-18155, *June 30, 2006*
Birkles. Zeng G, Gaol, Yu R.K., Aubry J. Biochimie, **85**:455-63, *2003*
Inokuchi J, Momosaki K., Shimeno H., Nagamatsu A., Radin NS. J. Cell Physiol, **141**: 573-83, *1989*

2050 **N-Octadecanoyl-D_3-monosialoganglioside GM_1** **0.5 mg**
N-D3-Stearoyl-GM_1 $C_{73}H_{128}N_3O_{31}D_3$

Source: semi-synthetic, bovine **Mol. Wt.:** 1548 **Purity:** 98+% by TLC
Appearance: solid **Solubility:** chloroform/methanol/water 2:1:0.1, forms micellar solution in water **Storage:** –20°C

Reference:
Qing Zhang, Keiko Furukawa, Ho-Hsiang Chen, Takumi Sakakibara, Takeshi, and Koichi Furukawa. J. Biol. Chem., **281**, Issue 26, 18145-18155, *June 30, 2006*

1502 **Monosialoganglioside GM_2 (NH_4^+ salt)** **500 µg**
GM_2 $C_{67}H_{121}N_3O_{26}$ **CAS#:** 19600-01-02

Source: natural, human **Mol. Wt.:** 1383 (stearoyl) **Purity:** 98+% by TLC
Appearance: white solid **Solubility:** chloroform/methanol/water 2:1:0.1, forms micellar solution in water **Storage:** –20°C

General formula: 1,2,3,5

1503 **Monosialoganglioside GM_3 (NH_4^+ salt)** **500 µg**
GM_3 $C_{64}H_{118}N_2O_{21}$ **CAS#:** 54827-14-4

Source: natural, bovine buttermilk **Mol. Wt.:** 1250 (tricosanoyl) **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform/methanol 2:1, forms micellar solution in water **Storage:** –20°C

General formula: 1,2,5

References:
Inokuchi J, Momosaki K., Shimeno H., Nagamatsu A., Radin NS. J. Cell Physiol, **141**: 573-83, *1989*
Lovat P.E., Corazzari M., Disano F., Piacentini M., Redfern C.P. Cancer Lett., **228**: 105-110, *2005*
Malisan R., Testi R., IUBMB Life, **57**:477-482, *2005*

1535 **Monosialoganglioside GM4, egg (NH_4^+ salt)** **0.5 mg**
GM_4 $C_{53}H_{88}N_2O_{16}$

Source: natural, egg, chicken **Mol. Wt.:** 1008 (oleoyl) **Purity:** 98+% by TLC
Appearance: white solid **Solubility:** chloroform/methanol 2:1, forms micellar solution in water **Storage:** –20°C

General formula: 1,5

References:
Ledeen, R.W., R.K. Yu, and L.F. Eng. J. Neurochem, **21**:829-839, *1978*
Li Y., E. Sugiyama, T. Ariga, J. Nakayama, M. Hayama, Y. Hama, H. Nakagawa, T. Tai, S. Li, and T. Ksama. J. Lipid Res., **43**:1019-1025, *2002*

1062 **Disialoganglioside GD_{1a} (NH_4^+ salt)** **5 mg**
GD_{1a} $C_{84}H_{148}N_4O_{40}$ **CAS#:** 12707-58-3

Source: natural, bovine **Mol. Wt.:** 1852 (stearoyl) **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform/methanol/water 2:1:0.1, forms micellar solution in water **Storage:** –20°C

General formula: 1,2,3,4,5,7

1501 **Disialoganglioside GD_{1b} (NH_4^+salt)** **1 mg**
GD_{1b} $C_{84}H_{148}N_4O_{40}$ **CAS#:** 19553-76-5

Source: natural, bovine **Mol. Wt.:** 1852 (stearoyl) **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform/methanol/water 2:1:0.1 **Storage:** –20°C

General formula: 1,2,3,4,5,6

1504 **Disialoganglioside GD_3 (NH_4^+ salt)** **1 mg**
GD_3 $C_{75}H_{125}N_3O_{29}$ **CAS#:** 62010-37-1

Source: natural, bovine buttermilk **Mol. Wt.:** 1541 (tricosanoyl) **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform/methanol 2:1, forms micellar solution in water **Storage:** –20°C

General formula: 1,2,5,6

References:
Lovat P.E., Corazzari M., Disano F., Piacentini M., Redfern C.P. Cancer Lett., **228**: 105-110, *2005*
Malisan R., Testi R., IUBMB Life, **57**:477-482, *2005*
Reimer A.B., Forster-Waldl E., Bramswig K.H., Pollak A., Zielinski C.C., Pehamberger H., Lode H.N., Scheiner O., Jensen-Jarolim E., Eur. J. Immunol., **36**:1267-1270, *2006*

1063 **Trisialoganglioside GT_{1b} (NH_4^+ salt)** **5 mg**
GT_{1b} $C_{95}H_{165}N_5O_{48}$ **CAS#:** 59247-13-1

Source: natural, bovine **Mol. Wt.:** 2144 (stearoyl) **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform/methanol/water 2:1:0.1, forms micellar solution in water **Storage:** –20°C

General Formula: 1,2,3,4,5,6,7

1516 **Tetrasialoganglioside GQ_{1b} (NH_4^+ salt)** **100 µg**
GQ_{1b} $C_{106}H_{182}N_6O_{56}$ **CAS#:** 68652-37-9

Source: natural, bovine **Mol. Wt.:** 2435 (stearoyl) **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform/methanol/water 2:1:0.1, forms micellar solution in water **Storage:** –20°C

General formula: 1,2,3,4,5,6,7,8

References:
Birkles. Zeng G, Gaol, Yu R.K., Aubry J. Biochimie, **85**:455-63, *2003*
Overell J.R., Willison H.J., Curr. Opin. Neurol., **18**:562-566, *2005*

1526 **Fucosylated monosialoganglioside GM_1 (NH_4^+ salt)** **500 µg**
Fucosyl-GM_1 $C_{79}H_{141}N_3O_{35}$

Source: natural, porcine **Mol. Wt.:** 1691 (stearoyl) **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform/methanol/water 2:1:0.1, forms micellar solution in water **Storage:** –20°C

1518 **lyso-Monosialoganglioside GM_1 (NH_4^+ salt)** **500 µg**
lyso-GM_1 $C_{55}H_{97}N_3O_{30}$ **CAS#:** 171483-40-2

Source: semi-synthetic, bovine **Mol. Wt.:** 1279 **Purity:** 98+% by TLC
Appearance: white solid **Solubility:** chloroform/methanol/water 2:1:0.2
Storage: –20°C

1065 **Purified mixed gangliosides, bovine (NH_4^+ salt)** **25 mg**
Mixed gangliosides

Source: natural, bovine **Purity:** 98+% by TLC **Appearance:** off white solid
Solubility: chloroform/methanol/water 2:1:0.1, forms micellar solution in water
Storage: –20°C

Approximately 98% GM_1, GD_{1a}, GD_{1b} and GT_{1b}, remaining 2% other gangliosides

1525 **Purified mixed gangliosides, porcine, (NH_4^+ salt)** **25 mg**

Source: natural, porcine **Purity:** 98+% by TLC **Appearance:** off-white solid
Solubility: chloroform/methanol/water 2:1:0.1, forms micellar solution in water
Storage: –20°C

Approximately 98% GM_1, GD_{1a}, GD_{1b} and GT_{1b}, remaining 2% other gangliosides

Glycosphingolipid reference mixes for TLC

These mixtures are qualitative standards prepared from our purified glycosphingolipids.

1505 **Neutral glycosphingolipid qualmix** **1 mg/ml, 1 ml**
Glycosylceramides, qualitative mix

Source: natural, bovine and porcine **Appearance:** liquid **Solvent:**
chloroform/methanol 2:1 **Solubility:** chloroform/methanol 2:1 **Storage:** –20°C

Contains: cerebrosides, lactosylceramide, ceramide trihexoside, globoside

1508 **Monosialoganglioside mix** **0.5 mg/ml, 1 ml**
GM_3, GM_2, GM_1 qualitative mix

Source: natural, bovine **Appearance:** liquid **Solvent:** chloroform/methanol/water
2:1:0.1 **Solubility:** chloroform/methanol/water 2:1:0.1 **Storage:** –20°C

Contains: GM_3, GM_2, GM_1

1509 **Disialoganglioside mix** **0.5 mg/ml, 1 ml**
GD_3, GD_{1a}, GD_{1b}, qualitative mix

Source: natural, bovine **Appearance:** liquid **Solvent:** chloroform/methanol/water
2:1:0.1 **Solubility:** chloroform/methanol/water 2:1:0.1 **Storage:** –20°C

Contains: GD_3, GD_{1a}, GD_{1b}

1510 **Lactosylceramide and sialosyl derivatives mix** **0.5 mg/ml, 1 ml**
LC, GM_3, GD_3 qualitative mix

Source: natural, bovine **Appearance:** liquid **Solvent:** chloroform/methanol/water
2:1:0.1 **Solubility:** chloroform/methanol/water 2:1:0.1 **Storage:** –20°C

Contains: LC, GM_3, GD_3

1511 **Gangliotetraosylceramide and sialosyl derivatives mix** **0.5 mg/ml, 1 ml**
asialo-GM_1, GM_1, GD_{1a}, GD_{1b}, GT_{1b} qualitative mix

Source: natural, bovine **Appearance:** liquid **Solvent:** chloroform/methanol/water 2:1:0.1 **Solubility:** chloroform/methanol/water 2:1:0.1 **Storage:** –20°C

Contains: asialo-GM_1, GM_1, GD_{1a}, GD_{1b}, GT_{1b}

Antibodies directed against glycolipids

These monoclonal and polyclonal antibodies are directed against the carbohydrate chains of Matreya's glycolipids. The same carbohydrate moieties are found on many glycoproteins. The antibodies are for use in ELISA or TLC immunoblotting applications (12). All antibodies are quality tested by actual performance in ELISA and TLC immunoblotting. The antibodies contain no preservatives and are shipped on dry ice.
See Literature References on page 96.

1977 **Anti-ganglioside GD_3** **50 µl**
Monoclonal antibody to GD_3, isotype IgG

Source: natural, mouse hybridoma R-24 cell line **Appearance:** liquid **Solubility:** water **Storage:** –20°C **Dry Ice Charge Applies**

Suitable for TLC immunoblotting, ELISA

References:
Kusunoki, A. et al., Neurology, **37**;1795 *1987*
Pukel, C. S. et al., J. Exptl. Med., **155**:1137, *1982*
Ren, S. et al., Cancer Res., **49**:7051, *1989*

1950 **Anti-ganglioside asialo GM_1** **100 µl**
Polyclonal antibody to asialo-GM_1, isotype IgG

Source: natural, rabbit **Appearance:** liquid **Solubility:** water **Storage:** –20°C **Dry Ice Charge Applies**

Suitable for ELISA, TLC-immunoblotting. Slight cross reaction to GM_1

References:
Kusunoki, A. et al., Neurology, **37**;1795 *1987*
Yoship, H. et al., J. Neurochemistry, **61**:658, *1993*

1951 **Anti-ganglioside asialo-GM_2** **50 µl**
Polyclonal antibody to asialo-GM_2, isotype IgG, IgM

Source: natural, rabbit **Appearance:** liquid **Solubility:** water **Storage:** –20°C **Dry Ice Charge Applies**

Suitable for ELISA, TLC-immunoblotting

References:
Kusunoki, A. et al., Neurology, **37**;1795 *1987*
Yoship, H. et al., J. Neurochemistry, **61**:658, *1993*

1954 **Anti-ganglioside GM_1** **100 µl**
Polyclonal antibody to GM_1, isotype IgG

Source: natural, rabbit **Appearance:** liquid **Solubility:** water **Storage:** –20°C **Dry Ice Charge Applies**

Suitable for ELISA, TLC-immunoblotting. Slight cross reaction to asialo-GM_1

References:
Kusunoki, A. et al., Neurology, **37**;1795 *1987*
Yoship, H. et al., J. Neurochemistry, **61**:658, *1993*

1961 **Anti-ganglioside GM_2 (NANA)** **50 µl**

Polyclonal antibody to GM_2 (NANA), isotype IgG, IgM

Source: natural, rabbit **Appearance:** liquid **Solubility:** water **Storage:** –20°C
Dry Ice Charge Applies

Suitable for ELISA, TLC-immunoblotting

References:
Kusunoki, A. et al., Neurology, **37**;1795 *1987*
Kusunoki, A. et al. Arch. Biochem. Biophys., 255-226, *1987*
Saito, M. et al. Biochem. Biophys. Res. Comm., **127**:1, *1985*
Pukel, C. S. et al., J. Exptl. Med., **155**:1137, *1982*
Ren, S. et al., Cancer Res., **49**:7051, *1989*
Yu, R. K. et al., Ann. Neurol., **27**:530, *1990*
Yoship, H. et al., J. Neurochemistry, **61**:658, *1993*

1962 **Anti-ganglioside GM_2 (NGNA)** **50 µl**

Polyclonal antibody to GM_2 (NGNA), isotype IgG, IgM

Source: natural, rabbit **Appearance:** liquid **Solubility:** water **Storage:** –20°C
Dry Ice Charge Applies

Suitable for TLC immunoblotting, ELISA

References:
Kusunoki, A. et al., Neurology, **37**;1795 *1987*
Kusunoki, A. et al. Arch. Biochem. Biophys., 255-226, *1987*
Saito, M. et al. Biochem. Biophys. Res. Comm., **127**:1, *1985*
Pukel, C. S. et al., J. Exptl. Med., **155**:1137, *1982*
Ren, S. et al., Cancer Res., **49**:7051, *1989*
Yu, R. K. et al., Ann. Neurol., **27**:530, *1990*

1957 **Anti-ganglioside GM_4** **50 µl**

Polyclonal antibody to GM_4, isotype IgG

Source: natural, rabbit **Appearance:** liquid **Solubility:** water **Storage:** –20°C
Dry Ice Charge Applies

Suitable for ELISA, TLC-immunoblotting

References:
Kusunoki, A. et al., Neurology, **37**;1795 *1987*
Yoship, H. et al., J. Neurochemistry, **61**:658, *1993*

1960 **Anti-globoside GL-4** **50 µl**

Polyclonal antibody to GL-4, isotype IgG, IgM

Source: natural, rabbit **Appearance:** liquid **Solubility:** water **Storage:** –20°C
Dry Ice Charge Applies

Suitable for ELISA, TLC-immunoblotting

References:
Kusunoki, A. et al., Neurology, **37**;1795 *1987*
Kusunoki, A. et al. Arch. Biochem. Biophys., 255-226, *1987*
Saito, M. et al. Biochem. Biophys. Res. Comm., **127**:1, *1985*
Pukel, C. S. et al., J. Exptl. Med., **155**:1137, *1982*
Ren, S. et al., Cancer Res., **49**:7051, *1989*
Yu, R. K. et al., Ann. Neurol., **27**:530, *1990*
Yoship, H. et al., J. Neurochemistry, **61**:658, *1993*

Enzyme Inhibitors

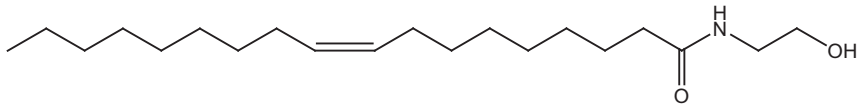
Ceramide: UDPglucose Transferase. PDMP (D,L-threo-1-phenyl-2-decanoylamino-3-morpholino-1-propanol-HCl) closely resembles the natural sphingolipid substrate of brain glucosyl transferase and is a very potent and competitive inhibitor of the enzyme (13). It has been shown to block outgrowth of neurites in cultured retina and to block glucolipid synthesis in cultured 3T3 cells (14). N.S. Radin and co-workers have shown (15) that PPMP has activity equivalent to that of PDMP when cell homogenates and brain and liver microsomes are used, but it is about 20 times more potent when used with intact cells. In another paper (16), Radin's group has shown that PDMP has substantial activity against Ehrlich ascites tumors in mice. Recent publications from the laboratory of Myles Cabot (17, 18) show that PPMP can reverse multi-drug resistance in cancer cells by causing a build-up of ceramide and preventing the synthesis of glycosylated ceramides. **See Literature References on page 96.**

Matreya also offers the resolved D- and L-threo-isomers of PDMP and PPMP.

Protein Kinase C Inhibitor. Sphingosine is a potent and reversible inhibitor of protein kinase C (19); it also has been shown at low concentrations to stimulate DNA synthesis and act synergistically with known growth factors (20). Note that Safingol (our L-threo-dihydrosphingosine) has also been shown to partially reverse multi-drug resistance in cancer cells (18) *via* inhibition of protein kinase C.

Dihydroceramide desaturase Inhibitor. Cyclopropenylceramide is the first known inhibitor of this enzyme and may allow significant studies on the role of ceramide in apoptosis. Matreya is the only source for this inhibitor. (58)

Ceramidase Inhibitors. N-Oleoylethanolamine has been shown to be an efficacious inhibitor of the ceramidase found in human kidney and cerebellum (21). It is specifically an inhibitor of acid ceramidase (22) with an IC_{50} of ca. 500 µM. N-Hexadecanoylethanolamine can be used as an inactive control. D-MAPP is a potent (IC_{50} approximately 5 µM) inhibitor of alkaline ceramidase. Its enantiomer L-MAPP is inactive as an inhibitor and acts as a substrate for this enzyme (22,23). **See Literature References on page 96.**



Catalog number 1751

1751 **N-Oleoylethanolamine** **100 mg**

NOE $C_{20}H_{39}NO_2$ **CAS#:** 111-58-0

Source: synthetic **Mol. Wt.:** 326 **Melting Point (°C):** 63-66 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol, ethyl ether, DMSO **Storage:** –20°C

Activity: acid ceramidase inhibitor

References:

C. J. Hillard and W.B. Campbell. J. Lipid. Res., **38**: 2383-2398, *1997*
Wasilewski M., Wieckowski M.R., Dymmowska D, Wojtczak L. BBA **1657**: 151-163, *2004*
Spinedi A., DiBartolomeo S., and Piacentini M. BBRC, **255**: 456-459, *1999*

1786 **N-Hexadecanoylethanolamine** **100 mg**

$C_{18}H_{37}NO_2$ **CAS#** 544-31-0

Source: synthetic **Mol. Wt.:** 299 **Melting Point (°C):** 99-102 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol **Storage:** –20°C

Activity: inactive as acid ceramidase inhibitor

References:

C. J. Hillard and W.B. Campbell. J. Lipid. Res., **38**: 2383-2398, *1997*
Wasilewski M., Wieckowski M.R., Dymmowska D, Wojtczak L. BBA **1657**: 151-163, *2004*
Spinedi A., DiBartolomeo S., and Piacentini M. BBRC, **255**: 456-459, *1999*

1757 **Anandamide** **10 mg/ml, 1 ml**

Arachidonylethanolamide; 5,8,11,14(Z,Z,Z,Z)-Eicosatetraenoyl 2'-hydroxy-ethyl-amide $C_{22}H_{37}NO_2$ **CAS#:** 94421-68-8

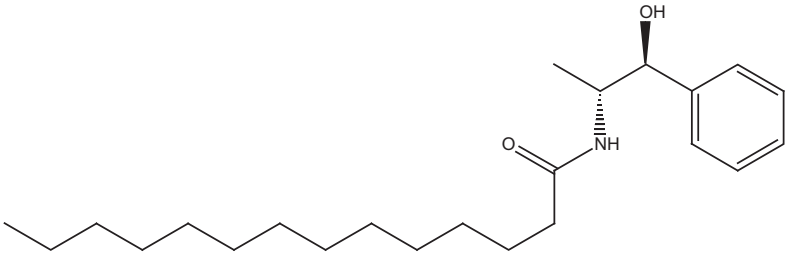
Source: synthetic **Mol. Wt.:** 347 **Purity:** 98+% by TLC **Appearance:** liquid
Solvent: chloroform **Solubility:** chloroform, ethanol **Storage:** –20°C

Induces apoptosis, endocannabinoid

References:
M. van der Stelt and V. DiMarzo; Prostaglandins Other Lipid Mediat. **77**, 111, *2005*
Wasilewski M., Wieckowski M.R., Dymmowska D, Wojtczak L. BBA **1657**: 151-163, *2004*
C. Grimaldi, et al.; Exp. Cell Res. **312**, 363, *2006*

1807 **L-threo-Dihydrosphingosine (Safingol)** **5 mg**
1807-025 L-threo-Sphinganine, C18 chain $C_{18}H_{39}NO_2$ **CAS#:** 15639-50-6 **25 mg**

Source: synthetic **Mol. Wt.:** 301 **Melting Point (°C):** 103-114 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol
Storage: –20°C
References:
C.W. Sachs et al., ibid., **270**, 26639, *1995*
G.K. Schwartz et al., J. Natl. Cancer Inst., **87**, 1394, *1995*



Catalog number 1859

1859 **D-MAPP** **100 mg**

D-erythro-2-Tetradecanoylamino-1-phenyl-1-propanol $C_{23}H_{39}NO_2$
CAS#: 143492-39-1

Source: synthetic **Mol. Wt.:** 361 **Purity:** 98+% by TLC **Appearance:** white solid
Solubility: ethanol **Storage:** –20°C

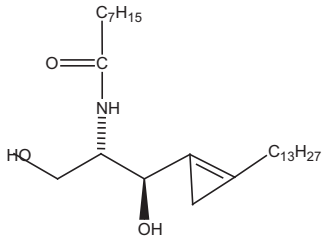
Activity: alkaline ceramidase inhibitor

1860 **L-MAPP** **100 mg**

L-erythro-2-Tetradecanoylamino-1-phenyl-1-propanol $C_{23}H_{39}NO_2$
CAS#: 143492-38-0

Source: synthetic **Mol. Wt.:** 361 **Purity:** 98+% by TLC **Appearance:** white solid
Solubility: ethanol **Storage:** –20°C

Activity: inactive as alkaline ceramidase inhibitor



Catalog number: 1886

1886 **N-C8:0-Cyclopropenylceramide** **1 mg**
1886-005 N-C8:0-CPPC; N-[(1R, 2S)-2-hydroxy-1-hydroxymethyl-2-(2-tridecyl-1-cyclopropenyl) ethyl] octanamide; GT_{11} $C_{27}H_{51}NO_3$ **5 mg**

Source: synthetic **Mol. Wt.:** 437 **Melting Point (°C):** 69-70 **Purity:** 98+% by ^{1}H NMR; HPLC **Appearance:** off white solid **Solubility:** chloroform, ethanol, methanol **Storage:** –20°C

Activity: Dihydroceramide desaturase inhibitor

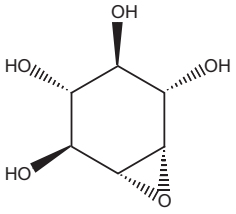
References:
Jacqueline M. Kraveka, Li Li, Zdzislaw M. Szulc, Jacek Bielawski, Besium Ogretmen, Yusuf A. Hannun, Lina M. Obeid, and Alicja Bielawska. J. Biol. Chem., **10**, 1074/jbc. M700647200, *February 5, 2007*
G. Triola, G. Fabrias, and A. Liebaria. Agnew. Chem. Int. Ed., 40, No. 10, 1960-1962, *2001*
Triola G., Fabrias G., Casas J., and Liebaria A. J. Org. Chem. 68 (26), 9924-9932, *2003*
Bedia C., Triola G., Casas J., Liebaria A., Fabrias G. Or. Biomol. Chem. 3 (20), 3707-3712, *2005*

1887 **N-C16:0-Cyclopropenylceramide** **1 mg**
1887-005 N-C16:0-CPPC; N-[(1R, 2S)-2-hydroxy-1-hydroxymethyl-2-(2-tridecyl-1-cyclopropenyl) ethyl] hexadecamide $C_{35}H_{67}NO_3$ **5 mg**

Source: synthetic **Mol. Wt.:** 550 **Melting Point (°C):** 156-157 **Purity:** 98+% by ^{1}H NMR; HPLC **Appearance:** off white solid **Solubility:** chloroform, ethanol, methanol **Storage:** –20°C

Activity: Dihydroceramide desaturase inhibitor

References:
G. Triola, G. Fabrias, and A. Liebaria. Agnew. Chem. Int. Ed., 40, No. 10, 1960-1962, *2001*
Triola G., Fabrias G., Casas J., and Liebaria A. J. Org. Chem. 68 (26), 9924-9932, *2003*
Bedia C., Triola G., Casas J., Liebaria A., Fabrias G. Or. Biomol. Chem. 3 (20), 3707-3712, *2005*



Catalog number 1889

1889 **Conduritol B epoxide** **25 mg**
$C_6H_{10}O_5$ **CAS#:** 6090-95-5

Source: synthetic **Mol. Wt.:** 162 **Melting Point (°C):** 164-166 **Purity:** 98+% by TLC, NMR **Appearance:** solid **Solubility:** water, DMSO, methanol (slightly) **Storage:** –20°C

Inhibits α-glucosidase activity; specific inhibitor of glucocerebrosidase in cultured cells.

1719 **D,L-threo-PDMP** **100 mg**

D,L-threo-1-Phenyl-2-decanoylamino-3-morpholino-1-propanol•HCl
$C_{23}H_{38}N_2O_3$•HCl **CAS#:** 80938-69-8

Source: synthetic **Mol. Wt.:** 427 **Melting Point (°C):** 158-161 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** ethanol, methanol, chloroform, DMSO **Storage:** –20°C

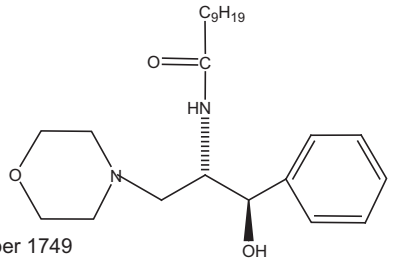
Activity: glucosyl ceramide synthase inhibitor

1720 **D,L-threo-PPMP** **100 mg**

D,L-threo-l-Phenyl-2-hexadecanoylamino-3-morpholino-1-propanol•HCl
$C_{29}H_{50}N_2O_3$•HCI **CAS#:** 149022-18-4

Source: synthetic **Mol. Wt.:** 511 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** alcohols, chloroform **Storage:** –20°C

Activity: glucosyl ceramide synthase inhibitor



Catalog number 1749

1749 **L-threo-PDMP** **10 mg**

L-threo-1-Phenyl-2-decanoylamino-3-morpholino-1-propanol•HCl
$C_{23}H_{38}N_2O_3$•HCl **CAS#:** 109836-81-9

Source: synthetic **Mol. Wt.:** 427 **Melting Point (°C):** 89-92 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** ethanol, methanol **Storage:** –20°C

1753 **D,L-erythro-PPMP** **100 mg**

D,L-erythro-1-Phenyl-2-hexadecanoylamino-3-morpholino-1-propanol•HCl
$C_{29}H_{50}N_2O_3$•HCl

Source: synthetic **Mol. Wt.:** 511 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol, DSMO **Storage:** –20°C

1755 **D,L-erythro-PDMP** **100 mg**

D,L-erythro-1-Phenyl-2-decanoylamino-3-morpholino-1-propanol•HCl
$C_{23}H_{38}N_2O_3$•HCl **CAS#:** 109760-77-2

Source: synthetic **Mol. Wt.:** 427 **Melting Point (°C):** 112-115 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol, DSMO **Storage:** –20°C

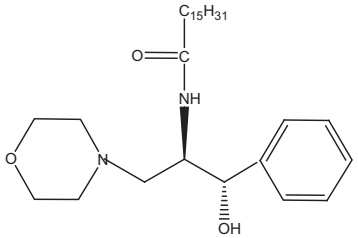
1756 **D-threo-PDMP** **10 mg**

D-threo-1-Phenyl-2-decanoylamino-3-morpholino-1-propanol•HCl
$C_{23}H_{38}N_2O_3$•HCl **CAS#:** 109836-82-0

Source: synthetic **Mol. Wt.:** 427 **Melting Point (°C):** 94-97 **Purity:** 98+% by TLC
Appearance: white solid **Solubility:** ethanol, methanol **Storage:** –20°C

Activity: glucosyl ceramide synthase inhibitor

References:
Nicholson K.M., Quinn D.M., Kellett G. L., Warr J.R. Br. J. Cancer **81**: 423-430, *1999*
Sietsma H., Veldman R.J., Vander Kolk D., Ausema B., Nijhof W., Kamps W., Vellenga E., Kok J.W. Clin. Cancer Res. **6**:942-948, *2000*
Basu S., Ma R., Mikulla B., Bradley M., Moulton C., Basu M., Banerjee S., Inokuchi J. J. Glycoconj. **20**:157-168, *2003*
Radin N.S. Biochem Pharmacol **57**:589-595, *1999*



Catalog number 1865

1865 **D-threo-PPMP** **10 mg**

D-threo-1-Phenyl-2-hexadecanoylamino-3-morpholino-1-propanol•HCl
$C_{29}H_{50}N_2O_2$•HCl

Source: synthetic **Mol. Wt.:** 511 **Melting Point (°C):** 94-98 **Purity:** 98+% by TLC
Appearance: white solid **Solubility:** ethanol, methanol **Storage:** –20°C

Activity: glucosyl ceramide synthase inhibitor

References:
Abe A., Inokuchi J., Jimbo M., Shimeno H., Nagamatsu A., Shayman J.A., Shukla G.S., Radin N.S.J. Biochem (Tokyo) **111**:191-196, *1992*
Maurer B.J., Melton L., Billups C., Cabot M.C., Reynolds C.P. J. Natl. Cancer Inst. **92**:1897-1909, *2000*
Puri A., Hug P., Munoz-Barroso I., Blumenthal R. Biochem. Biophys. Res. Commun **242**:219-225, *1998*
Couto A.S., Caffaro C., Uhrig M.L., Kimura E., Peres V.J., Merino E.F., Katzin A.M., Nishioka M., Nonami H., Era-Balsells R. Eur. J. Biochem. **271**: 2204-2214, *2004*
Morjani H., Aouali N., Belhoussine R., Veldman R.J., Levade T., Manfait M. Int. J. Cancer **94**:157-165, *2001*

1868 **L-threo-PPMP** **10 mg**

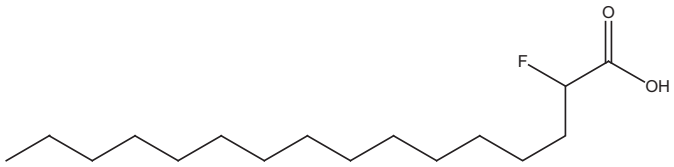
L-threo-1-Phenyl-2-hexadecanoylamino-3-morpholino-1-propanol•HCl
$C_{29}H_{50}N_2O_3$•HCl

Source: synthetic **Mol. Wt.:** 511 **Melting Point (°C):** 89-94 **Purity:** 98+% by TLC
Appearance: white solid **Solubility:** ethanol, methanol **Storage:** –20°C

1800 **Castanospermine** **25 mg**

1,6,7,8-tetrahydroxyoctahydroindolizine $C_8H_{15}NO_4$ **CAS#:** 79831-76-8

Source: natural, plant **Mol. Wt.:** 189 **Melting Point (°C):** 210-215 **Purity:** 98+% by TLC, NMR **Appearance:** solid **Solubility:** water, methanol/water, 90:10
Storage: –20°C



Catalog number 1717

1717 **2-Fluoropalmitic acid** **25 mg**
$C_{16}H_{31}FO_2$ **CAS#:** 89270-22-4

Source: synthetic **Mol. Wt.:** 274 **Melting Point (°C):** 83-85 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol **Storage:** –20°C

Activity: Acyl-CoA synthase inhibitor

1718 **Methyl 2-fluoropalmitate** **10 mg**
$C_{17}H_{33}FO_2$

Source: synthetic **Mol. Wt.:** 288 **Melting Point (°C):** 36-38 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol **Storage:** –20°C

Activity: inactive ester of 2-fluoropamitic acid

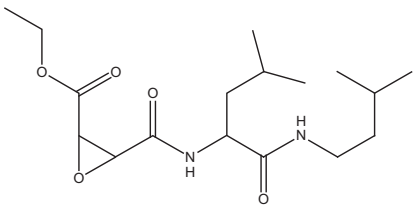
1750 **2,2-Difluoropalmitic acid** **25 mg**
$C_{16}H_{30}F_2O_2$

Source: synthetic **Mol. Wt.:** 292 **Melting Point (°C):** 50.8-53 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol **Storage:** –20°C

1858 **2-Acetyl-4-(1R, 2S, 3R, 4-tetrahydroxybutyl)-imidazole** **1 mg**
THI $C_9H_{14}N_2O_5$ **CAS#:** 94944-70-4

Source: synthetic **Mol. Wt.:** 230 **Melting Point (°C):** n/a **Purity:** 99% by HPLC, MS, NMR **Appearance:** white solid **Solubility:** water **Storage:** –20°C

Reference:
S.R. Schwab, J.P. Pereira, M. Matloubian, Y. Xu, Y. Huang, and J.G. Cyster. Science **309**: 1735, *2005*



Catalog number 1752

1752 **EST** **5 mg**
E-64-d; Loxastatin $C_{17}H_{30}N_2O_5$ **CAS#:** 88321-09-9

Source: synthetic **Mol. Wt.:** 342 **Melting Point (°C):** 125-127 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol **Storage:** –20°C

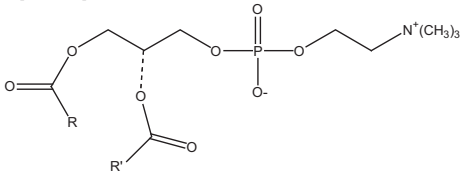
Activity: cystein protease inhibitor

Reference:
S. Mehdi, TIBS, **16**, *April 1991*

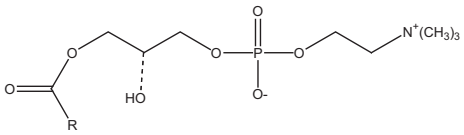
Glycerolipids

Glycerophospholipids

Natural phospholipids



Catalog number 1044



Catalog number 1046

1044 **Lecithin** **50 mg/ml, 1 ml**
Phosphatidylcholine; PC $C_{44}H_{84}NO_8P$ **CAS#:** 8002-43-5

Source: natural, egg **Mol. Wt.:** 787 (oleoyl) **Purity:** 98+% by TLC
Appearance: liquid **Solvent:** chloroform **Solubility:** chloroform, ethyl ether, ethanol
Storage: –20°C

See Table III page 90-94 for fatty acid content

1070 **Lecithin** **50 mg/ml, 1 ml**
Phosphatidylcholine; PC $C_{44}H_{84}NO_8P$ **CAS#:** 8002-43-5

Source: natural, bovine **Mol. Wt.:** 787 (oleoyl) **Purity:** 98+% by TLC **Appearance:** liquid **Solvent:** chloroform **Solubility:** chloroform, ethyl ether **Storage:** –20°C

See Table III page 90-94 for fatty acid content

1302 **Lecithin** **50 mg/ml, 1 ml**
Phosphatidylcholine; PC $C_{44}H_{80}NO_3P$ **CAS#:** 8002-43-5

Source: natural, plant **Mol. Wt.:** 783 (linoleoyl) **Purity:** 98+% by TLC
Appearance: liquid **Solvent:** chloroform **Solubility:** chloroform, ethyl ether
Storage: –20°C

See Table III page 90-94 for fatty acid content

1046 **lyso-Lecithin** **50 mg**
lyso-Phosphatidylcholine $C_{24}H_{52}NO_7P$ **CAS#:** 9008-30-4

Source: natural, egg **Mol. Wt.:** 496 (palmitoyl) **Purity:** 98+% by TLC **Appearance:** solid **Solubility:** chloroform/methanol 2:1 **Storage:** –20°C

See Table III page 90-94 for fatty acid content

1047 **Phosphatidylserine** **50 mg/ml, 1 ml**
PS $C_{42}H_{78}NO_{10}P$

Source: natural, bovine **Mol. Wt.:** 788 (oleoyl) **Purity:** 98+% by TLC **Appearance:** liquid **Solvent:** chloroform **Solubility:** chloroform, toluene
Storage: –20°C

See Table III page 90-94 for fatty acid content

1048 **Phosphatidylinositol (Na^+ salt)** **10 mg/ml, 1 ml**
PI $C_{45}H_{78}O_{13}P$ Na **CAS#** 383907-36-6

Source: natural, plant **Mol. Wt.:** 880 (linoleoyl) **Purity:** 98+% by TLC **Appearance:** liquid **Solvent:** chloroform **Solubility:** chloroform, ethyl ether **Storage:** –20°C

See Table III page 90-94 for fatty acid content

1336 **Phosphatidylinositol, plant, soy, (K+ salt)** **50 mg/ml, 1ml**
$C_{43}H_{78}O_{13}P$ K **CAS#** 383907-36-6

Source: natural, plant, soy **Mol. Wt.:** 873 (linoleoyl and pamitoyl) **Purity:** 98+% by TLC **Appearance:** tinted liquid **Solvent:** chloroform **Solubility:** chloroform, ethyl ether **Storage:** –20°C

1053 **Phosphatidic acid (NH_4^+ salt)** **50 mg**
PA $C_{39}H_{72}O_8P$ NH_4

Source: semi-synthetic, egg **Mol. Wt.:** 744 (oleoyl) **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform, ethyl ether **Storage:** –20°C

See Table III page 90-94 for fatty acid content

1045 **Phosphatidylethanolamine** **50 mg/ml, 1 ml**
PE $C_{41}H_{78}NO_8P$ **CAS#:** 39382-08-6

Source: natural, egg **Mol. Wt.:** 744 (oleoyl) **Purity:** 98+% by TLC **Appearance:** liquid **Solvent:** chloroform **Solubility:** chloroform **Storage:** –20°C

See Table III page 90-94 for fatty acid content

1069 **Phosphatidylethanolamine** **50 mg/ml, 1 ml**
PE $C_{41}H_{78}NO_8P$ **CAS#:** 90989-93-8

Source: natural, bovine **Mol. Wt.:** 744 (oleoyl) **Purity:** 98+% by TLC **Appearance:** liquid **Solvent:** chloroform **Solubility:** chloroform **Storage:** –20°C

1301 **Phosphatidylethanolamine** **50 mg/ml, 1 ml**
PE $C_{41}H_{74}NO_3P$ **CAS#:** 90989-93-8

Source: natural, plant **Mol. Wt.:** 740 (linoleoyl) **Purity:** 98+% by TLC **Appearance:** liquid **Solvent:** chloroform **Solubility:** chloroform **Storage:** –20°C

See Table III page 90-94 for fatty acid content

1052 **Phosphoglycerides kit** **1 each**

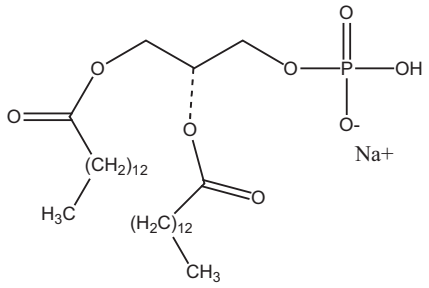
Source: natural, egg, bovine, plant **Purity:** 98+% by TLC **Appearance:** liquid/solid **Solvent:** various **Storage:** –20°C

Individually packed in ampules and vials (Purity 98+%): Phosphatidic acid NH_4^+ salt 10mg; Phosphatidylethanolamine, egg (in 1 ml $CHCl_3$) 10mg; Sphingomyelin, bovine 10mg; Phosphatidylserine, bovine (in 1 ml $CHCl_3$) 10 mg; Lecithin, egg (in 1 ml $CHCl_3$) 10 mg; lyso-Lecithin, egg 10 mg; Cerebrosides, bovine 10mg; Sulfatides, bovine 10mg; Phosphatidylinositol, Na^+salt, plant (in 1 ml $CHCl_3$) 3mg

Synthetic phospholipids

These phospholipids have 98+% chemical purity except where stated and 99% fatty acid chain purity. Store at -20° C. Solubility: see individual entries

Phosphatidic acid derivatives



Catalog number 1428

1428 **1,2-Dimyristoyl-sn-glycero-3-phosphatidic acid** **100 mg**
DMPA $C_{31}H_{60}O_8P•Na$ **CAS#:** 80724-31-8

Source: synthetic **Mol. Wt.:** 615 **Purity:** 98+% by TLC **Appearance:** white solid
Solubility: chloroform/methanol/acetic acid, 4:1:0.1 **Storage:** –20°C

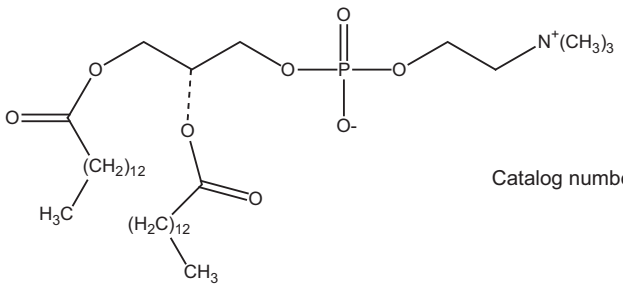
1429 **1,2-Dipalmitoyl-sn-glycero-3-phosphatidic acid** **100 mg**
DPPA $C_{35}H_{68}O_8P•Na$ **CAS#:** 70240-64-1

Source: synthetic **Mol. Wt.:** 671 **Purity:** 98+% by TLC **Appearance:** white solid
Solubility: chloroform/methanol/acetic acid, 4:1:0.1 **Storage:** –20°C

1430 **1,2-Distearoyl-sn-glycero-3-phosphatidic acid** **100 mg**
DSPA $C_{39}H_{76}O_8P•Na$ **CAS#:** 108321-18-2

Source: synthetic **Mol. Wt.:** 727 **Purity:** 98+% by TLC **Appearance:** white solid
Solubility: chloroform/methanol/acetic acid, 4:1:0.1 **Storage:** –20°C

Phosphatidylcholines



Catalog number 1425

1442 **1,2-Dilauroyl-sn-glycero-3-phosphorylcholine** **100 mg**
DLPC $C_{32}H_{64}NO_8P$ **CAS#:** 18194-25-7

Source: synthetic **Mol. Wt.:** 622 **Purity:** 98+% by TLC **Appearance:** white solid
Solubility: methylene chloride, methanol **Storage:** –20°C

1425 **1,2-Dimyristoyl-sn-glycero-3-phosphorylcholine** **100 mg**
DMPC $C_{36}H_{72}NO_8P$ **CAS#:** 18194-24-6

Source: synthetic **Mol. Wt.:** 678 **Purity:** 98+% by TLC **Appearance:** white solid
Melting Point: 130-139°C **Solubility:** methylene chloride, methanol **Storage:** –20°C

1426 **1,2-Dipalmitoyl-sn-glycero-3-phosphorylcholine** **100 mg**
DPPC $C_{40}H_{80}NO_8P$ **CAS#:** 63-89-8

Source: synthetic **Mol. Wt.:** 734 **Purity:** 98+% by TLC **Appearance:** white solid
Solubility: methylene chloride, methanol **Storage:** –20°C

1400 **1,2-Diheptadecanoyl-sn-glycero-3-phosphorylcholine** **50 mg**
DHDPC $C_{42}H_{84}NO_8P$ **CAS#:** 70897-27-7

Source: synthetic **Mol. Wt.:** 762 **Purity:** 98+% by TLC **Appearance:** white solid
Solubility: methylene chloride, methanol **Storage:** –20°C

1427 **1,2-Distearoyl-sn-glycero-3-phosphorylcholine** **100 mg**
DSPC $C_{44}H_{88}NO_8P$ **CAS#:** 816-94-4

Source: synthetic **Mol. Wt.:** 790 **Purity:** 98+% by TLC **Appearance:** white solid
Solubility: methylene chloride, methanol **Storage:** –20°C

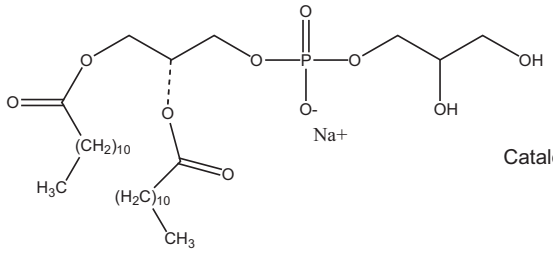
1437 **1-Palmitoyl-2-oleoyl-sn-glycero-3-phosphorylcholine** **100 mg**
POPC $C_{42}H_{84}NO_8P$ **CAS#:** 26853-31-6

Source: synthetic **Mol. Wt.:** 760 **Purity:** 98+% by TLC **Appearance:** white solid
Solubility: methylene chloride, methanol **Storage:** –20°C

1445 **1-Palmitoyl-sn-glycero-3-phosphorylcholine** **100 mg**
lyso-PPC $C_{24}H_{50}NO_7P$ **CAS#:** 17364-16-8

Source: synthetic **Mol. Wt.:** 496 **Purity:** 98+% by TLC **Appearance:** white solid
Solubility: methylene chloride, methanol **Storage:** –20°C

Phosphatidylglycerols



Catalog number 1443

1443 **1,2-Dilauroyl-sn-glycero-3-phosphorylglycerol** **100 mg**
DLPG $C_{30}H_{58}O_{10}P•Na$ **CAS#:** 73548-69-3

Source: synthetic **Mol. Wt.:** 632 **Purity:** 98+% by TLC **Appearance:** white solid
Solubility: chloroform/methanol, 5:1 **Storage:** –20°C

1431 **1,2-Dimyristoyl-sn-glycero-3-phosphorylglycerol** **100 mg**
DMPG $C_{34}H_{66}O_{10}P•Na$ **CAS#:** 67232-80-8

Source: synthetic **Mol. Wt.:** 689 **Purity:** 98+% by TLC **Appearance:** white solid
Melting Point: 120-129°C **Solubility:** chloroform/methanol, 5:1 **Storage:** –20°C

1432 **1,2-Dipalmitoyl-sn-glycero-3-phosphorylglycerol** **100 mg**
DPPG $C_{38}H_{74}O_{10}P•Na$ **CAS#:** 67232-81-9

Source: synthetic **Mol. Wt.:** 745 **Purity:** 98+% by TLC **Appearance:** white solid
Melting Point: 122-127°C **Solubility:** chloroform/methanol, 5:1 **Storage:** –20°C

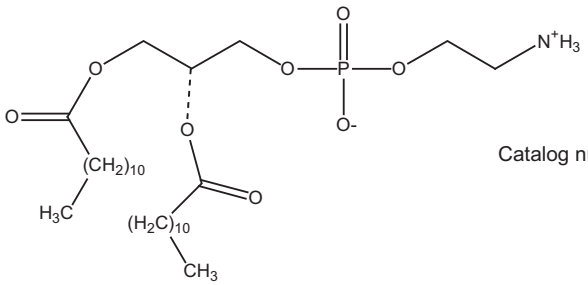
1433 **1,2-Distearoyl-sn-glycero-3-phosphorylglycerol** **100 mg**
DSPG $C_{42}H_{82}O_{10}P•Na$ **CAS#:** 4537-78-4

Source: synthetic **Mol. Wt.:** 801 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform/methanol, 5:1 **Storage:** –20°C

1438 **1-Palmitoyl-2-oleoyl-sn-glycero-3-phosphorylglycerol** **100 mg**
POPG $C_{40}H_{76}O_{10}P•Na$ **CAS#:** 81490-05-3

Source: synthetic **Mol. Wt.:** 771 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform/methanol, 5:1 **Storage:** –20°C

Phosphatidylethanolamines



Catalog number 1444

1444 **1,2-Dilauroyl-sn-glycero-3-phosphorylethanolamine** **100 mg**
DLPE $C_{29}H_{58}NO_8P$ **CAS#:** 59752-57-7

Source: synthetic **Mol. Wt.:** 579 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform + methanol mixture **Storage:** –20°C

1434 **1,2-Dimyristoyl-sn-glycero-3-phosphorylethanolamine** **100 mg**
DMPE $C_{33}H_{66}NO_8P$ **CAS#** 998-07-2

Source: synthetic **Mol. Wt.:** 636 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform/facetic acid 95:5; chloroform/methanol/water/acetic acid 100:30:10:2.5 **Storage:** –20°C

1435 **1,2-Dipalmitoyl-sn-glycero-3-phosphorylethanolamine** **100 mg**
DPPE $C_{37}H_{74}NO_8P$ **CAS#:** 923-61-5

Source: synthetic **Mol. Wt.:** 692 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform/acetic acid 95:5; chloroform/methanol/water/acetic acid 100:30:10:2.5 **Storage:** –20°C

1436 **1,2-Distearoyl-sn-glycero-3-phosphorylethanolamine** **100 mg**
DSPE $C_{41}H_{82}NO_8P$ **CAS#:** 1069-79-0

Source: synthetic **Mol. Wt.:** 748 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform/acetic acid 95:5; chloroform/methanol/water/acetic acid 100:30:10:2.5 **Storage:** –20°C

1439 **1,2-Distearoyl-phosphatidylethanolamine-methyl-polyethyleneglycol conjugate-2000 (Na^+ salt)** **100 mg**
DSPE-MPEG-2000 **CAS#:** 147867-65-0

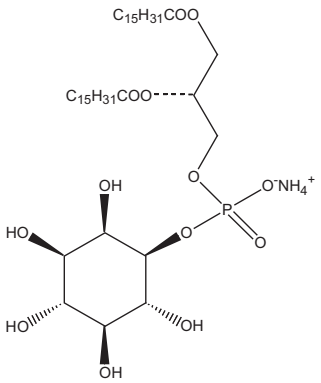
Source: synthetic **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform **Storage:** –20°C

Phosphatidylinositols

The metabolism of inositol lipids is involved in the signal transduction of many hormones, neurotransmitters and growth factors (1,2). In the classical pathway, phosphatidylinositol-specific phospholipase C (PI-PLC) hydrolyzes phosphatidyl 4,5-biphosphate (PIP_2) to yield 1,2-diacylglycerol (DAG) and inositol 1,4,5-triphosphate (IP_3). The role of IP_3 and DAG as second messengers is well recognized.

In a second, more recently discovered pathway, the activation of phosphoinositide (PI) 3-kinase results in the formation of three novel phosphatidyl (PI) lipids phosphorylated at the D3 position of the inositol ring: PI-3-P, PI-3,4-P_2 and PI-3,4,5-P_3 (3). These D3 lipids are not known substrates for any of the phospholipase C enzymes and function as second messengers. PI 3-kinase activity is correlated with many cellular processes, including the regulation of cell growth, oncogenic transformation, chemotaxis and receptor down-regulation among others (4,5,6). The recent paper on the effect of PI3,4-P2 on the *Akt* proto-oncogene product (9) also contains protocols for applying PIP's to cell cultures. Matreya's synthetic phosphatidylinositols and inositol phosphates are excellent tools for investigating these second messengers, understanding the enzyme mechanisms involved in phosphoinositide metabolism (7,8) and for designing therapeutic pharmacological agents. The compounds are evaluated by ^{1}H and ^{31}P NMR to guarantee enantiomeric purity of >98%. **See Literature References on page 96.**

Phosphatidylinositols



Catalog number 1779

1779 **Phosphatidylinositol, dipalmitoyl, (NH_4^+ salt)** **0.5 mg**
1779-1 PI; DPPI (NH_4^+ salt) $C_{41}H_{78}O_{13}P{\bullet}NH_4$ **1 mg**

Source: synthetic **Mol. Wt.:** 828 **Purity:** 98+% by ^{1}H NMR, ^{31}P NMR
Appearance: white solid **Solubility:** chlorofom/methanol/water 5:1:0.1
Storage: –20°C

1773 **Phosphatidylinositol 3-phosphate, dipalmitoyl, (NH_4^+ salt)** **100 µg**
1773-1 DPPI-3-P; PI-3-P dipalmitoyl (NH_4^+ salt) $C_{41}H_{77}O_{16}P_2 \bullet 3NH_4$ **1 mg**
1773-5 **5 mg**

Source: synthetic **Mol. Wt.:** 942 **Purity:** 98+% by ^{1}H NMR, ^{31}P NMR,
Appearance: white solid **Solubility:** chloroform/methanol/water 1:1:0.3
Storage: –20°C

References:
B.A. Fenderson, E.M. Eddy, S.Hakomori, BioEssays **12**, 173, *1990*
R. T. Dobrowsky et al., ibid, **268**, 15523, *1993*
Berridge, M. J., Nature **361**:315, *1993*
Bhamare, N. et al., 1996 *Phosphorus, Sulfur and Silicon* XXX, Overseas Publishers Association, Amsterdam B.V. 109-110:317

1780 **Phosphatidylinositol 3-phosphate, dipalmitoyl, (Na^+ salt)** **100 µg**
1780-1 DPPI-3-P; PI-3-P dipalmitoyl (Na^+ salt) $C_{41}H_{77}O_{16}P_2 \bullet 3Na$ **1 mg**
1780-5 **5 mg**

Source: synthetic **Mol. Wt.:** 957 **Purity:** 98+% by ^{1}H NMR, ^{31}P NMR
Appearance: white solid **Solubility:** water **Storage:** –20°C

1922	**Phosphatidylinositol 4-phosphate, dioctanoyl, (NH_4^+ salt)**	**100 µg**
1922-1	DOPI-4-P; PI-4-P dioctanoyl (NH_4^+ salt) $C_{25}H_{45}O_{16}P_2 \bullet 3NH_4$	**1 mg**
1922-5		**5 mg**

Source: synthetic **Mol. Wt.:** 718 **Purity:** 98+% by ^{1}H NMR, ^{31}P NMR
Appearance: white solid **Solubility:** soluble in water; slightly soluble in methanol; slightly soluble in chloroform/methanol/DI water, 1:1:0.3 **Storage:** –20°C

1919	**Phosphatidylinositol 4-phosphate, dipalmitoyl, (NH_4^+ salt)**	**100 µg**
1919-1	DPPI-4-P; PI-4-P dipalmitoyl (NH_4^+ salt) $C_{41}H_{77}O_{16}P_2 \bullet 3NH_4$	**1 mg**
1919-5		**5 mg**

Source: synthetic **Mol. Wt.:** 942 **Purity:** 98+% by ^{1}H NMR, ^{31}P NMR
Appearance: white solid **Solubility:** methanol, chloroform/methanol/water 1:1:0.3, slightly soluble in water **Storage:** –20°C

1923	**Phosphatidylinositol 5-phosphate, dioctanoyl, (NH_4^+ salt)**	**100 µg**
1923-1	DOPI-5-P; PI-5-P dioctanoyl (NH_4^+ salt) $C_{25}H_{45}O_{16}P_2 \bullet 3NH_4$	**1 mg**
1923-5		**5 mg**

Source: synthetic **Mol. Wt.:** 718 **Purity:** 98+% by ^{1}H NMR, ^{31}P NMR
Appearance: white solid **Solubility:** soluble in water; slightly soluble in methanol; slightly soluble in chloroform/methanol/DI water, 1:1:0.3 **Storage:** –20°C

1920	**Phosphatidylinositol 5-phosphate, dipalmitoyl, (NH_4^+ salt)**	**100 µg**
1920-1	DPPI-5-P; PI-5-P dipalmitoyl (NH_4^+ salt) $C_{41}H_{77}O_{16}P_2 \bullet 3NH_4$	**1 mg**
1920-5		**5 mg**

Source: synthetic **Mol. Wt.:** 942 **Purity:** 98+% by ^{1}H NMR, ^{31}P NMR
Appearance: white solid **Solubility:** methanol, chloroform/methanol/water 1:1:0.3, slightly soluble in water **Storage:** –20°C

1781	**Phosphatidylinositol bis-3,4-phosphate, dipalmitoyl, (NH_4^+ salt)**	**100 µg**
1781-1	DPPI-3,4-P2; PI-3,4-P2 dipalmitoyl (NH_4^+ salt) $C_{41}H_{76}O_{19}P_3 \bullet 5NH_4$	**1 mg**
1781-5	**Source:** synthetic **Mol. Wt.:** 1056 **Purity:** 98+% by ^{1}H NMR, ^{31}P NMR	**5 mg**

Appearance: white solid **Solubility:** chloroform/methanol/water 1:1:0.3
Storage: –20°C

1774	**Phosphatidylinositol bis-3,4-phosphate, dipalmitoyl, (Na^+ salt)**	**100 µg**
1774-1	DPPI-3,4-P2; PI-3,4-P2 dipalmitoyl (Na^+ salt) $C_{41}H_{76}O_{19}P_3 \bullet 5Na$	**1 mg**
1774-5		**5 mg**

Source: synthetic **Mol. Wt.:** 1081 **Purity:** 98+% by ^{1}H NMR, ^{31}P NMR,
Appearance: white solid **Solubility:** water **Storage:** –20°C

References:
Carpenter, C. L. and L.C. Cantley, Curr. Opin. Cell Biol. **8**:153, *1996*
Ireton, K. et al., Science **274**:80, 1996

1784	**Phosphatidylinositol bis-4,5-phosphate, dioctanoyl, (NH_4^+ salt)**	**100 µg**
1784-1	DOPI-4,5-P2; PI-4,5-P2 dioctanoyl (NH_4^+ salt) $C_{25}H_{49}O_{19}P_3 \bullet 5NH_4$	**1 mg**
1784-5		**5 mg**

Source: synthetic **Mol. Wt.:** 831 **Purity:** 98+% by ^{1}H NMR, ^{31}P NMR
Appearance: white solid **Solubility:** chloroform/methanol/water 1:1:0.3
Storage: –20°C

1778	**Phosphatidylinositol bis-4,5-phosphate, dioctanoyl, (Na^+ salt)**	**100 µg**
1778-1	DOPI-4,5-P2; PI-4,5-P2 dioctanoyl (Na^+ salt) $C_{25}H_{44}O_{19}P_3 \bullet 5Na$	**1 mg**
1778-5		**5 mg**

Source: synthetic **Mol. Wt.:** 856 **Purity:** 98+% by ^{1}H NMR, ^{31}P NMR
Appearance: white solid **Solubility:** water **Storage:** –20°C

1777	**Phosphatidylinositol bis-4,5-phosphate, dipalmitoyl, (NH_4^+ salt)**	**100 µg**
1777-1	DPPI-4,5-P2; PI-4,5-P2 dipalmitoyl (NH_4^+ salt) $C_{41}H_{76}O_{19}P_3 \bullet 5NH_4$	**1 mg**
1777-5		**5 mg**

Source: synthetic **Mol. Wt.:** 1056 **Purity:** 98+% by ^{1}H NMR, ^{31}P NMR
Appearance: white solid **Solubility:** chloroform/methanol/water 1:1:0.3
Storage: –20°C

1782 **Phosphatidylinositol bis-4,5-phosphate, dipalmitoyl, (Na^+ salt)** **100 µg**
1782-1 DPPI-4,5-P2; PI-4,5-P2 dipalmitoyl (Na^+ salt) $C_{41}H_{76}O_{19}P_3$•5Na **1 mg**
1782-5 **5 mg**

Source: synthetic **Mol. Wt.:** 1081 **Purity:** 98+% by ^{1}H NMR, ^{31}P NMR
Appearance: white solid **Solubility:** water **Storage:** –20°C

1921 **Phosphatidylinositol tris-3,4,5-phosphate, dioctanoyl, (Na^+ salt)** **100 µg**
1921-1 DOPI-3,4,5-P3; PI-3,4,5-P3 dioctanoyl (Na^+ salt) $C_{25}H_{43}O_{22}P_4$•7Na **1 mg**
1921-5 **5 mg**

Source: synthetic **Mol. Wt.:** 980 **Purity:** 98+% by ^{1}H NMR, ^{31}P NMR
Appearance: white solid **Solubility:** water **Storage:** –20°C

1783 **Phosphatidylinositol tris-3,4,5-phosphate, dipalmitoyl, (NH_4^+ salt)** **100 µg**
1783-1 DPPI-3,4,5-P3; PI-3,4,5-P3 dipalmitoyl (NH_4^+ salt) $C_{41}H_{75}O_{22}P_4$•7NH_4 **1 mg**
1783-5 **5 mg**

Source: synthetic **Mol. Wt.:** 1170 **Purity:** 98+% by ^{1}H NMR, ^{31}P NMR
Appearance: white solid **Solubility:** chloroform/methanol/water 1:1:0.3
Storage: –20°C

1775 **Phosphatidylinositol tris-3,4,5-phosphate, dipalmitoyl, (Na^+ salt)** **100 µg**
1775-1 DPPI-3,4,5-P3; PI-3,4,5-P3, dipalmitoyl (Na^+ salt) $C_{41}H_{75}O_{22}P_4$•7Na **1 mg**
1775-5 **5 mg**

Source: synthetic **Mol. Wt.:** 1205 **Purity:** 98+% by ^{1}H NMR, ^{31}P NMR
Appearance: white solid **Solubility:** water **Storage:** –20°C

References:
Carpenter, C. L. and L.C. Cantley, Curr. Opin. Cell Biol. **8**:153, *1996*
Ireton, K. et al., Science **274**:80, 1996

Bacterial tetraethers

1303 **Main phospholipid (MPL) of *Thermoplasma acidophilum*, (>95% pure)** **5 mg**
Purified MPL of *Thermoplasma acidophilum* (>95% pure) $C_{95}H_{188}O_{16}P$

Source: natural, Archaebacteria **Mol. Wt.:** 1618 **Purity:** >95% by TLC, HPLC
Appearance: yellow solid **Solubility:** chloroform/methanol 2:1, hexane/2-propanol/DI water 30:40:5 **Storage:** 4-8°C

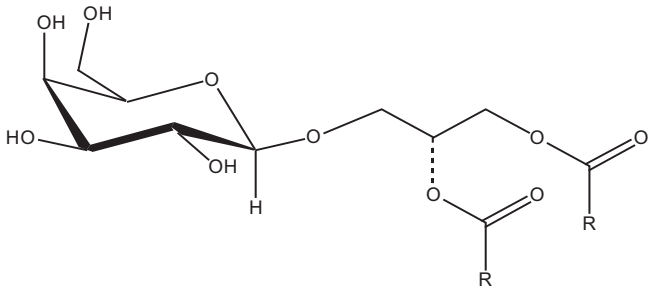
References:
H.-J. Freisleben et al., J. Liposome Res. **3**(3), 817, *1993*
H.-J. Freisleben et al., ibid., **5**(1), 215, *1995*
H.-J. Freisleben et al., Chem. Phys. Lipids **78**, 137, *1995*
H.-J. Freisleben et al., Archives Biochem. Biophys. **294**(2), 418, *1992*

1303-2 **Main phospholipid (MPL) of *Thermoplasma acidophilum*, (>50% pure)** **50 mg**
MPL of *Thermoplasma acidophilum* (>50% pure) $C_{95}H_{188}O_{16}P$

Source: natural, Archaebacteria **Mol. Wt.:** 1618 **Purity:** >50% by TLC
Appearance: brown viscous liquid **Solubility:** chloroform/methanol 2:1, hexane/2-propanol/DI water 30:40:5 **Storage:** 4–8°C highly hygroscopic

References:
H.-J. Freisleben et al., J. Liposome Res. **3**(3), 817, *1993*
H.-J. Freisleben et al., ibid., **5**(1), 215, *1995*
H.-J. Freisleben et al., Chem. Phys. Lipids **78**, 137, *1995*
H.-J. Freisleben et al., Archives Biochem. Biophys. **294**(2), 418, *1992*

Glycosyl glycerides



Catalog number 1058

1058 **Monogalactosyldiglyceride** **10 mg**
MGDG (hydrogenated) $C_{45}H_{86}O_{10}$ **CAS#:** 41670-62-6

Source: natural, plant **Mol. Wt.:** 787 (stearoyl) **Purity:** 98+% by TLC **Appearance:** off white solid **Solubility:** chloroform/methanol/water 4:1:0.1 **Storage:** –20°C

1059 **Digalactosyldiglyceride** **5 mg**
DGDG (hydrogenated) $C_{51}H_{96}O_{15}$ **CAS#:** 92457-02-8

Source: natural, plant **Mol. Wt.:** 949 (stearoyl) **Purity:** 98+% by TLC **Appearance:** off white solid **Solubility:** chloroform/methanol/water 4:1:0.1 **Storage:** –20°C

Fatty acids

Simple fatty acids

Saturated fatty acids and methyl esters

These products are 99% pure by GC. They are stable at room temperature and are supplied neat.

1200 **Methyl hexanoate** **1 g**
Methyl caproate; C6:0 methyl ester $C_7H_{14}O_2$ **CAS#:** 106-70-7

Source: natural, plant **Mol. Wt.:** 130 **Purity:** 99% by TLC, GC **Appearance:** liquid **Solubility:** chloroform, ethanol, ethyl ether **Storage:** room temperature

1196 **Heptanoic acid** **1 g**
C7:0 fatty acid $C_7H_{14}O_2$ **CAS#:** 111-14-8

Source: natural, plant **Mol. Wt.:** 130 **Purity:** 99% by TLC, GC **Appearance:** liquid **Solubility:** chloroform, ethanol, ethyl ether **Storage:** room temperature

1197 **Methyl heptanoate** **1 g**
C7:0 fatty acid methyl ester $C_8H_{16}O_2$ **CAS#:** 106-73-0

Source: natural, plant **Mol. Wt.:** 144 **Purity:** 99% by TLC, GC **Appearance:** liquid **Solubility:** chloroform, ethanol, ethyl ether **Storage:** room temperature

1198 **Octanoic acid** **1 g**
Caprylic acid;C8:0 acid $C_8H_{16}O_2$ **CAS#:** 124-07-2

Source: natural, plant **Mol. Wt.:** 144 **Purity:** 99% by TLC, GC **Appearance:** liquid **Solubility:** chloroform, ethanol, ethyl ether **Storage:** room temperature

1199 **Methyl octanoate** **1 g**
Methyl caprylate; C8:0 methyl ester $C_9H_{18}O_2$ **CAS#:** 111-11-5

Source: natural, plant **Mol. Wt.:** 158 **Purity:** 99% by TLC, GC **Appearance:** liquid
Solubility: chloroform, ethanol, ethyl ether **Storage:** room temperature

1163 **Nonanoic acid** **100 mg**
C9:0 fatty acid; pelargonic acid $C_9H_{18}O_2$ **CAS#:** 112-05-0

Source: synthetic **Mol. Wt.:** 158 **Purity:** 99% by TLC, GC **Appearance:** liquid
Solubility: chloroform, ethanol, ethyl ether **Storage:** room temperature

1164 **Methyl nonanoate** **100 mg**
C9:0 methyl ester $C_{10}H_{20}O_2$ **CAS#:** 1731-84-6

Source: synthetic **Mol. Wt.:** 172 **Purity:** 99% by TLC, GC **Appearance:** liquid
Solubility: chloroform, ethanol, ethyl ether **Storage:** room temperature

1261 **Methyl decanoate** **500 mg**
Methyl caprate; C10:0 methyl ester $C_{11}H_{22}O_2$ **CAS#:** 110-42-9

Source: natural, plant **Mol. Wt.:** 186 **Purity:** 99% by TLC, GC
Appearance: liquid **Solubility:** chloroform, hexane **Storage:** room temperature

1165 **Undecanoic acid** **100 mg**
C11:0 fatty acid $C_{11}H_{22}O_2$ **CAS#:** 112-37-8

Source: synthetic **Mol. Wt.:** 186 **Purity:** 99% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, ethyl ether **Storage:** room temperature

1166 **Methyl undecanoate** **100 mg**
C11:0 methyl ester $C_{12}H_{24}O_2$ **CAS#:** 1731-86-8

Source: synthetic **Mol. Wt.:** 200 **Purity:** 99% by TLC, GC **Appearance:** liquid
Solubility: chloroform, ethanol, ethyl ether **Storage:** room temperature

1008 **Dodecanoic acid** **1 g**
Lauric acid; C12:0 acid $C_{12}H_{24}O_2$ **CAS#:** 143-07-7

Source: natural, plant **Mol. Wt.:** 200 **Purity:** 99% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, ethyl ether **Storage:** room temperature

1009 **Methyl dodecanoate** **1 g**
Methyl laurate; C12:0 methyl ester $C_{13}H_{26}O_2$ **CAS#:** 111-82-0

Source: natural, plant **Mol. Wt.:** 214 **Purity:** 99% by TLC, GC **Appearance:** liquid
Solubility: chloroform, ethanol, ethyl ether **Storage:** room temperature

1161 **Tridecanoic acid** **100 mg**
C13:0 fatty acid $C_{13}H_{26}O_2$ **CAS#:** 638-53-9

Source: synthetic **Mol. Wt.:** 214 **Purity:** 99% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, ethyl ether **Storage:** room temperature

1162 **Methyl tridecanoate** **100 mg**
C13:0 methyl ester $C_{14}H_{28}O_2$ **CAS#:** 1731-88-0

Source: synthetic **Mol. Wt.:** 228 **Purity:** 99% by TLC, GC **Appearance:** liquid
Solubility: chloroform, ethanol, ethyl ether **Storage:** room temperature

1010 **Tetradecanoic acid** **1 g**
Myristic acid; C14:0 acid $C_{14}H_{28}O_2$ **CAS#:** 544-63-8

Source: natural, plant **Mol. Wt.:** 228 **Purity:** 99% by TLC, GC
Appearance: white solid **Solubility:** chloroform, ethanol, ethyl ether **Storage:** room temperature

1011 **Methyl tetradecanoate** **1 g**
Methyl myristate; C14:0 methyl ester $C_{15}H_{30}O_2$ **CAS#:** 124-10-7

Source: natural, plant **Mol. Wt.:** 242 **Purity:** 99% by TLC, GC
Appearance: liquid **Solubility:** chloroform, ethanol, ethyl ether **Storage:** room temperature

1012 **Pentadecanoic acid** **1 g**
C15:0 fatty acid $C_{15}H_{30}O_2$ **CAS#:** 1002-84-2

Source: synthetic **Mol. Wt.:** 242 **Purity:** 99% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, ethyl ether **Storage:** room temperature

1013 **Methyl pentadecanoate** **1 g**
C15:0 methyl ester $C_{16}H_{32}O_2$ **CAS#:** 7132-64-1

Source: synthetic **Mol. Wt.:** 256 **Purity:** 99% by TLC, GC **Appearance:** liquid **Solubility:** chloroform, ethanol, ethyl ether **Storage:** room temperature

1014 **Hexadecanoic acid** **1 g**
Palmitic acid; C16:0 fatty acid $C_{16}H_{32}O_2$ **CAS#:** 57-10-3

Source: natural, plant **Mol. Wt.:** 256 **Purity:** 99% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, ethyl ether **Storage:** room temperature

1015 **Methyl hexadecanoate** **1 g**
Methyl palmitate; C16:0 methyl ester $C_{17}H_{34}O_2$ **CAS#:** 112-39-0

Source: natural, plant **Mol. Wt.:** 270 **Purity:** 99% by TLC, GC
Appearance: white solid **Solubility:** chloroform, ethanol, ethyl ether **Storage:** room temperature

1018 **Heptadecanoic acid** **1 g**
Margaric acid; C17:0 fatty acid $C_{17}H_{34}O_2$ **CAS#:** 506-12-7

Source: synthetic **Mol. Wt.:** 270 **Purity:** 99% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, ethyl ether **Storage:** room temperature

1019 **Methyl heptadecanoate** **1 g**
Methyl margarate; C17:0 methyl ester $C_{18}H_{36}O_2$ **CAS#:** 1731-92-6

Source: synthetic **Mol. Wt.:** 284 **Purity:** 99% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, ethyl ether **Storage:** room temperature

1020 **Octadecanoic acid** **1 g**
Stearic acid; C18:0 fatty acid $C_{18}H_{36}O_2$ **CAS#:** 57-11-4

Source: natural, plant **Mol. Wt.:** 284 **Purity:** 99% by TLC, GC
Appearance: white solid **Solubility:** chloroform, ethanol, ethyl ether **Storage:** room temperature

1021 **Methyl octadecanoate** **1 g**
Methyl stearate; C18:0 methyl ester $C_{19}H_{38}O_2$ **CAS#:** 112-61-8

Source: natural, plant **Mol. Wt.:** 298 **Purity:** 99% by TLC, GC
Appearance: white solid **Solubility:** chloroform, ethanol, ethyl ether **Storage:** room temperature

1028 **Nonadecanoic acid** **100 mg**
C19:0 fatty acid $C_{19}H_{38}O_2$ **CAS#:** 646-30-0

Source: synthetic **Mol. Wt.:** 298 **Purity:** 99% by TLC, GC
Appearance: white solid **Solubility:** chloroform, ethyl ether **Storage:** room temperature

1029 **Methyl nonadecanoate** **100 mg**
C19:0 methyl ester $C_{20}H_{40}O_2$ **CAS#:** 1731-94-8

Source: synthetic **Mol. Wt.:** 312 **Purity:** 99% by TLC, GC
Appearance: white solid **Solubility:** chloroform, ethyl ether **Storage:** room temperature

1030 **Eicosanoic acid** **500 mg**
Arachidic acid; C20:0 fatty acid $C_{20}H_{40}O_2$ **CAS#:** 506-30-9

Source: natural, plant **Mol. Wt.:** 312 **Purity:** 99% by TLC, GC
Appearance: white solid **Solubility:** chloroform, ethyl ether **Storage:** room temperature

1031 **Methyl eicosanoate** **500 mg**
Methyl arachidate; C20:0 methyl ester $C_{21}H_{42}O_2$ **CAS#:** 1120-28-1

Source: natural, plant **Mol. Wt.:** 326 **Purity:** 99% by TLC, GC
Appearance: white solid **Solubility:** chloroform, ethyl ether **Storage:** room temperature

1241 **Heneicosanoic acid** **100 mg**
C21:0 fatty acid $C_{21}H_{42}O_2$ **CAS#:** 2363-71-5

Source: synthetic **Mol. Wt.:** 326 **Purity:** 99% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethyl ether **Storage:** room temperature

1242 **Methyl heneicosanoate** **100 mg**
C21:0 methyl ester $C_{22}H_{44}O_2$ **CAS#:** 6064-90-0

Source: synthetic **Mol. Wt.:** 341 **Purity:** 99% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethyl ether **Storage:** room temperature

1035 **Docosanoic acid** **500 mg**
Behenic acid; C22:0 fatty acid $C_{22}H_{44}O_2$ **CAS#:** 112-85-6

Source: natural, plant **Mol. Wt.:** 341 **Purity:** 99% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethyl ether **Storage:** room temperature

1036 **Methyl docosanoate** **500 mg**
Methyl behenate; C22:0 methyl ester $C_{23}H_{46}O_2$ **CAS#:** 929-77-1

Source: natural, plant **Mol. Wt.:** 354 **Purity:** 99% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethyl ether **Storage:** room temperature

1186 **Tricosanoic acid** **100 mg**
C23:0 fatty acid $C_{23}H_{46}O_2$ **CAS#:** 2433-96-7

Source: synthetic **Mol. Wt.:** 355 **Purity:** 99% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethyl ether **Storage:** room temperature

1187 **Methyl tricosanoate** **100 mg**
C23:0 methyl ester $C_{24}H_{48}O_2$ **CAS#:** 2433-97-8

Source: synthetic **Mol. Wt.:** 368 **Purity:** 99% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethyl ether **Storage:** room temperature

1037 **Tetracosanoic acid** **100 mg**
Lignoceric acid; C24:0 fatty acid $C_{24}H_{48}O_2$ **CAS#:** 557-59-5

Source: synthetic **Mol. Wt.:** 369 **Purity:** 99% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethyl ether **Storage:** room temperature

1038 **Methyl tetracosanoate** **100 mg**
Methyl lignocerate; C24:0 methyl ester $C_{25}H_{50}O_2$ **CAS#:** 2442-49-1

Source: synthetic **Mol. Wt.:** 382 **Purity:** 99% by GC **Appearance:** white solid **Solubility:** chloroform, ethyl ether **Storage:** room temperature

1251 **Hexacosanoic acid** **25 mg**
Cerotic acid; C26:0 acid $C_{26}H_{52}O_2$ **CAS#:** 506-46-7

Source: synthetic **Mol. Wt.:** 370 **Purity:** 99% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethyl ether **Storage:** room temperature

1252 **Methyl hexacosanoate** **25 mg**
Methyl cerotate; C26:0 methyl ester $C_{27}H_{54}O_2$ **CAS#:** 5802-85-4

Source: synthetic **Mol. Wt.:** 411 **Purity:** 99% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethyl ether **Storage:** room temperature

Unsaturated fatty acids and methyl esters

Unsaturated fatty acids are easily oxidized. Flush open containers with argon or nitrogen and store at -20°C, in dark.

1157 **Myristoleic acid** **100 mg**
C14:1 (cis-9) fatty acid $C_{14}H_{26}O_2$ **CAS#:** 544-64-9

Source: natural, plant **Mol. Wt.:** 226 **Purity:** 99% by TLC, GC
Appearance: liquid **Solubility:** chloroform, hexane, ethyl ether **Storage:** –20°C

1040 **Methyl myristoleate** **100 mg**
C14:1 (cis-9) methyl ester $C_{15}H_{28}O_2$ **CAS#:** 56219-06-8

Source: natural, plant **Mol. Wt.:** 240 **Purity:** 99% by TLC, GC
Appearance: liquid **Solubility:** chloroform, hexane, ethyl ether **Storage:** –20°C

1243 **cis-6-Hexadecenoic acid** **25 mg**
Sapienic acid $C_{16}H_{30}O_2$

Source: synthetic **Mol. Wt.:** 254 **Purity:** 99% by TLC, GC
Appearance: liquid **Solubility:** ethanol, methanol, chloroform, ethyl ether
Storage: –20°C

1016 **Palmitoleic acid** **100 mg**
C16:1 (cis-9) fatty acid $C_{16}H_{30}O_2$ **CAS#:** 373-49-9

Source: natural, plant **Mol. Wt.:** 254 **Purity:** 99% by TLC, GC
Appearance: liquid **Solubility:** chloroform, hexane, ethyl ether **Storage:** –20°C

1017 **Methyl palmitoleate** **100 mg**
C16:1 (cis-9) methyl ester $C_{17}H_{32}O_2$ **CAS#:** 1120-25-8

Source: natural, plant **Mol. Wt.:** 268 **Purity:** 99% by TLC, GC
Appearance: liquid **Solubility:** chloroform, hexane, ethyl ether **Storage:** –20°C

1147 **Palmitelaidic acid** **100 mg**
C16:1 (trans-9) acid $C_{16}H_{30}O_2$ **CAS#:** 10030-73-6

Source: synthetic **Mol. Wt.:** 254 **Purity:** 99% by TLC, GC **Appearance:** liquid
Solubility: chloroform, hexane, ethyl ether **Storage:** –20°C

1148 **Methyl palmitelaidate** **100 mg**
C16:1 (trans-9) methyl ester $C_{17}H_{32}O_2$ **CAS#:** 10030-74-7

Source: synthetic **Mol. Wt.:** 268 **Purity:** 99% by TLC, GC **Appearance:** liquid
Solubility: chloroform, hexane, ethyl ether **Storage:** –20°C

1208 **11-Hexadecenoic acid, (92% cis, 8% trans)** **50 mg**
C16:1 (cis-11) acid $C_{16}H_{30}O_2$

Source: synthetic **Mol. Wt.:** 254 **Purity:** >98%, by TLC **Appearance:** liquid
Solubility: chloroform, ethanol, hexane, methanol **Storage:** –20°C

92% cis, 8% trans by GC

1204 **Heptadecenoic acid** **100 mg**
C17:1 (cis-10) acid $C_{17}H_{32}O_2$ **CAS#:** 29743-97-3

Source: synthetic **Mol. Wt.:** 268 **Purity:** 99% by TLC, GC **Appearance:** liquid
Solubility: chloroform, hexane, ethyl ether **Storage:** –20°C

1203 **Methyl heptadecenoate** **100 mg**
C17:1 (cis-10) methyl ester $C_{18}H_{34}O_2$ **CAS#:** 75190-82-8

Source: synthetic **Mol. Wt.:** 282 **Purity:** 99% by TLC, GC **Appearance:** liquid
Solubility: chloroform, hexane, ethyl ether **Storage:** –20°C

1022 **Oleic acid** **1 g**
C18:1 (cis-9) acid $C_{18}H_{34}O_2$ **CAS#:** 112-80-1

Source: natural, plant **Mol. Wt.:** 282 **Purity:** 99% by TLC, GC
Appearance: liquid **Solubility:** chloroform, hexane, ethyl ether **Storage:** –20°C

1023 **Methyl oleate** **1 g**
C18:1 (cis-9) methyl ester $C_{19}H_{36}O_2$ **CAS#:** 112-62-9

Source: natural, plant **Mol. Wt.:** 296 **Purity:** 99% by TLC, GC
Appearance: liquid **Solubility:** chloroform, hexane, ethyl ether **Storage:** –20°C

1149 **Elaidic acid** **1 g**
C18:1 (trans-9) acid $C_{18}H_{34}O_2$ **CAS#:** 112-79-8

Source: synthetic **Mol. Wt.:** 282 **Purity:** 99% by TLC, GC **Appearance:** liquid
Solubility: chloroform, hexane, ethyl ether **Storage:** –20°C

1150 **Methyl elaidate** **1 g**
C18:1 (trans-9) methyl ester $C_{19}H_{36}O_2$ **CAS#:** 1937-62-8

Source: natural, plant **Mol. Wt.:** 296 **Purity:** 99% by TLC, GC **Appearance:** liquid
Solubility: chloroform, hexane, ethyl ether **Storage:** –20°C

1262 **trans 11-Octadecenoic acid** **100 mg**
C18:1 (trans-11) acid, trans vaccenic acid $C_{18}H_{34}O_2$ **CAS#:** 693-72-1

Source: synthetic **Mol. Wt.:** 282 **Purity:** 99% by TLC, GC **Appearance:** solid
Solubility: chloroform, hexane, ethyl ether **Storage:** –20°C

1263 **Methyl trans 11-octadecenoate** **100 mg**
Methyl trans vaccenate; C18:1 (trans-11) methyl ester $C_{19}H_{36}O_2$
CAS#: 6198-58-9

Source: synthetic **Mol. Wt.:** 296 **Purity:** 99% by TLC, GC **Appearance:** clear liquid **Solubility:** chloroform, hexane, ethyl ether **Storage:** –20°C

1024 **Linoleic acid** **1 g**
C18:2 (cis,cis-9,12) acid $C_{18}H_{32}O_2$ **CAS#:** 60-33-3

Source: natural, plant **Mol. Wt.:** 280 **Purity:** 99% by TLC, GC **Appearance:** clear liquid **Solubility:** ethyl ether, ethanol, hexane **Storage:** –20°C

1025 **Methyl linoleate** **1 g**
C18:2 (cis,cis-9,12) methyl ester $C_{19}H_{34}O_2$ **CAS#:** 112-63-0

Source: natural, plant **Mol. Wt.:** 294 **Purity:** 99% by TLC, GC **Appearance:** liquid **Solubility:** chloroform, hexane, ethyl ether **Storage:** –20°C

1151 **Linoelaidic acid** **100 mg**
C18:2 (trans, trans-9, 12) acid $C_{18}H_{32}O_2$ **CAS#:** 506-21-8

Source: natural, plant **Mol. Wt.:** 280 **Purity:** 99% by TLC, GC **Appearance:** liquid **Solubility:** chloroform, hexane, ethyl ether **Storage:** –20°C

1152 **Methyl linoelaidate** **100 mg**
C18:2 (trans, trans-9,12) methyl ester $C_{19}H_{34}O_2$ **CAS#:** 2566-97-4

Source: natural, plant **Mol. Wt.:** 294 **Purity:** 99% by TLC, GC **Appearance:** liquid **Solubility:** chloroform, hexane, ethyl ether **Storage:** –20°C

1266 **cis-11-Octadecenoic acid** **100 mg**
cis-vaccenic acid; C18:1(cis-11) acid $C_{18}H_{34}O_2$ **CAS#:** 506-17-2

Source: natural, plant **Mol. Wt.:** 282 **Purity:** 99% by TLC, GC **Appearance:** liquid **Solubility:** chloroform, hexane, ethyl ether **Storage:** –20°C

1267 **Methyl cis-11-octadecenoate** **100 mg**
Methyl cis-vaccenate; C18:1(cis-11) methyl ester $C_{19}H_{36}O_2$
CAS#: 1937-63-9

Source: semi-synthetic, plant **Mol. Wt.:** 296 **Purity:** 99% by TLC, GC **Appearance:** liquid **Solubility:** chloroform, hexane, ethyl ether **Storage:** –20°C

1026 **Linolenic acid** **500 mg**
C18:3 (all cis-9,12,15) acid $C_{18}H_{30}O_2$ **CAS#:** 463-40-1

Source: natural, plant **Mol. Wt.:** 278 **Purity:** 99% by TLC, GC **Appearance:** liquid **Solubility:** chloroform, hexane, ethyl ether **Storage:** –20°C

1027 **Methyl linolenate** **500 mg**
C18:3 (all cis-9,12,15) methyl ester $C_{19}H_{32}O_2$ **CAS#:** 301-00-8

Source: natural, plant **Mol. Wt.:** 292 **Purity:** 99% by TLC, GC **Appearance:** liquid **Solubility:** chloroform, hexane, ethyl ether **Storage:** –20°C

1153 **gamma-Linolenic acid** **100 mg**
C18:3 (all cis-6,9,12) acid $C_{18}H_{30}O_2$ **CAS#:** 506-26-3

Source: natural, plant **Mol. Wt.:** 278 **Purity:** 99% by TLC, GC **Appearance:** liquid **Solubility:** chloroform, hexane, ethyl ether **Storage:** –20°C

1154 **Methyl gamma-linolenate** **100 mg**
C18:3 (all cis-6,9,12) methyl ester $C_{19}H_{32}O_2$ **CAS#:** 16326-32-2

Source: natural, plant **Mol. Wt.:** 292 **Purity:** 99% by TLC, GC **Appearance:** liquid **Solubility:** chloroform, hexane, ethyl ether **Storage:** –20°C

1205 **Nonadecenoic acid** **100 mg**
C19:1 (cis-10) acid $C_{19}H_{32}O_2$ **CAS#:** 73033-09-7

Source: synthetic **Mol. Wt.:** 296 **Purity:** 99% by TLC, GC **Appearance:** liquid
Solubility: chloroform, hexane, ethyl ether **Storage:** –20°C

1206 **Methyl nonadecenoate** **100 mg**
C19:1 (cis-10) methyl ester $C_{20}H_{34}O_2$ **CAS#:** 19788-74-0

Source: synthetic **Mol. Wt.:** 310 **Purity:** 99% by TLC, GC **Appearance:** liquid
Solubility: chloroform, hexane, ethyl ether **Storage:** –20°C

1032 **Eicosenoic acid** **100 mg**
C20:1 (cis-11) acid $C_{20}H_{38}O_2$ **CAS#:** 5561-99-9

Source: natural, plant **Mol. Wt.:** 310 **Purity:** 99% by TLC, GC
Appearance: liquid **Solubility:** chloroform, hexane, ethyl ether **Storage:** –20°C

1033 **Methyl eicosenoate** **100 mg**
C20:1 (cis-11) methyl ester $C_{21}H_{40}O_2$ **CAS#:** 2390-09-2

Source: natural, plant **Mol. Wt.:** 324 **Purity:** 99% by TLC, GC
Appearance: liquid **Solubility:** chloroform, hexane, ethyl ether **Storage:** –20°C

1192 **Eicosadienoic acid** **100 mg**
C20:2 (cis, cis-11, 14) acid $C_{20}H_{36}O_2$ **CAS#:** 2091-39-6

Source: synthetic **Mol. Wt.:** 322 **Purity:** 99% by TLC, GC **Appearance:** liquid
Solubility: chloroform, hexane, ethyl ether **Storage:** –20°C

1193 **Methyl eicosadienoate** **100 mg**
C20:2 (cis, cis-11, 14) methyl ester $C_{21}H_{38}O_2$ **CAS#:** 2463-02-7

Source: synthetic **Mol. Wt.:** 322 **Purity:** 99% by TLC, GC **Appearance:** liquid
Solubility: chloroform, hexane, ethyl ether **Storage:** –20°C

1179 **Methyl 5,8,11-eicosatrienoate** **1 mg/ml, 1 ml**
C20:3 (all cis-5,8,11) methyl ester, mead acid methyl ester $C_{21}H_{36}O_2$
CAS#: 14602-39-2

Source: natural, plant **Mol. Wt.:** 320 **Purity:** 90% by TLC, GC **Appearance:** liquid
Solvent: hexane **Solubility:** chloroform, hexane, ethyl ether **Storage:** –20°C

1269 **Methyl homogamma linolenate, C20:3n6** **50 mg**
Methyl 8,11,14-eicosatrienoate $C_{21}H_{36}O_2$

Source: semi-synthetic, plant **Mol. Wt.:** 320 **Purity:** 99% by TLC, GC
Appearance: liquid **Solubility:** hexane, ethyl ether, chloroform **Storage:** –20°C

1042 **Arachidonic acid** **100 mg**
C20:4 (all cis-5,8,11,14) acid $C_{20}H_{32}O_2$ **CAS#:** 506-32-1

Source: natural, plant **Mol. Wt.:** 304 **Purity:** 99% by TLC, GC **Appearance:** liquid
Solubility: ethyl ether, hexane, methylene chloride **Storage:** –20°C
Dry Ice Charge Applies

1034 **Methyl arachidonate** **100 mg**
C20:4 (all cis-5,8,11,14) methyl ester $C_{21}H_{34}O_2$ **CAS#:** 2566-89-4

Source: natural, plant **Mol. Wt.:** 318 **Purity:** 99% by TLC, GC
Appearance: liquid **Solubility:** chloroform, hexane, ethyl ether **Storage:** –20°C
Dry Ice Charge Applies

1167 **Eicosapentaenoic acid** **25 mg**
EPA ; omega-3 fatty acid; C20:5 (all cis-5,8,11,14,17) acid $C_{20}H_{30}O_2$
CAS#: 10417-94-4

Source: natural, fish oil **Mol. Wt.:** 302 **Purity:** 99% by TLC, GC
Appearance: liquid **Solubility:** chloroform, hexane, ethyl ether, ethanol, DMSO, DMF
Storage: –20°C **Dry Ice Charge Applies**

Anti-hyperlipoproteinenic agent; 5-LOX inhibitor

1194 **Methyl eicosapentaenoate** **25 mg**
Methyl ester of omega-3 fatty acid; C20:5 (all cis-5,8,11,14,17) methyl ester
$C_{21}H_{32}O_2$ **CAS#:** 2734-47-6

Source: natural, fish oil **Mol. Wt.:** 316 **Purity:** 99% by TLC, GC **Appearance:** clear liquid **Solubility:** chloroform, ethyl ether, hexane **Storage:** –20°C
Dry Ice Charge Applies

1264 **Docosenoic acid** **100 mg**
C22:1 (cis-13), erucic acid $C_{22}H_{42}O_2$ **CAS#:** 112-86-7

Source: natural, plant **Mol. Wt.:** 339 **Purity:** >99% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethyl ether, hexane **Storage:** –20°C

1265 **Methyl docosenoate** **100 mg**
C22:1 (cis-13) methyl ester; methyl erucate $C_{23}H_{44}O_2$ **CAS#:** 1120-34-9

Source: plant **Mol. Wt.:** 352 **Purity:** >99% by TLC, GC **Appearance:** white solid
Solubility: chloroform, ethyl ether, hexane **Storage:** –20°C

1175 **Docosapentaenoic acid** **25 mg**
C22:5 (all cis-7,10,13,16,19) acid $C_{22}H_{34}O_2$ **CAS#:** 24880-45-3

Source: semi-synthetic **Mol. Wt.:** 330 **Purity:** 98+% by TLC, GC **Appearance:** liquid **Solubility:** chloroform, ethyl ether, hexane **Storage:** –20°C
Dry Ice Charge Applies

1244 **Methyl docosapentaenoate** **25 mg**
C22:5 (all cis-7,10,13,16,19) methyl ester $C_{23}H_{36}O_2$ **CAS#:** 108698-02-8

Source: semi-synthetic **Mol. Wt.:** 344 **Purity:** 98+% by TLC, GC **Appearance:** liquid **Solubility:** ethyl ether, ethanol, hexane, **Storage:** –20°C
Dry Ice Charge Applies

1136 **Docosahexaenoic acid** **100 mg**
DHA; C22:6, (all cis-4,7,10,13,16,19) omega-3 fatty acid $C_{22}H_{32}O_2$ **CAS#:** 6217-54-5

Source: natural, plant **Mol. Wt.:** 328 **Purity:** 99% by TLC, GC **Appearance:** liquid
Solubility: ethyl ether, hexane, methylene chloride, ethanol, DMSO, DMF
Storage: –20°C **Dry Ice Charge Applies**

1041 **Methyl docosahexaenoate** **100 mg**
C22:6 (all cis-4,7,10,13,16,19) methyl ester; methyl ester of omega-3 fatty acid
$C_{23}H_{34}O_2$ **CAS#:** 2566-90-7

Source: natural, plant **Mol. Wt.:** 342 **Purity:** 99% by TLC, GC **Appearance:** liquid
Solubility: chloroform, hexane, ethyl ether **Storage:** –20°C **Dry Ice Charge Applies**

1155 **Nervonic acid** **100 mg**
C24:1 (cis-15) acid $C_{24}H_{46}O_2$ **CAS#:** 506-37-6

Source: synthetic **Mol. Wt.:** 367 **Purity:** 99% by TLC, GC **Appearance:** liquid
Solubility: chloroform, hexane, ethyl ether **Storage:** –20°C

1156 **Methyl nervonate** **100 mg**
C24:1 (cis-15) methyl ester $C_{25}H_{48}O_2$ **CAS#:** 2733-88-2

Source: synthetic **Mol. Wt.:** 381 **Purity:** 99% by TLC, GC **Appearance:** liquid
Solubility: chloroform, hexane, ethyl ether **Storage:** –20°C

Trans fatty acids and methyl esters

1147 **Palmitelaidic acid** **100 mg**
C16:1 (trans-9) acid $C_{16}H_{30}O_2$ **CAS#:** 10030-73-6

Source: synthetic **Mol. Wt.:** 254 **Purity:** 99% by TLC, GC **Appearance:** liquid
Solubility: chloroform, hexane, ethyl ether **Storage:** –20°C

1148 **Methyl palmitelaidate** **100 mg**
C16:1 (trans-9) methyl ester $C_{17}H_{32}O_2$ **CAS#:** 10030-74-7

Source: synthetic **Mol. Wt.:** 268 **Purity:** 99% by TLC, GC **Appearance:** liquid
Solubility: chloroform, hexane, ethyl ether **Storage:** –20°C

1149 **Elaidic acid** **1 g**
C18:1 (trans-9) acid $C_{18}H_{34}O_2$ **CAS#:** 112-79-8

Source: synthetic **Mol. Wt.:** 282 **Purity:** 99% by TLC, GC **Appearance:** liquid
Solubility: chloroform, hexane, ethyl ether **Storage:** –20°C

1150 **Methyl elaidate** **1 g**
C18:1 (trans-9) methyl ester $C_{19}H_{36}O_2$ **CAS#:** 1937-62-8

Source: natural, plant **Mol. Wt.:** 296 **Purity:** 99% by TLC, GC **Appearance:** liquid
Solubility: chloroform, hexane, ethyl ether **Storage:** –20°C

1262 **trans 11-Octadecenoic acid** **100 mg**
C18:1 (trans-11) acid; trans vaccenic acid $C_{18}H_{34}O_2$ **CAS#:** 693-72-1

Source: synthetic **Mol. Wt.:** 282 **Purity:** 99% by TLC, GC **Appearance:** solid
Solubility: chloroform, hexane, ethyl ether **Storage:** –20°C

1263 **Methyl trans 11-octadecenoate** **100 mg**
Methyl trans vaccenate; C18:1 (trans-11) methyl ester $C_{19}H_{36}O_2$
CAS#: 6198-58-9

Source: synthetic **Mol. Wt.:** 296 **Purity:** 99% by TLC, GC **Appearance:** clear liquid **Solubility:** chloroform, hexane, ethyl ether **Storage:** –20°C

1151 **Linoelaidic acid** **100 mg**
C18:2 (trans, trans-9, 12) acid $C_{18}H_{32}O_2$ **CAS#:** 506-21-8

Source: natural, plant **Mol. Wt.:** 280 **Purity:** 99% by TLC, GC
Appearance: liquid **Solubility:** chloroform, hexane, ethyl ether **Storage:** –20°C

1152 **Methyl linoelaidate** **100 mg**
C18:2 (trans, trans-9,12) methyl ester $C_{19}H_{34}O_2$ **CAS#:** 2566-97-4

Source: natural, plant **Mol. Wt.:** 294 **Purity:** 99% by TLC, GC
Appearance: liquid **Solubility:** chloroform, hexane, ethyl ether **Storage:** –20°C

1131 **Cis-trans isomer standard** **5 mg/ml, 5 ml**
Qualitative mix

Source: margarine **Appearance:** liquid **Solvent:** 5ml methylene chloride
Solubility: methylene chloride **Storage:** –20°C

Analysis of positional cis-trans fatty acid isomers is ever more important in light of the new food industry rules. These isomers can be resolved on Supelco SP-2560 or an equivalent capillary GC column. Use this specially formulated mix to ensure proper operation of your column for this tricky separation. Mix consists of cis-trans fatty acid isomers as methyl esters in methylene chloride.

This is a qualitative standard containing in order of elution: C16:0, C18:0, C18:1 trans isomers (4 peaks), C18:1 cis & trans isomers (2 peaks), C18:1 cis isomers (4 peaks), C18:2, C20:0, C20:1 and C18:3 (same peak), C22:0

1181 **9(E),11(E)-Octadecadienoic acid** **25 mg**
9-trans, 11-trans CLA $C_{18}H_{32}O_2$ **CAS#:** 544-71-8

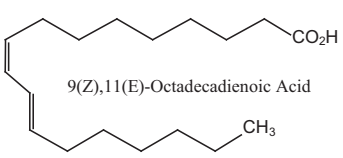
Source: synthetic **Mol. Wt.:** 280 **Melting Point (°C):** 55-57 **Purity:** 98+% by TLC, GC **Appearance:** off-white solid **Solubility:** chloroform, ethanol, hexane, methanol
Storage: –20°C

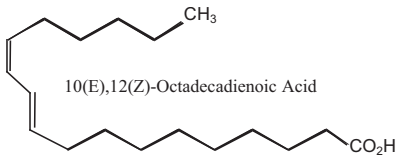
Conjugated linoleic acid isomers (CLA)

Linoleic acid is an essential fatty acid (18:2 ω6) of which several naturally occurring conjugated derivatives have been identified. These derivatives, called "conjugated linoleic acid" or CLA can have the two double bonds mainly in the 9 and 11 or in the 10 and 12 positions, resulting in eight possible geometric isomers. CLA occurs in meat (24) and dairy products (25,35). In both cases, the 9(Z),11(E)-isomer is predominant and is thought to be the biologically active form. CLA assimilated through the diet of animals is found in the intestinal musosa, liver and adipose tissue (26). See also review article by Parodi (35). CLA has several biological properties. It's anti-carcinogenic activity has been demonstrated by its ability to inhibit chemically induced tumor formation in animal models of carcinogenesis (24,27,28,29). The addition of CLA to culture medium suppresses the *in vitro* growth of human melanoma, colorectal and breast cancer cells (30). CLA also exhibits anti-atherogenic activity. Addition of CLA to a controlled atherogenic diet significantly reduced the development of atherosclerosis in hamsters and rabbits (31,32). Animals fed a diet containing CLA also had lower levels of low-density-lipoprotein (LDL) cholesterol. CLA may be involved in regulating fat and protein metabolism (33,34). Several species of animals fed CLA-supplemented diets showed improved feed efficiency. Lean body mass increased while body fat was reduced. This seems to be due, mainly or exclusively, to the 10(E),12(Z)-isomer (catalog # 1249, see below). CLA competes with linoleate for Δ6 desaturase (36). Dietary CLA normalizes impaired glucose tolerance in the Zucker diabetic fatty *fa/fa* rat (40) *via* activation of PPAR γ, a result which bears on the possible ameliorization or prevention of NIDDM. The 11(Z),13(E)-isomer (catalog # 1259) has been shown to be concentrated in the heart and in mitochondria. **See Literature References on page 96.**

CLA Research is Being Redone With Our Highly Pure Isomers

Most studies to date have utilized a mixture of CLA isomers containing less than 30% of the presumed active 9(Z),11(E)-isomer (37,38). In addition to the 9,11- and 10,12-isomers, 8,10- and 11,13-isomers have recently been identified in the widely used mixture (38,39). Matreya offers a highly pure CLA which is 98+% the active 9,11-"cis, trans" isomer. The corresponding "trans,trans" and "cis,cis" isomers are also available. In addition, we now offer the pure 10(E),12(Z)-isomer, which has been widely sought for comparison studies.
See Literature References on page 96.





1245 **9(Z),11(E)-Octadecadienoic acid** **25 mg**
1245-1 9-cis, 11-trans CLA $C_{18}H_{32}O_2$ **CAS#:** 2540-56-9 **1 g**
1245-10 **10 g**
Source: synthetic **Mol. Wt.:** 280 **Purity:** 98+% by TLC, GC **Appearance:** tinted oil
Solubility: chloroform, ethanol, hexane, methanol, DMSO **Storage:** –20°C

1255 **Methyl 9(Z), 11(E)-octadecadienoate** **25 mg**
Methyl ester of CLA (9-cis, 11-trans) $C_{19}H_{34}O_2$
Source: synthetic **Mol. Wt.:** 294 **Purity:** 98+% by TLC, GC **Appearance:** tinted oil
Solubility: chloroform, ethanol, hexane, methanol **Storage:** –20°C

1181 **9(E),11(E)-Octadecadienoic acid** **25 mg**
9-trans, 11-trans CLA $C_{18}H_{32}O_2$ **CAS#:** 544-71-8
Source: synthetic **Mol. Wt.:** 280 **Melting Point (°C):** 55-57 **Purity:** 98+% by TLC, GC **Appearance:** off-white solid **Solubility:** chloroform, ethanol, hexane, methanol **Storage:** –20°C

1257 **Methyl 9(E),11(E)-octadecadienoate** **25 mg**
Methyl ester of CLA (9-trans, 11-trans) $C_{19}H_{34}O_2$
Source: synthetic **Mol. Wt.:** 294 **Purity:** 98+% by TLC, GC **Appearance:** tinted oil
Solubility: chloroform, ethanol, hexane, methanol **Storage:** –20°C

1248	**9(Z),11(Z)-Octadecadienoic acid**	**25 mg**
1248-1	9-cis, 11-cis CLA $C_{18}H_{32}O_2$ **CAS#:** 544-40-7	**1 g**

Source: synthetic **Mol. Wt.:** 280 **Melting Point (°C):** 40-42 **Purity:** 96+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol, ethyl ether **Storage:** –20°C

1256	**Methyl 9(Z), 11(Z)-octadecadienoate**	**25 mg**
	Methyl ester of CLA (9-cis, 11-cis) $C_{19}H_{34}O_2$	

Source: synthetic **Mol. Wt.:** 294 **Purity:** 96+% by TLC, GC **Appearance:** tinted oil **Solubility:** chloroform, ethanol, hexane, methanol **Storage:** –20°C

1249	**10(E),12(Z)-Octadecadienoic acid**	**25 mg**
1249-1	10-trans, 12-cis CLA $C_{18}H_{32}O_2$ **CAS#:** 2420-44-2	**1 g**
1249-10		**10 g**

Source: synthetic **Mol. Wt.:** 280 **Purity:** 98+% by TLC, GC **Appearance:** tinted oil **Solubility:** chloroform, ethanol, hexane, methanol **Storage:** –20°C

1254	**Methyl 10(E), 12(Z)-octadecadienoate**	**25 mg**
	Methyl ester of CLA (10-trans, 12-cis) $C_{19}H_{34}O_2$	

Source: synthetic **Mol. Wt.:** 294 **Purity:** 98+% by TLC, GC **Appearance:** tinted oil **Solubility:** chloroform, ethanol, hexane, methanol **Storage:** –20°C

1259	**11(Z), 13(E)-Octadecadienoic acid**	**25 mg**
	11-cis, 13-trans CLA $C_{18}H_{32}O_2$	

Source: synthetic **Mol. Wt.:** 280 **Purity:** 77% cis, trans; 2 % cis, cis; 6% trans, trans by TLC, GC **Appearance:** tinted oil **Solubility:** chloroform, ethanol, hexane, methanol **Storage:** –20°C

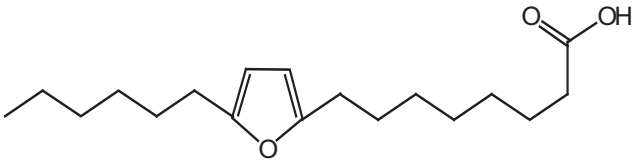
1247-1	**9(Z),11(E)-Octadecadienoic acid**	**1 g**
1247-10	9-cis, 11-trans CLA $C_{18}H_{32}O_2$ **CAS#:** 2540-56-9	**10 g**

Source: synthetic **Mol. Wt.:** 280 **Purity:** 74% 9(Z),11(E); 17%(Z),(Z); 1%(E),(E) by TLC, GC **Appearance:** tinted oil **Solubility:** ethanol, ethyl ether, hexane **Storage:** –20°C

1258	**Methyl 9(Z),11(E)-octadecadienoate**	**25 mg**
	Methyl ester of CLA (9-cis, 11-trans) $C_{19}H_{34}O_2$	

Source: synthetic **Mol. Wt.:** 294 **Purity:** 74% 9(Z),11(E); 17%(Z),(Z); 1% (E),(E) by TLC, GC **Appearance:** clear oil **Solubility:** chloroform, ethyl ether, hexane **Storage:** –20°C

Other CLA products and derivatives



Catalog number 1793

1793 **8-(5-Hexyl-2-furyl)-octanoic acid** **25 mg**
Furan fatty acid; 9,12-epoxy-9,11-octadecadienoic acid $C_{18}H_{30}O_3$
CAS#: 4179-44-6

Source: synthetic **Mol. Wt.:** 294 **Purity:** 98+% by TLC, GC **Appearance:** oil
Solubility: chloroform, ethanol, ethyl ether **Storage:** –20°C

1409 **1-Stearoyl-2-linoleoyl-sn-glycero-3-phosphorylcholine** **25 mg/ml, 1ml**
$C_{44}H_{84}NO_8P$

Source: synthetic **Mol. Wt.:** 786 **Purity:** 98+% by TLC **Appearance:** liquid
Solvent: chloroform **Solubility:** chloroform, ethanol **Storage:** –20°C

1410 **1-Stearoyl-2-[9(Z),11(E)-octadecadienoyl]-sn-glycero-3-phosphorylcholine** **25 mg/ml, 1ml**
$C_{44}H_{84}NO_8P$

Source: synthetic **Mol. Wt.:** 786 **Purity:** 98+% by TLC **Appearance:** liquid
Solvent: chloroform **Solubility:** chloroform, ethanol **Storage:** –20°C

1411 **1-Stearoyl-2-[10(E),12(Z)-octadecadienoyl]-sn-glycero-3-phosphorylcholine** **25 mg/ml, 1ml**
$C_{44}H_{84}NO_8P$

Source: synthetic **Mol. Wt.:** 786 **Purity:** 98+% by TLC **Appearance:** liquid
Solvent: chloroform **Solubility:** chloroform, ethanol **Storage:** –20°C

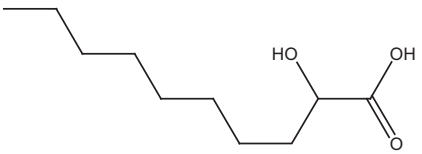
1794 **Methyl 8-(5-hexyl-2-furyl)-octanoate** **25 mg**
Methyl ester of furan fatty acid $C_{19}H_{32}O_3$ **CAS#:** 10038-16-1

Source: synthetic **Mol. Wt.:** 308 **Purity:** 98+% by TLC, GC **Appearance:** oil
Solubility: chloroform, ethanol, ethyl ether **Storage:** –20°C

Hydroxy fatty acids

2-Hydroxy fatty acids and methyl esters

These products are racemic and 98+% pure by GC and TLC. The 2-hydroxy fatty acids are components of glycosphingolipids and are involved in fatty acid degradation. They are stable and are supplied neat in vials.



Catalog number 1758

1758 **2-Hydroxydecanoic acid** **50 mg**
1758-1 2-Hydroxy C10:0 acid $C_{10}H_{20}O_3$ **CAS#:** 5393-81-7 **1 g**

Source: synthetic **Mol. Wt.:** 188 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, methanol **Storage:** –20°C

1759 **Methyl 2-hydroxydecanoate** **50 mg**
1759-1 2-Hydroxy C10:0 methyl ester $C_{11}H_{22}O_3$ **CAS#:** 71271-24-4 **1 g**

Source: synthetic **Mol. Wt.:** 202 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, methanol **Storage:** –20°C

1701 **2-Hydroxydodecanoic acid** **50 mg**
1701-1 2-Hydroxy C12:0 acid $C_{12}H_{24}O_3$ **CAS#:** 2984-55-6 **1 g**

Source: synthetic **Mol. Wt.:** 216 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, methanol **Storage:** –20°C

1702 **Methyl 2-hydroxydodecanoate** **50 mg**
1702-1 2-Hydroxy C12:0 methyl ester $C_{13}H_{26}O_3$ **CAS#:** 51067-85-7 **1 g**

Source: synthetic **Mol. Wt.:** 230 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethyl ether, methanol **Storage:** –20°C

1703 **2-Hydroxytetradecanoic acid** **50 mg**
1703-1 2-Hydroxy C14:0 acid $C_{14}H_{28}O_3$ **CAS#:** 2507-55-3 **1 g**

Source: synthetic **Mol. Wt.:** 244 **Melting Point (°C):** 81-82 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, methanol **Storage:** –20°C

1704 **Methyl 2-hydroxytetradecanoate** **50 mg**
1704-1 2-Hydroxy C14:0 methyl ester $C_{15}H_{30}O_3$ **CAS#:** 56009-40-6 **1 g**

Source: synthetic **Mol. Wt.:** 258 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethyl ether, methanol **Storage:** –20°C

1705 **2-Hydroxyhexadecanoic acid** **50 mg**
1705-1 2-Hydroxy C16:0 acid $C_{16}H_{32}O_3$ **CAS#:** 764-67-0 **1 g**

Source: synthetic **Mol. Wt.:** 272 **Melting Point (°C):** 86-87 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform/methanol 2:1, methanol **Storage:** –20°C

1706 **Methyl 2-hydroxyhexadecanoate** **50 mg**
1706-1 2-Hydroxy C16:0 methyl ester $C_{17}H_{34}O_3$ **CAS#:** 16742-51-1 **1 g**

Source: synthetic **Mol. Wt.:** 286 **Melting Point (°C):** 59-60 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethyl ether, methanol **Storage:** –20°C

1707 **2-Hydroxyoctadecanoic acid** **50 mg**
1707-1 2-Hydroxy C18:0 acid $C_{18}H_{36}O_3$ **CAS#:** 629-22-1 **1 g**

Source: synthetic **Mol. Wt.:** 300 **Melting Point (°C):** 92-93 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform/methanol 5:1 **Storage:** –20°C

1708 **Methyl 2-hydroxyoctadecanoate** **50 mg**
1708-1 2-Hydroxy C18:0 methyl ester $C_{19}H_{38}O_3$ **CAS#:** 2420-35-1 **1 g**

Source: synthetic **Mol. Wt.:** 315 **Melting Point (°C):** 64-66 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethyl ether, methanol **Storage:** –20°C

1709 **2-Hydroxyeicosanoic acid** **25 mg**
1709-0.5 2-Hydroxy C20:0 acid $C_{20}H_{40}O_3$ **CAS#:** 16742-48-6 **0.5 g**

Source: synthetic **Mol. Wt.:** 329 **Melting Point (°C):** 91-92 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform/methanol 5:1 **Storage:** –20°C

1710 **Methyl 2-hydroxyeicosanoate** **25 mg**
1710-0.5 2-Hydroxy C20:0 methyl ester $C_{21}H_{42}O_3$ **CAS#:** 16742-49-7 **0.5 g**

Source: synthetic **Mol. Wt.:** 343 **Melting Point (°C):** 62-64 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethyl ether **Storage:** –20°C

1711 **2-Hydroxydocosanoic acid** **25 mg**
1711-0.5 2-Hydroxy C22:0 acid $C_{22}H_{44}O_3$ **CAS#:** 13980-14-8 **0.5 g**

Source: synthetic **Mol. Wt.:** 366 **Melting Point (°C):** 96-97 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform/methanol 5:1 **Storage:** –20°C

1712 **Methyl 2-hydroxydocosanoate** **25 mg**
1712-0.5 2-Hydroxy C22:0 methyl ester $C_{23}H_{46}O_3$ **CAS#:** 13980-17-1 **0.5 g**

Source: synthetic **Mol. Wt.:** 371 **Melting Point (°C):** 72-73 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethyl ether **Storage:** –20°C

1713 **2-Hydroxytricosanoic acid** **10 mg**
2-Hydroxy C23:0 acid $C_{23}H_{46}O_3$ **CAS#:** 2718-37-8

Source: synthetic **Mol. Wt.:** 371 **Melting Point (°C):** 98-99 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform/methanol 5:1 **Storage:** –20°C

1714 **Methyl 2-hydroxytricosanoate** **10 mg**
2-Hydroxy C23:0 methyl ester $C_{24}H_{48}O_3$ **CAS#:** 118745-41-8

Source: synthetic **Mol. Wt.:** 385 **Melting Point (°C):** 68-70 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethyl ether **Storage:** –20°C

1715 **2-Hydroxytetracosanoic acid** **5 mg**
2-Hydroxy C24:0 acid; cerebronic acid $C_{24}H_{48}O_3$ **CAS#:** 544-57-0

Source: synthetic **Mol. Wt.:** 385 **Melting Point (°C):** 101-104 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform/methanol 5:1 **Storage:** –20°C

1716 **Methyl 2-hydroxytetracosanoate** **5 mg**
2-Hydroxy C24:0 methyl ester $C_{25}H_{50}O_3$ **CAS#:** 2433-95-6

Source: synthetic **Mol. Wt.:** 399 **Melting Point (°C):** 64-65 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethyl ether **Storage:** –20°C

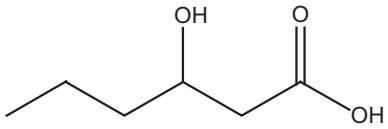
1722 **2-Hydroxy methyl ester mix** **10 mg/ml, 1 ml**
Quantitative mixture

Source: synthetic **Appearance:** liquid **Solvent:** methylene chloride **Solubility:** methylene chloride **Storage:** –20°C

Contains: 2-OH C14:0, 20%; 2-OH C16:0, 20%; 2-OH C18:0, 15%; 2-OH C20:0, 15.0%; 2-OH C22:0, 10%; 2-OH C23:0, 10%; 2-OH C24:0, 10%

3-Hydroxy fatty acids and methyl esters

These products are racemic and 98+% pure by GC and TLC. 3-Hydroxy fatty acids occur in the lipid fraction of many microorganisms and are useful in the typing of microbial isolates. They are stable and are supplied neat in vials.



Catalog number 1747

1747 **3-Hydroxyhexanoic acid** **25 mg**
1747-0.5 3-Hydroxy C6:0 acid $C_6H_{12}O_3$ **CAS#:** 10191-24-9 **0.5 g**

Source: synthetic **Mol. Wt.:** 132 **Purity:** 98+% by TLC, GC **Appearance:** liquid
Solubility: chloroform, ethanol, methanol **Storage:** –20°C

1748 **Methyl 3-hydroxyhexanoate** **25 mg**
1748-0.5 3-Hydroxy C6:0 methyl ester $C_7H_{14}O_3$ **CAS#:** 21188-58-9 **0.5 g**

Source: synthetic **Mol. Wt.:** 146 **Purity:** 98+% by TLC, GC **Appearance:** liquid
Solubility: chloroform, ethanol, methanol **Storage:** –20°C

1745 **3-Hydroxyoctanoic acid** **25 mg**
1745-0.5 3-Hydroxy C8:0 acid $C_8H_{16}O_3$ **CAS#:** 88930-08-9 **0.5 g**

Source: synthetic **Mol. Wt.:** 160 **Purity:** 98+% by TLC, GC **Appearance:** liquid
Solubility: chloroform, ethanol, methanol **Storage:** –20°C

1746 **Methyl 3-hydroxyoctanoate** **25 mg**
1746-0.5 3-Hydroxy C8:0 methyl ester $C_9H_{18}O_3$ **CAS#:** 85549-54-8 **0.5 g**

Source: synthetic **Mol. Wt.:** 174 **Purity:** 98+% by TLC, GC **Appearance:** liquid
Solubility: chloroform, ethanol, ethyl ether **Storage:** –20°C

1725 **3-Hydroxynonanoic acid** **25 mg**
1725-0.5 3-Hydroxy C9:0 acid $C_9H_{18}O_3$ **CAS#:** 88930-09-0 **0.5 g**

Source: synthetic **Mol. Wt.:** 174 **Melting Point (°C):** 60-62 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol
Storage: –20°C

1726 **Methyl 3-hydroxynonanoate** **25 mg**
1726-0.5 3-Hydroxy C9:0 methyl ester $C_{10}H_{20}O_3$ **CAS#:** 83968-06-3 **0.5 g**

Source: synthetic **Mol. Wt.:** 188 **Purity:** 98+% by TLC, GC **Appearance:** liquid
Solubility: chloroform, ethanol, ethyl ether **Storage:** –20°C

1727 **3-Hydroxydecanoic acid** **25 mg**
1727-0.5 3-Hydroxy C10:0 acid $C_{10}H_{20}O_3$ **CAS#:** 5561-87-5 **0.5 g**

Source: synthetic **Mol. Wt.:** 188 **Melting Point (°C):** 57-60 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol
Storage: –20°C

1728 **Methyl 3-hydroxydecanoate** **25 mg**
1728-0.5 3-Hydroxy C10:0 methyl ester $C_{11}H_{22}O_3$ **CAS#:** 62675-82-5 **0.5 g**

Source: synthetic **Mol. Wt.:** 202 **Purity:** 98+% by TLC, GC **Appearance:** liquid
Solubility: chloroform, ethanol, methanol **Storage:** –20°C

1729 **3-Hydroxyundecanoic acid** **25 mg**
1729-0.5 3-Hydroxy C11:0 acid $C_{11}H_{22}O_3$ **CAS#:** 40165-88-6 **0.5 g**

Source: synthetic **Mol. Wt.:** 202 **Melting Point (°C):** 74-76 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol **Storage:** –20°C

1730 **Methyl 3-hydroxyundecanoate** **25 mg**
1730-0.5 3-Hydroxy C11:0 methyl ester $C_{12}H_{24}O_3$ **CAS#:** 127593-21-9 **0.5 g**

Source: synthetic **Mol. Wt.:** 216 **Purity:** 98+% by TLC, GC **Appearance:** liquid **Solubility:** chloroform, ethanol, methanol **Storage:** –20°C

1731 **3-Hydroxydodecanoic acid** **25 mg**
1731-0.5 3-Hydroxy C12:0 acid $C_{12}H_{24}O_3$ **CAS#:** 8355-89-3 **0.5 g**

Source: synthetic **Mol. Wt.:** 216 **Melting Point (°C):** 71-72 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** ethanol, methanol **Storage:** –20°C

1732 **Methyl 3-hydroxydodecanoate** **25 mg**
1732-0.5 3-Hydroxy C12:0 methyl ester $C_{13}H_{26}O_3$ **CAS#:** 85464-97-7 **0.5 g**

Source: synthetic **Mol. Wt.:** 230 **Purity:** 98+% by TLC, GC **Appearance:** liquid **Solubility:** chloroform, ethanol, ethyl ether **Storage:** –20°C

1733 **3-Hydroxytridecanoic acid** **25 mg**
1733-0.5 3-Hydroxy C13:0 acid $C_{13}H_{26}O_3$ **CAS#:** 32602-69-0 **0.5 g**

Source: synthetic **Mol. Wt.:** 230 **Melting Point (°C):** 80-83 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol **Storage:** –20°C

1734 **Methyl 3-hydroxytridecanoate** **25 mg**
1734-0.5 3-Hydroxy C13:0 methyl ester $C_{14}H_{28}O_3$ **0.5 g**

Source: synthetic **Mol. Wt.:** 244 **Purity:** 98+% by TLC, GC **Appearance:** liquid **Solubility:** chloroform, ethyl ether **Storage:** –20°C

1735 **3-Hydroxytetradecanoic acid** **25 mg**
1735-0.5 3-Hydroxy C14:0 acid $C_{14}H_{28}O_3$ **CAS#:** 3422-31-9 **0.5 g**

Source: synthetic **Mol. Wt.:** 244 **Melting Point (°C):** 80-81 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol **Storage:** –20°C

1736 **Methyl 3-hydroxytetradecanoate** **25 mg**
1736-0.5 3-Hydroxy C14:0 methyl ester $C_{15}H_{30}O_3$ **CAS#:** 55682-83-2 **0.5 g**

Source: synthetic **Mol. Wt.:** 258 **Melting Point (°C):** 36-37 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethyl ether, methanol **Storage:** –20°C

1739 **3-Hydroxyhexadecanoic acid** **25 mg**
1739-0.5 3-Hydroxy C16:0 acid $C_{16}H_{32}O_3$. **CAS#:** 928-17-6 **0.5 g**

Source: synthetic **Mol. Wt.:** 272 **Melting Point (°C):** 85-86 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol **Storage:** –20°C

1740 **Methyl 3-hydroxyhexadecanoate** **25 mg**
1740-0.5 3-Hydroxy C16:0 methyl ester $C_{17}H_{34}O_3$ **CAS#:** 51883-36-4 **0.5 g**

Source: synthetic **Mol. Wt.:** 286 **Melting Point (°C):** 43-45 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** ethanol, methanol **Storage:** –20°C

1741 **3-Hydroxyheptadecanoic acid** **25 mg**
1741-0.5 3-Hydroxy C17:0 acid $C_{17}H_{34}O_3$ **0.5 g**

Source: synthetic **Mol. Wt.:** 286 **Melting Point (°C):** 93-95 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** ethanol, methanol **Storage:** –20°C

1742 **Methyl 3-hydroxyheptadecanoate** **25 mg**
1742-0.5 3-Hydroxy C17:0 methyl ester $C_{18}H_{36}O_3$ **0.5 g**

Source: synthetic **Mol. Wt.:** 300 **Melting Point (°C):** 53-55 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** ethanol, methanol **Storage:** –20°C

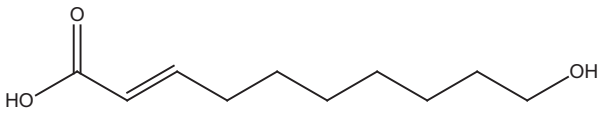
1743 **3-Hydroxyoctadecanoic acid** **25 mg**
1743-0.5 3-Hydroxy C18:0 acid $C_{18}H_{36}O_3$ **CAS#:** 45261-96-9 **0.5 g**

Source: synthetic **Mol. Wt.:** 300 **Melting Point (°C):** 52-54 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** ethanol, methanol **Storage:** –20°C

1744 **Methyl 3-hydroxyoctadecanoate** **25 mg**
1744-0.5 3-Hydroxy C18:0 methyl ester $C_{19}H_{38}O_3$ **CAS#:** 14531-40-9 **0.5 g**

Source: synthetic **Mol. Wt.:** 315 **Melting Point (°C):** 52-54 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** ethanol, methanol **Storage:** –20°C

Omega hydroxy fatty acids



Catalog number 1754

1754 **Royal Jelly acid** **50 mg**
1754-0.5 10-Hydroxy-2-(E)-decenoic acid; omega-hydroxy C10:1 (2-trans) $C_{10}H_{18}O_3$ **0.5 g**
CAS#: 14113-05-4

Source: synthetic **Mol. Wt.:** 186 **Melting Point (°C):** 63-65 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol
Storage: –20°C

1881 **15-Hydroxypentadecanoic acid** **25 mg**
omega-Hydroxy C15:0 $C_{15}H_{30}O_3$ **CAS#:** 4617-33-8

Source: synthetic **Mol. Wt.:** 258 **Melting Point (°C):** 84-86 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol
Storage: room temperature

1882 **Methyl 15-hydroxypentadecanoate** **25 mg**
omega-Hydroxy C15:0 fatty acid methyl ester $C_{16}H_{32}O_3$
CAS#: 76529-42-5

Source: synthetic **Mol. Wt.:** 272 **Melting Point (°C):** 50-52 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, warm ethanol, ethyl ether
Storage: room temperature

1760 **17-Hydroxyheptadecanoic acid** **25 mg**
omega-Hydroxy C17:0 fatty acid $C_{17}H_{34}O_3$ **CAS#:** 13099-34-8

Source: synthetic **Mol. Wt.:** 286 **Melting Point (°C):** 93-95 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, warm ethanol, ethyl ether
Storage: room temperature

1761 **Methyl 17-hydroxyheptadecanoate** **25 mg**
omega-Hydroxy C17:0 fatty acid methyl ester $C_{18}H_{36}O_3$
CAS#: 94036-00-7

Source: synthetic **Mol. Wt.:** 300 **Melting Point (°C):** 59-63 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, warm ethanol, ethyl ether **Storage:** room tempature

1877 **20-Hydroxyeicosanoic acid** **25 mg**
omega-Hydroxy C20:0 fatty acid $C_{20}H_{40}O_3$

Source: synthetic **Mol. Wt.:** 328 **Melting Point (°C):** 96-98 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, warm ethanol **Storage:** room temperature

1878 **Methyl 20-hydroxyeicosanoate** **25 mg**
omega-Hydroxy C20:0 fatty acid methyl ester $C_{21}H_{42}O_3$

Source: synthetic **Mol. Wt.:** 342 **Melting Point (°C):** 69-71 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, warm ethanol, ethyl ether **Storage:** room temperature

1879 **21-Hydroxyheneicosanoic acid** **25 mg**
omega-Hydroxy C21:0 fatty acid $C_{21}H_{42}O_3$

Source: synthetic **Mol. Wt.:** 342 **Melting Point (°C):** 72-75 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, warm ethanol **Storage:** room temperature

1880 **Methyl 21-hydroxyheneicosanoate** **25 mg**
omega-Hydroxy C21:0 fatty acid methyl ester $C_{22}H_{44}O_3$

Source: synthetic **Mol. Wt.:** 356 **Melting Point (°C):** 73-76 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, warm ethanol, ethyl ether **Storage:** room temperature

1818 **22-Hydroxydocosanoic acid** **25 mg**
Phellonic acid; omega-hydroxy C22:0 fatty acid $C_{22}H_{44}O_3$

Source: synthetic **Mol. Wt.:** 356 **Melting Point (°C):** 100-102 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, warm ethanol **Storage:** room temperature

1819 **Methyl 22-hydroxydocosanoate** **25 mg**
omega-Hydroxy C22:0 fatty acid methyl ester $C_{23}H_{46}O_3$

Source: synthetic **Mol. Wt.:** 370 **Melting Point (°C):** 73-75 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, warm ethanol, ethyl ether **Storage:** room temperature

1883 **Methyl 27-hydroxyheptacosanoate** **25 mg**
omega-Hydroxy C27:0 fatty acid methyl ester $C_{28}H_{56}O_3$

Source: synthetic **Mol. Wt.:** 440 **Melting Point (°C):** 85-89 **Purity:** 97+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform **Storage:** room temperature

1884 **Methyl 30-hydroxytriacontanoate** **25 mg**
omega-Hydroxy C30:0 fatty acid methyl ester $C_{31}H_{62}O_3$

Source: synthetic **Mol. Wt.:** 482 **Melting Point (°C):** 88-91 **Purity:** 97+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform **Storage:** room temperature

Other hydroxy fatty acids

1815 **Methyl threo-2,3-dihydroxypalmitate** **10 mg**
2,3-Dihydroxy C16:0 fatty acid methyl ester $C_{17}H_{34}O_4$

Source: synthetic **Mol. Wt.:** 302 **Melting Point (°C):** 77-79 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol **Storage:** room temperature

1182 **Ricinelaidic acid** **100 mg**
12-Hydroxy C18:1 (9-trans) fatty acid $C_{18}H_{34}O_3$ **CAS#:** 82188-83-8

Source: synthetic **Mol. Wt.:** 298 **Melting Point (°C):** 50-53 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** ethanol, methanol **Storage:** –20°C

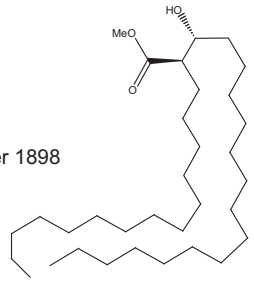
1183 **Methyl ricinelaidate** **100 mg**
12-Hydroxy C18:1 (9-trans) methyl ester $C_{19}H_{36}O_3$ **CAS#:** 7706-01-6

Source: synthetic **Mol. Wt.:** 312 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** ethanol, methanol **Storage:** –20°C

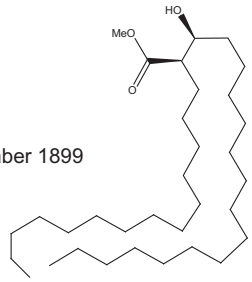
1766 **6-Hydroxyoctadecanoic acid** **10 mg**
6-Hydroxy C18:0 fatty acid $C_{18}H_{36}O_3$

Source: synthetic **Mol. Wt.:** 300 **Melting Point (°C):** 80-82 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** ethanol, methanol **Storage:** room temperature

Catalog number 1898



Catalog number 1899



1898 **Methyl D, L-threo-corynomycolate** **25 mg**
Hydroxy fatty acid with long branched chain $C_{33}H_{66}O_3$

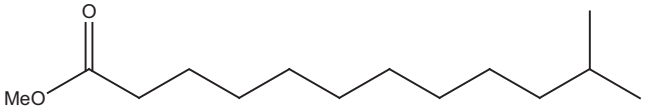
Source: synthetic **Mol. Wt.:** 511 **Melting Point (°C):** 70 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform **Storage:** room temperature

1899 **Methyl D,L-erythro-corynomycolate** **25 mg**
Hydroxy fatty acid with long branched chain $C_{33}H_{66}O_3$

Source: synthetic **Mol. Wt.:** 511 **Melting Point (°C):** 58 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform **Storage:** room temperature

Branched and cyclic fatty acids

iso-Fatty acids and esters



Catalog number 1656

1656 **Methyl 11-methyldodecanoate** **20 mg**
iso-Tridecanoic methyl ester; iso C13 methyl ester $C_{14}H_{28}O_2$
CAS#: 5129-57-7

Source: synthetic **Mol. Wt.:** 228 **Purity:** 98+% by GC **Appearance:** liquid
Solubility: hexane, ethyl ether, methylene chloride **Storage:** –20°C

1657 **Methyl 12-methyltridecanoate** **20 mg**
iso-Tetradecanoic methyl ester; iso C14 methyl ester $C_{15}H_{30}O_2$
CAS#: 5129-58-8

Source: synthetic **Mol. Wt.:** 242 **Purity:** 98+% by GC **Appearance:** liquid
Solubility: chloroform, ethyl ether, ethanol **Storage:** –20°C

1605 **13-Methyltetradecanoic acid** **20 mg**
iso-Pentadecanoic acid; iso C15 acid $C_{15}H_{30}O_2$

Source: synthetic **Mol. Wt.:** 242 **Purity:** 98+% by GC **Appearance:** white solid
Solubility: chloroform, ethyl ether, ethanol **Storage:** –20°C

1600 **Methyl 13-methyltetradecanoate** **20 mg**
iso-Pentadecanoic methyl ester; iso C15 methyl ester $C_{16}H_{32}O_2$
CAS#: 5129-59-9

Source: synthetic **Mol. Wt.:** 256 **Purity:** 98+% by GC **Appearance:** clear liquid
Solubility: chloroform, ethyl ether, ethanol **Storage:** –20°C

1601 **Methyl 14-methylpentadecanoate** **20 mg**
iso-Palmitic methyl ester; iso C16 methyl ester $C_{17}H_{34}O_2$ **CAS#:** 5129-60-2

Source: synthetic **Mol. Wt.:** 270 **Purity:** 98+% by GC **Appearance:** clear liqiud
Solubility: chloroform, ethyl ether, ethanol **Storage:** –20°C

1606 **15-Methylhexadecanoic acid** **20 mg**
iso-Heptadecanoic acid; iso C17 acid $C_{17}H_{34}O_2$

Source: synthetic **Mol. Wt.:** 270 **Purity:** 98+% by GC **Appearance:** white solid
Solubility: chloroform, ethyl ether, ethanol **Storage:** –20°C

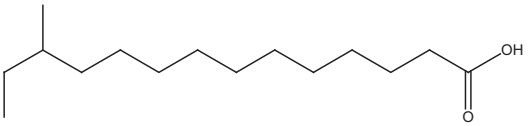
1602 **Methyl 15-methylhexadecanoate** **20 mg**
iso-Heptadecanoic methyl ester; iso C17 methyl ester $C_{18}H_{36}O_2$
CAS#: 6929-04-0

Source: synthetic **Mol. Wt.:** 284 **Purity:** 98+% by GC **Appearance:** clear liquid
Solubility: chloroform, ethyl ether, ethanol **Storage:** –20°C

1603 **Methyl 17-methyloctadecanoate** **20 mg**
iso-Nonadecanoic methyl ester; iso C19 methyl ester $C_{20}H_{40}O_2$

Source: synthetic **Mol. Wt.:** 312 **Purity:** 98+% by GC **Appearance:** clear liquid
Solubility: chloroform, ethyl ether, ethanol **Storage:** –20°C

anteiso-Fatty acids and esters



1615 **12-Methyltetradecanoic acid** **20 mg**
anteiso-Pentadecanoic acid; anteiso C15 acid $C_{15}H_{30}O_2$ **CAS#:** 5502-94-3

Source: synthetic **Mol. Wt.:** 242 **Purity:** 98+% by GC **Appearance:** white solid
Solubility: chloroform, ethyl ether, ethanol **Storage:** –20°C

1612 **Methyl 12-methyltetradecanoate** **20 mg**
anteiso-Pentadecanoic methyl ester; anteiso C15 methyl ester $C_{16}H_{32}O_2$
CAS#: 5129-66-8

Source: synthetic **Mol. Wt.:** 256 **Purity:** 98+% by GC **Appearance:** liquid
Solubility: chloroform, ethyl ether, ethanol **Storage:** –20°C

1613 **Methyl 13-methylpentadecanoate** **20 mg**
anteiso-Palmitic methyl ester; anteiso C16 methyl ester $C_{17}H_{34}O_2$
CAS#: 5487-50-3

Source: synthetic **Mol. Wt.:** 270 **Purity:** 98+% by GC **Appearance:** liquid
Solubility: chloroform, ethyl ether, ethanol **Storage:** –20°C

1616 **14-Methylhexadecanoic acid** **20 mg**
anteiso-Heptadecanoic acid; anteiso C17 acid $C_{17}H_{34}O_2$ **CAS#:** 5918-29-6

Source: synthetic **Mol. Wt.:** 270 **Purity:** 98+% by GC **Appearance:** white solid
Solubility: chloroform, ethyl ether, ethanol **Storage:** –20°C

1614 **Methyl 14-methylhexadecanoate** **20 mg**
anteiso-Heptadecanoic methyl ester; anteiso C17 methyl ester $C_{18}H_{36}O_2$
CAS#: 2490-49-5

Source: synthetic **Mol. Wt.:** 284 **Purity:** 98+% by GC **Appearance:** liquid
Solubility: chloroform, ethyl ether, ethanol **Storage:** –20°C

Methylated fatty acids

1207 **D,L-2,6-Dimethylheptanoic acid** **50 mg**
2,6-Dimethyl C7:0 fatty acid $C_9H_{18}O_2$

Source: synthetic **Mol. Wt.:** 158 **Purity:** 98+% by TLC, GC **Appearance:** clear oil
Solubility: chloroform **Storage:** room temperature

1791 **10-Methylhexadecanoic acid** **25 mg**
10-Methyl C16:0 fatty acid $C_{17}H_{34}O_2$

Source: synthetic **Mol. Wt.:** 270 **Purity:** 98+% by TLC, GC **Appearance:** clear oil
Solubility: chloroform **Storage:** room temperature

1792 **Methyl 10-methylhexadecanoate** **25 mg**
10-Methyl C16:0 fatty acid methyl ester $C_{18}H_{36}O_2$

Source: synthetic **Mol. Wt.:** 284 **Purity:** 98+% by TLC, GC **Appearance:** clear oil
Solubility: chloroform **Storage:** room temperature

1195 **Phytanic acid** **25 mg**
3,7,11,15-Tetramethylhexadecanoic acid $C_{20}H_{40}O_2$ **CAS#:** 14721-66-5

Source: semi-synthetic **Mol. Wt.:** 312 **Purity:** 97+% by GC **Appearance:** white solid **Solubility:** chloroform, methanol **Storage:** –20°C

Cyclopropyl fatty acids and esters

1822 **Dihydrosterculic acid** **25 mg**
cis-9,10-Methyleneoctadecanoic acid $C_{19}H_{36}O_2$ **CAS#:** 4675-61-0

Source: synthetic **Mol. Wt.:** 296 **Melting Point (°C):** 38-42 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol, hexane **Storage:** –20°C

1823 **Methyl dihydrosterculate** **25 mg**
Methyl cis-9,10-methyleneoctadecanoate $C_{20}H_{38}O_2$ **CAS#:** 3971-54-8

Source: synthetic **Mol. Wt.:** 310 **Purity:** 98+% by TLC, GC **Appearance:** oil **Solubility:** chloroform, ethanol, methanol, hexane **Storage:** –20°C

Unusual fatty acids and derivatives

1751 **N-Oleoylethanolamine** **100 mg**
NOE $C_{20}H_{39}NO_2$ **CAS#:** 111-58-0

Source: synthetic **Mol. Wt.:** 326 **Melting Point (°C):** 63-66 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol, ethyl ether, DMSO **Storage:** –20°C

Activity: acid ceramidase inhibitor

References:
C. J. Hillard and W.B. Campbell. J. Lipid. Res., **38**: 2383-2398, *1997*
Wasilewski M., Wieckowski M.R., Dymmowska D, Wojtczak L. BBA **1657**: 151-163, *2004*
Spinedi A., DiBartolomeo S., and Piacentini M. BBRC, **255**: 456-459, *1999*

1786 **N-Hexadecanoylethanolamine** **100 mg**
$C_{18}H_{37}NO_2$ **CAS#** 544-31-0

Source: synthetic **Mol. Wt.:** 299 **Melting Point (°C):** 99-102 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform, ethanol, methanol, **Storage:** –20°C

Activity: inactive as acid ceramidase inhibitor

References:
C. J. Hillard and W.B. Campbell. J. Lipid. Res., **38**: 2383-2398, *1997*
Wasilewski M., Wieckowski M.R., Dymmowska D, Wojtczak L. BBA **1657**: 151-163, *2004*
Spinedi A., DiBartolomeo S., and Piacentini M. BBRC, **255**: 456-459, *1999*

1757 **Anandamide** **10 mg/ml, 1 ml**

Arachidonylethanolamide; 5,8,11,14(Z,Z,Z,Z)-eicosatetraenoyl 2-hydroxy-ethyl-amide $C_{22}H_{37}NO_2$ **CAS#:** 94421-68-8

Source: synthetic **Mol. Wt.:** 347 **Purity:** 98+% by TLC **Appearance:** liquid **Solvent:** chloroform **Solubility:** chloroform, ethanol **Storage:** –20°C

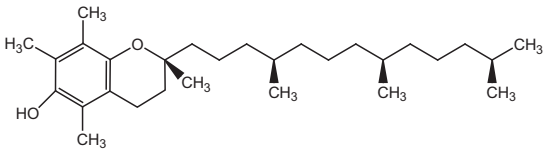
Induces apoptosis, endocannabinoid

References:
Wasilewski M., Wieckowski M.R., Dymmowska D, Wojtczak L. BBA **1657**: 151-163, *2004*
M. van der Stelt and V. Di Marzo; Prostaglandins Other Lipid Mediat. **77**, *2005*
C. Grimaldi, et al.; Exp. Cell Res. **312**, 363, *2006*

Other lipids

Tocopherols

Catalog number 1072

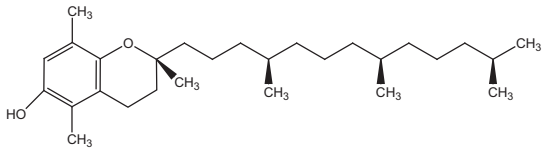


1072 **rac-alpha-Tocopherol** **50 mg/ml, 1 ml**

5,7,8-Trimethyltocol $C_{29}H_{50}O_2$ **CAS#:** 59-02-9

Source: synthetic **Mol. Wt.:** 431 **Purity:** 95% by TLC, 98% by GC **Appearance:** liquid **Solvent:** hexane **Solubility:** chloroform, ethanol, hexane, methanol **Storage:** –20°C

Catalog number 1071

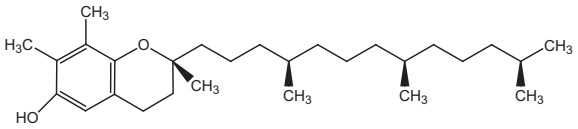


1071 **rac-beta-Tocopherol** **50 mg/ml, 1 ml**

5,8-Dimethyltocol $C_{28}H_{48}O_2$ **CAS#:** 148-03-8

Source: synthetic **Mol. Wt.:** 417 **Purity:** 95% by TLC, 98% by GC **Appearance:** liquid **Solvent:** hexane **Solubility:** chloroform, ethanol, hexane, methanol **Storage:** –20°C

Catalog number 1073

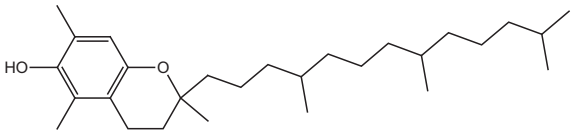


1073 **rac-gamma-Tocopherol** **50 mg/ml, 1 ml**

7,8-Dimethyltocol $C_{28}H_{48}O_2$ **CAS#:** 73980-80-0

Source: synthetic **Mol. Wt.:** 417 **Purity:** 95% by TLC, 97% by GC **Appearance:** liquid **Solvent:** hexane **Solubility:** chloroform, ethanol, hexane, methanol **Storage:** –20°C

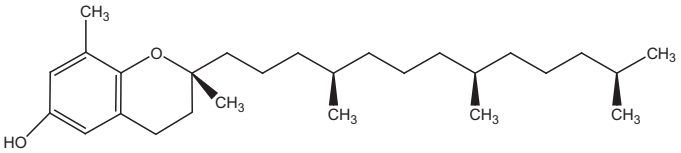
Catalog number 1074



1074 **rac-5,7-Dimethyltocol** **50 mg/ml, 1 ml**
$C_{28}H_{48}O_2$ **CAS#:** 493-35-6

Source: synthetic **Mol. Wt.:** 417 **Purity:** 95% by TLC, 98% by GC
Appearance: liquid **Solvent:** hexane **Solubility:** hexane, ethyl ether, chloroform, alcohols **Storage:** –20°C

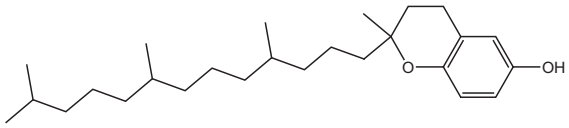
Catalog number 1790



1790 **(+)-delta-Tocopherol** **50 mg/ml, 1 ml**
8-Methyltocol $C_{27}H_{46}O_2$ **CAS#:** 119-13-1

Source: natural, plant **Mol. Wt.:** 403 **Purity:** 95% by TLC, 98% by GC
Appearance: liquid **Solvent:** hexane **Solubility:** chloroform, ethanol, hexane, methanol **Storage:** –20°C

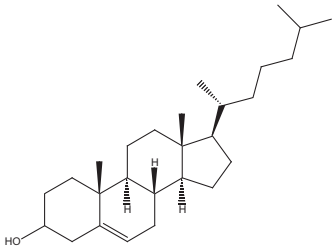
Catalog number 1797



1797 **Tocol** **50 mg/ml, 1 ml**
rac-Tocol $C_{26}H_{44}O_2$

Source: synthetic **Mol. Wt.:** 389 **Purity:** 95% by TLC, 98% by GC
Appearance: liquid **Solvent:** hexane **Solubility:** hexane, methanol, ethanol
Storage: –20°C

Cholestane derivatives



Catalog number 1006

1006 **Cholesterol** **500 mg**
$C_{27}H_{46}O$ **CAS#:** 57-88-5

Source: natural, ovine **Mol. Wt.:** 386 **Melting Point (°C):** 147-148 **Purity:** 98+% by GC **Appearance:** white solid **Solubility:** chloroform, ethanol **Storage:** –20°C

1115 **5-alpha-Cholestane** **100 mg**
$C_{27}H_{48}O$ **CAS#:** 481-21-0

Source: synthetic **Mol. Wt.:** 373 **Purity:** 98+% by GC **Appearance:** white solid **Solubility:** chloroform, ethyl ether, hexane **Storage:** –20°C

1116 **Coprostanol** **25 mg**
5-beta-Cholestane-3-beta-ol $C_{27}H_{48}O$ **CAS#:** 360-68-9

Source: semi-synthetic **Mol. Wt.:** 390 **Melting Point (°C):** 101-103 **Purity:** 98+% by GC **Appearance:** white solid **Solubility:** chloroform, ethyl ether, warm methanol **Storage:** –20°C

Plant sterols and steryl glucosides

1119 **Plant sterol mix** **25 mg/ml, 1 ml**
Sterol mixture, qualitative

Source: natural, plant **Appearance:** liquid **Solvent:** chloroform **Solubility:** chloroform **Storage:** –20°C

Contains: Brassicasterol (13%), campesterol (26%), stigmasterol (7%), β-sitosterol (53%) in order of elution

1123 **Plant sterols kit** **1 kit**
Sterols kit

Source: synthetic or plant **Appearance:** liquid **Solvent:** chloroform **Solubility:** chloroform **Storage:** –20°C

Contains in individual packages: steryl glucoside 25 mg, esterified steryl glucoside 10 mg, plant sterol mixture 25 mg, β-sitosterol (55%) 100 mg, desmosterol (85%) 2 mg, lanosterol (55%) 100 mg, stigmasterol 25 mg, ergosterol 25 mg, coprostanol 5 mg, cholestanol 100 mg

1113 **β-Sitostanol** **50 mg**
Stigmastanol $C_{29}H_{52}O$ **CAS#:** 19466-47-8

Source: synthetic **Mol. Wt.:** 417 **Melting Point (°C):** 127-132 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** chloroform **Storage:** –20°C

1120 **Lanosterol** **500 mg**
$C_{30}H_{50}O$ **CAS#:** 79-63-0

Source: synthetic or plant **Mol. Wt.:** 427 **Purity:** 55% by TLC, GC **Appearance:** white solid **Solubility:** chloroform **Storage:** –20°C

1121 **Stigmasterol** **100 mg**
5,22-cholestadien-24-beta-ethyl-3-beta-ol $C_{29}H_{48}O$ **CAS#:** 83-48-7

Source: synthetic **Mol. Wt.:** 413 **Melting Point (°C):** 170 **Purity:** 95% by TLC, GC **Appearance:** white solid **Solubility:** chloroform **Storage:** –20°C

1122 **Ergosterol** **100 mg**
$C_{28}H_{44}O$ **CAS#:** 57-87-4

Source: synthetic or plant **Mol. Wt.:** 397 **Melting Point (°C):** 156 **Purity:** 95% by TLC, GC **Appearance:** white solid **Solubility:** chloroform **Storage:** –20°C

1117 **Steryl glucoside** **25 mg**
$C_{35}H_{60}O_6$

Source: natural, plant **Mol. Wt.:** 576 **Melting Point (°C):** 283-287 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform/methanol 2:1 **Storage:** –20°C

1118 **Esterified steryl glucoside** **10 mg**
1:1:1, sterol:glucose:fatty acid $C_{51}H_{90}O_7$

Source: natural, plant **Mol. Wt.:** 814 **Purity:** 98+% by TLC **Appearance:** solid film **Solubility:** chloroform, ethyl ether, pyridine **Storage:** –20°C

Sterol, glucose and fatty acid in a molar ratio 1:1:1. Mol. Wt. based on ß-sitosterol glucoside palmitate.

Propyleneglycol Monoesters

1862 **2-Hydroxypropyl hexadecanoate** **100 mg**
Propyleneglycol monopalmitate $C_{19}H_{38}O_3$

Source: synthetic **Mol. Wt.:** 314 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** hexane, ethyl ether, alcohol, chloroform, **Storage:** –20°C

1863 **2-Hydroxypropyl octadecanoate** **100 mg**
Propyleneglycol monostearate $C_{21}H_{42}O_3$

Source: synthetic **Mol. Wt.:** 342 **Purity:** 98+% by TLC, GC **Appearance:** white solid **Solubility:** hexane, ethyl ether, alcohol, chloroform, **Storage:** –20°C

Standards and reference compounds

Food industry mixes

Each methyl ester mix is carefully prepared by weight.

4210 **KEL-FIM-FAME-5 mix** **15.5 mg/ml 1 ml**
Methyl ester mix

Source: synthetic or plant **Appearance:** liquid **Solvent:** heptane **Solubility:** heptane **Storage:** –20°C

Contains the methyl esters of the following fatty acids (mg/ml in brackets): C8:0 (0.3), C10:0 (0.5), C12:0 (1.0), C13:0 (0.5), C14:0 (0.5), C14:1 (0.3), C15:0 (0.3), C16:0 (2.0), C16:1 (1.0), C17:0 (0.5), C18:0 (1.0), C18:1tr (0.4), C18:1c (3.0), C18:2 (2.0), C20:0 (0.3), C18:3 (1.0), C20:1 (0.3), C22:0 (0.3), C22:1 (0.3), listed in order of their elution.

2009 **FIM-FAME-6 mix** **33 mg/ml, 1 ml**
Methyl ester mix

Source: synthetic or plant **Appearance:** liquid **Solvent:** heptane **Solubility:** **Storage:** –20°C

Contains the methyl esters of these fatty acids. Each methyl ester is 3.03% of the mixture except C16:0 which is 6.06%. C4:0 , C6:0 , C8:0, C10:0 , C11:0, C12:0, C13:0 , C14:0, C14:1(cis-9), C15:0, C15:1(cis-10), C16:0, C16:1(cis-9), C17:0, C17:1(cis-10), C18:0, C18:1(trans-9), C18:1(cis-9), C18:2(all-cis-9,12), C20:0, C18:3(all-cis 6,9,12), C20:1(cis-11), C18:3(all-cis 9,12,15), C20:2(all-cis 11,14), C22:0, C20:3(all-cis 8,11,14), C22:1(cis 13), C20:3(all-cis 11,14,17), C20:4(all-cis 5,8,11,14), C22:2(all-cis 13,16), C24:1(cis-15), C22:6(all-cis 4,7,10,13,16,19), listed in order of their elution.

2010 **FIM-FAME-7 mix** **30 mg/ml, 1 ml**
Methyl ester mix

Source: synthetic or plant **Appearance:** liquid **Solvent:** methylene chloride **Solubility:** methylene chloride **Storage:** –20°C

Contains the methyl esters of these fatty acids (weight percent in [brackets]): C4:0 [4.0], C6:0 [4.0], C8:0 [4.0], C10:0 [4.0], C11:0 [2.0], C12:0 [4.0], C13:0 [2.0], C14:0 [4.0], C14:1(cis-9) [2.0], C15:0 [2.0], C15:1(cis-10) [2.0], C16:0 [6.0], C16:1(cis-9) [2.0], C17:0 [2.0], C17:1(cis-10) [2.0], C18:0 [4.0], C18:1(trans-9) [2.0], C18:1(cis-9) [4.0], C18:2(all-trans-9,12) [2.0], C18:2(all-cis-9,12) [2.0], C18:3(all-cis 6,9,12) [2.0], C20:0 [4.0], C20:1(cis-11) [2.0], C18:3(all-cis 9,12,15) [2.0], C21:0 [2.0], C20:2(all-cis 11,14) [2.0], C20:3 (all-cis 8,11,14) [2.0], C22:0 [4.0], C22:1(cis 13) [2.0], C20:3(all-cis 11,14,17) [2.0], C20:4(all-cis 5,8,11,14) [2.0], C23:0 [2.0], C22:2(all-cis 13,16) [2.0], C20:5(all-cis 5,8,11,14,17) [2.0], C24:0 [4.0], C24:1(cis-15) [2.0], 22:6(all-cis 4,7,10,13,16,19) [2.0}, listed in order of their elution.

Polyunsaturated fatty acid methyl esters mixes

These are complex qualitative standard mixtures of polyunsaturated fatty acid methyl esters. Because they are extracted from natural materials, relative peak sizes may vary from lot to lot.

1093 **PUFA-1** **100 mg**
Qualitative mix

Source: natural, fish oil **Appearance:** yellow oil **Solubility:** chloroform, ethanol, hexane, methanol **Storage:** –20°C

Contains: C14:0, C16:0, C16:1ω7, C18:1ω9, C18:1ω7, C18:2ω6, C18:4ω3, C20:1ω9, C20:2ω6, C20:5ω3, C22:1ω11, C22:1ω9, C22:5ω3, C22:6ω3

1081 **PUFA-2** **100 mg**
Qualitative mix

Source: natural, porcine **Appearance:** yellow oil **Solubility:** alcohols, hexane, chloroform **Storage:** –20°C

Contains: C14:0, C16:0, C16:1ω7, C18:0, C18:1ω9, C18:1ω7, C18:2ω6, C18:3ω6, C18:3ω3, C20:1ω9, C20:2ω6, C20:3ω6, C20:4ω6, C20:5ω3, C22:4ω6, C22:5ω3, C22:6ω3

1177 **PUFA-3** **100 mg**
Qualitative mix

Source: natural, menhaden oil **Appearance:** yellow oil **Solubility:** alcohols, hexane, chloroform **Storage:** –20°C

Contains: C14:0, C16:0, C16:1ω7, C16:2ω4, C16:3ω4, C16:4ω1, C18:0, C18:1ω9, C18:1ω7, C18:2ω6, C18:2ω4, C18:3ω4, C18:3ω3, C18:4ω3, C20:1ω9, C20:4ω6, C20:4ω3, C20:5ω3, C21:5ω3, C22:5ω3, C22:6ω3

Carbohydrate mixes

1124 **Alditol acetate mix-1** **50 mg/ml, 1 ml**
Quantitative carbohydrate mix

Source: synthetic **Appearance:** liquid **Solvent:** chloroform **Solubility:** chloroform **Storage:** –20°C

Contains: rhamnitol, fucitol, ribitol and arabinitol pentaacetates, 12.5 mg/ml each

1125 **Alditol acetate mix-2** **50 mg/ml, 1 ml**
Quantitative carbohydrate mix

Source: synthetic **Appearance:** liquid **Solvent:** chloroform **Solubility:** chloroform **Storage:** –20°C

Contains: mannitol, galactitol, glucitol and inositol hexaacetates, 12.5 mg/ml each

Other fatty acid methyl ester mixes

1722 **2-Hydroxy methyl ester mix** **10 mg/ml, 1 ml**
Source: synthetic **Appearance:** liquid **Solvent:** methylene chloride **Solubility:** methylene chloride **Storage:** –20°C

Quantitative mix contains: C14:0, 20%; C16:0, 20%; C18:0, 15%; C20:0, 15%; C22:0, 10%; C23:0, 10%; C24:0, 10%

1131 **Cis-trans isomer standard** **5 mg/ml, 5 ml**

Source: margarine **Appearance:** liquid **Solvent:** 5ml methylene chloride **Solubility:** methylene chloride **Storage:** –20°C

Analysis of positional cis-trans fatty acid isomers is ever more important in light of the new food industry rules. These isomers can be resolved on Supelco SP-2560 or an equivalent capillary GC column. Use this specially formulated mix to ensure proper operation of your column for this tricky separation. Mix consists of cis-trans fatty acid isomers as methyl esters in methylene chloride.

This is a qualitative standard containing in order of elution: C16:0, C18:0, C18:1 trans isomers (4 peaks), C18:1 cis & trans isomers (2 peaks), C18:1 cis isomers (4 peaks), C18:2, C20:0, C20:1 and C18:3 (same peak), C22:0

AOCS animal and vegetable oil reference mixes (RM mixes)

By studying problems with the quantitative analysis of animal and vegetable oils and fats, the American Oil Chemists' Society has found certain mixtures to be useful as reference standards. The composition of each mixture (see Table I below) is similar to the fatty acid distribution of certain oils. All mixtures are in methyl ester form and ready for GC analysis

Table I. AOCS Oil Reference Mixes

Each methyl ester mixture is carefully prepared by weight and the composition verified by gas chromatography. The weight percentage of each component is indicated in the Table.

Mix No. **Catalog No.**	RM-1 1084	RM-2 1085	RM-3 1086	Rapeseed 1083	RM-4 1087	RM-5 1088	RM-6 1089
C8:0 Caprylate						7.0	
C10:0 Caprate						5.0	
C12:0 Laurate						48.0	
C14:0 Myristate			1.0	1.0		15.0	2.0
C16:0 Palmitate	6.0	7.0	4.0	4.0	11.0	7.0	30.0
C16:1 Palmitoleate							3.0
C18:0 Stearate	3.0	5.0	3.0	3.0	3.0	3.0	14.0
C18:1 Oleate	35.0	18.0	45.0	60.0	80.0	12.0	41.0
C18:2 Linoleate	50.0	36.0	15.0	12.0	6.0	3.0	7.0
C18:3 Linolenate	3.0	34.0	3.0	5.0			3.0
C20:0 Arachidate	3.0		3.0	3.0			
C20:1 Eicosenoate				1.0			
C22:0 Behenate			3.0	3.0			
C22:1 Erucate			20.0	5.0			
C24:0 Lignocerate			3.0	3.0			

1083 **Rapeseed oil reference mixture** **25 mg/ml, 1 ml**

AOCS rapeseed oil reference mix

Source: synthetic or plant **Appearance:** liquid **Solvent:** methylene chloride
Solubility: ethyl ether, methylene chloride **Storage:** –20°C

Suitable standard for low erucic acid oil

1084 **RM-1 mix** **50 mg**

AOCS reference mix RM-1

Source: synthetic or plant **Appearance:** clear oil **Solubility:** chloroform, ethyl ether
Storage: –20°C

Suitable standard for corn, cottonseed, soybean, safflower, sesame, poppy seed, walnut kapok, and rice oils

1085 **RM-2 mix** **50 mg**
AOCS reference mix RM-2

Source: synthetic or plant **Appearance:** clear oil **Solubility:** chloroform, ethanol, ethyl ether **Storage:** –20°C

Suitable standard for linseed, perilla, hempseed, and rubberseed oils

1086 **RM-3 mix** **50 mg/ml, 1 ml**
AOCS reference mix RM-3

Source: synthetic or plant **Appearance:** liquid **Solvent:** methylene chloride **Solubility:** ethyl ether, methylene chloride **Storage:** –20°C

Suitable standards for peanut, rapeseed, and mustard seed oils

1087 **RM-4 mix** **50 mg**
AOCS reference mix RM-4

Source: synthetic or plant **Appearance:** clear oil **Solubility:** chloroform, ethyl ether **Storage:** –20°C

Suitable standard for olive, teaseed, and neatsfoot oils

1088 **RM-5 mix** **50 mg**
AOCS reference mix RM-5

Source: synthetic or plant **Appearance:** clear oil **Solubility:** chloroform **Storage:** –20°C

Suitable standard for coconut, palm kernel, babassu and ouri-ouri oils

1089 **RM-6 mix** **50 mg**
AOCS reference mix RM-6

Source: synthetic or plant **Appearance:** clear oil **Solubility:** ethyl ether, methylene chloride **Storage:** –20°C

Suitable standard for lard, beef tallow, mutton tallow, and palm oil

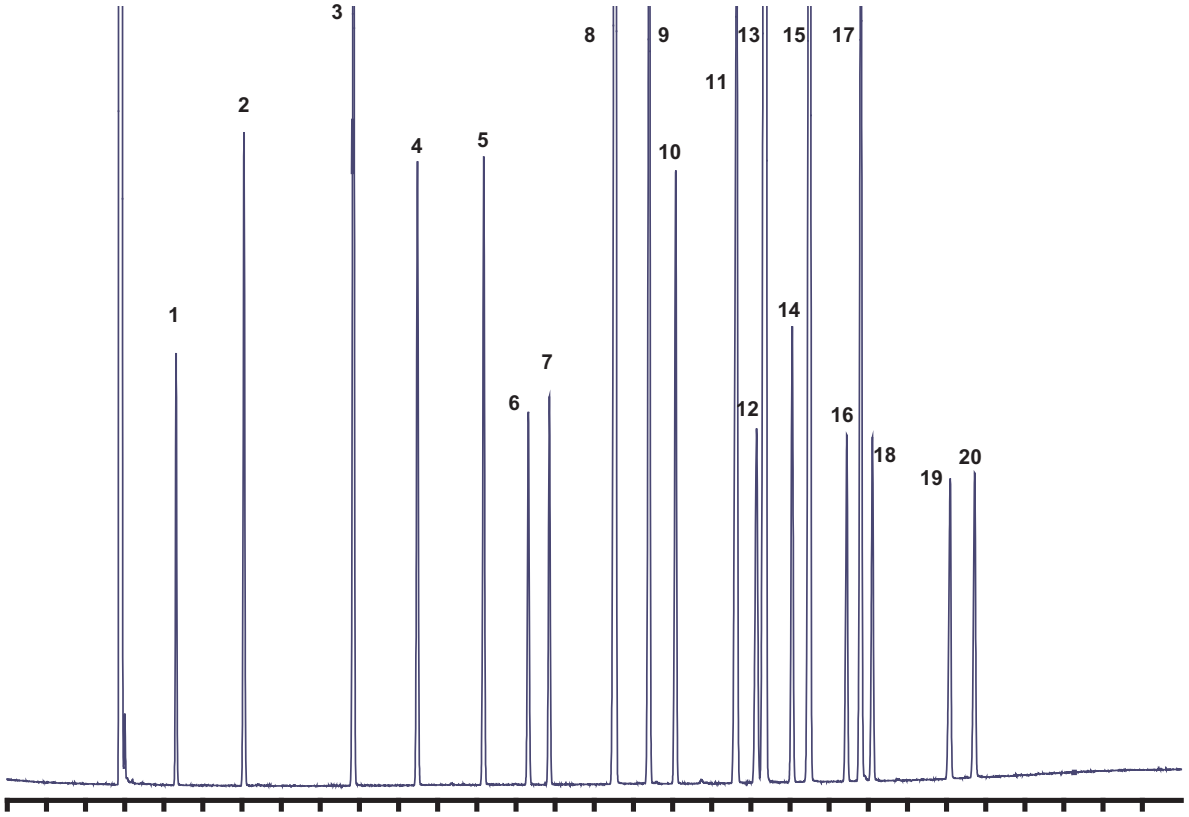
1082 **RM-7 kit** **50 mg ampules**
AOCS reference mix RM-7 kit

Source: synthetic or plant **Appearance:** liquid **Solvent:** methylene chloride **Solubility:** methylene chloride **Storage:** –20°C

50 mg ampules of RM-1, RM-2, RM-3, RM-4, RM-5, RM-6, and 25 mg of Rapeseed oil reference mixture

Custom mixes

Custom fatty acid methyl ester mixes can be prepared to your specification. Minimum quantity requirements apply to these orders.



Cat# 4210 spiked with 0.4 mg/ml C18:2t ester (methyl linoelaidate) and chromatographed on a Supelco SP 2330 fused silica column.

Peak number	FAME
1	C8:0
2	C10:0
3	C12:0
4	C13:0
5	C14:0
6	C14:1
7	C15:0
8	C16:0
9	C16:1
10	C17:0
11	C18:0
12	C18:1t-9
13	C18:1c-9
14	C18:2t,t-9,12
15	C18:2c,c-9,12
16	C20:0
17	C18:3
18	C20:1
19	C22:0
20	C22:1

Table II. Standards for GC analysis

GLC Standard mixes

GLC-10 through GLC-100 standards are **equal weight measures** of fatty acid methyl esters. They are quantitative standards, useful for determining relative **retention times and response factors.**

Each methyl ester mixture is carefully prepared by weight and the composition verified by gas chromatography. The weight percentage of each component is indicated below. All double bonds are cis.

Mixture Number Catalog Number	GLC-10 1095	GLC-30 1097	GLC-40 1098	GLC-50 1099	GLC-60 1100	GLC-70 1101	GLC-80 1102	GLC-90 1103	GLC-100 1104
C8:0 Caprylate		20.0				20.0			
C9:0 Nonanoate						20.0			
C10:0 Caprate		20.0				20.0			
C11:0 Undecanoate						20.0			
C12:0 Laurate		20.0				20.0			
C13:0 Tridecanoate							20.0	20.0	
C14:0 Myristate		20.0					20.0		
C15:0 Pentadecanoate							20.0	20.0	
C16:0 Palmitate	20.0	20.0	25.0				20.0		
C16:1 Palmitoleate-9 cis				20.0					
C17:0 Heptadecanoate							20.0	20.0	
C18:0 Stearate	20.0		25.0						20.0
C18:1 Oleate-9 cis	20.0			20.0					
C18:2 Linoleate-9,12 all cis	20.0								
C18:3 Linolenate-9,12,15 all cis	20.0								
C19:0 Nonadecanoate								20.0	20.0
C20:0 Arachidate			25.0		25.0				20.0
C20:1 Eicosenoate-11 cis				20.0	25.0				
C20:2 Eicosadienoate-11,14 all cis					25.0				
C20:3 Eicosatrienoate-11,14,17 all cis					25.0				
C21:0 Heneicosanoate								20.0	20.0
C22:0 Behenate			25.0						20.0
C22:1 Erucate-13				20.0					
C24:1 Nervonate				20.0					

1095 **GLC-10 mix** **50 mg**
Quantitative GC mix

Source: synthetic or plant **Appearance:** clear oil **Solubility:** methylene chloride
Storage: –20°C

1097 **GLC-30 mix** **50 mg**
Quantitative GC mix

Source: synthetic or plant **Appearance:** clear oil **Solubility:** methylene chloride
Storage: –20°C

1098 **GLC-40 mix** **50 mg/ml, 1 ml**
Quantitative GC mix

Source: synthetic or plant **Appearance:** liquid **Solvent:** methylene chloride
Solubility: methylene chloride **Storage:** –20°C

1099 **GLC-50 mix** **50 mg/ml, 1 ml**
Quantitative GC mix

Source: synthetic or plant **Appearance:** liquid **Solvent:** methylene chloride
Solubility: methylene chloride **Storage:** –20°C

1100 **GLC-60 mix** **50 mg/ml, 1 ml**
Quantitative GC mix

Source: synthetic or plant **Appearance:** liquid **Solvent:** methylene chloride
Solubility: methylene chloride **Storage:** –20°C

1101 **GLC-70 mix** **50 mg**
Quantitative GC mix

Source: synthetic or plant **Appearance:** clear oil **Solubility:** methylene chloride
Storage: –20°C

1102 **GLC-80 mix** **50 mg/ml, 1 ml**
Quantitative GC mix

Source: synthetic or plant **Appearance:** liquid **Solvent:** methylene chloride
Solubility: methylene chloride **Storage:** –20°C

1103 **GLC-90 mix** **50 mg/ml, 1 ml**
Quantitative GC mix

Source: synthetic or plant **Appearance:** liquid **Solvent:** methylene chloride
Solubility: methylene chloride **Storage:** –20°C

1104 **GLC-100 mix** **50 mg/ml, 1 ml**
Quantitative GC mix

Source: synthetic or plant **Appearance:** liquid **Solvent:** methylene chloride
Solubility: methylene chloride **Storage:** –20°C

Water soluble fatty acid mixes

1106 **WSFA-2 mix** **5 ml**
Water soluble fatty acid qualitative mix

Appearance: liquid **Solvent:** water **Solubility:** water **Storage:** Room Temp

Contains: acetic, propionic, isobutyric, n-butyric, isovaleric and n-valeric acids

1108 **WSFA-4 mix** **5 ml**
Water soluble fatty acid qualitative mix

Appearance: liquid **Solvent:** water **Solubility:** water **Storage:** Room Temp

Contains: acetic, propionic, isobutyric, n-butyric, 2-methyl butyric, isovaleric and n-valeric acids

Microbiology standard mixes

1105 **GLC-110 mix** **10 mg/ml, 1 ml**
Bacterial lipid standard, qualitative mix

Source: various **Appearance:** liquid **Solvent:** chloroform **Solubility:** methylene chloride, choroform **Storage:** –20°C

Contains:

methyl 12-methyltridecanoate	(iso-C14:0)	methyl 14-methylpentadecanoate	(iso-C16:0)
methyl myristate	(C14:0)	methyl palmitate	(C16:0)
methyl 12-methyltetradecanoate	(anteiso-C15:0)	methyl 14-methylhexadecanoate	(anteiso-C17:0)
methyl pentadecanoate	(C15:0)		

1114 **Bacterial acid methyl esters CP mix** **10 mg/ml, 1 ml**
Qualitative mix

Source: various **Appearance:** liquid **Solvent:** methyl caproate **Solubility:** hexane, ethanol, methanol **Storage:** –20°C

A qualitative standard. Mixture consists of equal amounts of the compounds listed.

methyl undecanoate	C11:0	methyl cis-9-hexadecenoate	C16:1^{9}
methyl 2-hydroxydecanoate	2-OH C10:0	methyl hexadecanoate	C16:0
methyl dodecanoate	C12:0	methyl 15-methylhexadecanoate	iso-C17:0
methyl tridecanoate	C13:0	methyl cis-9,10-methylenehexadecanoate	C17:0$\Delta^{9,10}$
methyl 2-hydroxydodecanoate	2-OH C12:0	methyl heptadecanoate	C17:0
methyl 3-hydroxydodecanoate	3-OH C12:0	methyl 2-hydroxyhexadecanoate	2-OH C16:0
methyl tetradecanoate	C14:0	methyl cis, cis-9,12-octadecadienoate	C18:2 ^{9,12}
methyl 13-methyltetradecanoate	iso-C15:0	methyl cis-9-octadecenoate	C18:1^{9}
methyl 12-methyltetradecanoate	anteiso-C15:0	methyl trans-9-octadecenoate	C18:1^{9}
methyl pentadecanoate	C15:0	methyl octadecanoate	C18:0
methyl 2-hydroxytetradecanoate	2-OH C14:0	methyl cis-9,10-methyleneoctadecanoate	C19:0$\Delta^{9,10}$
methyl 3-hydroxytetradecanoate	3-OH C14:0	methyl nonadecanoate	C19:0
methyl 14-methylpentadecanoate	iso-C16:0	methyl eicosanoate	C20:0

1075 **Volatile acid mix** **100 ml**
Qualitative mix

Appearance: liquid **Solvent:** water **Solubility:** water
Storage: 4-8°C

Contains: formic, acetic, propionic, isobutyric, n-butyric, isovaleric, n-valeric, isocaproic, n-caproic, and heptanoic acids

1077 **Non-volatile acid mix** **100 ml**
Qualitative mix

Appearance: liquid **Solvent:** water **Solubility:** water
Storage: 4-8°C

Contains: pyruvic, lactic, oxalacetic, oxalic, methyl malonic, malonic, fumaric and succinic acids.

Biochemical research standard mixes

These mixtures are prepared by precise gravimetric technique. All mixes contain equal amounts of listed components. A data sheet is supplied with each mixture.

1127 **Polar lipid mix** **25 mg/ml, 1 ml**
TLC standards mix

Source: natural, egg, ovine **Appearance:** liquid **Solvent:** chloroform/methanol 2:1
Solubility: chloroform/methanol 2:1 **Storage:** –20°C

Contains: cholesterol, phosphatidylethanolamine, lecithin, and lyso-lecithin

1128 **Sphingolipid mix** **25 mg/ml, 1 ml**
TLC standards mix

Source: natural, bovine **Appearance:** liquid **Solvent:** chlorofom/methanol 2:1
Solubility: chloroform/methanol 2:1 **Storage:** –20°C

Contains: cerebrosides, sulfatides, and sphingomyelin

1129 **Non-polar lipid mix A** **25 mg/ml, 1 ml**
TLC standards mix

Source: natural, plant, ovine **Appearance:** liquid **Solvent:** chloroform
Solubility: chloroform **Storage:** –20°C

Contains: cholesteryl palmitate, tripalmitin, palmitic acid, and cholesterol

1130 **Non-polar lipid mix B** **25 mg/ml, 1 ml**
TLC standards mix

Source: natural, plant, ovine **Appearance:** liquid **Solvent:** chloroform
Solubility: chloroform **Storage:** –20°C

Contains: cholesteryl oleate, methyl oleate, triolein, oleic acid, and cholesterol

Glycosphingolipid mixtures for TLC

These mixtures are qualitative standards prepared from our purified glycosphingolipids.

1505 **Neutral glycosphingolipid qualmix,** **1 mg/ml, 1 ml**
Glycosylceramides, qualitative mix

Source: natural, bovine and porcine **Appearance:** liquid **Solvent:**
chloroform/methanol 2:1 **Solubility:** chloroform/methanol 2:1 **Storage:** –20°C

Contains: cerebrosides, lactosylceramide, ceramide trihexoside, globoside

1508 **Monosialoganglioside mix** **0.5 mg/ml, 1 ml**
GM_3, GM_2, GM_1 qualitative mix

Source: natural, bovine **Appearance:** liquid **Solvent:** chloroform/methanol/water
2:1:0.1 **Solubility:** chloroform/methanol/water 2:1:0.1 **Storage:** –20°C

Contains: GM_3, GM_2, GM_1

1509 **Disialoganglioside mix** **0.5 mg/ml, 1 ml**
GD_3, GD_{1a}, GD_{1b}, qualitative mix

Source: natural, bovine **Appearance:** liquid **Solvent:** chloroform/methanol/water
2:1:0.1 **Solubility:** chloroform/methanol/water 2:1:0.1 **Storage:** –20°C

Contains: GD_3, GD_{1a}, GD_{1b}

1510 **Lactosylceramide and sialosyl derivatives mix** **0.5 mg/ml, 1 ml**
LC, GM_3, GD_3 qualitative mix

Source: natural, bovine **Appearance:** liquid **Solvent:** chloroform/methanol/water
2:1:0.1 **Solubility:** chloroform/methanol/water 2:1:0.1 **Storage:** –20°C

Contains: LC, GM_3, GD_3

1511 **Gangliotetraosylceramide and sialosyl derivatives mix** **0.5 mg/ml, 1 ml**
asialo-GM_1, GM_1, GD_{1a}, GD_{1b}, GT_{1b} qualitative mix

Source: natural, bovine **Appearance:** liquid **Solvent:** chloroform/methanol/water 2:1:0.1 **Solubility:** chloroform/methanol/water 2:1:0.1 **Storage:** –20°C

Contains: asialo-GM_1, GM_1, GD_{1a}, GD_{1b}, GT_{1b}

Biochemicals and reagents

Stable isotope labeled compounds

1914 **N-Stearoyl-D_{35}-psychosine, perdeuterated** **5 mg**
Cerebrosides with N-C18:0-D_{35} fatty acid side chain $C_{42}H_{46}D_{35}NO_8$

Source: semi-synthetic, bovine **Mol. Wt.:** 762 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform, hot ethanol, chloroform/methanol 2:1 **Storage:** –20°C

1533 **N-Palmitoyl-D_3-glucopsychosine, deuterated** **1 mg**
N-C16:0-D_3-Glucopsychosine; glucocerebroside with C16:0-D_3 fatty acid side chain $C_{40}H_{74}D_3NO_8$

Source: semi-synthetic, bovine buttermilk **Mol. Wt.:** 703 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform/methanol 2:1 **Storage:** –20°C

1534 **N-Palmitoyl-D_3-lactosylceramide, deuterated** **1 mg**
N-C16:0-D_3-Lactosylceramide; lactosylceramide with C16:0-D_3 fatty acid side chain $C_{46}H_{84}D_3NO_{13}$

Source: semi-synthetic, bovine buttermilk **Mol. Wt.:** 864 **Purity:** 98+% by TLC **Appearance:** white solid **Solubility:** chloroform/methanol/water 5:1:0.1 **Storage:** –20°C

2200 **N-1-^{13}C-Palmitoyl-sphingosylphosphorylcholine** **1 mg**
D-erythro-Sphingomyelin with 1-^{13}C-palmitic acid; SPM with ^{13}C labeled fatty acid $^{12}C_{38}{}^{13}CH_{79}N_2O_6P$

Source: semi-synthetic, bovine **Mol. Wt.:** 703 **Purity:** 98+% by TLC **Appearance:** waxy solid **Solubility:** chloroform, ethanol, methanol **Storage:** –20°C

2050 **N-Octadecanoyl-D_3-monosialoganglioside GM_1** **0.5 mg**
N-D_3-Stearoyl-GM_1 $C_{73}H_{128}N_3O_{31}D_3$

Source: semi-synthetic, bovine brain **Mol. Wt.:** 1548 **Purity:** 98+% by TLC **Appearance:** solid, **Solubility:** chloroform/methanol/water 2:1:0.1, forms micellar solution in water **Storage:** –20°C

1536 **N-Octadecanoyl-D_3-sulfatide** **1 mg**
N-C18:0-D_3-Sulfatide $C_{42}H_{78}D_3NO_{11}S$

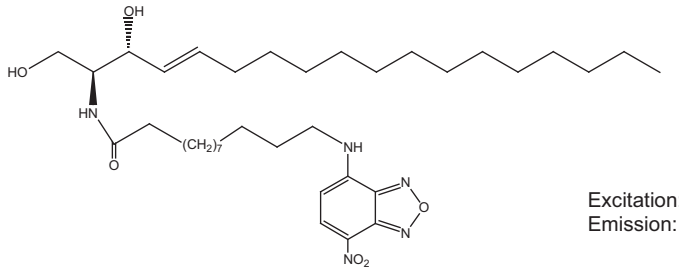
Source: semi-synthetic, bovine **Mol. Wt.:** 833 **Purity:** 98+% by TLC **Appearance:** off-white solid **Solubility:** chloroform/methanol/DI water 2:1:0.1 **Storage:** –20°C

1537 **N-Octadecanoyl-D_3-ceramide trihexoside** **0.5 mg**

C18:0-D_3-CTH; C18:0-D_3-Gb3; N-Octadecanoyl-D_3-globotriaosylceramide
$C_{54}H_{98}D_3NO_{18}$

Source: semi-synthetic, porcine **Mol. Wt.:** 1055 **Purity:** 98+% by TLC
Appearance: off-white solid **Solubility:** chloroform/methanol 2:1:, DMSO
Storage: –20°C

Fluorescent compounds



Catalog number 1618

Excitation: 460 nm
Emission: 535 nm

1841 **N-Hexanoyl-NBD-D-erythro-sphingosine** **100 µg**
1841-001 N-C6:0-NBD-ceramide; N-C6:0-NBD-D-erythro-sphingosine, fluorescent; N-(NBD-aminocaproyl)-D-erythro-sphingosine $C_{30}H_{49}N_5O_6$ **CAS#:** 86701-10-2 **1 mg**

Source: synthetic **Mol. Wt.:** 575 **Melting Point (°C):** 85-88 **Purity:** 98+% by TLC
Appearance: orange film, vacuum dried **Solubility:** chloroform, ethanol, methanol
Storage: –20°C

Reference:
J. M. L. Hauser et al., J. Biol. Chem. **269**, 6803, *1994*

1618 **N-Dodecanoyl-NBD-D-erythro-sphingosine** **100 µg**
1618-001 N-C12:0-NBD-ceramide; N-C12:0-NBD-D-erythro-sphingosine, fluorescent; N-(NBD-aminolauroyl)-D-erythro-sphingosine $C_{36}H_{61}N_5O_6$ **1 mg**

Source: synthetic **Mol. Wt.:** 660 **Purity:** 98+% by TLC **Appearance:** orange solid
Solubility: chloroform/methanol 2:1, methanol **Storage:** –20°C

1857 **N-Hexanoyl-NBD-L-threo-sphingosine** **100 µg**
1857-001 N-C6:0-NBD-ceramide; N-C6:0-NBD-L-threo-sphingosine, fluorescent; N-(NBD-aminocaproyl)-L-threo-sphingosine $C_{30}H_{49}N_5O_6$ **1 mg**

Source: synthetic **Mol. Wt.:** 575 **Purity:** 98+% by TLC **Appearance:** red-orange solid **Solubility:** chloroform, ethanol, methanol **Storage:** –20°C

Reference:
J. M. L. Hauser et al., J. Biol. Chem. **269**, 6803, *1994*

1620 **N-Dodecanoyl-NBD-L-threo-sphingosine** **100 µg**
1620-001 N-C12:0-NBD-ceramide; N-C12:0-NBD-L-threo-sphingosine, fluorescent; N-(NBD-aminolauroyl)-L-threo-sphingosine $C_{36}H_{61}N_5O_6$ **1 mg**

Source: synthetic **Mol. Wt.:** 660 **Purity:** 98+% by TLC **Appearance:** orange solid
Solubility: chloroform/methanol 2:1, methanol **Storage:** –20°C

1624 **N-Hexanoyl-NBD-L-threo-dihydrosphingosine** **100 µg**
1624-001 N-C6:0-NBD-dihydroceramide; N-C6:0-NBD-L-threo-dihydrosphingosine, fluorescent; N-(NBD-aminocaproyl)-L-threo-dihydrosphingosine $C_{30}H_{51}N_5O_6$ **1 mg**

Source: synthetic **Mol. Wt.:** 578 **Purity:** 98+% by TLC **Appearance:** orange solid
Solubility: chloroform/methanol 2:1, methanol **Storage:** –20°C

1623 **N-Dodecanoyl-NBD-L-threo-dihydrosphingosine** **100 µg**
1623-001 N-C12:0-NBD-dihydroceramide; N-C12:0-NBD-L-threo-dihydrosphingosine, fluorescent; N-(NBD-aminolauroyl)-L-threo-dihydrosphingosine **1 mg**
$C_{36}H_{63}N_5O_6$

Source: synthetic **Mol. Wt.:** 662 **Purity:** 98+% by TLC **Appearance:** orange solid
Solubility: chloroform/methanol 2:1, methanol **Storage:** –20°C

1626 **N-Hexanoyl-NBD-D-erythro-dihydrosphingosine** **100 µg**
1626-001 N-C6:0-NBD-dihydroceramide; N-C6:0-NBD-D-erythro-dihydrosphingosine, fluorescent; N-(NBD-aminocaproyl)-D-erythro-dihydrosphingosine **1 mg**
$C_{30}H_{51}N_5O_6$

Source: synthetic **Mol. Wt.:** 578 **Purity:** 98+% by TLC **Appearance:** orange solid
Solubility: chloroform/methanol 2:1, methanol **Storage:** –20°C

1625 **N-Dodecanoyl-NBD-D-erythro-dihydrosphingosine** **100 µg**
1625-001 N-C12:0-NBD-dihydroceramide; N-C12:0-NBD-D-erythro-dihydrosphingosine, fluorescent; N-(NBD-aminolauroyl)-D-erythro-dihydrosphingosine $C_{36}H_{63}N_5O_6$ **1 mg**

Source: synthetic **Mol. Wt.:** 662 **Purity:** 98+% by TLC **Appearance:** orange solid
Solubility: chloroform/methanol 2:1, methanol **Storage:** –20°C

1628 **N-Hexanoyl-NBD-phytosphingosine** **100 µg**
1628-001 N-C6:0-NBD-phytoceramide; N-C6:0-NBD-phytosphingosine, fluorescent; N-(NBD-aminocaproyl)-phytosphingosine $C_{30}H_{51}N_5O_7$ **1 mg**

Source: semi-synthetic, bacteria **Mol. Wt.:** 594 **Purity:** 98+% by TLC
Appearance: orange solid **Solubility:** chloroform/methanol 2:1, methanol
Storage: –20°C

1627 **N-Dodecanoyl-NBD-phytosphingosine** **100 µg**
1627-001 N-C12:0-NBD-phytoceramide; N-C12:0-NBD-phytosphingosine, fluorescent; N-(NBD-aminolauroyl)-phytosphingosine $C_{36}H_{63}N_5O_7$ **1 mg**

Source: semi-synthetic, bacteria **Mol. Wt.:** 678 **Purity:** 98+% by TLC
Appearance: orange solid **Solubility:** chloroform/methanol 2:1, methanol
Storage: –20°C

1912 **N-Hexanoyl-NBD-sphingosylphosphorylcholine** **100 µg**
1912-001 N-C6:0-NBD-sphingomyelin, fluorescent; N-C6:0-NBD-sphingosylphosphorylcholine; fluorescent sphingomyelin; N-(NBD-aminocaproyl)-sphingomyelin $C_{35}H_{61}N_6O_9P$ **CAS#:** 94885-04-8 **1 mg**

Source: semi-synthetic, bovine buttermilk **Mol. Wt.:** 740 **Purity:** 98+% by TLC
Appearance: red-brown solid **Solubility:** chloroform, ethanol, methanol
Storage: –20°C

Mixture of D-erythro and L-threo isomers

1619 **N-Dodecanoyl-NBD-sphingosylphosphorylcholine** **100 ug**
1619-001 N-C12:0-NBD-sphingomyelin, fluorescent; N-C12:0-NBD-sphingosylphosphorylcholine; fluorescent sphingomyelin; N-(NBD-aminolauroyl)-sphingomyelin $C_{41}H_{73}N_6O_4P$ **1 mg**

Source: semi-synthetic, bovine buttermilk **Mol. Wt.:** 825 **Purity:** 98+% by TLC
Appearance: orange solid **Solubility:** chloroform/methanol 2:1, methanol
Storage: –20°C

Mixture of D-erythro and L-threo isomers

1621 **N-Hexanoyl-NBD-galactosylceramide** **100 µg**
1621-001 N-C6:0-NBD-beta-D-galactosylsphingosine; N-C6:0-NBD-cerebrosides; N-C6:0-NBD-galactosylceramide, fluorescent; N-(NBD-aminocaproyl)-beta-D-galactosylsphingosine $C_{36}H_{59}N_5O_{11}$ **1 mg**

Source: semi-synthetic, bovine **Mol. Wt.:** 738 **Purity:** 98+% by TLC
Appearance: orange solid **Solubility:** chloroform/methanol 5:1, methanol
Storage: –20°C

1622 **N-Hexanoyl-NBD-glucosylceramide** **100 µg**
1622-001 N-C6:0-NBD-beta-D-glucosylsphingosine; N-C6:0-NBD-glucosylceramide, fluorescent; N-(NBD-aminocaproyl)-beta-D-glucosylsphingosine $C_{36}H_{59}N_5O_{11}$ **1 mg**

Source: semi-synthetic, bovine **Mol. Wt.:** 738 **Purity:** 98+% by TLC
Appearance: orange solid **Solubility:** chloroform/methanol 5:1, methanol
Storage: –20°C

1629 **N-Hexanoyl-NBD-lactosylceramide** **50 ug**
1629-001 N-Hexanoyl-NBD-beta-D-lactosylsphingosine; N-C6:0-NBD-beta-D-lactosylsphingosine; N-C6:0-NBD-lactosylceramide, fluorescent; fluorescent LC; N-(NBD-aminocaproyl)-beta-D-lactosylsphingosine $C_{42}H_{69}N_5O_{16}$ **1 mg**

Source: semi-synthetic, bovine buttermilk **Mol. Wt.:** 900 **Purity:** 98+% by TLC
Appearance: orange solid **Solubility:** chloroform/methanol 2:1 **Storage:** –20°C

1630 **N-Dodecanoyl-NBD-lactosylceramide** **50 µg**
1630-001 N-Dodecanoyl-NBD-beta-D-lactosylsphingosine; N-C12:0-NBD-beta-D-lactosylsphingosine; N-C12:0-NBD-lactosylceramide, fluorescent; fluorescent LC; N-(NBD-aminolauroyl)-beta-D-lactosylsphingosine $C_{48}H_{81}N_5O_{16}$ **1 mg**

Source: semi-synthetic, bovine buttermilk **Mol. Wt.:** 984 **Purity:** 98+% by TLC
Appearance: orange solid **Solubility:** chloroform/methanol 2:1 **Storage:** –20°C

1631 **N-Dodecanoyl-NBD-ceramide trihexoside** **100 µg**
1631-001 N-C12:0-NBD-CTH; N-C12:0-NBD-globotriaosylceramide; N-(NBD-aminolauroyl)-ceramide trihexoside $C_{54}H_{91}N_5O_{21}$ **1 mg**

Source: semi-synthetic, porcine **Mol. Wt.:** 1145 **Purity:** 98+% by TLC
Appearance: red-orange solid **Solubility:** chloroform/methanol 2:1: DMSO; hot methanol **Storage:** –20°C

1632 **N-Dodecanoyl-NBD-sulfatide** **100 µg**
1632-001 N-C12:0-NBD-sulfatide; N-Dodecanoyl-NBD-lyso-sulfatide; N-Dodecanoyl-NBD-sphingosyl-beta-D-galactoside-3-sulfate; N-(NBD-aminolauroyl)-sulfatide $C_{42}H_{71}N_5O_{14}S$ **1 mg**

Source: semi-synthetic, bovine **Mol. Wt.:** 901 **Purity:** 98+% by TLC
Appearance: red-orange solid **Solubility:** chloroform/methanol 2:1 **Storage:** –20°C

Appendix

Table III. Typical Fatty Acid Composition of Natural Lipids Made by Matreya LLC.
(actual composition may vary according to dietary history and growth condition of the source)

	Cat. # 1044 Lecithin (egg)	Cat: # 1070 Lecithin (bovine)	Cat: # 1302 Lecithin (plant)	Cat. # 1045 Phosphatidyl-ethanolamine (egg)	Cat: # 1301 Phosphatidyl-ethanolamine (plant)	Cat. # 1046 lyso-Lecithin (egg)	Cat. # 1047 Phosphatidylserine (bovine)	Cat. # 1048 Phosphatidylinositol (plant)
Fatty Acids								
C14:0		trace						
C16:0	31	35	14	19	22	72	1	36
C16:1		1		1				
C18:0	16	14	4	26	3	24	42	
C18:1	31	33	11	23	7	3	27	7
C18:2	16		66	14	60			50
C18:3			6		8			7
C20:0							1	
C20:1							4	
C20:4				10			4	
C21:0								
C22:0							1	
C22:1							1	
C22:6							7	
C23:0								
C24:0								
C24:1								
C25:0								
C25:1								
C26:0								
C26:1								
C27:0								
C27:1								
C14:0 2-OH								
C16:0 2-OH								
C18:0 2-OH								
C20:0 2-OH								
C22:0 2-OH								
C23:0 2-OH								
C24:0 2-OH								
C24:1 2-OH								
C25:0 2-OH								
C25:1 2-OH								
C26:0 2-OH								
C26:1 2-OH								
C16 cis 9,10 methylene								
C18 cis 9,10 methylene								
Others	6	17	0	7	0	1	12	0
Total	100	100	100	100	100	100	100	100

Typical Fatty Acid Composition of Natural Lipids Made by Matreya LLC (continued)

(actual composition may vary according to dietary history and growth condition of the source)

	Cat: # 1051 Sphingomyelin (bovine)	Cat: # 1328 Sphingomyelin (porcine RBC)	Cat: # 1053 Phosphatidic acid (semi-synthetic)	Cat: # 1057 Glucocerebrosides (human)	Cat: # 1058 Monogalactosyl-diglycerides (plant)	Cat: # 1059 Digalactosyldiglyceride (plant)	Cat: # 1061 Monosialoganglioside GM_1	Cat: # 1062 Disialoganglioside GD_{1a}
Fatty Acids								
C14:0							trace	trace
C16:0	3	30	39	14	23	9	1	1
C16:1								
C18:0	45	8	12	3	77	91	86	86
C18:1		2	34				3	3
C18:2			15					
C18:3								
C20:0	1	2		3			4	4
C20:1								
C20:4								
C21:0								
C22:0	4	10		24			2	2
C22:1								
C22:6								
C23:0		1		9			1	1
C24:0	8	30		33			1	1
C24:1	31	14		13			2	2
C25:0								
C25:1								
C26:0		2						
C26:1								
C27:0								
C27:1								
C14:0 2-OH								
C16:0 2-OH								
C18:0 2-OH								
C20:0 2-OH								
C22:0 2-OH								
C23:0 2-OH								
C24:0 2-OH								
C24:1 2-OH								
C25:0 2-OH								
C25:1 2-OH								
C26:0 2-OH								
C26:1 2-OH								
C16 cis 9,10 methylene								
C18 cis 9,10 methylene								
Others	8	1	0	1	0	0	0	0
Total	100	100	100	100	100	100	100	100

Typical Fatty Acid Composition of Natural Lipids Made by Matreya LLC (continued)
(actual composition may vary according to dietary history and growth condition of the source)

	Cat: # 1063 Trisialoganglioside GT_{1b}	Cat: # 1064 Gangliotetraosylceramide	Cat: # 1065 Purified mixed gangliosides	Cat: # 1501 Disialoganglioside GD_{1b}	Cat. # 1050 Cerebrosides (bovine)	Cat: # 1066 Cerebrosides Kerasin (bovine)	Cat: # 1138 Cerebrosides Phrenosin (bovine)	Cat. # 1049 Sulfatides (bovine)
Fatty Acids								
C14:0	trace	trace	trace	trace				
C16:0	1	1	1	1	trace	trace		trace
C16:1								
C18:0	86	86	86	86	4	5		5
C18:1	3	3	3	3				trace
C18:2								
C18:3								
C20:0	4	4	4	4	1	1		1
C20:1								
C20:4								
C21:0								
C22:0	2	2	2	2	4	9		7
C22:1						trace		trace
C22:6								
C23:0	1	1	1	1	2	5		
C24:0	1	1	1	1	10	25		18
C24:1	2	2	2	2	15	43		29
C25:0					3	3		2
C25:1					1	3		2
C26:0					2	2		1
C26:1					1	4		3
C27:0					2			1
C27:1					2			
C14:0 2-OH								
C16:0 2-OH								
C18:0 2-OH					15		36	5
C20:0 2-OH					1		1	trace
C22:0 2-OH					6		8	3
C23:0 2-OH					5		6	
C24:0 2-OH					17		25	10
C24:1 2-OH					6		9	6
C25:0 2-OH					3		4	2
C25:1 2-OH							2	
C26:0 2-OH							2	
C26:1 2-OH							2	
C16 cis 9,10 methylene								
C18 cis 9,10 methylene								
Others	0	0	0	0	0	0	5	5
Total	100	100	100	100	100	100	100	100

Typical Fatty Acid Composition of Natural Lipids Made by Matreya LLC (continued)

(actual composition may vary according to dietary history and growth condition of the source)

	Cat: # 1067 Ceramide trihexoside (porcine)	Cat: # 1068 Globosides (porcine)	Cat: # 1118 Esterified steryl glucoside	Cat: # 1056 Ceramides (bovine)	Cat: # 1322 Ceramides (non-hydroxy)	Cat: # 1323 Ceramides (hydroxy)	Cat: # 1535 Monosialoganglioside GM_4	Cat: # 1332 Sphingomyelin, (egg, chicken)	Cat: # 1516 Tetrasialoganglioside $GQ1_b$
Fatty Acids									
C14:0								trace	
C16:0	3	2	34	trace			4	72	5
C16:1									1
C18:0	2	1	8	4	11		2	8	80
C18:1	2		8					3	2
C18:2			36						3
C18:3			4						
C20:0	2	1	1	1	2		trace	2	4
C20:1							trace		
C20:4									
C21:0									
C22:0	17	15	4	4	10		3	5	2
C22:1							4		
C22:6									
C23:0	1	1	2	2	6		4	1	
C24:0	29	23	2	10	24		6	2	
C24:1	5	15		15	31		4	4	
C25:0				9	3				
C25:1				1	3				
C26:0		1		2	2				
C26:1		1		1	3				
C27:0				2					
C27:1				2					
C14:0 2-OH									
C16:0 2-OH									
C18:0 2-OH		trace		15		24	1		
C20:0 2-OH		trace		1		1	3		
C22:0 2-OH	3	3		6		8	25		
C23:0 2-OH	1			5		6	17		
C24:0 2-OH	19	11		17		35	18		
C24:1 2-OH	10	23				17	7		
C25:0 2-OH				3		4			
C25:1 2-OH									
C26:0 2-OH									
C26:1 2-OH						2			
C16 cis 9,10 methylene									
C18 cis 9,10 methylene									
Others	6	3	1	0	5	3	2	3	3
Total	100	100	100	100	100	100	100	100	100

Typical Fatty Acid Composition of Natural Lipids Made by Matreya LLC (continued)
(actual composition may vary according to dietary history and growth condition of the source)

	Cat: # 1329 Sphingomyelin (buttermilk)	Cat: # 1500 Lactosyl ceramide (porcine)	Cat: # 1507 Lactosyl ceramide (buttermilk)	Cat: # 1502 Monosialoganglioside GM2	Cat: # 1503 Monosialoganglioside GM3 (buttermilk)	Cat: # 1504 Disialoganglioside GD3 (buttermilk)	Cat: # 1521 Glucocerebrosides (buttermilk)	Cat: # 1522 Glucocerebrosides (plant)
Fatty Acids								
C14:0	1						trace	
C16:0	21	14	8	2	6	8	15	
C16:1								
C18:0	3	6	3	82	1	1	3	
C18:1		4	trace					
C18:2								
C18:3								
C20:0	1	1	2	7	1	1	2	
C20:1								
C20:4								
C21:0					1	2		
C22:0	23	9	28	4	23	24	31	
C22:1								
C22:6								
C23:0	29	1	33	trace	36	35	28	
C24:0	20	15	20	1	22	21	17	
C24:1	1	5	3	2	3	3		
C25:0								
C25:1								
C26:0								
C26:1								
C27:0								
C27:1								
C14:0 2-OH								trace
C16:0 2-OH								79
C18:0 2-OH		trace						trace
C20:0 2-OH								
C22:0 2-OH		8						8
C23:0 2-OH								1
C24:0 2-OH		24						9
C24:1 2-OH		13						
C25:0 2-OH								
C25:1 2-OH								
C26:0 2-OH								
C26:1 2-OH								
C16 cis 9,10 methylene								
C18 cis 9,10 methylene								
Others	1	0	3	2	7	5	4	3
Total	100	100	100	100	100	100	100	100

Chem Service Pesticide Standards - Alphabetical Listing

A

Catalog #	Size	Description
PS-1072	30mg	Aastar®
PS-380	500mg	Aatrex®
PS-2068	100mg	Abamectin
PS-665	100mg	Abaphos®
PS-677	1g	Abar®
PS-665	100mg	Abat®
PS-665	100mg	Abate®
PS-665	100mg	Abathion®
PS-2141	250mg	Abound®
PS-2197	250mg	AC 263, 222®
PS-2216	100mg	Acaban®
PS-857	1g	Acaralate®
PS-854	250mg	Acarben®
PS-2015	100mg	Acaristop®
PS-2216	100mg	Acaritan®
PS-1062	250mg	Acarol®
PS-2005	100mg	Accent®
PS-1088	100mg	Acclaim
PS-2223	100mg	Acclaim®
PS-678	500mg	Accothion®
PS-2040	100mg	Acenite®
PS-738	1g	Acephate
PS-2219	100mg	Acer®
PS-2219	100mg	Acetamiprid
PS-2040	100mg	Acetochlor
PS-104	1g	3-(a-Acetonylbenzyl)-4-hydroxycoumarin
PS-1021	1g	Acetoxy-triphenylstannane
PS-2135	500mg	Achieve®
PS-2212	250mg	Acibenzolar-S-methyl
PS-1016	1g	Acifluorfen
PS-1111	100mg	Acifluorfen methyl ester
PS-2105	100mg	Acord®
PS-397	250mg	ACP 63303®
PS-4	1g	Acquinite®
PS-2138	500mg	Acrobat®
PS-2215	100mg	Actara®
PS-644	250mg	Actellic®
PS-1002	100mg	Acti-Aid®
PS-397	250mg	Actril®
PS-2110	100mg	Adeal®
PS-2266	500mg	Adios®
PS-2110	100mg	Admiral®
PS-2086	500mg	Admire®
PS-1063	250mg	Advantage®
PS-372	250mg	Afalon®
PS-2036	100mg	Aflix®
PS-2283	50mg	Afos®
PS-2049	100mg	Afugan®
PS-2105	100mg	Agreen®
PS-2278	250mg	Agribon®
PS-2089	500mg	Agribrom®
PS-2068	100mg	Agri-Mek®
PS-2007	100mg	Agrisil®
PS-2007	100mg	Agritox®
PS-2062	250mg	Agrocol®
PS-2203	250mg	Agrothrin®
PS-40	1g	Agroxone®
PS-2170	100mg	Aim®
PS-2062	250mg	Airone®
PS-854	250mg	Akar®
PS-675	1g	Akton®
PS-357	1g	Alachlor
PS-343	1g	Alanap®
PS-391	1g	Alar®
PS-2278	250mg	Albon®
PS-734	1g	Aldicarb
PS-1055	10mg	Aldicarb sulfone
PS-1054	10mg	Aldicarb sulfoxide
PS-1055	10mg	Aldoxycarb
PS-69	100mg	Aldrin®
PS-2112	250mg	Alfa Z®
PS-2112	250mg	Alfa-4®
PS-1202	5ml	Alfacron®
PS-2112	250mg	Alfamat®
PS-90	1g	Alfa-Tox®
PS-2026	100mg	Aliette®
PS-1202	5ml	Alificron®
PS-95	500mg	Alkron®
PS-96	5ml	Allethrin
PS-791	250mg	d-trans-Allethrin
PS-2182	250mg	Alliage®
PS-351	1g	Allidochlor
PS-293	1g	Allisan®
PS-1200	5ml	Alloxydim - Sodium
PS-79	1g	Alltex®
PS-1078	100mg	Ally 60 DF Weed Killer®
PS-940	1g	Allylguaiacol®
PS-790	250mg	d-2-Allyl-4-hydroxy-3-methyl-2-cyclopentene -1-one,d-trans-chrysanthemum monocarboxylic acid ester
PS-940	1g	4-Allyl-2-methoxyphenol
PS-2043	100mg	(+/-)-1-(B-Allyloxy-2,4-dichlorophenylethyl) imidazole
PS-2082	500mg	3-Allyloxy-1,2-benz[d]isothiazole 1,1-dioxide
PS-360	1g	Allyl trimethylammonium bromide
PS-2000	1g	Alon®
PS-2177	100mg	Alpha-(2-Fluorophenyl)-alpha-(4-fluorophenyl)-1H-1,2,4-triazole-1-ethanol
PS-2083	250mg	Alphamethrin®
PS-2176	100mg	Alsystine®
PS-2249	100mg	Altima®
PS-2130	50mg	Alto®
PS-1040	250mg	Altosid®
PS-2026	100mg	Aluminum tris (O-ethyl phosphonate)
PS-1003	100mg	Amaze®
PS-2042	100mg	Amber®
PS-758	250mg	Ambush
PS-2203	250mg	Ambush C®
PS-317	1g	Amchem 3CP®
PS-344	1g	Amcide®
PS-317	1g	Amdol 3CP®
PS-1001	100mg	Amdro
PS-2122	100mg	Amethopterin®
PS-383	500mg	Ametryne
PS-1004	500mg	Amex®
PS-314	250mg	Amiben®
PS-382	1g	Amigol®
PS-2055	100mg	2-Aminobenzoic acid methyl ester
PS-751	250mg	Aminocarb
PS-430	1g	5-Amino-4-chloro-2-phenyl-3(2H)-pyridazinone
PS-1113	100mg	3-Amino-2,5-dichlorobenzoic acid methyl ester
PS-314	250mg	3-Amino-2.5-dichlorobenzoic acid
PS-326	1g	3-Amino-2.5-dichlorobenzoic acid, ethyl ester
PS-2191	100mg	((4-Amino-3,5-dichloro-6-fluoro-2-pyridinyl)oxy)acetic acid,1-methylheptyl ester acetic acid
PS-2136	100mg	5-Amino-[2,6-dichloro-4-(trifluoromethyl)phenyl]-4-[(1R,S)-(trifluoromethyl) sulfinyl]-1H-pyrazole-3-carbonitrile
PS-2117	500mg	4-Amino-4,5-dihydro-3-methyl-6-phenyl-1,2,4-triazin-5-one
PS-1092	100mg	4-Amino-6-(1,1-dimethylethyl)-3- (ethylthio)-1,2,4-triazin-5(4H)-one®
PS-398	1g	4-Amino-6-tert-butyl-3-[methylthio]- 1.2.4-triazine-5[4H]-one
PS-2278	250mg	4-Amino-N-(2,6-dimethoxy-4-pyrimidinyl) benzenesulfonamide
PS-1010	1g	4-Aminopyridine
PS-382	1g	Aminotriazole
PS-382	1g	3-Amino-1.2.4-triazole
PS-274	250mg	4-Amino-3.5.6-trichloropicolinic acid
PS-1108	100mg	4-Amino-3.5.6-trichloropicolinic acid methyl ester
PS-391	1g	Aminozide®
PS-1013	500mg	Amiral®
PS-2141	250mg	Amistar®
PS-1005	500mg	Amitraz
PS-382	1g	Amitrole®
PS-58	500mg	Amizine
PS-2157	500mg	Amizol®
PS-382	1g	Amizol®
PS-1068	100mg	Ammo®
PS-2203	250mg	Ammo®
PS-344	1g	Ammonium amidosulphate
PS-414	1g	Ammonium ethyl carbamoylphosphonate
PS-291	1g	Ammonium fluosilicate
PS-344	1g	Ammonium sulfamate
PS-2124	250mg	Ammonium-4-[hydroxy(methyl) phosphinoyl]-DL-homoalaninate
PS-228	1g	Amobam®
PS-344	1g	AMS
PS-2137	100mg	Anchor®
PS-1008	1g	Ancymidol
PS-388	250mg	Anilazine
PS-2292	100mg	(S)-1-Anilino-4-methyl-2-methylthio-4-phenylimidazolin-5-one
PS-2259	100mg	3-Anilino-5-methyl-5-(4-phenoxyphenyl)-1,3-oxazolidine-2,4-dione
PS-74	1g	Anofex®
PS-429	1g	Ansar 170®
PS-281	500mg	Ansar 8100
PS-51	500mg	Ansar®
PS-2036	100mg	Anthio®
PS-6	1g	Anthiphen®
PS-608	1g	Anthon
PS-926	1g	9.10-Anthraquinone
PS-926	1g	Anthraquinone
PS-2203	250mg	Antiborer 3767®
PS-690	1g	Anticarie®
PS-2056	10mg	Anti-K®
PS-2030	1g	Antimilace®
PS-57	1g	Antinonnin®
PS-1006	1g	Antor®
PS-2062	250mg	Antracol®
PS-106	1g	ANTU
PS-106	1g	Anturat®
PS-2157	500mg	Anvil®
PS-1010	1g	4-Ap
PS-2199	100mg	Apache®
PS-71	1g	Aparasin®
PS-95	500mg	Aphamite®
PS-71	1g	Aphtiria
PS-1071	100mg	Apistan®

Chem Service Pesticide Standards - Alphabetical Listing

Catalog#	Size	Description
PS-1057	1g	Apl-Luster®
PS-2226	100mg	Apogee®
PS-2015	100mg	Apollo®
PS-2067	100mg	Applaud®
PS-551	1g	Aprocarb®
PS-1099	100mg	Apron®
PS-365	1g	Aquacide®
PS-2200	250mg	Aquacycline®
PS-315	1g	Aqua-Kleen®
PS-850	5ml	Aracide®
PS-850	5ml	Aramite
PS-24	1g	Arasan®
PS-1057	1g	Arbotec®
PS-2203	250mg	Ardap®
PS-2000	1g	Arelon®
PS-2210	250mg	Aresin®
PS-1008	1g	A-Rest®
PS-2210	250mg	Arezine®
PS-366	1g	Arial Gramoxone®
PS-2073	500mg	Armor®
PS-2177	100mg	Armour®
PS-1014	250mg	Arrat®
PS-2016	100mg	Arsenal®
PS-281	500mg	Arsinyl®
PS-84	1g	Arylam®
PS-2216	100mg	Asalto®
PS-2004	100mg	Asana®
PS-904	1g	Ascabin
PS-904	1g	Ascabiol®
PS-2175	250mg	Ascurit®
PS-663	50mg	Asp-51
PS-2219	100mg	Aspilan®
PS-663	50mg	Aspon®
PS-2195	100mg	Assert®
PS-2151	500mg	Assure II®
PS-1080	100mg	Assure Weed Killer®
PS-1009	1g	Asulam
PS-1009	1g	Asulox 40®
PS-1009	1g	Asulox F®
PS-1009	1g	Asulox®
PS-656	100mg	Asuntol®
PS-382	1g	ATA®
PS-2248	25mg	Atabron®
PS-2130	50mg	Atemi®
PS-104	1g	Athrombine-K®
PS-2110	100mg	Atominal®
PS-380	500mg	Atratol®
PS-395	500mg	Atraton
PS-380	500mg	Atrazine
PS-66	1g	Auligen
PS-66	1g	Aulinogen
PS-2132	250mg	Authority®
PS-506	1g	Avadex BW®
PS-507	100mg	Avadex®
PS-404	1g	Avenge®
PS-2068	100mg	Avermectin B1
PS-2068	100mg	Avid®
PS-1010	1g	Avitrol®
PS-901	1g	Avolin®
PS-2075	10mg	Azadiractin
PS-550	100mg	Azak®
PS-1202	5ml	Azamethiphos
PS-2075	10mg	Azatin®
PS-673	100mg	Azinphos ethyl
PS-666	1g	Azinphos methyl
PS-851	1g	Azobenzene
PS-851	1g	Azobenzide®
PS-2063	250mg	Azocyclotin
PS-609	1g	Azodrin
PS-682	1g	Azofene
PS-851	1g	Azofume®
PS-2141	250mg	Azoxystrobin

B

Catalog #	Size	Description
PS-388	250mg	B-622
PS-1005	500mg	BAAM®
PS-2278	250mg	Bactrovet®
PS-389	1g	Balan®
PS-2166	500mg	Balance®
PS-2106	1g	Bancol®
PS-1085	100mg	Banol
PS-2167	250mg	Banol turf fungicide®
PS-397	250mg	Bantrol®
PS-106	1g	Bantu®
PS-346	1g	Banvel®
PS-2206	250mg	BAP
PS-540	100mg	Barbamate®
PS-540	100mg	Barban
PS-666	1g	Barben®
PS-2029	1g	Baron®
PS-2133	500mg	Barricade®
PS-2203	250mg	Barricade®
PS-1068	100mg	Barricide®
PS-1047	10mg	BAS 08300W
PS-1011	250mg	Basagran®
PS-17	1g	Basamid®
PS-2203	250mg	Basathrin®
PS-2226	100mg	Baseline®
PS-2156	500mg	Basilex®
PS-2227	100mg	Basitac®
PS-1046	1g	Bassa®
PS-2124	250mg	Basta®
PS-90	1g	Basudin®
PS-1021	1g	Batasan®
PS-2108	100mg	Battalion®
PS-1077	100mg	Bavistin®
PS-2205	250mg	BAY FOE 5043®
PS-1046	1g	Baycarb®
PS-655	500mg	Baycid®
PS-2176	100mg	Baycidal®
PS-1093	100mg	Baycor®
PS-551	1g	Baygon®
PS-1013	500mg	Bayleton®
PS-1207	250mg	Bayluscide® (100ug/ml in Methanol)
PS-2192	100mg	BAY-MAT 7484®
PS-1093	100mg	Baymat®
PS-2010	250mg	Bayrusil®
PS-1064	250mg	Baytan®
PS-655	500mg	Baytex®
PS-2100	1g	Baythion®
PS-1090	250mg	Baythroid®
PS-2204	250mg	Beta-Baythroid®
PS-450	100mg	BDMC
PS-2169	500mg	Beacon®
PS-1083	100mg	Beam®
PS-1032	250mg	Belmark®
PS-1032	500mg	Belmark®
PS-2142	250mg	Benalaxyl
PS-2193	250mg	Benazolin ethyl ester
PS-2193	250mg	Benazolin-ethyl
PS-1082	100mg	Bendas®
PS-739	250mg	Bendiocarb
PS-389	1g	Benefin®
PS-389	1g	Benfluralin
PS-2241	100mg	Benfuracarb
PS-71	1g	Ben-Hex®
PS-222	100mg	Benlate®
PS-222	100mg	Benomyl
PS-851	1g	Bensofume®
PS-1082	100mg	Bensulfuron-methyl
PS-425	250mg	Bensulide
PS-2106	1g	Bensultap
PS-425	250mg	Bensumec®
PS-1011	250mg	Bentazon
PS-1112	50mg	Bentazon methyl derivative
PS-1017	1g	Benthiocarb

Catalog #	Size	Description
PS-904	1g	Benylate®
PS-70	1g	Benzene hexachloride
PS-692	100mg	alpha-Benzenehexachloride
PS-691	100mg	beta-Benzenehexachloride
PS-693	100mg	delta-Benzenehexachloride
PS-71	1g	gamma-Benzenehexachloride
PS-425	250mg	S-2-Benzenesulfon amidoethyl-O,O-di-isopropyl phosphorodithioate
PS-1000	250mg	Benzofuroline
PS-904	1g	Benzoic acid benzyl ester
PS-2146	500mg	benzoic acid, 4-Chloro-2-benzoyl-2-(1,1-dimethylethyl)-hydrazide
PS-2212	250mg	Benzo(1,2,3)thiadiazole-7-carbothioic acid-S-methyl ester
PS-2193	250mg	3-Benzothiazolineacetic acid, 4-chloro-2-oxo-, ethyl ester
PS-2048	100mg	1-(1,3-Benzothiazol-2-yl)-1,3-dimethylurea
PS-1201	5ml	1-(1,3-Benzothiazol-2-yl)-3-methylurea (100ug/ml in Methylene chloride)
PS-2140	500mg	2-(1,3-benzothiazol-2-yloxy)-N-methylacetanilide
PS-2140	500mg	2-(2-benzothiazolyloxy)-N-methyl-N-phenylacetamide
PS-2079	100mg	Benzoylprop ethyl
PS-1082	100mg	Benzsulfuron methyl
PS-1201	5ml	Benzthiazuron (100ug/ml in Methylene chloride)
PS-2206	250mg	6-Benzyladenine
PS-2206	250mg	N-Benzyladenine
PS-2206	250mg	N(sup 6)-Benzyladenine
PS-2206	250mg	6-Benzylaminopurine
PS-904	1g	Benzyl benzenecarboxylate
PS-904	1g	Benzyl benzoate
PS-170	1g	o-Benzyl-p-chlorophenol
PS-2084	1g	Benzyldiethyl [(2,6-xylylcarbamoyl)ammonium benzoate
PS-1000	250mg	(5-Benzyl-3-furyl)methyl-2.2-dimethyl-3-(2-methylpropenyl) cyclopropane carboxylate
PS-2266	500mg	Benzylideneacetaldehyde
PS-2065	500mg	S-Benzyl O,O-di-isopropyl phosphorothioate
PS-2255	250mg	N-Benzyl-N-isopropyl pivalamide
PS-98	1g	Benzyl rhodanide
PS-98	1g	Benzyl thiocyanate
PS-81	500mg	Beosit®
PS-2083	250mg	Bestox®
PS-2203	250mg	Betamethrate®
PS-1015	250mg	Betanal AM®
PS-1014	250mg	Betanal®
PS-1015	250mg	Betanex®
PS-1014	250mg	Betapost®
PS-425	250mg	Betasan®
PS-66	1g	Bexide®
PS-70	1g	BHC (mixed isomers)
PS-692	100mg	BHC alpha isomer
PS-692	100mg	a-BHC
PS-692	100mg	alpha-BHC
PS-691	100mg	BHC beta isomer
PS-691	100mg	b-BHC
PS-691	100mg	beta-BHC
PS-693	100mg	BHC delta isomer
PS-693	100mg	d-BHC
PS-693	100mg	delta-BHC
PS-2222	1ml	BHC (epsilon isomer)

Chem Service Pesticide Standards - Alphabetical Listing

Catalog #	Size	Description
PS-71	1g	BHC gamma isomer
PS-71	1g	g-BHC
PS-71	1g	gamma-BHC
PS-324	250mg	BH® Mecoprop
PS-2194	250mg	Bifenazate
PS-311	1g	Bifenox
PS-2003	100mg	Bifenthrin
PS-1083	100mg	Bim®
PS-2087	100mg	Binapacryl
PS-389	1g	Binnell®
PS-791	250mg	Bioallethrin
PS-790	250mg	s-Bioallethrin
PS-17	1g	Biocide N521®
PS-1057	1g	Bioguard®
PS-18	1g	Bioquin
PS-2080	500mg	Bioresmethrin
PS-2200	250mg	Biosolvomycin®
PS-665	100mg	Biothion®
PS-2032	1g	Biphenyl
PS-1093	100mg	B-([1,1'-Biphenyl]-4-yloxy)-a-(1,1-dimethylethyl)-1H-1,2,4-triazole-1-ethanol
PS-2143	100mg	3-[3-(1,1'-Biphenyl)-4-yl-1,2,3,4-tetrahydro-1-naphthalenyl]-4-hydroxy-2H-1-benzopyran-2-one
PS-2143	100mg	3-(3-Biphenyl-4-yl-1,2,3,4-tetrahydro-1-naphthyl)-4-hydroxycoumarin
PS-1087	100mg	Birlane®
PS-910	1g	2.3:4.5-Bis(2-butylene)tetrahydro-2-furaldehyde
PS-72	1g	2.2-Bis(p-chlorophenyl)-1.1-dichloroethane
PS-72	1g	1.1-Bis(p-chlorophenyl)-2.2-dichloroethane
PS-2015	100mg	3,6-Bis(2-chlorophenyl)-1,2,4,5-tetrazine
PS-82	250mg	1.1-Bis(p-chlorophenyl)-2.2.2-trichloroethanol
PS-24	1g	Bis(dimethylthiocarbamyl) disulfide
PS-223	1g	1.2-Bis(3-ethoxycarbonyl-2-thioureido) benzene
PS-381	50mg	2,4-Bis(ethylamino)-6-methylthio-1,3,5-triazine
PS-73	1g	2.2-Bis(p-ethylphenyl)-1.1-dichloroethane
PS-2041	100mg	Bis(4-fluorophenyl) (methyl) (1H-1,2,4-triazol-1-ylmethyl) silane
PS-384	1g	2.4-Bis(isopropylamino)-6-methylthio-s-triazine
PS-2221	250mg	N-(2,6-Bis(1-methylethyl)-4-phenoxyphenyl)-N'- (1,1-dimethylethyl)thiourea
PS-862	1g	Bis(pentachloro-2.4-cyclopentadien-1-yl)
PS-2164	1g	N,N-Bis(phosphonomethyl) glycine
PS-2246	100mg	Bispyribac Sodium
PS-282	1g	Bis(tributyltin)oxide
PS-282	1g	Bis(tri-n-butyltin)oxide
PS-1093	100mg	Bitertanol
PS-2084	1g	Bitrex®
PS-2084	1g	Bitterguard®
PS-85	1g	Black Leaf 40
PS-2024	50mg	Bladafum®
PS-95	500mg	Bladan®
PS-387	1g	Bladex
PS-551	1g	Blattanex®
PS-1111	100mg	Blazer methyl ester
PS-1016	1g	Blazer®
PS-1073	100mg	Bloc®
PS-391	1g	B-Nine®
PS-1017	1g	Bolero®
PS-1018	100mg	Bolstar®
PS-2176	100mg	Bolstar®
PS-2046	50mg	Boltage®
PS-2097	500mg	Bonzi®
PS-2260	100mg	Boscalid
PS-293	1g	Botran®
PS-1046	1g	BPMC
PS-309	1g	Brambicide®
PS-150	1g	Brassicol®
PS-1020	1g	Bravo®
PS-1021	1g	Brestan®
PS-2003	100mg	Brigade®
PS-2111	500mg	Broadstrike®
PS-1056	50mg	Brodifacoum
PS-62	1g	Bromacil
PS-1038	100mg	Bromadiolone
PS-325	1g	Bromeflor®
PS-426	1g	Brominal®
PS-426	1g	Brominil®
PS-273	500mg	Bromoacetyl bromide
PS-1038	100mg	3-[3-(4'-Bromo[1.1'biphenyl]-4-yl)-3-hydroxy-1-phenylpropyl]-4-hydroxy-2H-1-benzopyran-2-one
PS-1056	50mg	3-[3-(4'-Bromo[1,1'-biphenyl]-4-yl])- 1,2,3,4-tetrahydro-1-naphthalenyl] -4-hydroxy-2H-benzopyran-2-one
PS-62	1g	5-Bromo-3-sec-butyl-6-methyluracil
PS-2171	100mg	4-Bromo-2-(4-chlorophenyl)-1-ethoxymethyl-5-trifluoromethylpyrrole-3-carbonitrile
PS-2089	500mg	1-Bromo-3-chloro-5,5-dimethyl-2,4-imidazolidinedione
PS-368	1g	3-[4-Bromo-3-chlorophenyl]-1-methoxy-1-methylurea
PS-1024	250mg	O-(4-Bromo-2-chlorophenyl)-O-ethyl-S-propyl phosphorothioate
PS-2008	100mg	O-(4-Bromo-2,5-dichlorophenyl)-O,O-diethylphosphorothioate
PS-2009	50mg	O-(4-Bromo-2,5-dichlorophenyl)-O,O-dimethylphosphorothioate
PS-677	1g	O-(4-Bromo-2.5-dichloro phenyl)-O-methylphenyl phosphonothioate
PS-450	100mg	4-Bromo-3.5-dimethyl phenyl-N-methyl carbamate
PS-361	1g	(2-Bromoethyl)trimethyl ammonium bromide
PS-154	1g	Bromofume®
PS-155	5ml	Bromomethane
PS-2128	1g	2-Bromo-2-nitro-1,3-propanediol
PS-312	1g	p-Bromophenoxy acetic acid
PS-374	1g	3-(p-Bromophenyl)-1-methoxy-1-methylurea
PS-374	1g	3-(p-Bromophenyl)-1-methyl-1-methoxyurea
PS-2009	50mg	Bromophos
PS-2008	100mg	Bromophos ethyl
PS-2009	50mg	Bromophos methyl
PS-1062	250mg	Bromopropylate
PS-426	1g	Bromoxynil
PS-434	1g	Bromoxynil octanoic acid ester
PS-2128	1g	Bronopol
PS-1005	500mg	BTS 27419
PS-2186	25mg	Bucid®
PS-426	1g	Buctril®
PS-429	1g	Bueno®
PS-2223	100mg	Bugle®
PS-2157	500mg	Bullet®
PS-690	1g	Bunt-cure®
PS-690	1g	Bunt-no-more®
PS-2067	100mg	Buprofezin
PS-2021	100mg	Busan 30A
PS-2019	100mg	Busan 40
PS-2020	100mg	Busan 85
PS-348	250mg	Butachlor
PS-100	100mg	Butacide®
PS-2255	250mg	Butam®
PS-907	1g	Butopyronoxyl
PS-2071	100mg	Butox®
PS-100	100mg	Butoxide®
PS-306	1g	Butoxone®
PS-730	250mg	2-[2-Butoxyethoxy]ethyl thiocyanate
PS-315	1g	Butoxyethyl-2.4-dichlorophenoxyacetate
PS-309	1g	Butoxyethyl-2.4.5-trichlorophenoxy-acetate
PS-348	250mg	N-(Butoxymethyl)-2-chloro-2',6'-diethylacetanilide
PS-908	1g	Butoxypolypropylene glycol
PS-1004	500mg	Butralin
PS-2186	25mg	Butsid®
PS-2120	1g	2-tert-Butylamino-4-ethylamino-6-methoxy-s-triazine
PS-2067	100mg	2-tert-Butylamino-3-isopropyl-5-phenyl- 1,3,5-thiadiazinan-4-one
PS-413	50mg	2-tert-Butylamino-4-chloro-6-ethylamino-1.3.5-triazine
PS-379	1g	2-tert-Butylamino-4-ethylamino-6-methyl-thio-s-triazine
PS-503	1g	Butylate
PS-2146	500mg	N-tert-butyl-N'-(4-Chlorobenzoyl) benzohydrazide
PS-375	1g	3-tert-Butyl-5-chloro-6-methyluracil
PS-607	50mg	4-tert-Butyl-2-chlorophenylmethyl-N-methyl-phosphoramidate
PS-2280	100mg	Butyl (R)-2-[4-(4-cyano-2-fluorophenoxy)phenoxy] propionate
PS-1050	1g	2-tert-Butyl-4-(2.4-dichloro-5-isopropoxyphenyl)- 2-1.3.4-oxadiazolin-5-one
PS-42	1g	Butyl-2.4-dichlorophenoxy acetate
PS-377	1g	1-n-Butyl-3-[3.4-dichlorophenyl]-1-methylurea
PS-2216	100mg	t-Butyl (E)-alpha-(1,3-dimethyl-5-phenoxypyrazol-4-ylmethyleneaminooxy)-p-toluate
PS-436	1g	2-sec-Butyl-4,6-dinitrophenol triethanolamine salt
PS-433	1g	2-sec-Butyl-4.6-dinitrophenol, ethanolamine salt
PS-2087	100mg	2-sec-Butyl-4,6-dinitrophenyl 3-methylcrotonate
PS-2257	50mg	(RS)-5-tert-Butyl-2-[2-(2,6-

WARNING - READ YOUR MATERIAL SAFETY DATA SHEET BEFORE HANDLING OR USING ANY CHEMICALS

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Chem Service Pesticide Standards - Alphabetical Listing

Catalog#	Size	Description
		difluorophenyl)-4,5-dihydro-1,3-oxazol-4-yl]phenetole
PS-907	1g	Butyl-3.4-dihydro-2.2-dimethyl-4-oxo- 1.2-H-pyran -[6-carboxylate]
PS-2293	POR	8-tert-Butyl-1,4-dioxaspiro[4.5]decan-2-ylmethyl (ethyl)(propyl)amine
PS-2188	100mg	N-tert-Butyl-N'-(4-ethylbenzoyl)-3,5-dimethylbenzohydrazide
PS-2120	1g	N2-tert-Butyl-N4-ethyl-6-methoxy-1,3,5-triazine-2,4-diamine
PS-2273	30mg	S-sec-Butyl O-ethyl (2-oxo-1,3-thiazolidine-3-yl) phosphonothioate
PS-101	1g	2-Butyl-2-ethyl-1.3-propanediol
PS-389	1g	N-Butyl-N-ethyl-a.a.a-trifluoro-2.6-dinitro-p-toluidine
PS-907	1g	Butylmesityl oxide oxalate
PS-2258	100mg	4-tert-Butylphenethyl quinazolin-4-yl ether
PS-858	1g	2-[p-tert-Butylphenoxy] cyclohexyl-2-propynyl sulfite
PS-850	5ml	2[p-tert-Butylphenoxy]iso-propyl-2-chloroethyl sulfite (0.1mg/ml in Hexane)
PS-1046	1g	2-sec-Butylphenyl-N-methylcarbamat
PS-1214	5ml	(+/-)cis-4-[3-(4-tert-Butylphenyl) -2-methyl propyl] -2,6-dimethyl morpholine
PS-2125	1g	2-tert-Butyl-5-(4-tert-butylbenzylthio)-4-chloropyridazin-3(2H)-one
MET-222B	500mg	3-Butyl-1,3,5-triazino[1,2a] benzamidazole-2,4-dione
PS-1097	100mg	R,S-Butyl-2-[4-(5-trifluoromethyl-2-pyridyloxy)phenoxy] propinoate
PS-2240	POR	Butyl (RS)-2-[4-(5-trifluoromethyl-2-yridyloxy) phenoxy]propionate
PS-306	1g	Butyrac®
PS-2030	1g	C-8-Tetramethyl-1,3,5,7-tetroxocane
PS-2006	100mg	a,n-Butyl-a-(4-chlorophenyl)-1H-1,2,4-triazole-1 -propanenitrile

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Catalog #	Size	Description
PS-2235	100mg	Cabrio EG®
PS-51	500mg	Cacodylic acid
PS-280	1g	Cadminate®
PS-280	1g	Cadmium succinate
PS-2197	250mg	Cadre®
PS-2199	100mg	Cadusafos
PS-2085	500mg	Caid®
PS-2289	100mg	Calciol
PS-2226	100mg	Calcium 3-oxido-5-oxo-4-propionylcyclohex-3-enecarboxylate
PS-2242	100mg	Calixin®
PS-79	1g	Camphechlor
PS-2182	250mg	Candit®
PS-307	100mg	Cantrol
PS-2157	500mg	Canvil®
PS-384	1g	Caparol®
PS-260	1g	Captafol
PS-25	1g	Captan
PS-2120	1g	Caragard®
PS-20	1g	Carbamate®
PS-2167-1	250mg	Carbamic acid, (3-(dimethylamino)propyl)- , propyl ester
PS-282	1g	Car-Ban®
PS-1085	100mg	Carbanolate
PS-84	1g	Carbaryl
PS-1077	100mg	Carbendazim
PS-602	250mg	Carbicron
PS-754	1g	Carbofuran
PS-87	250mg	2-Carbomethoxy-1-methylvinyl dimethyl-phosphate
PS-88	1g	Carbophenothion
PS-1063	250mg	Carbosulfan
PS-294	1g	Carboxin
PS-2164	1g	N-Carboxymethyl-N,N-bis(methylenephosphonic acid)-amine
PS-540	100mg	Carbyne®
PS-2220	100mg	Cardomec®
PS-2170	100mg	Carfentrazone-ethyl
PS-2069	500mg	Cartap hydrochloride
PS-1046	1g	Carvil®
PS-940	1g	Caryophyllic acid®
PS-400	1g	Carzol SP®
PS-2213	250mg	Cascade®
PS-392	1g	Casoron®
PS-2143	100mg	Castrix D®
PS-75	1g	CD-68®
PS-351	1g	CDAA
PS-19	250mg	CDEC®
PS-58	500mg	CDT®
PS-2008	100mg	Cela S-2225
PS-2014	100mg	Cela W524
PS-2172	100mg	Celest Special®
PS-2172	100mg	Celest®
PS-325	1g	CEPHA®
PS-223	1g	Cercobin
PS-230	1g	Cercobin-M®
PS-209	250mg	Ceresan®
PS-397	250mg	Certrol®
PS-58	500mg	CET®
PS-2124	250mg	Challenge®
PS-2013	100mg	Checkmate®
PS-562	1g	Chemagro B-1776
PS-86	500mg	Chemathion®
PS-220	1g	Chem Bam®
PS-22	1g	Chem Neb®
PS-106	1g	Chemical 109®
PS-228	1g	Chem-O-Bam®
PS-2203	250mg	Chinmix®
PS-860	250mg	Chinomethionate
PS-1052	1g	Chipco 26019
PS-2112	250mg	a-Chloralose
PS-2113	1g	b-Chloralose
PS-314	250mg	Chloramben
PS-326	1g	Chloramben ethyl ester
PS-1113	100mg	Chloramben methyl ester
PS-2043	100mg	Chloramizol®
PS-11	1g	Chloranil
PS-63	1g	Chloranocryl
PS-853	100mg	Chlorbenside
PS-368	1g	Chlorbromuron
PS-75	1g	Chlordane
PS-75-1	10mg	alpha-Chlordane
PS-75-1	10mg	alpha(cis)-Chlordane
PS-75-2	10mg	beta-Chlordane
PS-75-1	10mg	cis-Chlordane
PS-75-2	10mg	trans-Chlordane
PS-701	50mg	Chlordecone
PS-840	1g	Chlordimeform
PS-59	1g	Chlorea®
PS-2217	250mg	Chlorethoxyfos
PS-308	1g	Chlorfenac
PS-2171	100mg	Chlorfenapyr
PS-855	1g	Chlorfenson®
PS-1087	100mg	Chlorfenvinphos
PS-2248	25mg	Chlorfluazuron
PS-1022	100mg	Chlorflurecol-methyl ester
PS-1022	100mg	Chlorflurenol methyl ester
PS-430	1g	Chloridazon
PS-1081	100mg	Chlorimuron ethyl
PS-79	1g	Chlorinated camphene
PS-2209	250mg	Chlormephos
PS-363	1g	Chlormequat chloride
PS-31	1g	Chloroacetic acid
PS-1006	1g	N-Chloroacetyl-N-(2.6-diethylphenyl)-glycine ethyl ester
PS-152	1g	a-Chloroallyl chloride
PS-19	250mg	2-Chloroallyl diethyldithiocarbamate
PS-2234	POR	1-cis-3-Chloroallyl-3,5,7-triaza-1-azonia-adamantane chloride
PS-854	250mg	Chlorobenzilate
PS-853	100mg	p-Chlorobenzyl-p-chlorophenyl sulfide
PS-2225	250mg	7-Chlorobicyclo(3.2.0)hepta-2,6-dien-6-yl dimethyl phosphate
PS-58	500mg	2-Chloro-4.6-bis(ethylamino)-s-triazine
PS-385	500mg	2-Chloro-4.6-bis (isopropylamino)-s-triazine
PS-540	100mg	4-Chloro-2-butynyl-m-chlorocarbanilate
PS-540	100mg	4-Chloro-2-butynyl-N-[3-chlorophenyl]-carbamate
PS-2260	100mg	2-Chloro-N-(4'-chloro biphenyl-2-yl)nicotinamide
PS-1207	250mg	5-Chloro-N-(2-chloro-4-nitrophenyl)salicylamide (100ug/ml in Methanol)
PS-2249	100mg	3-Chloro-N-(3-chloro-5-trifluoromethyl-2-pyridyl)-alpha,alpha,alpha-trifluoro -2,6-dinitro-p-toluidine
PS-363	1g	Chlorocholine chloride
PS-40	1g	4-Chloro-o-cresoxyacetic acid
PS-402	1g	2-[[-4-Chloro-6-(cyclopropylamino)-1.3.5-triazin-2-yl]-amino]-2-methylpropanenitrile
PS-2104	100mg	2-Chloro-4-(cyclopropyl amino)-6-(isopropylamino)-s-triazine
PS-351	1g	a-Chloro-N.N-diallylacetamide
PS-675	1g	O-[2-Chloro-1-[2.5-dichlorophenyl]vinyl] O.O-diethyl phosphorothioate
PS-1087	100mg	2-Chloro-1-(2,4-dichloro phenyl)vinyl diethyl phosphate
PS-2107	100mg	2-Chloro-4-diethylamino-6-ethylamino-1,3,5-triazine
PS-348	250mg	2-Chloro-2',6'-diethyl-N-(butoxymethyl)acetanilide
PS-357	1g	2-Chloro-2',6'-diethyl-N-[methoxymethyl]acetanilide
PS-606	250mg	2-Chloro-2-diethyl

Chem Service Pesticide Standards - Alphabetical Listing

Alphabetical Listing

Catalog #	Size	Description
		carbamoyl-1-methylvinyl dimethyl phosphate
PS-606	250mg	2-Chlorodiethylcarbamoyl methyl vinyl dimethyl phosphate
PS-357	1g	2'-Chloro-N-[2.6-diethylphenyl]-N-methoxy methylacetamide
PS-1202	5ml	S-6-Chloro-2,3-dihydro-2-oxo-oxazolo[4,5-b]pyridin-3-ylmethyl O,O-dimethyl phosphorothioate (100ug/ml in Methylene chloride)
PS-2291	100mg	(S)-2-Chloro-N-(2,4-dimethyl-3-thienyl) -N-(2-methoxy-1- methylethyl) acetamide
PS-2161	250mg	(RS)-2-Chloro-N-(2,4-dimethyl -3-thienyl) -N-(2-methoxy-1-methylethyl) acetamide
PS-2040	100mg	2-Chloro-N-ethoxymethyl-6'-ethylacet-o-toluidide
PS-1033	1g	2-Chloro-1-(3-ethoxy-4-nitrophenoxy)-4-(trifluoromethyl)benzene
PS-2042	100mg	1-[2-(2-Chloroethoxy) phenylsulfonyl]-3-(4-methoxy-6-methyl)-1,3,5-triazin-2-yl)urea
PS-380	500mg	2-Chloro-4-ethylamino-6-isopropylamino-s-triazine
PS-387	1g	2-[(4-Chloro-6-ethylamino-s-triazin-2-yl)amino]-2-methylpropionitrile
PS-209	250mg	Chloroethylmercury
PS-403	500mg	2-Chloro-N-[2-ethyl-6-methylphenyl]-N-[2-methoxy-1-methylethyl] acetamide
PS-1084	500mg	4-(4-Chloro-2-ethylphenoxy) butyric acid, methyl ester
PS-325	1g	(2-Chloroethyl)phosphonic acid
PS-363	1g	[2-Chloroethyl] trimethyl ammonium chloride
PS-1211	5ml	N-(2-Chloro-6-fluorobenzyl)-N-ethyl-a,a,a-trifluoro-2,6-dinitro-p-toluidine (100ug/ml in Acetone)
PS-2168	250mg	N-(2-Chloro-6-fluorobenzyl)-N-ethyl-a,a,a-trifluoro-2,6-dinitro-p-toluidine (100ug/ml in Acetone)
PS-608	1g	Chlorofos
PS-52	1g	Chloro IPC®
PS-355	1g	2'-Chloro-N-isopropyl acetanilide
PS-355	1g	2-Chloro-N-isopropyl-N-phenylacetamide
PS-310	1g	p-Chloromandelic acid
PS-1065	100mg	2-Chloro-N-[[4-methoxy-6-methyl-1.3.5-triazin-2-yl)amino]carbonyl] benzenesulfonamide
PS-2178	250mg	N-(3-Chloro-4-methoxy phenyl) -N',N'-dimethylurea
PS-1044	100mg	4-Chloro-5-(methylamino)-2-(a.a.a-trifluoro-m-tolyl)-3(2H)-pyridazinone
PS-2209	250mg	S-(Chloromethyl) O,O-diethyl ester phosphorodithioic acid
PS-2209	250mg	S-(Chloromethyl) O,O-diethylphosphorodithioate
PS-2209	250mg	S-Chloromethyl-O,O-diethylphosphoro thiolothionate
PS-40	1g	(4-Chloro-2-methylphenoxy) acetic acid
PS-324	250mg	2-(4-Chloro-2-methyl phenoxy)propanoic acid
PS-1106	100mg	2-(4-Chloro-2-methyl phenoxy) propanoic acid methyl ester
PS-2116	500mg	(+)-(R)-2-(4-Chloro-2-methylphenoxy) propionic acid
PS-2281	POR	N-(3-Chloro-4-methylphenyl)-2-methylpentanamide
PS-2281	POR	3'-Chloro-2-methylvalero-p-toluidide
PS-255	1g	Chloroneb
PS-669	1g	O-(2-Chloro-4-nitrophenyl)-O.O-dimethyl phosphorothioate
PS-853	100mg	Chloroparacide®
PS-2085	500mg	Chlorophacinone
PS-840	1g	Chlorophedine®
PS-7	1g	Chlorophen®
PS-74	1g	Chlorophenothan
PS-38	1g	o-Chlorophenoxy acetic acid
PS-39	1g	p-Chlorophenoxy acetic acid
PS-376	1g	3-[p-(p-Chlorophenoxy) phenyl]1.1-dimethylurea
PS-359	1g	2-[3-Chlorophenoxy] propionamide
PS-855	1g	p-Chlorophenyl-p-chlorobenzene sulfonate
PS-1073	100mg	a-(2-Chlorophenyl)-a-(4-chlorophenyl) -5-(pyrimidinemethanol)
PS-1079	100mg	trans-5-(4-Chlorophenyl-N-cyclohexyl-4-methyl-2-oxo-3-thiazolidine carboxamide
PS-2130	50mg	(2RS,3RS;2RS,3SR)-2-(4-Chlorophenyl)-3-cyclopropyl -1-(1H-1,2,4-triazol-1-yl) butan-2-ol
PS-1028	1g	1-(4-Chlorophenyl)-3-(2,6-difluorobenzoyl)urea
PS-2138-1	500mg	(Z)-4-[3-(4-Chlorophenyl)-3-(3,4-dimethoxyphenyl) acryloyl]-morpholine
PS-2138	500mg	(E,Z)-4-[3-(4-Chlorophenyl)-3-(3,4-dimethoxyphenyl) acryloyl]-morpholine
PS-2097	500mg	(2RS,3RS)-1-(4-Chlorophenyl)-4,4-dimethyl-2-(1H-1,2,4-triazol-1-yl) pentan-3-ol
PS-2076	10mg	(E)-(RS)-1-(4-Chlorophenyl)-4,4-dimethyl-2- (1H-1,2,4-triazol-1-yl) pent-1-en-3-ol
PS-59	1g	3-(4-Chlorophenyl)-1.1-dimethylurea
PS-371	1g	3-[4-Chlorophenyl]-1.1-dimethylurea trichloroacetate
PS-1091	100mg	a-[2-(4-Chlorophenyl)ethyl]-
PS-2072	100mg	alpha-(3-(4-Chlorophenyl) ethyl-alpha-phenyl- (1H-1,2,4-triazole)-1-propanenitrile
PS-2210	250mg	3-(4-Chlorophenyl)-1-methoxy-1-methylurea
PS-1095	100mg	N-[(4-Chlorophenyl)methyl]-N-cyclopentyl-N'-phenylurea
PS-1017	1g	S-(4-Chlorophenyl)methyl diethylcarbamothioate
PS-2001	100mg	2-(2-Chlorophenyl)methyl-4,4-dimethyl-3-isoxazolidinone
PS-2085	500mg	2-[2-(4-Chlorophenyl)-2-phenylacetyl] indan-1,3-dione
PS-2085	500mg	2-[(4-Chlorophenyl) phenylacetyl]-1H-indene-1,3(2H)-dione
PS-2072	100mg	4-(4-Chlorophenyl)-2-phenyl-2-[1H-1,2,4-triazol-1-yl) methyl]butanenitrile
PS-2210	250mg	3-(4-Chlorphenyl)-1-methoxy-1-methylharnstoff
PS-2046	50mg	(RS)-[O-1-(4-Chlorophenyl)pyrazole-4-yl O-ethyl S-propyl
PS-2081	500mg	O-(6-Chloro-3-phenyl-4-pyridazinyl) S-octyl carbonothioate
PS-88	1g	S[[(p-Chlorophenyl)thio] methyl)-O.O-diethylphosphorodithioate
PS-88	1g	S-[[(4-chlorophenyl)thio] methyl] O,O-Diethylphos phorodithioate
PS-80	1g	p-Chlorophenyl-2.4.5-trichlorophenyl sulfone
PS-4	1g	Chlor-O-Pic®
PS-4	1g	Chloropicrin
PS-2045	100mg	E,E-(±)-2[1-[[3-Chloro-2-propenyl)oxy]imino] [propyl]5-[2-(ethylthio) propyl] -3-hydroxy-2-cyclohexen-1-one
PS-857	1g	Chloropropylate
PS-2219	100mg	(E)-N-[(6-Chloro-3-pyridinyl)methyl]-N'-cyano-N-methylethanimidamide
PS-2086	500mg	1-[(6-Chloro-3-pyridinyl)methyl]-N-nitro-2-imidazolidinimine
PS-2262	100mg	(3-((6-Chloro-3-pyridinyl) methyl)-2-thiazolidinylidene) cyanamide
PS-2150	500mg	1-(2-Chloro-4-pyridyl)-3-phenylurea
PS-1020	1g	Chlorothalonil
PS-2215	100mg	3-(2-Chloro-1,3-thiazol-5-a-(1,1-dimethylethyl)- 1H-1,2,4-triazole-1-ethanol
PS-2261	100mg	(E)-1-(2-Chloro-1,3-thiazol-5-ylmethyl)-3-methyl-2-nitroguanidine
PS-2078	250mg	Chlorotoluron
PS-840	1g	N'-(4-Chloro-o-tolyl)-N.N-dimethyl formamidine
PS-40	1g	4-Chloro-o-tolyloxyacetic acid
PS-1105	100mg	4-Chloro-o-tolyoxyacetic acid methyl ester
		ylmethyl)- 1,3,5-oxadiazinan-4-ylidene(nitro)amine
PS-419	1g	2-Chloro-6-(trichloromethyl)pyridine
PS-611	1g	2-Chloro-1-[2.4.5-

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Chem Service Pesticide Standards - Alphabetical Listing

Catalog#	Size	Description
		trichlorophenyl]vinyl-dimethylphosphate
PS-2121	1g	4-Chloro-a,a,a-trifluoro-N-(1-imidazol-1-yl-2-propoxyethylidene) -o-toluidine
PS-2176	100mg	2-Chloro-N-(((4-(trifluoromethoxy)phenyl) amino)carbonyl)benzamide
PS-2213	250mg	N-((4-(2-Chloro-4-(trifluoromethyl)phenoxy)-2-fluorophenyl)carbamoyl)-2,6-difluorobenzamide
PS-1016	1g	5-[2-Chloro-4-(trifluoromethyl) phenoxy]-2-nitrobenzoic acid
PS-1111	100mg	5-[2-Chloro-4-(trifluoromethyl)phenoxy] -2-nitrobenzoic acid methyl ester
PS-2102	500mg	5-[2-Chloro-4-(trifluoromethyl)phenoxy] -N-(methylsulfonyl)-2-nitrobenzamide
PS-2253	100mg	(+/-)-N-[[[3-Chloro-4-[1,1,2-trifluoro-2-(trifluoromethoxy) ethoxy]-phenyl] amino] carbonyl]-2,6-difluorobenzamide
PS-1085	100mg	6-Chloro-3.4-xylyl-methyl carbamate phosphorothioate
PS-376	1g	Chloroxuron
PS-2090	500mg	Chloroxynil
PS-840	1g	Chlorphenamidine®
PS-67	50mg	Chlorphonium chloride
PS-52	1g	Chlorpropham
PS-857	1g	Chlorpropylat
PS-674	1g	Chlorpyrifos
PS-418	250mg	Chlorpyrifos Methyl
PS-1065	100mg	Chlorsulfuron
PS-853	100mg	Chlorsulphacide®
PS-33	1g	Chlorthal
PS-33	1g	Chlorthal-Methyl®
PS-81	500mg	Chlorthiepin®
PS-2289	100mg	Cholecalciferol
PS-2144	500mg	Chorus®
PS-1000	250mg	Chrysron®
PS-369	1g	CIBA 2059®
PS-374	1g	CIBA 3126
PS-606	250mg	CIBA 570
PS-2025	100mg	Cidial®
PS-2273	30mg	Cierto®
PS-2266	500mg	Cinnacure®
PS-2266	500mg	Cinnamaldehyde
PS-2266	500mg	Cinnamite®
PS-603	50mg	Ciodrin®
PS-52	1g	CIPC®
PS-1025	1g	CL 26691
PS-224	1g	Clairsit®
PS-1081	100mg	Classic 25 DF Weed Killer®
PS-2063	250mg	Clermait®
PS-2045	100mg	Clethodim
PS-2097	500mg	Clipper®
PS-2276	100mg	Clodinafop-propargyl
PS-2015	100mg	Clofentezine
PS-2001	100mg	Clomazone
PS-317	1g	Cloprop
PS-1069	250mg	Clopyralid
PS-2165	100mg	Cloransulam-methyl
PS-2261	100mg	Clothianidin
PS-1200	5ml	Clout® (100ug/ml in Acetonitrile)
PS-59	1g	CMU®
PS-2028	1g	CNC

Catalog #	Size	Description
PS-2077	100mg	Cobra®
PS-2199	100mg	Codusafos
PS-9	1g	Collunosol
PS-2255	250mg	Colzor®
PS-2129	1g	Combat®
PS-2001	100mg	Command
PS-2018	100mg	Commodore®
PS-2255	250mg	Comodor®
PS-324	250mg	Compitox Plus®
PS-324	250mg	Compitox®
PS-2174	250mg	Comply®
PS-2086	500mg	Confidor®
PS-2188	100mg	Confirm®
PS-2124	250mg	Conquest®
PS-2074	250mg	Consult®
PS-2151	500mg	Co-Pilot®
PS-2028	1g	Copper naphthenate
PS-292	1g	Copper oxychloride
PS-2091	500mg	Copper-8-quinolinolate
PS-2028	1g	Copper Uversol®
PS-2028	1g	Coppo W®
PS-656	100mg	7-Co-Ral®
PS-1214	5ml	Corbel®
PS-926	1g	Corbit®
PS-40	1g	Cornox M®
PS-21	1g	Corozate®
PS-203	100mg	Corubex®
PS-369	1g	Cotoran®
PS-104	1g	Coumadin®
PS-104	1g	Coumafene®
PS-104	1g	Coumaphene®
PS-656	100mg	Coumaphos
PS-2093	250mg	Coumatetralyl
PS-680	500mg	Counter®
PS-39	1g	4-CPA
PS-313	1g	Crag 1®
PS-908	1g	Crag Fly Repellent®
PS-261	1g	Crag Fruit Fungicide 341®
PS-313	1g	Crag Herbicide 1®
PS-313	1g	Crag SES
PS-17	1g	Crage Fungicide 974®
PS-2058	100mg	Croneton®
PS-27	100mg	Crotothane®
PS-603	50mg	Crotoxyphos
PS-607	50mg	Crufomate
PS-2097	500mg	Cultar®
PS-2179	1g	Cumene®
PS-2000	1g	3-p-Cumenyl-1,1-dimethylurea
PS-2179	1g	Cumol®
PS-2028	1g	Cunapsol®
PS-250	1g	Cupene®
PS-2028	1g	Cuprinol®
PS-1024	250mg	Curacron®
PS-2028	1g	Curap 20®
PS-1022	100mg	Curbiset®
PS-1067	100mg	Curzate®
PS-2131	100mg	Cutless ®
PS-842	1g	Cyalane®
PS-387	1g	Cyanazine
PS-2250	100mg	4-Cyano-2,6-di-iodophenyl octanoate
PS-1067	100mg	2-Cyano-N-[(ethylamino) carbonyl]-2-methoxyimino) acetamide
PS-2204	250mg	(RS)-alpha-cyano-4-fluoro-3-phenoxybenzyl (1RS,3RS;1RS,3SR)-3- (2,2-dichlorovinyl)2,2- dimethyl cyclopropanecarboxylate
PS-1090	250mg	Cyano-(4-fluoro-3-phenoxyphenyl) methyl-3-(2,2-dichloroethenyl)-2,2-dimethylcyclopropane carboxylate
PS-2290	POR	N-Cyanomethyl-4-(trifluoromethyl) nicotinamide
PS-2034	100mg	O-4-Cyanophenyl-O,O-dimethylphosphorothioate
PS-1071	100mg	(RS)-a-Cyano-3-phenoxybenzyl (R)-2-[2-chloro-4-(trifluoromethyl) anilino]-3-methylbutanoate
PS-2071	100mg	(S)-a-Cyano-3-phenoxybenzyl(1R,3R) -3-(2,2-dibromovinyl)- 2,2-dimethylcyclopropane carboxylate
PS-1068	100mg	(+/-)(a)-Cyano-3-phenoxybenzyl (+) cis,trans-3-(2.2-dichlorovinyl) -2.2-dimethylcyclopropane carboxylate
PS-2203	250mg	(+-)-alpha-Cyano-3-phenoxybenzyl 2,2-dimethyl -3-(2,2-dichlorovinyl) cyclopropane carboxylate
PS-2004	100mg	(S)-a-Cyano-3-phenoxy benzyl-(S)-2-(4-chlorophenyl) -3-methylbutyrate
PS-2115	100mg	(S)-a-Cyano-3-phenoxybenzyl (1R,3S)-2,2-dimethyl-3-[(RS)-1,2,2,2-tetrabromoethyl] cyclopropanecarboxylate
PS-2244	250mg	(+-)-alpha-Cyano-3-phenoxybenzyl 2,2-dimethyl -3-(2,2-dichlorovinyl) cyclopropane carboxylate
PS-1072	30mg	(+-)-Cyano(3-phenoxy phenyl) methyl(+)-4-(difluoromethoxy) -alpha-(1-methylethyl)benzeneacetate
PS-1032	250mg	Cyano(3-phenoxyphenyl)-methyl-4-chloro-alpha- (1-methylethyl)benzeneacetate
PS-1032	500mg	Cyano(3-phenoxyphenyl)-methyl-4-chloro-alpha- (1-methylethyl)benzeneacetate
PS-2083	250mg	[1a(S®),3a]-(+/-)-Cyano-(3-phenoxyphenyl) methyl-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropane carboxylate
PS-2034	100mg	Cyanophos
PS-2034	100mg	Cyanox®
PS-1072	30mg	CyBolt®
PS-2279	100mg	Cybutryne
PS-2243	POR	Cyclanilide
PS-402	1g	Cycle®
PS-842	1g	Cyclic ethylene[diethoxy phosphinyl]dithio-imidocarbonate
PS-502	1g	Cycloate
PS-363	1g	Cyclocel®
PS-81	500mg	Cyclodan®
PS-1086	100mg	4-Cyclododecyl-2,6-dimethylmorpholine
PS-1042	100mg	Cyclohex-1-ene-1,2-dicarboximidomethyl-(1RS,3RS;1RS,3SR)-2,2-dimethyl-3-(2-methylprop-1-enyl)cyclopropane carboxylate
PS-1002	100mg	Cycloheximide

Chem Service Pesticide Standards - Alphabetical Listing

Catalog #	Size	Description
PS-416	1g	3-Cyclohexyl-6-(dimethylamino)-1-methyl-1.3.5-triazine-2.4-(1H.3H)-dione
PS-415	1g	3-Cyclohexyl-6,7-dihydro-1(H)-cyclopentapyrimidine - 2,4-(3H,5H)-dione
PS-415	1g	3-Cyclohexyl-5.6-trimethyleneuracil
PS-2033	500mg	Cyclopentadiene dimer
PS-2092	500mg	Cycloprate
PS-2204	250mg	Cyclopropanecarboxylic acid, 3-(2,2-dichloroethenyl) -2,2-dimethyl-,cyano(4-fluoro-3-phenoxyphenyl) methylester
PS-2279	100mg	N-Cyclopropyl-N'-(1,1-dimethylethyl)-6-(methylthio)-1,3,5-Triazine-2,4-diamine
PS-2144	500mg	4-Cyclopropyl-6-methyl-N-phenylpyrimidin-2-amine
PS-2166	500mg	5-Cyclopropyl-1,2-oxazol-4-yl a,a,a-trifluoro-2-mesyl-p-tolyl ketone
PS-2214	250mg	1-[2-(Cyclopropylcarbonyl) phenylsulfamoyl]-3- (4,6-dimethoxypyrimidin-2-yl) urea
PS-1008	1g	a-Cyclopropyl-a(p-methoxyphenyl)-5-pyrimidine methanol
PS-2073	500mg	N-Cyclopropyl-1,3,5-triazine-2,4,6-triamine
PS-2214	250mg	Cyclosulfamuron
PS-363	1g	Cycocel®
PS-678	500mg	Cyfen®
PS-1025	1g	Cyflee®
PS-1090	250mg	Cyfluthrin
PS-2204	250mg	beta-Cyfluthrin
PS-659	250mg	Cygon®
PS-2280	100mg	Cyhalofop-butyl
PS-107	250mg	Cyhexatin
PS-842	1g	Cylan®
PS-1068	100mg	Cymbush
PS-2203	250mg	Cymbush®
PS-1067	100mg	Cymoxanil
PS-668	100mg	Cynem®
PS-2182	250mg	Cyngus®
PS-842	1g	Cyolan®
PS-842	1g	Cyolane®
PS-1068	100mg	Cyperkill
PS-2203	250mg	Cyperkill®
PS-1068	100mg	Cypermethrin
PS-2083	250mg	alpha-Cypermethrin
PS-2203	250mg	(1R,alpha-S) cisCypermethrin
PS-2203	250mg	beta-Cypermethrin
PS-2203	250mg	Cypermetryna®
PS-2198	100mg	d-trans-Cyphenothrin
PS-2203	250mg	Cypor®
PS-2104	100mg	Cyprazine
PS-250	1g	Cyprex®
PS-2130	50mg	Cyproconazole
PS-2144	500mg	Cyprodinil
PS-2073	500mg	Cypromazine
PS-678	500mg	Cytel®
PS-1025	1g	Cythioate®
PS-86	500mg	Cythion®
PS-1072	30mg	Cythrin®
PS-382	1g	Cytrol®
PS-1026	100mg	Cytrolane®

D

Catalog #	Size	Description
PS-41	1g	2.4-D
PS-315	1g	2.4-D butoxyethyl ester
PS-42	1g	2.4-D butyl ester
PS-337	1g	2.4-D dimethylamine salt
PS-338	1g	2.4-D ethanolamine salt
PS-304	1g	2.4-D ethyl ester
PS-319-1	1g	2,4-D 2-ethylhexyl ester
PS-319	1g	2.4-D isooctyl ester
PS-332	1g	2.4-D isopropanol amine salt
PS-299	1g	2,4-D isopropylamine salt
PS-43	1g	2.4-D isopropyl ester
PS-41-1	1g	2.4-D methyl ester
PS-302	1g	2.4-D propylene glycol ester
PS-301	1g	2.4-D sec-butyl ester
PS-429	1g	Daconate®
PS-1020	1g	Daconil 2787®
PS-33	1g	Dacthal®
PS-2195	100mg	Dagger®
PS-2223	100mg	Dakota®
PS-32	1g	Dalapon
PS-1100	100mg	Dalapon methyl ester
PS-2236	250mg	Dalapon Sodium
PS-94	500mg	Dalf®
PS-2218	100mg	Damfin®
PS-391	1g	Daminozide
PS-2216	100mg	Danitron®
PS-2247	250mg	Dart®
PS-667	100mg	Dasanit®
PS-507	100mg	DATC
PS-17	1g	Dazomet
PS-306	1g	2.4-DB
PS-316	1g	2.4-DB dimethylamine salt
PS-1101	100mg	2,4-DB methyl ester
PS-1	1g	DBCP®
PS-900	1g	DBP®
PS-60	500mg	DCMU
PS-293	1g	DCNA
PS-33	1g	DCPA methyl ester®
PS-694	100mg	o.p'-DDD
PS-72	1g	p,p'-DDD
PS-695	50mg	o.p'-DDE
PS-696	100mg	p.p'-DDE
PS-74	1g	DDT
PS-74	1g	DDT (mixture p,p' & o,p')
PS-698	50mg	o.p'-DDT
PS-699	1g	p.p'-DDT
PS-89	1g	DDVF®
PS-89	1g	DDVP®
PS-701	50mg	Decachloro octahydro-1.3.4-metheno-2H-cyclobuta[cd]pentalen-2-one
PS-862	1g	Decachlorobis(2.4-cyclopentadiene-1-yl)
PS-2043	100mg	Deccozil®
PS-702	100mg	Dechlorane®
PS-2071	100mg	Decis®
PS-89	1g	Dedevap®
PS-902	1g	DEET
PS-562	1g	DEF®
PS-2178	250mg	Deftor®
PS-562	1g	Degreen
PS-57	1g	Dekrysil®
PS-2035	50mg	Delan®
PS-68	250mg	Deleaf Defolliant
PS-68	1g	Deleaf Defolliant
PS-658	100mg	Delnav®
PS-902	1g	Delphene®
PS-24	1g	Delsan®
PS-1077	100mg	Delsene®
PS-2071	100mg	Deltamethrin
PS-661	100mg	Demeton O
PS-661/662	100mg	Demeton O & S
PS-662	100mg	Demeton S
PS-1096	50mg	Demeton-S-methyl
PS-642	100mg	Demeton-S-methyl sulfone
PS-641	50mg	Demeton-S-methyl sulfoxide
PS-255	1g	Demosan®
PS-2014	100mg	Denarin®
PS-2084	1g	Denatonium benzoate
PS-1088	100mg	Depon®
PS-1077	100mg	Derosal®
PS-1015	250mg	Desmedipham
PS-57	1g	Detal®
PS-902	1g	Detamide®
PS-104	1g	Dethmor®
PS-553	1g	Devrinol®
PS-262	1g	Dexon®
PS-366	1g	Dextrone X®
PS-429	1g	Diamond Arsonate Liquid®
PS-2221	250mg	Diafenthiuron
PS-507	100mg	Di-allate
PS-351	1g	N.N-Diallyl-2-chloroacetamide
PS-2054	100mg	N,N-Diallyl-2,2-dichloroacetamide
PS-2277	100mg	2,4-Diamino-5-(6-methyl veratryl)pyrimidine
PS-83	1g	Dianisyl trichloroethane
PS-2247	250mg	Diaract®
PS-90	1g	Diazinon
PS-2175	250mg	Dibavit®
PS-733	1g	Dibenzo-1.4-thiazine
PS-605	1g	Dibrom
PS-426	1g	3.5-Dibromo-4-hydroxy benzonitrile
PS-1	1g	1,2-Dibromo-3-chloropropane
PS-434	1g	2,6-Dibromo-4-cyanophenyl octanoate
PS-605	1g	1.2-Dibromo-2.2-dichloroethyl dimethylphosphate
PS-154	1g	1.2-Dibromoethane
PS-154	1g	Dibromoethane
PS-550	100mg	2.6-Di-t-butyl-4-methyl phenyl N-methylcarbamate
PS-900	1g	Dibutylphthalate
PS-900	1g	Di-n-butyl phthalate
PS-903	1g	Di-n-butyl succinate
PS-903	1g	Dibutyl succinate
PS-550	100mg	2.6-Di-t-butyl-p-tolyl-methylcarbamate
PS-398	1g	DIC 1468®
PS-346	1g	Dicamba
PS-1102	100mg	Dicamba methyl ester
PS-669	1g	Di-Captan®
PS-669	1g	Dicapthon
PS-86	500mg	S-[1.2-Dicarbethoxyethyl]-O.O-dimethyl-dithiophosphate
PS-6	1g	Dicestal®
PS-392	1g	Dichlobenil
PS-103	1g	Dichlofenthion
PS-2047	1g	Dichlofluanid
PS-12	1g	Dichlone
PS-293	1g	Dichloran®
PS-3	1g	Di-chloricide®
PS-2054	100mg	Dichlormid
PS-82	250mg	Di(p-chlorophenyl) trichloromethylcarbinol
PS-856	1g	2.4-Dichlorophenyl benzenesulfonate
PS-426	1g	3.5-Dibromo-4-hydroxyphenyl cyanide
PS-507	100mg	S-[2.3-Dichloroallyl]-N.N'-diisopropyl thiocarbamate
PS-346	1g	3.6-Dichloro-o-anisic acid

Chem Service Pesticide Standards - Alphabetical Listing

Catalog#	Size	Description
PS-2	1g	1,2-Dichlorobenzene
PS-3	1g	1,4-Dichlorobenzene
PS-2	1g	o-Dichlorobenzene
PS-3	1g	p-Dichlorobenzene
PS-1107	1g	3,5-Dichlorobenzoic acid
MET-392C	250mg	2,6-Dichlorobenzoic acid methyl ester
PS-1114	100mg	3.5-Dichlorobenzoic acid methyl ester
PS-392	1g	2.6-Dichlorobenzonitrile
PS-2064	1g	2-[4-(2,4-Dichlorobenzoyl)-1,3-dimethylpyrazol-5-yloxy]acetophenone
PS-388	250mg	2.4-Dichloro-6-o-chloroanilino-s-triazine
PS-696	100mg	1.1-Dichloro-2.2-bis(p-chlorophenyl)ethylene
PS-694	100mg	1.1-Dichloro-2-(o-chloro phenyl)-2-(p-chlorophenyl) ethane
PS-695	50mg	1.1-Dichloro-2-(p-chloro phenyl)-2-(o-chlorophenyl) ethylene
PS-2248	25mg	1-[3,5-Dichloro-4-(3-chloro-5-trifluoromethyl-2-pyridyloxy)phenyl] -3-(2,6-difluoro-benzoyl)urea
PS-2132	250mg	2',4'-Dichloro-5'-(4-difluoromethyl-4,5- dihydro-3-methyl-5-oxo-1H-1,2,4-triazol-1-yl) methanesulfonanilide
PS-2247	250mg	1-(3,5-Dichloro-2,4-difluoro phenyl)-3-(2,6-difluoro benzoyl) urea
PS-255	1g	1.4-Dichloro-2.5-dimethoxy benzene
PS-2060	500mg	1,1-Dichloro-N-[dimethyl amino)sulfonyl]-1-fluoro-N-(4-methylphenyl) methanesulfenamide
PS-349	1g	3.5-Dichloro-N-(1.1-dimethyl-2-propynyl) benzamide
PS-72	1g	Dichlorodiphenyl dichloroethane
PS-74	1g	Dichlorodiphenyl trichloroethane
PS-73	1g	1.1-Dichloro-2.2-bis(p-ethylphenyl)ethane
PS-2047	1g	N-Dichlorofluoromethylthio-N',N'-dimethyl- N-phenylsulfamide
PS-2284	100mg	5,7-Dichloro-4-(4-fluorophenoxy)quinoline
PS-2252	100mg	(RS)-1-[2,5-Dichloro-4-(1,1,2,3,3,3-hexafluoro propoxy)phenyl]-3-(2,6-difluoro-benzoyl)urea
PS-2090	500mg	3,5-Dichloro-4-hydroxy benzonitrile
PS-2202	250mg	N-(2,3-dichloro-4-hydroxyphenyl)-1-methyl-cyclohexanecarboxamide
PS-1206	5ml	O-2,5-Dichloro-4-iodophenyl- O,O-dimethylphosphorothioate (100ug/ml in Acetone)
PS-63	1g	3'.4'-Dichloro-2-methylacrylanilide
PS-12	1g	2.3-Dichloro-1.4-naphthaquinone
PS-293	1g	2.6-Dichloro-4-nitroaniline
PS-2267	250mg	1.2-Dichloro-3-nitrobenzene
PS-2270	1g	1.2-Dichloro-4-nitrobenzene

Catalog #	Size	Description
PS-2269	250mg	1,4-Dichloro-2-nitrobenzene
PS-2267	250mg	2.3-Dichloronitrobenzene
PS-2268	250mg	2.4-Dichloronitrobenzene
PS-2269	250mg	2.5-Dichloronitrobenzene
PS-2270	1g	3.4-Dichloronitrobenzene
PS-2271	250mg	3.5-Dichloronitrobenzene
PS-5	1g	1.1-Dichloro-1-nitroethane
PS-1207	250mg	2',5-Dichloro-4'-nitrosalicyl anilide (100ug/ml in Methanol)
PS-6	1g	Dichlorophen
PS-41	1g	(2.4-Dichlorophenoxy)acetic acid
PS-42	1g	(2.4-Dichlorophenoxy)acetic acid butyl ester
PS-301	1g	(2.4-Dichlorophenoxy)acetic acid, sec-butyl ester
PS-306	1g	4-(2.4-Dichlorophenoxy) butyric acid
PS-337	1g	(2.4-Dichlorophenoxy)acetic acid, dimethylamine salt
PS-338	1g	(2,4-Dichlorophenoxy)acetic acid, ethanolamine salt
PS-304	1g	(2.4-Dichlorophenoxy)acetic acid, ethyl ester
PS-319-1	1g	(2,4-Dichlorophenoxy)acetic acid, 2-ethylhexyl ester
PS-332	1g	(2.4-Dichlorophenoxy)acetic acid, isopropanolamine salt
PS-43	1g	(2.4-Dichlorophenoxy)acetic acid isopropyl ester
PS-299	1g	(2.4-Dichlorophenoxy)acetic acid, isopropylamine salt
PS-41-1	1g	(2.4-Dichlorophenoxy)acetic acid methyl ester
PS-302	1g	(2.4-Dichlorophenoxy)acetic acid, propylene glycol ester
PS-390	10mg	N-[(2.4-Dichlorophenoxy) acetyl]-DL-methionine
PS-1036	1g	2-[4-(2'.4'-Dichlorophenoxy)phenoxy]-methyl-propanoate
PS-44	250mg	2-(2.4-Dichlorophenoxy) propionic acid
PS-2243	POR	1-(((2,4-Dichlorophenyl) amino)carbonyl) -cyclopropanecarboxylic acid
PS-103	1g	O-(2.4-Dichlorophenyl)-O.O-diethylphosphorothioate
PS-2126	250mg	N-(3,5-Dichlorophenyl)-1,2-dimethylcyclopropane-1,2-dicarboximide
PS-2239	1ml	(2RS,3RS)-1-(2,4-Dichloro phenyl)-4,4-dimethyl-2-(1H-1,2,4-triazol-1-yl)pentan-3-ol
PS-2152	100mg	(E)-(RS)-1-(2,4-Dichloro phenyl-4,4-dimethyl-2-(1H-1,2,4-triazol-1-yl)pent-1-en-3-ol/
PS-60	500mg	3-(3.4-Dichlorophenyl)-1.1-dimethylurea
PS-1049	1g	3-(3.5-Dichlorophenyl)-5-ethenyl-5-methyl-2.4-oxazolidinedione
PS-2208	250mg	N-(2,6-Dichlorophenyl)-5-ethoxy-7-fluoro-[1,2,4]-triazolo-[1,5-c]pyrimidine-2-sulfonamide
PS-1094	100mg	O-(2,4-Dichlorophenyl)-O-ethyl-S-propylphos phorodithioate
PS-372	250mg	3-(3.4-Dichlorophenyl)-1-methoxy-1-methylurea
PS-63	1g	N-(3.4-Dichlorophenyl) methylacrylamide

Catalog #	Size	Description
PS-2043	100mg	1-[2-(2,4-Dichlorophenyl)-2-(2-propenyloxy)ethyl] -1H-imidazole
PS-1075	250mg	1-[2-(2.4-Dichlorophenyl)-4-propyl-1.3-dioxolan-2-ylmethyl]-1H-1.2.4-triazole
PS-2207	100mg	1-(2-(2,4-Dichlorophenyl) pentyl)-1H-1,2,4-triazole
PS-2154	500mg	1-(3,5-Dichlorophenyl)-2,5-pyrrolidinedione
PS-2154	500mg	N-(3,5-Dichlorophenyl) succinimide
PS-2157	500mg	(RS)-2-(2,4-Dichlorophenyl)-1-(1H-1,2,4-triazol-1-yl)hexan-2-ol
PS-1069	250mg	3.6-Dichloropicolinic acid
PS-153	1g	1.2-Dichloropropane
PS-152	1g	1.3-Dichloropropene
PS-152	1g	Dichloropropene
PS-356	500mg	3'.4'-Dichloropropionanilide
PS-32	1g	2.2-Dichloropropionic acid
PS-2236	250mg	2,2-Dichloropropionic acid, sodium salt
PS-152	1g	Dichloropropylene
PS-1069	250mg	3.6-Dichloro-2-pyridine carboxylic acid
PS-2098	500mg	3,7-Dichloro-8-quinolinecarboxylic acid
PS-2284	100mg	5,7-Dichloro-4-quinolyl 4-fluorophenyl ether
PS-2074	250mg	1-[3,5-Dichloro-4-(1,1,2,2-tetrafluoroethoxy)phenyl]3-(2,6-difluorobenzoyl)urea
PS-2156	500mg	O-2,6-Dichloro-p-tolyl O,O-dimethyl phosphorothioate
PS-82	250mg	4.4'-Dichloro-a-[trichloromethyl]benzhydrol
PS-758-2	50mg	3-(2,2-Dichlorovinyl)-2,2-dimethylcyclopropane
PS-89	1g	2.2-Dichlorovinyl dimethylphosphate
PS-89	1g	Dichlorovos carboxylate
PS-44	250mg	Dichlorprop
PS-1103	100mg	Dichlorprop methyl ester
PS-2239	1ml	Diclobutrazol
PS-1036	1g	Diclofop methyl
PS-293	1g	Dicloran
PS-2208	250mg	Diclosulam
PS-82	250mg	Dicofol
PS-74	1g	Dicophane®
PS-602	250mg	Dicrotophos
PS-63	1g	Dicryl®
PS-2173	100mg	Dictran®
PS-2078	250mg	Dicuran®
PS-2033	500mg	Dicyclopentadiene
PS-6	1g	Didroxane®
PS-76	250mg	Dieldrin
PS-902	1g	Dieltamid®
PS-862	1g	Dienochlor
PS-1006	1g	Diethatyl ethyl
PS-2153	250mg	Diethofencarb
PS-1026	100mg	2-(Diethoxyphosphinyl imino) -4-methyl-1.3-dithiolane
PS-2100	1g	alpha-[(Diethoxyphosphino thioyl)oxy]imino]benzene-acetonitrile
PS-675	1g	O.O-Diethyl-O-[2-chloro-1-[2.5-dichlorophenyl]vinyl] phosphorothioate
PS-656	100mg	O.O-Diethyl-O-[3-chloro-4-methyl-2-oxo-2H-1 -benzopyran-7-yl] phosphorothioate

For new pesticides and custom mixtures contact us at +1-610-692-3026 or www.chemservice.com

PestCat05_Blue.pmd 11 1/3/06, 11:31 AM

Chem Service Pesticide Standards - Alphabetical Listing

Catalog #	Size	Description
PS-682	1g	O.O-Diethyl-S-[-(6-chloro-2-oxo-benzoxazolin-3-yl)-methyl]-phosphorodithioate
PS-2287	POR	Diethyl (RS)-1-(2,4-dichlorophenyl)-5-methyl-2-pyrazoline-3,5-dicarboxylate
PS-643	250mg	O.O-Diethyl-O-[2-(diethylamino)-6-methyl-4-pyrimidinyl] phosphorothioate
PS-66	1g	Diethyl dithiobis(thionoformate)
PS-19	250mg	Diethyldithiocarbamic acid, 2-chloroallyl ester
PS-661	100mg	Diethyl 2-eththioethyl thionophosphate
PS-652	1g	O.O-Diethyl-S-[2-(ethylthio) ethyl]phosphorodithioate
PS-661	100mg	O,O-Diethyl O-2-(ethylthio)ethyl phosphorothioate
PS-662	100mg	O.O-Diethyl-S-[2-(ethylthio) ethyl]phosphorothioate
PS-654	100mg	O.O-Diethyl-S-[(ethylthio) methyl]phosphorodithioate
PS-681	1g	O.O-Diethyl-O-[1-isopropyl-5-chloro-1.2.4-triazolyl-[3]]-phosphorothioate
PS-90	1g	O.O-Diethyl-O-[2-isopropyl-4-methyl-6-pyrimidyl] phosphorothioate
PS-1026	100mg	Diethyl-N-(4-methyl-1.3-dithiolan-2-ylidene)-phosphoramidate
PS-2275	500mg	O,O-Diethyl O-(3-methyl-4-(methylthio)phenyl) phosphorothioate
PS-667	100mg	O.O-Diethyl[p-(methyl sulfinyl) phenyl] phosphorothioate
PS-381	50mg	N,N'-Diethyl-6-(methylthio)-1,3,5-triazine-2,4-diamine
PS-610	100mg	Diethyl-p-nitrophenylphosphate
PS-95	500mg	O.O-Diethyl-O-p-nitrophenyl phosphorothioate
PS-673	100mg	O.O-Diethyl-S-[4-oxo-1.2.3-benzotriazin-3-[4H]-ylmethyl]phosphorodithioate
PS-223	1g	Diethyl 4.4'-o-phenylene bis (3-thioallophanate)
PS-1213	5ml	O,O-Diethyl O-1-(phenyl-1H-1,2,4-triazol-3-yl phosphorothioate
PS-2139	100mg	O,O-Diethyl O-1-Phenyl-1H-1,2,4-triazol-3-yl phosphorothioate
PS-670	1g	O.O-Diethyl phosphoro chloridothioate
PS-610	100mg	O.O-Diethylphosphoric acid-o-p-nitrophenyl ester
PS-2127	100mg	O,O-Diethyl phthalimidophos phonothioate
PS-1208	5ml	O,O-Diethyl phthalimidophos phonothioate (100ug/ml in Hexane)
PS-668	100mg	O,O-Diethyl-O-2-pyrazinylphosphorothioate
PS-2010	250mg	O,O-Diethyl-O-quinoxalin-2-yl phosphorothioate
PS-2217	250mg	O,O-Diethyl O-(1,2,2,2-tetrachloroethyl) phosphorothioate
PS-902	1g	N.N-Diethyl-m-toluamide
PS-674	1g	O.O-Diethyl-O-[3.5.6-trichloro-2-pyridyl] -phosphorothioate
PS-2143	100mg	Difenacoum
PS-404	1g	Difenzoquat methylsulfate
PS-1028	1g	Diflubenzuron
PS-2148	250mg	Diflufenzopyr
PS-2172	100mg	4-(2,2-Difluoro-1,3-benzodioxol-4-yl)-1H-pyrrole-3-carbonitrile
PS-2172	100mg	4-(2,2-Difluoro-1,3-benzodioxol-4-yl)-1H-pyrrole-3-carbonitrile
PS-2169	500mg	2-[4,6-bis(Difluoromethoxy) pyrimidin-2-ylcarbamoyl sulfamoyl]benzoic acid methyl ester
PS-2111	500mg	N-(2,6-Difluorophenyl)-5-methyl-[1,2,4]triazolo[1,5-a]pyrimidine-2-sulfonamide
PS-2148	250mg	2-{1-[4-(3,5-difluorophenyl) semicarbazono]ethyl} nicotinic acid
PS-2111	500mg	2-(2,6-Difluorophenyl sulphamoyl)-5-methyl[1,2,4] -triazolo[1,5-a]pyridine
PS-260	1g	Difolatan®
PS-2220	100mg	22,23-Dihydroabamectin
PS-2220	100mg	22,23-Dihydroavermectin B1
PS-295	1g	2.3-Dihydro-5-carboxanilide-6-methyl-1.4-oxathiin-4.4-dioxide
PS-365	1g	9.10-Dihydro-8a,10a-diazoniaphenanthrene ion
PS-1063	250mg	2,3-Dihydro-2,2-dimethyl-7-benzofuranyl [(dibutylamino) thio] methylcarbamate
PS-754	1g	2.3-Dihydro-2.2-dimethyl-benzofuran-7-yl methylcarbamate
PS-2052	1g	2,3-Dihydro-5,6-dimethyl-1,4-dithi-ine-1,1,4,4-tetraoxide
PS-2035	50mg	5,10-Dihydro-5,10-dioxonaphtho[2,3-b]-1,4-dithi-in-2,3-dicarbonitrile
PS-2035	50mg	5,10-Dihydro-5,10-dioxonaphtho[2,3-b]-p-dithiin-2,3-dicarbonitril
PS-365	1g	6.7-Dihydrodipyrido[1.2-a:2'1'-c]pyrazinediium dibromide
PS-432	250mg	1.2-Dihydro-6-ethoxy-2.2.4-trimethyl-quinoline
PS-203	100mg	[Dihydrogen borato]phenyl mercury
PS-2197	250mg	(RS)-2-(4,5-Dihydro-4-isopropyl-4-methyl-5-oxoimidazol-2-yl)-5-methyl nicotinic acid
PS-2231	250mg	4,5-Dihydro-3-methoxy-4-methyl-5-oxo-N- (2-trifluoromethoxy phenylsulfonyl) -1H-1,2,4-triazole-1-carboxamide sodium salt
PS-2053	100mg	(+/-)-2-[4,5-Dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-quinolinecarboxylic acid
PS-295	1g	5,6-Dihydro-2-methyl-1.4-oxathin-3-carboxanilide-4.4-dioxide
PS-294	1g	5.6-Dihydro-2-methyl-1.4-oxathiin-3-carboxanilide
PS-2189	250mg	(E)-4,5-Dihydro-6-methyl-4-(3-pyridylmethyleneamino)-1,2,4-triazin-3(2H)-one
PS-2155	250mg	O-(1,6-Dihydro-6-oxo-1-phenylpyridazin-3-yl) O,O-diethyl phosphorothioate
PS-907	1g	Dihydropyrone®
PS-65	1g	1.2-Dihydro-pyridazine-3.6-dione
PS-397	250mg	3.5-Diiodo-4-hydroxy benzonitrile
PS-2101	500mg	Di-isopropyl 1,3-dithiolan-2-ylindenemalonate
PS-2272	250mg	2,6-Diisopropylnaphthalene
PS-2190	250mg	Dikegulac acid
PS-606	250mg	Dimecron®
PS-2184	250mg	Dimehypo
PS-2173	100mg	Dimension®
PS-2154	500mg	Dimetachlone
PS-659	250mg	Dimetate®
PS-2154	500mg	Dimethachlon
PS-2161	250mg	Dimethenamid
PS-2291	100mg	Dimethenamid-P
PS-2052	1g	Dimethipin
PS-659	250mg	Dimethoate
PS-2017	100mg	Dimethoate-O-analog
PS-2138	500mg	Dimethomorph
PS-2138-1	500mg	Z-Dimethomorph
PS-83	1g	Dimethoxy-DT®
PS-2277	100mg	5-(4,5-Dimethoxy-2-methylbenzyl)-2,4-diaminopyrimidine
PS-609	1g	cis-3-[Dimethoxy phosphinyloxy]-N-methyl-crotonamide
PS-2005	100mg	2-[[(4,6-Dimethoxypyrimidin-2-yl) aminocarbonyl]amino sulfonyl]-N,N-dimethyl-3-pyridine carboxamide
PS-2232	100mg	2-[[[[(4,6-Dimethoxy-2-pyrimidinyl)amino] carbonyl]amino]sulfonyl] -4-(formylamino)-N,N-dimethylbenzamide
PS-2286	POR	2-[(4,6-Dimethoxypyrimidin-2-ylcarbamoyl)sulfamoyl]-a-(methanesulfonamido)-p-toluate
PS-2232	100mg	1-(4,6-Dimethoxypyrimidin-2-yl)-3-[2-(dimethyl carbamoyl) -5-formamido phenysulfonyl]urea
PS-2118	100mg	1-(4,6-Dimethoxypyrimidin-2-yl)-3-(3-ethylsulfonyl-2-pyridylsulfonyl)urea
PS-2278	250mg	2,6-Dimethoxy-4-sulfanilamidopyrimidine
PS-738	1g	O,S-Dimethyl acetylphosphoramidothioate
PS-316	1g	Dimethylamine-4-(2.4-dichlorophenoxy)-butyrate
PS-262	1g	p-Dimethylaminobenzene
PS-757	1g	2-[Dimethylamino]-5.6-dimethyl-4-pyrimidinyl dimethylcarbamate
PS-756	500mg	4-(Dimethylamino)-3,5-dimethylphenyl methylcarbamate

Chem Service Pesticide Standards - Alphabetical Listing

Catalog#	Size	Description
PS-2200	250mg	4-(Dimethylamino)-1,4,4a,5,5a,6,11,12a-octahydro-3,5,6,10,12,12a-hexahydroxy-6-methyl-1,11-dioxo-2-Naphthacene carboxamide monohydrochloride
PS-751	250mg	4-Dimethylamino-m-tolyl-methylcarbamate
PS-2147	500mg	2-[4-Dimethylamino-6-(2,2,2-trifluoroethoxy)-1,3,5-triazin-2-ylcarbamoylsulfamoyl]-m-toluic acid methyl ester
PS-2069	500mg	S,S'-2-Dimethylamino trimethylene bis(thiocarbamate) hydrochloride
PS-2106	1g	S,S'-2-Dimethylamino trimethylene di(benzenethiosulfonate)
PS-754	1g	4-Dimethylamino-3,5-xylyl-methylcarbamate
PS-51	500mg	Dimethylarsinic acid
PS-901	1g	Dimethyl 1.2-benzen dicarboxylate
PS-739	250mg	2.2-Dimethylbenzo-1.3-dioxol-4-yl methylcarbamate
PS-366	1g	1.1'-Dimethyl-4.4'-bipyridinium dichloride
PS-602	250mg	(E)-2-Dimethylcarbamoyl-1-methylvinyldimethyl phosphate
PS-669	1g	O.O-Dimethyl-O-(2-chloro-4-nitrophenyl) phosphorothioate
PS-91	1g	Dimethyl chloro thiophosphate
PS-644	250mg	O.O-Dimethyl-O-[2-(diethylamino)-6-methyl-4-pyrimidinyl] phosphorothioate
PS-2173	100mg	S,S'-Dimethyl 2-difluoromethyl- 4-isobutyl-6-trifluoromethylpyridine -3,5-dicarbothioate
PS-671	1g	O.O-Dimethyl-O-p-(dimethylsulfamoyl)phenyl phosphorothioate
PS-350	1g	N.N-Dimethyl-2.2-diphenylacetamide
PS-404	1g	1.2-Dimethyl-3.5-diphenyl-1H-pyrazolium methyl sulfate
PS-20	1g	Dimethyldithiocarbamic acid, ferric salt
PS-21	1g	Dimethyldithiocarbamic acid, zinc salt
PS-2120	1g	N-(1,1-Dimethylethyl)-N'-ethyl-6-methoxy-1,3,5-triazine-2,4-diamine
PS-1004	500mg	4-(1.1-Dimethylethyl)-N-(1-methylpropyl)-2.6-dinitrobenzenamine
PS-1004	500mg	4-(1.1-Dimethylethyl)-N-(1-methylpropyl)-2.6-dinitrobenzenamine
PS-2192	100mg	O-(2-(1,1-Dimethylethyl)-5-pyrimidinyl) O-ethyl O-(1-methylethyl)
PS-641	50mg	O.O-Dimethyl-S-(2-ethylsulfinylethyl) phosphorothioate
PS-642	100mg	O.O-Dimethyl-S-(2-ethylsulfonylethyl) phosphorothioate
PS-407	1g	N-[5-(1.1-Dimethylethyl)-1.3.4-thiadiazol-2-yl]-N.N'-dimethylurea
PS-2233	50mg	O,O-Dimethyl S-(2-ethylthio)ethyl ester phosphorodithioic acid
PS-680	500mg	S-[(1.1-Dimethylethylthio) methyl]-O.O-diethyl phosphorodithioate
PS-400	1g	N.N-Dimethyl-N'-[3-[[(methylamino)-carbonyl] oxy]phenyl] methanimidamide
PS-2187	100mg	O,O-Dimethyl S-2-(1-N-methylcarbamoylethyl mercapto)ethyl thiophosphate
PS-2017	100mg	O,O-Dimethyl-S-methylcarbamoyl methyl phosphorothioate
PS-659	250mg	O.O-Dimethyl-S-(N-methylcarbamoylmethyl) phosphorodithioate
PS-737	250mg	N,N-Dimethyl-2-methylcarbamoyloxyimino-2-(methythio)acetamide
PS-840	1g	N.N-Dimethyl-N'-(2-methyl-4-chlorophenyl)-formanidine
PS-2000	1g	N,N-Dimethyl-N'-[4-(1-methylethyl)phenyl]urea
PS-2198	100mg	2,2-Dimethyl-3-(2-methyl-1-propenyl)-cyano (3-phenoxyphenyl) methyl ester cyclopropane carboxylic acid
PS-96	5ml	2.2-Dimethyl-3-[2-methylpropenyl] cyclopropane carboxylic acid ester) of 2-allyl-4-hydroxy-3-methyl-2'-cyclopenten-1-on
PS-543	1g	3.5-Dimethyl-4-[methylthio] phenyl methylcarbamate
PS-655	500mg	O.O-Dimethyl-O-[4-(methylthio)-m-tolyl]-phosphorothioate
PS-613	100mg	Dimethyl-p-nitrophenylphosphate
PS-94	500mg	O.O-Dimethyl-O-p-nitrophenyl phosphorothioate
PS-678	500mg	O.O-Dimethyl-O-(4-nitro-m-tolyl)phosphorothioate
PS-2288	POR	3a,alpha,4alpha,5alpha, 7alpha,7a,alpha-N,N-Dimethyl-N'-(octahydro-4,7-methano-1H-inden-5-yl)urea
PS-666	1g	O.O-Dimethyl-S-[4-oxo-1.2.3-benzotriazin-3(4H) -ylmethyl]phosphorodithioate
PS-1002	100mg	3-[2(3.5-Dimethyl-2-oxocyclohexyl)-2-hydroxyethyl]-glutarimide
PS-94	500mg	Dimethyl parathion
PS-1005	500mg	N'-(2.4-Dimethylphenyl)-N-[(2.4-dimethylphenyl) imino]methyl]-N-methylmethanimidamide
PS-230	1g	Dimethyl([1.2-phenylene]bis (iminocarbono thioyl)) bis(carbamate)
PS-230	1g	Dimethyl-4.4'-o-phenylenebis-(3-thioallophanate)
PS-1099	100mg	N-(2,6-Dimethylphenyl)-N-(methoxyacetyl)-alanine methyl ester
PS-2137	100mg	N-(2,6-Dimethylphenyl)-2-methoxy-N-(2-oxo-3-oxazolidinyl)acetamide
PS-61	1g	1.1-Dimethyl-3-phenylurea
PS-364	1g	1.1-Dimethyl-3-phenylurea trichloroacetate
PS-609	1g	Dimethyl phosphate ester of 3-hydroxy-N-methyl-cis-crotonamide
PS-676	100mg	O.S-Dimethyl phosphoramidothioate
PS-91	1g	Dimethyl phosphorochloridothioate
PS-91	1g	O.O-Dimethyl phosphorochloridothioate
PS-679	1g	O.O-dimethylphos phorodithioate, S-ester with 4-[mercaptomethyl]-2-methoxy-delta² -1.3.4-thiadiazolin-5-one
PS-901	1g	Dimethylphthalate
PS-653	1g	O.O-Dimethyl-S-phthalimido methyl phosphorodithioate
PS-653	1g	O.O-Dimethyl phthalimido-methyl phosphoro thiolothionate
PS-1025	1g	O.O-Dimethyl-O-p-sulfamoylphenyl phosphorothioate
PS-1047	10mg	N.N-Dimethyl-piperidinium chloride
PS-349	1g	N-[1.1-Dimethylpropynyl]-3.5-dichlorobenzamide
PS-2251	100mg	N-(4,6-Dimethylpyrimidin-2-yl)aniline
PS-340	1g	N.N-Dimethylsuccinamic acid
PS-33	1g	Dimethyl-2.3.5.6-tetrachloroterephthalate
PS-24	1g	Dimethyl thiuram disulfide
PS-608	1g	Dimethyl-[2.2.2-trichloro-1-hydroxyethyl]phosphonate
PS-611	1g	Dimethyl-1-[2.4.5-trichlorophenyl]-2-chlorovinyl phosphate
PS-657	100mg	O.O-Dimethyl-O-[2.4.5-trichlorophenyl] phosphorothioate
PS-418	250mg	O.O-Dimethyl O-(3,5,6-trichloro-2-pyridinyl) phosphorothioate
PS-2242	100mg	Dimethyl-2,6 tridecyl-4 morpholine
PS-2050	100mg	N-2,4-Dimethyl-5-[[(trifluoromethyl) sulfonyl]amino]phenyl] acetamide
PS-369	1g	1,1-Dimethyl-3-(a,a,a-trifluoro-m-tolyl) urea
PS-1028	1g	Dimilin®
PS-2152	100mg	Diniconazole
PS-1104	100mg	2,4-Dinitro-6-sec-butylanisole
PS-433	1g	4.6-Dinitro-2-sec-butylphenol ethanolamine salt
PS-57	1g	4.6-Dinitro-o-cresol
PS-410	1g	3.5-Dinitro-N4,N4-dipropyl sulfanilamide
PS-56	100mg	2.4-Dinitro-6-sec-butylphenol
PS-57	1g	Dinitrol®
PS-406	1g	2.6-Dinitro-N.N-di-n-propyl cumidine

Chem Service Pesticide Standards - Alphabetical Listing

Catalog #	Size	Description
PS-27	100mg	2,4-Dinitro-6-octylphenyl crotonate:2,6-Dinitro-4-octylphenyl crotonate (2:1)
PS-27	100mg	Dinocap
PS-56	100mg	Dinoseb
PS-1104	100mg	Dinoseb methyl ether
PS-2278	250mg	Dinosol®
PS-2022	250mg	Dioxacarb
PS-658	100mg	S,S'-p-Dioxane-2,3-bis[O.O-diethyl phosphorodithioate]
PS-658	100mg	S,S'-(p-Dioxane-2.3-diyl)O,O,O',O'-tetraethyldi (phosphorodithioate)
PS-658	100mg	Dioxathion
PS-2022	250mg	2-(1,3-Dioxolan-2-yl)phenyl methylcarbamate
PS-642	100mg	Dioxydemeton-S-methyl
PS-350	1g	2.2-Diphenyl-N.N-dimethylacetamide
PS-288	100mg	Diphacinone
PS-350	1g	Diphenamid
PS-64	1g	Diphenatrile
PS-6	1g	Di-phenthane-70®
PS-2032	1g	Diphenyl
PS-851	1g	Diphenyl diimide
PS-64	1g	Diphenylacetonitrile
PS-288	100mg	2-Diphenylacetyl-1.3-indandione
PS-427	1g	Diphenylamine
PS-411	100mg	Dipropetryn
PS-393	1g	4-Dipropylamino-3.5-dinitrobenzotrifluoride
PS-2133	500mg	5-Dipropylamino-a,a,a-trifluoro-4,6-dinitro-o-toluidine
PS-906	1g	Di-n-propyl isocinchomeronate
PS-608	1g	Dipterex®
PS-365	1g	Diquat Dibromide monhydrate
PS-60	500mg	Direx
PS-2182	250mg	Discus®
PS-661	100mg	Di-septon
PS-220	1g	Disodium ethylene bis[dithiocarbamate]
PS-281	500mg	Disodium methane arsonate
PS-281	500mg	Disodium methyl arsenate
PS-2184	250mg	Disodium S,S'-(2-dimethylamino-1,3-propanediyl)bis(thiosulfate)
PS-1102	100mg	Disugran
PS-652	1g	Disulfoton
PS-313	1g	Disul-Na®
PS-652	1g	Di-Syston®
PS-281	500mg	Ditac®
PS-2127	100mg	Ditalimfos
PS-1208	5ml	Ditalimfos (100ug/ml in Hexane)
PS-2095	500mg	Dithane®
PS-22	1g	Dithane M-22®
PS-220	1g	Dithane S®
PS-23	1g	Dithane Z-78®
PS-2035	50mg	Dithianon
PS-2024	50mg	Dithio®
PS-652	1g	Dithiodemeton®
PS-2233	50mg	Dithiometon
PS-2024	50mg	Dithione®
PS-2173	100mg	Dithiopyr
PS-652	1g	Dithio-Systox®
PS-293	1g	Ditranil®
PS-57	1g	Ditrosol®
PS-60	500mg	Diuron
PS-901	1g	DMP®
PS-83	1g	DMTD
PS-17	1g	DMTT
PS-56	100mg	DNBP
PS-57	1g	DNC
PS-57	1g	DNOC
PS-702	100mg	Dodecachloro octahydro-1.3.4-metheno-2H-cyclobuta[cd]pentalene
PS-250	1g	n-Dodecylguanidine acetate
PS-1086	100mg	Dodemorph
PS-250	1g	Dodine
PS-2083	250mg	Dominex®
PS-2178	250mg	Dosaflo®
PS-2178	250mg	Dosagran®
PS-2178	250mg	Dosanex®
PS-2209	250mg	Dotan®
PS-2191	100mg	Dowco 433®
PS-420	1g	Dowicide 1®
PS-9	1g	Dowicide 2®
PS-10	1g	Dowicide 2S®
PS-8	100mg	Dowicide 6®
PS-7	1g	Dowicide 7®
PS-2234	POR	Dowicil 150®
PS-2236	250mg	Dowpon S®
PS-32	1g	Dowpon®
PS-44	250mg	2.4-DP®
PS-78	100mg	Drinox®
PS-2044	1g	Dropp®
PS-2154	500mg	DSI®
PS-281	500mg	DSMA
PS-403	500mg	Dual
PS-80	1g	Duphar®
PS-2116	500mg	Duplosan® KV
PS-87-1	100mg	cis-Duraphos®
PS-50	1g	Duraset 20W®
PS-50	1g	Duraset®
PS-1096	50mg	Duratox®
PS-674	1g	Dursban®
PS-1031	500mg	Duter®
PS-1031	500mg	Du-Ter®
PS-61	1g	Dybar®
PS-664	100mg	Dyfonate®
PS-608	1g	Dylox®
PS-350	1g	Dymid®
PS-2068	100mg	Dynamec®
PS-2216	100mg	Dynamite®
PS-388	250mg	Dyrene®
PS-608	1g	Dyrex®

E

Catalog #	Size	Description
PS-2233	50mg	Ebicid®
PS-2199	100mg	Ebufos
PS-1092	100mg	Ebuzin®
PS-2203	250mg	Ectopor®
PS-154	1g	EDB
PS-2066	500mg	Edifenophos
PS-57	1g	Effusan®
PS-328	1g	EGT
PS-2010	250mg	Ekalux®
PS-2233	50mg	Ekatin®
PS-602	250mg	Ektafos®
PS-2202	250mg	Elevate®
PS-56	100mg	Elgetol 318®
PS-57	1g	Elgetol® 30
PS-1091	100mg	Elite®
PS-2022	250mg	Elocron®
PS-2025	100mg	Elsan®
PS-2265	100mg	Emamectin
PS-155	5ml	Embafume®
PS-2050	100mg	Embark®
PS-2152	100mg	Embassador®
PS-306	1g	Embutox®
PS-2260	100mg	Emerald®
PS-2072	100mg	Enable®
PS-81	500mg	Endosulfan
PS-81-1	100mg	Endosulfan (alpha isomer)
PS-81-2	100mg	Endosulfan (beta isomer)
PS-81-1	100mg	Endosulfan I
PS-81-2	100mg	Endosulfan II
PS-81-3	50mg	Endosulfan sulfate
PS-345	250mg	Endothal
PS-345	250mg	Endothal (unstated stereochemistry)
PS-77	250mg	Endrin
PS-77-1	10mg	Endrin aldehyde
PS-77-2	10mg	Endrin ketone
PS-2260	100mg	Endura®
PS-2133	500mg	Endurance®
PS-2200	250mg	Engemycin®
PS-350	1g	Enide®
PS-2051	100mg	Enstar®
PS-655	500mg	Entex®
PS-2110	100mg	Epingle®
PS-93	1g	EPN
PS-2222	1ml	epsilon-BHC
PS-2222	1ml	epsilon-Hexachlorocyclohexane
PS-54	500mg	Eptam®
PS-54	500mg	EPTC
PS-2220	100mg	Eqvalan®
PS-2040	100mg	Erunite®
PS-790	250mg	Esbiol®
PS-1082	100mg	Escuri®
PS-2004	100mg	Esfenvalerate
PS-855	1g	Estonmite®
PS-408	1g	Ethalfluralin
PS-2183	100mg	Ethametsulfuron-methyl
PS-412	1g	Ethanedial dioxime
PS-325	1g	Ethephon
PS-5	1g	Ethide®
PS-2061	100mg	Ethidimuron
PS-2058	100mg	Ethiofencarb
PS-92	1g	Ethion
PS-1092	100mg	Ethiozin®
PS-2237	100mg	Ethofenprox®
PS-1045	1g	Ethofumesate
PS-102	1g	Ethohexadiol®
PS-672	1g	Ethoprop®
PS-672	1g	Ethoprophos®
PS-1015	250mg	3-Ethoxycarbonyl aminophenyl-N-phenyl-carbamate
PS-2283	50mg	S-(N-Ethoxycarbonyl-N-methylcarbamoylmethyl) O,O-diethyl phosphorodithioate
PS-1045	1g	(+/-)-2-Ethoxy-2,3-dihydro-3,3-dimethyl-5-benzofuranyl methanesulfonate
PS-2013	100mg	(±)-(EZ)-2-(1-Ethoxyiminobutyl)-5-[2-(ethylthio)propyl]-3-hydroxycyclohex-2-enone
PS-2135	500mg	2-[1-(Ethoxyimino) propyl]-3-hydroxy-5-mesitylcyclohex-2-enone
PS-2237	100mg	2-(4-Ethoxyphenyl)-2-methylpropyl 3-phenoxybenzyl ether
PS-264	1g	5-Ethoxy-3-trichloromethyl-1.2.4-thiadiazole
PS-432	250mg	Ethoxyquin
PS-325	1g	Ethrel®
PS-326	1g	Ethyl-3-amino-2.5-dichlorobenzoate
PS-395	500mg	2-[Ethylamino]-4-[isopropylamino]-6-methoxy-s-triazine
PS-383	500mg	2-Ethylamino-4-isopropylamino-6-methylthio-s-triazine

Chem Service Pesticide Standards - Alphabetical Listing

Catalog#	Size	Description
PS-2079	100mg	Ethyl N-benzoyl-N-(3,4-dichlorophenyl)-DL-alaninate
PS-2199	100mg	O-Ethyl-S,S-di-sec-butylphosphorodithioate
PS-101	1g	2-Ethyl-2-butyl-1,3-propanediol
PS-1088	100mg	(+/-)-Ethyl-2-[4-(6-chloro-2-benzoxazolyloxy) phenoxy]propanoate
PS-2223	100mg	Ethyl(R)-2-[4-[(6-chloro-2-benzoxazolyl)oxy] phenoxy]propanoate
PS-2170	100mg	Ethyl (RS)-2-chloro-3-[2-chloro-5-(4-difluoromethyl-4,5-dihydro-3-methyl-5-oxo-1H-1,2,4-triazol-1-yl)-4-fluorophenyl]propionate
PS-1081	100mg	Ethyl-2-[[[[(4-chloro-6-methoxy-2-pyrimidinyl) amino]carbonyl]amino] sulfonyl] benzoate
PS-2193	250mg	Ethyl 4-chloro-2-oxo-3(2H)-benzothiazoleacetate
PS-2151	500mg	Ethyl (R)-2-[4-(6-chloroquinoxalin-2-yloxy)phenoxy]propionate
PS-1080	100mg	Ethyl-2-[4-[(6-chloro-2-quinoxalinyl)oxyl]-phenoxy]propionate
PS-2077	100mg	Ethyl O-[5-(2-chloro-a,a,a-trifluoro-p-tolyloxy)-2-nitrobenzenzoyl]-DL-lactate
PS-502	1g	S-Ethyl cyclohexyl (ethyl)thiocarbamate
PS-2158	250mg	Ethyl 4-cyclopropyl (hydroxy)methylene-3,5-dioxocyclohexane carboxylate
PS-854	250mg	Ethyl-4.4'-dichlorobenzilate
PS-2049	100mg	Ethyl-2-diethoxyphosphino thioyloxy -5-methylpyrazolo [1,5-a]-pyrimidine-6-carboxylate
PS-503	1g	S-Ethyl diisobutylthiocarbamate
PS-503	1g	S-Ethyl-N,N-diisobutylthiolcarbamate
PS-2025	100mg	Ethyl-2-dimethoxy phosphinothioyl thio(phenyl)acetate
PS-2241	100mg	Ethyl N-[2,3-dihydro-2,2-dimethylbenzofuran-7-yloxycarbonyl(methyl) aminothio]-N-isopropyl-beta-alaninate
PS-2105	100mg	Ethyl 5-(4,6-dimethoxy pyrimidin-2-ylcarbamoyl sulfamoyl)-1-methylpyrazole-4-carboxylate
PS-2066	500mg	O-Ethyl S,S-diphenyl phosphorodithioate
PS-672	1g	O-Ethyl-S.S-dipropylphosphorodithioate
PS-54	500mg	S-Ethyl dipropylthiocarbamate
PS-365	1g	1.1'-Ethylene-2.2-bipyridylium ion
PS-328	1g	Ethylene bistrichloroacetate
PS-154	1g	Ethylenedibromide
PS-228	1g	Ethylene bis(dithiocarbamic acid) diammonium salt
PS-22	1g	Ethylene bis(dithiocarbamic acid) manganese salt
PS-23	1g	Ethylene bis(dithiocarbamic acid) zinc salt
PS-328	1g	Ethylene glycol bis[trichloroacetate]
PS-2180	1g	N.N'-Ethylenethiourea
PS-502	1g	S-Ethyl-N-ethyl-N-cyclohexylthiolcarbamate
PS-501	250mg	S-Ethylhexahydro-1H-azepine-1-carbothioate
PS-501	250mg	Ethyl-1-hexamethylene imine carbothiolate
PS-102	1g	Ethyl hexanediol
PS-102	1g	2-Ethyl-1.3-hexanediol
PS-962	250mg	N-[2-Ethylhexyl]bicyclo-[2.2.1]-5-heptene-2.3-dicarboximide
PS-319-1	1g	2-Ethylhexyl-2.4-dichlorophenoxy acetate
PS-1015	250mg	Ethyl-m-hydroxycarbanilate carbanilate(ester)
PS-2039	100mg	(RS)-5-Ethyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-nicotinic acid
PS-209	250mg	Ethylmercuric chloride
PS-92	1g	Ethyl methylene phosphorodithioate
PS-612	1g	Ethyl-3-methyl-4-[methylthio]phenyl [1-methylethyl] phosphoramidate
PS-408	1g	N-Ethyl-N-(2-methyl-2-propenyl)-2.6-dinitro-4-(trifluoromethyl) benzenamine
PS-2129	1g	N-[3-(1-Ethyl-1-methylpropyl) isoxazol-5-yl] -2,6-dimethoxybenzamide
PS-2199	100mg	O-Ethyl-S,S-bis(1-methylpropyl) phosphorodithioate
PS-1018	100mg	O-Ethyl-O-[4-(methylthio)phenyl]-S-propyl phosphorodithioate
PS-612	1g	Ethyl-4-[methylthio]-m-tolyl isopropylphosphoroamidate
PS-335	1g	Ethyl 1-naphthalene acetate
PS-93	1g	O-Ethyl-O-p-nitrophenyl phenylphosphonothioate
PS-93	1g	O-Ethyl-O-p-nitrophenyl phenylthiophosphonate
PS-95	500mg	Ethyl parathion®
PS-2174	250mg	Ethyl (2-(4-phenoxy phenoxy)ethyl)carbamate
PS-664	100mg	O-Ethyl-S-phenylethyl phosphonodithioate
PS-401	1g	N-[1-Ethylpropyl]-3.4-dimethyl-2.6-dinitro benzeneamine
MET-401A	100mg	N-(1-Ethylpropyl)-N-nitroso-3,4-dimethyl-2,6-dinitrobenzenamine
PS-601	500mg	Ethyl pyrophosphate
PS-2224	500mg	1-(2-Ethylsulfonylimidazo [1,2a]pyridin-3-ylsulfonyl)-3-(4,6-dimethyoxypyrimidin-2-yl)urea
PS-2061	100mg	1-(5-Ethylsulfonyl-1,3,4-thiadiazol-2-yl)-1,3-dimethylurea
PS-411	100mg	2-Ethylthio-4.6-di(isopropylamino)-1.3.5-triazine
PS-2233	50mg	S-(2-(Ethylthio)ethyl) O,O-dimethylphosphoro dithionate
PS-1096	50mg	S-[2-(Ethylthio)ethyl]-O,O-dimethyl phosphorothioate
PS-2058	100mg	a-Ethylthio-o-tolylmethyl carbamate
PS-2007	100mg	O-Ethyl-O-(2,4,5-trichlorophenyl)ethyl phosphonothioate
PS-2134	50mg	Ethyl-(2E,4E,7S)-3,7,11-trimethyl-2,4-dodecadienoate
PS-610	100mg	Eticol
PS-95	500mg	Etilon®
PS-2109	10mg	Etoc®
PS-2237	100mg	Etofenprox
PS-2257	50mg	Etoxazole
PS-264	1g	Etridiazole
PS-657	100mg	Etrolene
PS-940	1g	Eugenic acid®
PS-940	1g	Eugenol
PS-2060	500mg	Euparen M®
PS-2047	1g	Euparen®
PS-502	1g	Eurex
PS-383	500mg	EVIK®
PS-1044	100mg	Evital®
PS-1088	100mg	Excel®
PS-66	1g	EXD
PS-2099	250mg	Express®
PS-2223	100mg	Extra®
PS-562	1g	E-Z Off D

F

PS-2098	500mg	Facet®
PS-2022	250mg	Famid®
PS-671	1g	Famophos®
PS-203	100mg	Famosept®
PS-2259	100mg	Famoxadone
PS-671	1g	Famphur
PS-506	1g	Fargo®
PS-2083	250mg	Fastac®
PS-33	1g	Fatal®
PS-2043	100mg	Fecundal®
PS-308	1g	Fenac
PS-2292	100mg	Fenamidone
PS-262	1g	Fenaminosulf
PS-612	1g	Fenamiphos
PS-1073	100mg	Fenarimol
PS-308	1g	Fenatrol
PS-2258	100mg	Fenazaquin
PS-2072	100mg	Fenbuconazole
PS-1060	1g	Fenbutatin-oxide
PS-657	100mg	Fenchlorphos
PS-2083	250mg	Fendona®
PS-2203	250mg	Fendona®
PS-2202	250mg	Fenhexamid
PS-678	500mg	Fenitrothion
PS-1046	1g	Fenobucarb
PS-47	250mg	Fenoprop®
PS-1088	100mg	Fenoxaprop ethyl
PS-2223	100mg	Fenoxaprop-P-ethyl
PS-2174	250mg	Fenoxycarb
PS-2002	250mg	Fenpropathrin
PS-1214	5ml	Fenpropimorph
PS-2216	100mg	Fenpyroximate
PS-667	100mg	Fensulfothion
PS-655	500mg	Fenthion
PS-2275	500mg	Fenthion-ethyl
PS-655	500mg	Fenthion-methyl
PS-1021	1g	Fentin acetate
PS-1031	500mg	Fentin hydroxide
PS-61	1g	Fenuron
PS-364	1g	Fenuron TCA

Chem Service Pesticide Standards - Alphabetical Listing

Catalog #	Size	Description
PS-1032	250mg	Fenvalerate®
PS-1032	500mg	Fenvalerate®
PS-2013	100mg	Fenvinal®
PS-20	1g	Ferbam
PS-20	1g	Ferberk®
PS-20	1g	Fermate®
PS-901	1g	Fermine
PS-20	1g	Ferradow®
PS-20	1g	Ferric dimethyldithio carbamate
PS-1200	5ml	Fervin® (100ug/ml in Acetonitrile)
PS-902	1g	Feypel®
PS-739	250mg	Ficam®
PS-2167	250mg	Filex®
PS-2124	250mg	Finale®
PS-2279	100mg	Fintryne®
PS-2136	100mg	Fipronil
PS-2165	100mg	FirstRate®
PS-2037	100mg	Flamprop-isopropyl
PS-2038	100mg	Flamprop-methyl
PS-2203	250mg	Flectron®
PS-2102	500mg	Flex®
PS-2129	1g	Flexidor®
PS-2102	500mg	Flexstar
PS-2196	100mg	Flint®
PS-1068	100mg	Flocord®
PS-2149	10mg	Flocoumafen
PS-2290	POR	Flonicamid
PS-2043	100mg	Flo-Pro®
PS-561	1g	Floraltone
PS-2194	250mg	Floramite®
PS-2043	100mg	Florasan®
PS-1205	5ml	Fluazifop (100ug/ml in Acetonitrile)
PS-2240	POR	Fluazifop-butyl
PS-1097	100mg	Fluazifop-P-butyl
PS-2249	100mg	Fluazinam
PS-2231	250mg	Flucarbazone-sodium
PS-1012	50mg	Fluchloralin
PS-1072	30mg	Flucythrinate
PS-2172	100mg	Fludioxonil
PS-2205	250mg	Flufenacet
PS-2213	250mg	Flufenoxuron
PS-2168	250mg	Flumetralin
PS-1211	5ml	Flumetralin (100ug/ml in Acetone)
PS-2111	500mg	Flumetsulam
PS-2119	500mg	Flumiclorac-pentyl
PS-2245	100mg	Flumioxazin
PS-2245	100mg	Flumyzin®
PS-369	1g	Fluometuron
PS-2029	1g	Fluorakil 100®
PS-2029	1g	2-Fluoroacetamide
PS-105	1g	Fluoroacetic acid sodium salt
PS-431	1g	Fluorodifen
PS-2245	100mg	N-(7-Fluoro-3,4-dihydro-3-oxo-4-prop-2-ynyl-2H-1,4-benzoxazin-6-yl)cyclohex-1-ene-1,2-dicarboxamide
PS-2205	250mg	N-(4-Fluorophenyl)-N-(1-methylethyl)-2-((5-(trifluoromethyl)-1,3,4-
PS-1070	100mg	Fluridone
PS-2191	100mg	Fluroxypyr-1-methylheptyl ester
PS-2191	100mg	Fluroxypyr-meptyl
PS-2131	100mg	Flurprimidol
PS-2041	100mg	Flusilazole
PS-2205	250mg	Fluthiamide
PS-2057	1g	Flutolanil
PS-2177	100mg	Flutriafol
PS-1071	100mg	(a-RS,2R)-Fluvalinate
PS-1071	100mg	tau-Fluvalinate
PS-854	250mg	Folbex®
PS-260	1g	Folcid®
PS-68	250mg	Folex®
PS-68	1g	Folex®
PS-1091	100mg	Folicur®
PS-95	500mg	Folidol®
PS-94	500mg	Folidol-M®
PS-2017	100mg	Folimat®
PS-678	500mg	Folithion®
PS-150	1g	Folosan®
PS-26	1g	Folpet
PS-2102	500mg	Fomesafen
PS-664	100mg	Fonofos
PS-2232	100mg	Foramsulfuron
PS-2238	1ml	Force®
PS-2150	500mg	Forchlorfenuron
PS-2095	500mg	Fore®
PS-2031	1g	Formaldehyde (in water)
PS-2031	1g	Formalin
PS-400	1g	Formetanate hydrochloride
PS-2036	100mg	Formothion
PS-2036	100mg	S-[2-(Formylmethylamino-2-oxoethyl]-O,O-dimethyl-phosphorodithionate
PS-2217	250mg	Fortress®
PS-2156	500mg	FortuneT2®
PS-414	1g	Fosamine Ammonium
PS-2181	50mg	Fosarbin
PS-2026	100mg	Fosetyl-Aluminum
PS-610	100mg	Fosfakol
PS-562	1g	Fos-Fall "A"
PS-95	500mg	Fosferno®
PS-2273	30mg	Fosthiazate
PS-659	250mg	Fostion MM®
PS-105	1g	Fratol
PS-2043	100mg	Freshgard®
PS-2161	250mg	Frontier®
PS-2249	100mg	Frowncide®
PS-29	1g	Fruit Fax®
PS-317	1g	Fruitone® CPA
PS-2143	100mg	Frunax-DS®
PS-2059	100mg	Fuberidazole
PS-21	1g	Fuclasine®
PS-2101	500mg	Fuji-One®
PS-21	1g	Fuklasin®
PS-1	1g	Fumazone®
PS-151	1g	Fumite®
PS-1072	30mg	Funchiong jujr®
PS-840	1g	Fundal®
PS-2014	100mg	Fundinex®
PS-2043	100mg	Fungaflor®
PS-2043	100mg	Fungazil®
PS-230	1g	Fungitox®
PS-2241	100mg	Furacon®
PS-341	1g	Furacrylic acid
PS-754	1g	Furadan®
PS-341	1g	2-Furalacetic acid
PS-341	1g	2-Furanacrylic acid
PS-2059	100mg	2-(2-Furanyl)-1H-benzimidazole
PS-341	1g	B-Furylacrylic acid
PS-1088	100mg	Furore®
PS-341	1g	Fururylidene acetic acid
PS-2244	250mg	Fury®
PS-151	1g	Fusarex®
PS-1097	100mg	Fusilade®
PS-2240	POR	Fusilade®
PS-1097	100mg	Fusilade® 2000
PS-1097	100mg	Fusilade® 5
PS-1097	100mg	Fusilade® DX
PS-1097	100mg	Fusilade® Super
PS-2029	1g	Fussol®

G

Catalog #	Size	Description
PS-2142	250mg	Galben®
PS-2129	1g	Gallery®
PS-14	1g	Gallotox®
PS-2193	250mg	Galtak®
PS-71	1g	Gammexane
PS-611	1g	Gardona®
PS-413	50mg	Gardoprim®
PS-417	1g	Garlon®
PS-88	1g	Garrathion®
PS-1201	5ml	Gatnon® (100ug/ml in Methylene chloride)
PS-2086	500mg	Gaucho®
PS-1063	250mg	Gazelle®
PS-436	1g	Gebotox®
PS-1214	5ml	Gemini®
PS-79	1g	Geniphene®
PS-856	1g	Genite®
PS-856	1g	Genitol®
PS-74	1g	Genitox®
PS-2134	50mg	GenTrol®
PS-384	1g	Gesagard®
PS-385	500mg	Gesamil®
PS-383	500mg	Gesapax®
PS-380	500mg	Gesaprim®
PS-58	500mg	Gesapun
PS-2122	100mg	Gesaran®
PS-74	1g	Gesarol®
PS-395	500mg	Gesatamin
PS-58	500mg	Gesatop®
PS-71	1g	Gexane
PS-49	100mg	Gibberellic acid
PS-49	100mg	Gibberellin X
PS-840	1g	Glaecron®
PS-1065	100mg	Glean®
PS-2124	250mg	Glufosinate-ammonium
PS-2185	250mg	Glycel®
PS-2185	1g	Glycel®
PS-1052	1g	Glycophene
PS-261	1g	Glyodin
PS-261	1g	Glyoxide®
PS-412	1g	Glyoxime
PS-1051	1g	Glyphosate
PS-2185	250mg	Glyphosate isopropylamine salt
PS-2185	1g	Glyphosate isopropylamine salt
PS-2185	250mg	Glyphosate-isopropylammonium Salt
PS-2185	1g	Glyphosate-isopropylammonium Salt
PS-2164	1g	Glyphosine
PS-328	1g	Glytac®
PS-1033	1g	Goal 2EC
PS-2198	100mg	Gokilaht®
PS-2117	500mg	Goltix®
PS-2072	100mg	Govern®
PS-2000	1g	Graminon®
PS-366	1g	Gramoxone®
PS-1200	5ml	Grasip® (100ug/ml in Acetonitrile)
PS-1200	5ml	Grasipan® (100ug/ml in Acetonitrile)
PS-2135	500mg	Grasp®
PS-379	1g	GS 14260
PS-74	1g	Guesarol®
PS-673	100mg	Gusathion A®
PS-666	1g	Gusathion M®
PS-673	100mg	Guthion Ethyl
PS-666	1g	Guthion®
PS-381	50mg	Gybon®

Chem Service Pesticide Standards - Alphabetical Listing

H

Catalog#	Size	Description
PS-2240	POR	Hache Uno Super®
PS-2146	500mg	Halofenozide
PS-2240	POR	Halokon®
PS-2108	100mg	Halosulfuron-methyl
PS-2040	100mg	Harness Plus®
PS-2052	1g	Harvade®
PS-2124	250mg	Harvest®
PS-272	1g	HCA
PS-690	1g	HCB®
PS-2222	1ml	HCH (epsilon isomer)
PS-71	1g	HCH®
PS-692	100mg	alpha-HCH
PS-691	100mg	beta-HCH
PS-693	100mg	delta-HCH
PS-71	1g	gamma-HCH
324	250mg	Hedonal MCPP®
PS-2248	25mg	Helix®
PS-1018	100mg	Helothion®
PS-76	250mg	HEOD
PS-78	100mg	Heptachlor
PS-700	50mg	Heptachlor epoxide (Isomer B)
PS-700-1	50mg	trans-Heptachlor epoxide
PS-700-1	50mg	trans-Heptachlor epoxide (Isomer A)
PS-2023	100mg	Heptachloro-2,2-dimethyl-3-methylenenorbornane
PS-700-1	50mg	1,4,5,6,7,8,8-Heptachloro-2,3-epoxy-3a,4,7,7a-tetrahydro-4,7-methanoindan
PS-700	50mg	1.4.5.6.7.8.8-Heptachloro-2.3-epoxy-3a.4.7.7a-tetrahydro-4.7-methanoindan
PS-78	100mg	1.4.5.6.7.8.8-Heptachloro-3a.4.7.7a-tetrahydro-4.7-methanoindene
PS-261	1g	2-Heptadecyl-2-imidazoline acetate
PS-2225	250mg	Heptenofos
PS-2225	250mg	Heptenophos
PS-2151	500mg	Herban®
PS-2288	POR	Herban®
PS-66	1g	Herbisan 5®
PS-66	1g	Herbisan®
PS-2141	250mg	Heritage®
PS-89	1g	Herkol®
PS-320	1g	Heteroauxin
PS-601	500mg	HETP
PS-272	1g	Hexachloroacetone
PS-690	1g	Hexachlorobenzene
PS-692	100mg	alpha-Hexachloro cyclohexane
PS-691	100mg	beta-Hexachloro cyclohexane
PS-693	100mg	delta-Hexachloro cyclohexane
PS-71	1g	gamma-Hexachloro cyclohexane
PS-692	100mg	1.2.3.4.5.6-Hexachloro cyclohexane [a-isomer]
PS-691	100mg	1.2.3.4.5.6-Hexachloro cyclohexane [b-isomer]
PS-693	100mg	1.2.3.4.5.6-Hexachloro cyclohexane [d-isomer]
PS-71	1g	1.2.3.4.5.6-Hexachloro cyclohexane [g-isomer]
PS-70	1g	1.2.3.4.5.6-Hexachloro cyclohexane
PS-2222	1ml	1,2,3,4,5,6-Hexachloro cyclohexane (epsilon isomer)
PS-77-2	10mg	3b.4.5.6.6.6a-Hexachloro decahydro-2.5.7-metheno-3H-cyclopenta(a)pentalene-3-one
PS-77-1	10mg	2.2a.3.3.4.7-Hexachloro decahydro -1.2.4-metheno-cyclopenta(c.d)pentalene-5-carboxaldehyde
PS-77	250mg	1.2.3.4.10.10-Hexachloro-6.7-epoxy-1.4.4a.5.6.7.8.8a-octahydro-1.4-endo-endo-5.8-dimethanonaphthalene
PS-171	1g	Hexachlorodimethyl sulfone
PS-13	1g	1.4.5.6.7.7-Hexachloro-N-(ethylmercuri)-5-norbornene-2.3-dicarboximide
PS-69	100mg	1.2.3.4.10.10-Hexachloro-1.4.4a.5.8.8a.-hexahydro-endo-exo-1.4:5.8-dimethanonaphthalene
PS-69	100mg	1.2.3.4.10.10-Hexachloro-1.4.4a.5.8.8a-hexahydro-1.4-endo-exo-5.8-dimethylnaphthalene
PS-81	500mg	6.7.8.9.10.10-Hexachloro-1,5,5a,6,9,9a-hexahydro-6,9-methano-2,4,3-benzo-dioxathiepin-3-oxide
PS-81-3	50mg	6.7.8.9.10.10-Hexachloro-1.5.5a.6.9.9a-hexahydro-6.9-methano-2.4.3-benzodioxathiepin-3.3-dioxide
PS-81-1	100mg	6.7.8.9.10.10-Hexachloro-1.5.5a.6.9.9a-hexahydro-6.9-methano-2.4.3-benzodioxathiepin-3-oxide, alpha isomer
PS-81-2	100mg	6.7.8.9.10.10-Hexachloro-1.5.5a.6.9.9a-hexahydro-6.9-methano-2.4.3-benzodioxathiepin-3-oxide, beta isomer
PS-2288	POR	3-(Hexahydro-4,7-methanoindan-5-yl)- 1,1-dimethylurea
PS-81	500mg	1.4.5.6.7.7-Hexachloro-5-norbornene-2.3-dimethanol cyclic sulfite
PS-1035	1g	Hexachlorophene
PS-272	1g	Hexachloro-2-propanone
PS-76	250mg	1.2.3.4.10.10-Hexachloro-6.7-epoxy-1.4.4a.5.6.7.8.8a-octahydro-endo-exo-1.4:5.8-dimethanonaphthalene
PS-2157	500mg	Hexaconazole
PS-2092	500mg	Hexadecyl cyclopropane carboxylate
PS-2074	250mg	Hexaflumuron
PS-1060	1g	Hexakis-(2-methyl-2-phenylpropyl)-distannoxane
PS-416	1g	Hexazinone
PS-1035	1g	Hexide®
PS-1079	100mg	Hexythiazox
PS-71	1g	HGI®
PS-2203	250mg	Hilcyperin®
PS-2140	500mg	Hinochloa®
PS-2066	500mg	Hinosan®
PS-1036	1g	Hoe-Grass®
PS-1036	1g	Hoelon®
PS-1046	1g	Hopcin®
PS-2184	250mg	Hope®
PS-401	1g	Horbadox®
PS-48	100mg	Hormodin
PS-2225	250mg	Hostaquick®
PS-2139	100mg	Hostathion
PS-1213	5ml	Hostathion®
PS-2225	250mg	Hostavik®
PS-1036	1g	Hoxan®
PS-2191	100mg	Hurler®
PS-501	250mg	Hydram
PS-1001	100mg	Hydramethylnon
PS-2200	250mg	Hydrocyclin®
PS-2134	50mg	Hydroprene
PS-420	1g	2-Hydroxybiphenyl
PS-87	250mg	3-Hydroxy-crotonic acid methyl ester dimethyl phosphate
PS-397	250mg	4-Hydroxy-3,5-diiodobenzonitrile
PS-397	250mg	4-Hydroxy-3,5-diiodophenyl cyanide
PS-51	500mg	Hydroxydimethyl-arsine oxide
PS-952	1g	2-Hydroxyethyl-n-octyl sulphide
PS-2186	25mg	Hydroxyisoxazole
PS-2186	25mg	3-Hydroxy-5-methyl isoxazole
PS-65	1g	6-Hydroxy-3-[2H]-pyridazinone
MET-668B	1ml	2-Hydroxypyrazine
PS-18	1g	8-Hydroxyquinoline
PS-2200	250mg	5-Hydroxytetracycline hydrochloride®
PS-2093	250mg	4-Hydroxy-3-(1,2,3,4-tetrahydro-1-naphtalenyl)-2H-1-benzopyran-2-one
PS-2149	10mg	4-Hydroxy-3-[1,2,3,4-tetrahydro-3-[4-(4-trifluoromethylbenzyl-oxy)phenyl]-1-naphthyl] coumarin
PS-2186	25mg	Hymexazole
PS-6	1g	Hyosan®
PS-62	1g	Hyvar®
PS-2220	100mg	Hyvermectin®
PS-2186	25mg	Hyzole

I

Catalog #	Size	Description
PS-57	1g	Ibertox®
PS-2065	500mg	IBP
PS-2018	100mg	Icon®
PS-379	1g	Igran®
PS-1036	1g	Illoxan®
PS-2197	250mg	Imaxapic
PS-2043	100mg	Imazalil
PS-2043-1	100mg	Imazalil hydrogensulfate
PS-2197	250mg	Imazameth
PS-2195	100mg	Imazamethabenz-methyl
PS-2162	500mg	Imazamox
PS-2016	100mg	Imazapyr®
PS-2053	100mg	Imazaquin
PS-2039	100mg	Imazethapyr
PS-2086	500mg	Imidacloprid
PS-653	1g	Imidan®
PS-2180	1g	2-Imidazolidinethione
PS-2177	100mg	Impact®
PS-1068	100mg	Imperator
PS-907	1g	Indalone®
PS-2072	100mg	Indar®
PS-320	1g	3-Indoleacetic acid
PS-48	100mg	3-Indolebutyric acid
PS-321	1g	3-Indolepropionic acid
PS-2230	100mg	Indoxacarb
PS-53	1g	INPC®
PS-2174	250mg	Insegar®
PS-2233	50mg	Intrathion®
PS-2178	250mg	Investt®

Chem Service Pesticide Standards - Alphabetical Listing

Catalog #	Size	Description
PS-1206	5ml	Iodofenphos (100ug/ml in Acetone)
PS-397	250mg	Ioxynil
PS-2250	100mg	Ioxynil octanoate
PS-53	1g	IPC®
PS-2065	500mg	Iprobenfos
PS-1052	1g	Iprodione
PS-2279	100mg	Irgarol®
PS-681	1g	Isazophos
PS-704	10mg	Isobenzan
PS-731	1g	Isobornyl thiocyanoacetate
PS-324	250mg	Iso-Cornox®
PS-27	100mg	Isocothane®
PS-2103	1g	Isodrin
PS-1003	100mg	Isofenphos
PS-319	1g	Isooctyl-2.4-dichloro phenoxy acetate
PS-53	1g	Iso-PPC®
PS-2070	500mg	Isoprocarb
PS-406	1g	Isopropalin
PS-1076	100mg	(E)-O,2-Isopropoxy-carbonyl-1-methylvinyl O-methyl-ethyl phosphoramidothioate
PS-2227	100mg	3'-Isopropoxy-2-methylbenzanilide
PS-551	1g	2-Isopropoxyphenyl-N-methylcarbamate
PS-551	1g	O-Isopropoxyphenyl methyl carbamate
PS-2179	1g	Isopropylbenzene
PS-52	1g	Isopropyl-N-[m-chlorophenyl]carbamate
PS-1052	1g	1-Isopropylcarbamoyl-3(3.5-dichlorophenyl)-hydantoin
PS-355	1g	N-Isopropyl-a-chloro acetanilide
PS-52	1g	Isopropyl-m-chlorocarbanilate
PS-1062	250mg	Isopropyl-4.4'-dibromobenzilate
PS-43	1g	Isopropyl-2.4-dichlorophenoxy acetate
PS-857	1g	Isopropyl-4.4'-dichlorobenzilate
PS-2153	250mg	Isopropyl-3,4-diethoxycarbanilate
PS-2190	250mg	2,3:4,6-di-O-Isopropylidene-a-L-xylo-2-hexulofuranosonic acid
PS-2194	250mg	Isopropyl 2-(4-methoxy biphenyl-3-yl)hydrazino formate
PS-2122	100mg	N2-Isopropyl-N4-(3-methoxypropyl)-6-methylthio-1,3,5-triazine-2,4-diamine
PS-1040	250mg	Isopropyl (2E-4E)-11-methoxy-3.7.11-trimethyl-2.4-dodecadienoate
PS-2162	500mg	(RS)-2-(4-Isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-methoxy-methylnicotinic acid
PS-2016	100mg	2-(4-Isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-nicotinic acid
PS-2027	100mg	3-Isopropyl-5-methyl phenyl methyl carbamate
PS-2000	1g	3-(4-Isopropylphenyl)-1,1-dimethylurea
PS-46	100mg	Isopropyl-(2.4.5-trichlorophenoxy) acetate
PS-53	1g	Isopropyl-N-phenyl carbamate
PS-2101	500mg	Isoprothiolane
PS-2000	1g	Isoproturon
PS-71	1g	Isotox®
PS-911	250mg	2-Isovaleryl-1.3-indanedione
PS-2129	1g	Isoxaben
PS-2166	500mg	Isoxaflutole
PS-2186	25mg	Itachigarden®
PS-2220	100mg	Ivermectin
PS-2220	100mg	Ivomec®

J

PS-2125	1g	Jarben®
PS-1206	5ml	Jodfenphos® (100ug/ml in Acetone)
PS-1009	1g	Jonnix®
PS-71	1g	Jucutin®
PS-690	1g	Julin's carbon chloride
PS-2110	100mg	Juvinal®

K

PS-1068	100mg	Kafil Super
PS-2173	100mg	Kalcorn®
PS-2025	100mg	Kap®
PS-2018	100mg	Karate®
PS-27	100mg	Karathane®
PS-20	1g	Karbam black®
PS-21	1g	Karbam white®
PS-60	500mg	Karmex®
PS-82	250mg	Kelthane®
PS-388	250mg	Kemate®
PS-1014	250mg	Kemifam®
PS-1045	1g	Kemiron®
PS-2216	100mg	Kendo®
PS-701	50mg	Kepone®
PS-349	1g	Kerb®
PS-71	1g	Kewll®
PS-601	500mg	Killaz
PS-324	250mg	Kilprop®
PS-2187	100mg	Kilval®
PS-2126	250mg	Kimono®
PS-2010	250mg	Kinalux®
PS-2051	100mg	Kinoprene
PS-2216	100mg	Kiron®
PS-2065	500mg	Kitazin®
PS-1071	100mg	Klartan®
PS-1056	50mg	Klerat®
PS-377	1g	Kloben®
PS-2110	100mg	Knack®
PS-1033	1g	Koltar®
PS-2238	1ml	Komet®
PS-2203	250mg	Kordon®
PS-657	100mg	Korlan®
PS-2071	100mg	K-Othrin®
PS-414	1g	Krenite®
PS-2182	250mg	Kresoxim-methyl
PS-47	250mg	Kuron®
PS-1200	5ml	Kusagard® (100ug/ml in Acetonitrile)
PS-104	1g	Kypfarin®

L

PS-230	1g	Labilite®
PS-2077	100mg	Lactofen
PS-216	1g	(Lactoyloxy)phenylmercury
PS-2018	100mg	lambda-Cyhalothrin
PS-775	1g	Lannate®
PS-2110	100mg	Lano®
PS-2127	100mg	Laptran®
PS-1208	5ml	Laptran® (100ug/ml in Hexane)
PS-4	1g	Larvacide®
PS-2012	250mg	Larvin®
PS-357	1g	Lasso®
PS-250	1g	Laurylguanidine acetate
PS-2173	100mg	Lazo®
PS-357	1g	Lazo®
PS-290	1g	Lead arsenate
PS-655	500mg	Lebaycid®
PS-2249	100mg	Legacy®
PS-1092	100mg	Lektan®
PS-415	1g	Lenacil
PS-66	1g	Leniscarin
PS-2081	500mg	Lentagran®
PS-2078	250mg	Lentipur®
PS-677	1g	Lepton®
PS-677	1g	Leptophos
PS-855	1g	Lethalaire®
PS-730	250mg	Lethane 384®
PS-730	250mg	Lethane®
PS-398	1g	Lexone®
PS-2124	250mg	Liberty®
PS-2030	1g	Limatox®
PS-71	1g	Lindane
PS-71	1g	Lintox®
PS-372	250mg	Linuron
PS-57	1g	Lipan®
PS-2085	500mg	Liphadione®
PS-2200	250mg	Liquamycin injectable®
PS-14	1g	Liquiphene®
PS-42	1g	Lironox®
PS-2174	250mg	Logic®
PS-2042	100mg	Logran®
PS-23	1g	Lonacol®
PS-1082	100mg	Londax®
PS-1069	250mg	Lontrel®
PS-71	1g	Lorexane®
PS-372	250mg	Lorox®
PS-2252	100mg	Lufenuron
PS-2233	50mg	Luxistelm®
PS-1091	100mg	Lynx®
PS-2173	100mg	Lyton®

M

PS-281	500mg	MAA®
PS-2146	500mg	Mach 2
PS-348	250mg	Machete®
PS-2278	250mg	Madribon®
PS-89	1g	Mafu®
PS-1022	100mg	Maintain A®
PS-1022	100mg	Maintain CF 125®
PS-1038	100mg	Maki®
PS-86	500mg	Malaspray®
PS-86	500mg	Malathion
PS-86	500mg	Malathiozol®
PS-86	500mg	Malathiozoo®
PS-86	500mg	Malathon®
PS-65	1g	Malazide
PS-65	1g	Maleic hydrazide
PS-81	500mg	Malix®
PS-368	1g	Maloran®
PS-2108	100mg	Manage®
PS-2095	500mg	Mancozeb
PS-22	1g	Maneb
PS-22	1g	Manganese ethylene bis(dithiocarbamate)
PS-1207	250mg	Mansonil® (100ug/ml in Methanol)
PS-2095	500mg	Manzate®
PS-2133	500mg	Marathon®
PS-2126	250mg	Marcidone®
PS-83	1g	Marlate®
PS-1063	250mg	Marshal®
PS-2176	100mg	Mascot®
PS-751	250mg	Matacil®
PS-2018	100mg	Matador®
PS-2151	500mg	Matador®

Chem Service Pesticide Standards - Alphabetical Listing

Catalog#	Size	Description
PS-2038	100mg	Mataven®
PS-2134	50mg	Mator®
PS-2143	100mg	Matrak®
PS-2118	100mg	Matrix®
PS-2224	500mg	Maverick®
PS-1071	100mg	Mavrik Aquaflow®
PS-1071	100mg	Mavrik®
PS-2172	100mg	Maxim®
PS-40	1g	MCP
PS-1105	100mg	MCPA methyl ester
PS-40	1g	MCPA®
PS-307	100mg	MCPB
PS-1084	500mg	MCPB methyl ester
PS-1106	100mg	MCPP methyl ester
PS-324	250mg	MCPP®
PS-2116	500mg	MCPP-P
PS-22	1g	MEB
PS-2283	50mg	Mecarbam
PS-324	250mg	Mecoprop
PS-1106	100mg	Mecoprop methyl ester
PS-1212	5ml	Mecoprop-2,4,4-trimethylpentyl ester (100ug/ml in Acetone)
PS-2116	500mg	Mecoprop-P
PS-2116	500mg	D(+)-Mecoprop
PS-2220	100mg	Mectizan®
PS-2172	100mg	Medallion®
PS-346	1g	Mediben®
PS-1014	250mg	Medifene®
PS-2140	500mg	Mefenacet
PS-2160	100mg	Mefenoxam
PS-2287	POR	Mefenpyr-diethyl
PS-2050	100mg	Mefluidide
PS-250	1g	Melprex®
PS-1086	100mg	Meltatox®
PS-2200	250mg	Mepatar®
PS-40	1g	Mephanance®
PS-1026	100mg	Mephosfolan
PS-1047	10mg	Mepiquat chloride
PS-324	250mg	Mepro®
PS-2227	100mg	Mepronil
PS-224	1g	Mercaptan methylique perchlore
PS-227	1g	2-Mercaptobenzothiazole monoethanolamine salt
PS-543	1g	Mercaptodimethur
PS-653	1g	N-[Mercaptomethyl] phthalimide-S-[O.O-dimethyl phosphoro dithioate]
PS-655	500mg	Mercaptophos®
PS-24	1g	Mercuram®
PS-203	100mg	Merfen®
PS-2086	500mg	Merit®
PS-202	100mg	Merphenyl nitrate
PS-68	250mg	Merphos
PS-68	1g	Merphos
PS-1057	1g	Mertect®
PS-429	1g	Mesamate®
PS-2286	POR	Mesosulfuron-methyl
PS-2274	100mg	Mesotrione
PS-543	1g	Mesurol®
PS-2274	100mg	2-(4-Mesyl-2-nitrobenzoyl)cyclohexane-1,3-dione
PS-2030	1g	Metacetaldehyde
PS-94	500mg	Metacide®
PS-2096	500mg	Metacrate®
PS-902	1g	Meta-delphene®
PS-1099	100mg	Metalaxyl
PS-2160	100mg	Metalaxyl-M
PS-2160	100mg	R-Metalaxyl
PS-2030	1g	Metaldehyde
PS-221	500mg	Metam®
PS-2117	500mg	Metamitron

Catalog #	Size	Description
PS-14	1g	Metasol 30®
PS-2030	1g	Metason®
PS-1096	50mg	Metasystox I®
PS-642	100mg	Metasystox R sulfone
PS-641	50mg	Metasystox-R®
PS-2216	100mg	Meteor®
PS-2048	100mg	Methabenzthiazuron
PS-2218	100mg	Methacrifos
PS-221	500mg	Metham sodium
PS-676	100mg	Methamidophos
PS-281	500mg	Methanearsonic acid disodium salt
PS-281	500mg	Methar
PS-21	1g	Methasan®
PS-679	1g	Methidathion
PS-543	1g	Methiocarb
PS-775	1g	Methomyl
PS-1040	250mg	Methoprene®
PS-2122	100mg	Methoprotryne
PS-395	500mg	2-Methoxyatrazine
PS-1077	100mg	2-(Methoxycarbonylamino)-benzimidazole
PS-1014	250mg	3-methoxycarbonyl aminophenyl 3-methylcarbanilate
PS-83	1g	Methoxychlor
PS-83	1g	Methoxy-DDT®
PS-346	1g	2-Methoxy-3.6-dichlorobenzoic acid
PS-1102	100mg	2-Methoxy-3,6-dichloromethyl benzoate
PS-2264	100mg	Methoxyfenozide
PS-386	250mg	2-Methoxy-4.6-bis(isopropylamino)-s-triazine
PS-2264	100mg	3-Methoxy-2-methylbenzoic acid 2-(3,5-dimethylbenzoyl) -2-(1,1-dimethylethyl) hydrazide
PS-2123	500mg	1-(4-Methoxy-6-methyl-1,3,5-triazin-2-yl)-3-[2-(3,3,3-trifluoropropyl) phenylsulfonyl]urea
PS-2137	100mg	2-Methoxy-N-(2-oxo-1,3-oxazolidin-3-yl)aceto-2',6'-xylidide
PS-1200	5ml	Methyl (E)-(RS)-3-[1-(allyloxyimino)butyl]-4-hydroxy-6,6-dimethyl-2-oxocyclohex-3-enecarboxylate sodium salt (100ug/ml in Acetonitrile)
PS-1113	100mg	Methyl-3-amino-2,5-dichloro benzoate
PS-2055	100mg	Methyl anthranilate
PS-2038	100mg	Methyl N-benzoyl-N-(3-chloro-4-fluorophenyl)-DL-ananinate
PS-603	50mg	a-Methylbenzyl-3-hydroxycrotonate dimethylphosphate
PS-603	50mg	1-Methylbenzyl-3-[dimethoxy phosphinyloxy] cis-crotonate
PS-2003	100mg	2-Methylbiphenyl-3yl-methyl (Z)-(1RS)-cis-3-(2-chloro-3,3,3-trifluoroprop-1-enyl)-2,2-dimethylcyclopropane carboxylate
PS-155	5ml	Methylbromide
PS-222	100mg	Methyl-1-[butylcarbamoyl]-2-benzimidazole carbamate

Catalog #	Size	Description
PS-2165	100mg	Methyl 3-chloro-2-(5-ethoxy-7-fluoro[1,2,4]triazolo[1,5-c]-pyrimidin-2-ylsulfonamido) benzoate
PS-1022	100mg	Methyl 2-chloro-9-hydroxyfluorene-9-carboxylate
PS-307	100mg	4-(2-Methyl-4-chlorophenoxy)butyric acid
PS-2235	100mg	Methyl N-{2-[1-(4-chlorophenyl)-1H-pyrazol-3-yloxymethyl]phenyl}(N-methoxy)carbamate
PS-2230	100mg	Methyl (S)-N-[7-chloro-2,3,4a,5-tetrahydro-4a-(methoxycarbonyl)indeno[1,2-e]-,3,4]oxadiazin -2-ylcarbonyl]-4'-(trifluoromethoxy) carbanilate
PS-2141	250mg	Methyl (E)-2-2-6-(2-Cyanophenoxy)pyrimidin-4-yloxy-phenyl-3-methoxyacrylate
PS-373	1g	1-(2-Methylcyclohexyl)-3-phenylurea
PS-87-1	100mg	(E)-Methyl ester-3-((dimethoxyphosphinyl)oxy) -2-Butenoic acid
PS-1103	100mg	Methyl-2-(2,4-dichlorophenoxy)propionate
PS-1114	100mg	Methyl-3,5-dichlorobenzoate
PS-1101	100mg	Methyl-4-(2,4-dichlorophenoxy) butyrate
PS-311	1g	Methyl-5-(2.4-dichlorophenoxy)-2-nitrobenzoate
PS-1036	1g	Methyl-2-[4-(2'.4'-dichlorophenoxy)phenoxy] propanoate
PS-1098	50mg	Methyl-N-(3,4-dichlorophenyl)carbamate
PS-1100	100mg	Methyl-2,2-dichloro propionate
PS-2163	500mg	Methyl 2-difluoromethyl-5-(4,5-dihydro-1,3-thiazol-2-yl)-4-isobutyl-6-trifluoromethylnicotinate
PS-2195	100mg	Methyl-2-(4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl)-4(or 5)-methyl ester benzoic acid
PS-2108	100mg	Methyl 5-{[(4,6-dimethoxy-2-pyrimidinyl)amino] carbonylaminosulfonyl} -3-chloro-1-methyl-1H-pyrazole-4-carboxylate
PS-737	250mg	S-methyl-N',N'-dimethyl-N-(methylcarbamoyloxy)-1-thio-oxamimidate
PS-1074	100mg	Methyl 2(((((4.6-dimethyl-2-pyrimidinyl)amino)carbonyl) amino)sulfonyl)benzoate
PS-2187	100mg	N-Methyl O,O-dimethyl thiolophosphoryl-5-thia-3-methyl-2-valeramide
PS-860	250mg	6-Methyl-1,3-dithiolo[4,5-b]quinoxalin-2-one
PS-860	250mg	6-Methyl-1,3-dithiolo[4,5-b]quinoxalin-2-one
PS-418	250mg	Methyl Dursban
PS-6	1g	2.2'-Methylene bis(4-chlorophenol)
PS-92	1g	S.S'-Methylene bis[O.O-diethyl phosphorodithioate]

Chem Service Pesticide Standards - Alphabetical Listing

Alphabetical Listing

Catalog #	Size	Description
PS-1035	1g	2.2'-Methylene bis(3.4.6-trichlorophenol)
PS-1082	100mg	Methyl 2-[[[[[(4.6-dimethoxy-2-pyrimidinyl) amino] carbonyl]amino] sulfonyl]methyl]benzoate
PS-976	100mg	1.2-Methylenedioxy-4-[2-(octylsulfinyl)propyl] benzene
PS-100	100mg	3.4-Methylene-dioxy-6-propylbenyzl n-butyl diethylene glycol ether
PS-2062	250mg	[[(1-Methyl-1,2-ethanediyl)bis [carbamodithioato]](2-)]zinc homopolymer
PS-2183	100mg	Methyl 2-((4-ethoxy-6-methylamino-1,3,5-triazin-2-yl)carbamoylsulfamoyl) benzoate
PS-2179	1g	(1-Methylethyl)benzene
PS-1011	250mg	3-(1-Methylethyl)-1H-2.1.3-benzothiadiazin-4(3H)-one-2.2-dioxide
PS-2153	250mg	1-Methylethyl (3,4-diethoxy phenyl) carbamate/Isopropyl 3,4-diethoxyphenyl carbamate
PS-1003	100mg	1-Methylethyl-2-[[ethoxy[(1-methylethyl)amino] phophinothioyl]-oxy]benzoate
PS-2194	250mg	1-Methylethyl 2-(4-methoxy[1,1'-biphenyl]-3-yl)hydrazinecarboxylate
PS-2070	500mg	2-(1-Methylethyl)phenyl methylcarbamate
PS-2131	100mg	a-(1-Methylethyl)-a-[4-trifluoromethoxy)phenyl]-5-pyrimidinemethanol
PS-2186	25mg	5-methyl-3(2H)-isoxazolone
PS-1014	250mg	Methyl-m-hydroxy carbanilate m-methylcarbanilate
PS-676-1	100mg	N-Methyl-methamidophos
PS-2160	100mg	Methyl N-(methoxyacetyl)-N-(2,6-xylyl)-D-alaninate
PS-2182	250mg	Methyl(E)-2-methoxyimino-[2-(o-tolyloxymethyl) phenyl]acetate
PS-2011	100mg	Methyl 3-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl) amino]carbonyl]amino] sulfonyl]-2-thiophenecarboxylate
PS-2011	100mg	Methyl 3-(4-methoxy-6-methyl-1,3,5-triazin-2-yl-carbamoyl)sulfamoyl)-thiophen-2-carboxylatePS-
1078	100mg	Methyl 2[[[[(4-methoxy-6-methyl-1.3.5-triazin-2-yl)amino]carbonyl]amino] sulfonyl]benzoate
PS-2099	250mg	Methyl 2-[[[[4-methoxy-6-methyl-1,3,5-triazin-2-yl) methylamino]carbonyl] amino]sulfonyl]benzoate
PS-775	1g	S-Methyl-N-[(methylcarbamoyl)oxy] thioacetimidate
PS-1014	250mg	Methyl 3-(3-methylcarbaniloyloxy) carbanilate
PS-2227	100mg	2-Methyl-N-(3-(1-methyl ethoxy)phenyl)benzamide
PS-1055	10mg	2-Methyl-2-(methylsulfonyl)propanal-O-[(methylamino) carbonyl]oxime
PS-1054	10mg	2-Methyl-2-(methylsulfoxo) propanal-O-[(methylamino) carbonyl]oxime
PS-2292	100mg	S-5-Methyl-2-methylthio-5-phenyl-3-phenylamino-3,5-dihydro-4H-imidazol-4 -one
PS-734	1g	2-Methyl-2-[methylthio] propionaldehyde-O-[methylcarbamoyl]oxime
PS-676-1	100mg	N-Methyl-monitor®
PS-30	1g	Methyl-1-naphthalene acetate
PS-352	1g	N-Methyl-N-1-naphthyl acetamide
PS-2186	25mg	5-methyl-1,2-oxazol-3-ol
PS-2109	10mg	(S)-2-Methyl-4-oxo-3-(2-propynyl)-cyclopenten-1-yl (1R)-cis-trans-chrysanthemate
PS-613	100mg	Methyl paraoxon
PS-94	500mg	Methyl parathion
PS-2110	100mg	2-[1-Methyl-2-(4-phenoxyphenoxy) ethoxy]pyridine
PS-2142	250mg	Methyl N-phenylacetyl-N-2,6-xylyl-DL-alaninate
PS-1070	100mg	1-Methyl-3-phenyl-5-(3-trifluoromethyl)phenyl)-4(1H)-pyridinone
PS-676-1	100mg	Methylphosphoramidothioic acid, O,S-dimethyl ester
PS-50	1g	3'-Methylphthalanilic acid
PS-901	1g	Methyl phthalate
PS-409	1g	3-(2-Methylpiperidino)propyl-3.4-dichlorobenzoate
PS-85	1g	1-Methyl-2-[3-pyridyl] pyrrolidine
PS-860	250mg	6-Methyl-2.3-quinoxalinedithiol cyclic-S.S.-dithiocarbonate
PS-860	250mg	S,S-(6-Methylquinoxaline-2,3-diyl) dithiocarbonate
PS-1009	1g	Methyl sulfanilylcarbamate
PS-358	1g	4-[Methylsulfonyl]-2.6-dinitro-N.N-di-propylaniline
PS-676-1	100mg	N-Methyl-Tamaron®
PS-543	1g	4-[Methylthio]-3.5-xylyl-N-methylcarbamate
PS-676-1	100mg	N-Methyl-thio phosphoramidic acid, O,S-dimethyl ester
PS-1083	100mg	5-Methyl-1.2.4-triazolo-[3.4.b]-benzothiazole
PS-366	1g	Methyl viologen
PS-1005	500mg	N-Methyl-N'-2.4-xylyl-N-(N-2.4-xylylformimidoyl) formamidine
PS-225	1g	Metiram
PS-374	1g	Metobromuron
PS-403	500mg	Metolachlor
PS-403-1	250mg	S-Metolachlor
PS-2096	500mg	Metolcarb
PS-2178	250mg	Metoxuron
PS-398	1g	Metribuzin
PS-608	1g	Metrifonate
PS-94	500mg	Metron®
PS-1078	100mg	Metsulfuron methyl
PS-87-1	100mg	alpha-Mevinphos
PS-87-1	100mg	cis-Mevidrin®
PS-87-1	100mg	cis-Mevinphos
PS-87-1	100mg	(E)-Mevinphos
PS-87	250mg	Mevinphos
PS-756	500mg	Mexacarbate
PS-962	250mg	MGK 264®
PS-906	1g	MGK 326®
PS-910	1g	MGK R-11®
PS-906	1g	MGK Repellent 326®
PS-952	1g	MGK Repellent 874®
PS-65	1g	MH
PS-2026	100mg	Mikal®
PS-21	1g	Milbam®
PS-1086	100mg	Milban®
PS-27	100mg	Mildex®
PS-230	1g	Mildothane
PS-385	500mg	Milogard®
PS-2188	100mg	Mimic®
PS-610	100mg	Mintacol
PS-610	100mg	Miotisal A
PS-901	1g	Mipax®
PS-2070	500mg	MIPC
PS-681	1g	Miral®
PS-702	100mg	Mirex
PS-2216	100mg	Miro®
PS-1005	500mg	Mitac®
PS-853	100mg	Mitox®
PS-855	1g	Mitran®
PS-403-1	250mg	Mix of [(aRS,1S)-2-Chloro-6'-ethyl-N-(2-methoxy-1-methylethyl)aceto-o-toluidide and (aRS,1R)-2-Chloro-6'-ethyl-N-(2-methoxy-1-methylethyl)ac
PS-103	1g	Mobilawn®
PS-672	1g	Mocap®
PS-311	1g	Modown®
PS-501	250mg	Molinate
PS-1095	100mg	Monceren®
PS-2057	1g	Moncut®
PS-2064	1g	Mondaris®
PS-2224	500mg	Monitor®
PS-676	100mg	Monitor®
PS-155	5ml	Monobromomethane®
PS-31	1g	Monochloroacetic acid
PS-609	1g	Monocrotophos
PS-2185	250mg	Mono-isopropylammoniova sul
PS-2185	1g	Mono-isopropylammoniova sul
PS-2210	250mg	Monolinuron
PS-429	1g	Monosodium acid methane arsonate, sesquihydrate
PS-2181	50mg	Monothiono TEPP
PS-607	50mg	Montrel
PS-59	1g	Monuron
PS-371	1g	Monuron TCA
PS-860	250mg	Morestan R®
PS-2087	100mg	Morocide®
PS-601	500mg	Mortopal®
PS-2219	100mg	Mospilan®
PS-2151	500mg	Mostar®
PS-94	500mg	MPT®
PS-1096	50mg	MSI®
PS-429	1g	MSMA sesquihydrate
PS-2096	500mg	MTMC
PS-902	1g	m-Toluic Acid diethylamide
PS-2096	500mg	m-Tolyl methylcarbamate
PS-2181	50mg	MTST
PS-2283	50mg	Murfotox®
PS-656	100mg	Muscatox®
PS-2244	250mg	Mustang®
PS-2183	100mg	Muster®
PS-2006	100mg	Myclobutanil
PS-17	1g	Mylone®

Chem Service Pesticide Standards - Alphabetical Listing

N

Catalog#	Size	Description
PS-354	500mg	N-1-Naphthylacetamide
PS-343	1g	N-1-Naphthylphthalamic acid
PS-29	1g	NAA®
PS-1035	1g	Nabac®
PS-220	1g	Nabam
PS-2013	100mg	Nabu®
PS-2216	100mg	Naja®
PS-605	1g	Naled
PS-668	100mg	Namafos®
PS-281	500mg	Namate®
PS-2030	1g	Namekil®
PS-657	100mg	Nankor®
PS-35	1g	2-Naphthoxyacetic acid
PS-553	1g	2-(a-Naphthoxy)-N.N-diethyl propionamide
PS-28	1g	1-Naphthalene acetamide
PS-29	1g	1-Naphthaleneacetic acid
PS-30	1g	1-Naphthaleneacetic acid methyl ester
PS-1048	500mg	1,8-Naphthalic anhydride
PS-106	1g	a-Naphthylthiocarbamide
PS-106	1g	a-Naphthylthiourea
PS-2028	1g	Naphthenic acid copper salt
PS-84	1g	1-Naphthyl-N-methylcarbamate
PS-553	1g	Napropamide®
PS-343	1g	Naptalam
PS-658	100mg	Navadel®
PS-2029	1g	Navron®
PS-377	1g	Neburon
PS-608	1g	Neguvon®
PS-103	1g	Nemacide VC-13®
PS-612	1g	Nemacur®
PS-1	1g	Nemafume®
PS-1	1g	Nemagon®
PS-2273	30mg	Nemathorin®
PS-4	1g	Nemax®
PS-2110	100mg	Nemesis®
PS-74	1g	Neocid®
PS-90	1g	Neocidol
PS-2201	250mg	Neomycin sulfate salt
PS-1042	100mg	Neo-Pynamin®
PS-1062	250mg	Neoron®
PS-2143	100mg	Neosorexa®
PS-2278	250mg	Neostrepal®
PS-89	1g	Nerkol®
PS-2114	1g	Nevirol®
PS-2008	100mg	Nexagan®
PS-2125	1g	Nexter®
PS-850	5ml	Niagarmite® (0.1mg/ml in Hexane)
PS-92	1g	Nialate®
PS-394	100mg	Niclofen®
PS-1207	250mg	Niclosamide (100ug/ml in Methanol)
PS-2260	100mg	Nicobifen
PS-2005	100mg	Nicosulfuron
PS-85	1g	Nicotine
PS-601	500mg	Nifos T®
PS-665	100mg	Nimitex®
PS-394	100mg	NIP®
PS-95	500mg	Niran®
PS-1079	100mg	Nissorun
PS-2185	250mg	Nitosorg®
PS-2185	1g	Nitosorg®
PS-358	1g	Nitralin
PS-94	500mg	Nitran
PS-419	1g	Nitrapyrin
PS-4	1g	Nitrochloroform®
PS-394	100mg	Nitrofen
PS-94	500mg	Nitrox 80®
PS-2268	250mg	asym-Nitro-m-dichlorobenzene
PS-431	1g	p-Nitrophenyl-2-nitro-4-[trifluoromethyl]phenyl ether diazosulfonic acid, sodium salt
MET-401A	100mg	N-Nitroso-N-(1-ethylpropyl)-2,6-dinitro-3,4-xylidine
MET-401A	100mg	N-Nitrosopendimethalin
PS-56	100mg	NNOSBP®
PS-1056	50mg	Nofar®
PS-89	1g	Nogos®
PS-24	1g	Nomersan®
PS-2246	100mg	Nominee®
PS-2247	250mg	Nomolt®
PS-2288	POR	Norea
PS-1044	100mg	Norflurazon®
PS-1045	1g	Nortron®
PS-2288	POR	Noruron
PS-2253	100mg	Novaluron
PS-343	1g	NPA
PS-90	1g	Nucidol®
PS-2203	250mg	Nurele®
PS-2041	100mg	Nustar®
PS-609	1g	Nuvacron®
PS-89	1g	Nuvan®
PS-1206	5ml	Nuvanol® N (100ug/ml in Acetone)
PS-2109	10mg	Nylar®
PS-14	1g	Nylmerate®

O

Catalog #	Size	Description
PS-952	1g	2-(Octylthio)ethanol
PS-345	250mg	7-Oxabicyclo[2.2.1]heptane-2.3-dicarboxylic acid phosphorothioate
PS-75	1g	Octachlor®
PS-75	1g	1.2.4.5.6.7.8.8-Octachloro-3a.4.7.7a-tetrahydro-4.7-methanoindene
PS-75	1g	1.2.4.5.6.7.8.8-Octachloro-4.7-methane-3a.4.7.7a-tetrahydroindane
PS-962	250mg	Octacide 264®
PS-75	1g	Octa-Klor®
PS-76	250mg	Octalox®
PS-2175	250mg	Octave®
PS-962	250mg	N-Octylbicycloheptene dicarboximide
PS-102	1g	Octylene glycol®
PS-976	100mg	n-Octyl sulphoxide of isosafrole
PS-902	1g	OFF®
PS-2207	100mg	Ofir®
PS-1003	100mg	Oftanol
PS-2155	250mg	Ofunack®
PS-2249	100mg	Ohayo®
PS-2154	500mg	Ohric®
PS-89	1g	Oko®
PS-2041	100mg	Olymp®
PS-10	1g	Omal
PS-2175	250mg	Omega®
PS-2249	100mg	Omega®
PS-2017	100mg	Omethoate
PS-858	1g	Omite®
PS-704	10mg	Omtan
PS-2241	100mg	Oncol®
PS-2240	POR	Onecide®
PS-2207	100mg	Onmex®
PS-2116	500mg	Optica®
PS-1088	100mg	Option®
PS-2223	100mg	Option®
PS-1214	5ml	Orbit®
PS-501	250mg	Ordram®
PS-2155	250mg	Oreste®
PS-2277	100mg	Ormetoprin
PS-738	1g	Orthene®
PS-850	5ml	Ortho-mite® (0.1mg/ml in Hexane)
PS-95	500mg	Orthophos®
PS-855	1g	Orthotran®
PS-2216	100mg	Ortus®
PS-410	1g	Oryzalin
PS-2082	500mg	Oryzamate®
PS-1046	1g	Osbac®
PS-2200	250mg	Otetryn®
PS-1074	100mg	Oust Weed Killer®
PS-2291	100mg	Outlook®
PS-2224	500mg	Outrider®
PS-855	1g	Ovex
PS-855	1g	Ovotox®
PS-855	1g	Ovotran®
PS-1050	1g	Oxadiazon
PS-2137	100mg	Oxadixyl
PS-737	250mg	Oxamyl
PS-2091	500mg	Oxine-copper
PS-2200	250mg	Oxlopar®
PS-282	1g	Oxybis(tributyltin)
PS-295	1g	Oxycarboxin
PS-641	50mg	Oxydemeton-methyl
PS-642	100mg	Oxydemeton-methyl sulfone
PS-1033	1g	Oxyfluorfen
PS-2200	250mg	Oxyject 100®
PS-2200	250mg	Oxytetracycline hydrochloride
PS-2200	250mg	Oxytetrin®
PS-860	250mg	Oxythioquinox

P

Catalog #	Size	Description
PS-406	1g	Paarlan®
PS-2097	500mg	Paclobutrazol
PS-2069	500mg	Padan®
PS-2064	1g	Paicer®
PS-901	1g	Palatinol M®
PS-2025	100mg	Papthion®
PS-6	1g	Parabis®
PS-3	1g	Paracide®
PS-3	1g	Paramoth
PS-610	100mg	Paraoxon
PS-95	500mg	Paraphos®
PS-366	1g	Paraquat CL tetrahydrate
PS-613	100mg	Parathion methyl O-analog
PS-610	100mg	Parathion O-analog
PS-95	500mg	Parathion®
PS-94	500mg	Paridol®
PS-2097	500mg	Parlay
PS-94	500mg	Parton®
PS-220	1g	Parzate Liquid®
PS-23	1g	Parzate zineb®
PS-23	1g	Parzate®
PS-374	1g	Patoran
PS-2206	250mg	Paturyl®
PS-1072	30mg	Pay-Off®
PS-387	1g	Payze®
PS-430	1g	PCA
PS-150	1g	PCNB®
PS-7	1g	PCP®
PS-3	1g	PDB®
PS-61	1g	PDU®
PS-2123	500mg	Peak®
PS-55	1g	PEBC
PS-55	1g	Pebulate
PS-2221	250mg	Pegasus®
PS-7	1g	Penchlorol
PS-2207	100mg	Penconazole
PS-1095	100mg	Pencycuron
PS-401	1g	Pendimethalin
PS-2095	500mg	Penncozeb®

Chem Service Pesticide Standards - Alphabetical Listing

Catalog #	Size	Description
PS-2095	500mg	Pennfluid®
PS-79	1g	Penphene®
PS-7	1g	Penta®
PS-862	1g	Pentac®
PS-74	1g	Pentachlorin®
PS-1109	1g	2,3,4,5,6-Pentachloroanisole
PS-1109	1g	Pentachloroanisole
PS-150	1g	Pentachloronitrobenzene
PS-7	1g	Pentachlorophenol
PS-1109	1g	Pentachlorophenyl methyl ether
PS-2281	POR	Pentanochlor
PS-2119	500mg	Pentyl[2-chloro-5-(cyclohex-1-ene-1,2-dicarboximido)-4-fluorophenoxy]acetate
PS-224	1g	Perchlormethylmerkaptan
PS-690	1g	Perchlorobenzene
PS-224	1g	Perchloromethyl mercaptan
PS-702	100mg	Perchloropentacyclodecane
PS-659	250mg	Perfekthion®
PS-2028	1g	Perm E-8®
PS-2108	100mg	Permit®
PS-758	250mg	Permethrin
PS-758-1	50mg	cis-Permethrin
PS-758-2	50mg	Trans-Permethrin (Isomeric Mix)
PS-2063	250mg	Peropal®
PS-73	1g	Perthane®
PS-2283	50mg	Pestan®
PS-154	1g	Pestmaster EDB-85®
PS-26	1g	Phaltan®
PS-79	1g	Phenacide®
PS-612	1g	Phenamiphos
PS-88	1g	Phencapton®
PS-79	1g	Phenetox®
PS-1014	250mg	Phenmedipham
PS-202	100mg	Phenmerzyl nitrate®
PS-733	1g	Phenothiazine
PS-1030	50mg	d-(cis/trans)-Phenothrin
PS-1030	50mg	d-Phenothrin®
PS-733	1g	Phenoxur
PS-36	1g	Phenoxyacetic acid
PS-758-2	50mg	Trans-meta-Phenoxybenzyl
PS-1030	50mg	3-Phenoxybenzyl d-cis.trans-chrysanthemate
PS-36	1g	Phenoxyethanoic acid
PS-2174	250mg	(2-(4-Phenoxyphenoxy) ethyl) carbamic acid ethyl ester
PS-758	250mg	[3-Phenoxyphenyl] methyl-[+]-cis,trans-3-[2.2-dichloroethenyl]-2.2-dimethylcyclopropane carboxylate
PS-758-1	50mg	(3-Phenoxyphenyl)methyl-cis-3-(2,2-dichloroethenyl)-2,2-dimethylcyclopropane carboxylate
PS-2110	100mg	4-Phenoxyphenyl (RS)-2-(2-pyridyloxy)propyl ether
PS-37	1g	2-Phenoxypropionic acid
PS-36	1g	o-Phenylglycolic acid
PS-420	1g	o-Phenylphenol
PS-2025	100mg	Phenthoate
PS-1021	1g	Phentinoacetate
PS-2032	1g	Phenyl benzene
PS-36	1g	Phenyl ether glycolic acid
PS-36	1g	Phenylium®
PS-14	1g	Phenyl mercuric acetate
PS-15	1g	Phenyl mercuric benzoate
PS-203	100mg	Phenyl mercuric borate
PS-214	1g	Phenyl mercuric chloride
PS-215	1g	Phenyl mercuric hydroxide
PS-216	1g	Phenyl mercuric lactate
PS-217	1g	Phenyl mercuric phthalate
PS-203	100mg	Phenyl mercury borate
PS-203	100mg	Phenylmercuriborate
PS-199	100mg	Phenylmercuric oleate
PS-202	100mg	Phenylmercury nitrate
PS-205	1g	Phenylmercury salicylate
PS-2114	1g	Phenylphthalanic acid
PS-2179	1g	2-Phenyl propane
PS-2266	500mg	3-Phenyl-2-propenal
PS-205	1g	Phenyl[salicyloyloxy] mercury
PS-2044	1g	1-Phenyl-3-(1,2,3-thiadiazol-5-yl)urea
PS-801	1g	Phenylthiocarbamide
PS-801	1g	Phenyl-2-thiourea
PS-2139	100mg	1-Phenyl-1,2,4-triazolyl-3-(O,O-diethylthiono phosphate)
PS-202	100mg	Phermernite®
PS-952	1g	Phillips R-874®
PS-14	1g	Phix®
PS-672	1g	Phophos®
PS-654	100mg	Phorate
PS-682	1g	Phosalone
PS-2181	50mg	Phosarbin
PS-87	250mg	Phosdrin®
PS-87-1	100mg	cis-Phosdrin®
PS-672	1g	Phosethoprop
PS-842	1g	Phosfolan
PS-67	50mg	Phosfon®
PS-653	1g	Phosmet
PS-610	100mg	Phosphacol
PS-606	250mg	Phosphamidon
PS-67	50mg	Phosphon
PS-1051	1g	N-(Phosphonomethyl) glycine
PS-86	500mg	Phosphothion®
PS-2192	100mg	Phostebupirim
PS-677	1g	Phosvel®
PS-2100	1g	Phoxim
PS-2114	1g	Phthalanillic acid
PS-901	1g	Phthalic acid dimethyl ester
PS-653	1g	Phthalophos
PS-1042	100mg	Phthalthrin
PS-12	1g	Phygon Paste®
PS-12	1g	Phygon XL®
PS-12	1g	Phygon®
PS-51	500mg	Phytar®
PS-2007	100mg	Phytosol®
PS-4	1g	Picfume®
PS-274	250mg	Picloram
PS-1108	100mg	Picloram methyl ester
PS-2174	250mg	Pictyl®
PS-412	1g	Pik-off®
PS-1082	100mg	Pilardax®
PS-2151	500mg	Pilot Super®
PS-905	250mg	Pindone
PS-2207	100mg	Pine gel
PS-2011	100mg	Pinnacle®
PS-409	1g	Piperalin
PS-2014	100mg	N,N'-[Piperazine-1,4-diylbis[(trichloromethyl) methylene]]diformamide
PS-960	1g	Piperonal bis[2-(2'-n-butoxyethoxy)ethyl] acetal
PS-100	100mg	Piperonyl butoxide
PS-409	1g	Pipron®
PS-960	1g	Piprotal
PS-757	1g	Pirimicarb
PS-643	250mg	Pirimiphos-ethyl
PS-644	250mg	Pirimiphos-methyl
PS-757	1g	Pirimor®
PS-2181	50mg	Pirofos
PS-905	250mg	Pival®
PS-905	250mg	2-Pivaloyl-1.3-indandione
PS-905	250mg	2-Pivalyl-1.3-indandione
PS-905	250mg	Pivalyl indandione®
PS-905	250mg	Pivalyl Valone®
PS-905	250mg	Pivalyn®
PS-2039	100mg	Pivot®
PS-1047	10mg	Pix®
PS-358	1g	Planavin®
PS-2157	500mg	Planete Aster®
PS-29	1g	Planofix
PS-295	1g	Plantvax®
PS-2197	250mg	Plateau®
PS-6	1g	Plath-Lyse®
PS-2245	100mg	Pledge®
PS-107	250mg	Plictran®
PS-2127	100mg	Plondrel®
PS-1208	5ml	Plondrel® (100ug/ml in Hexane)
PS-14	1g	PMA®
PS-14	1g	PMAC®
PS-14	1g	PMAS®
PS-911	250mg	PMP®
PS-2013	100mg	Poast®
PS-2164	1g	Polaris®
PS-2221	250mg	Polo®
PS-79	1g	Polychlorobicyclic terpenes
PS-1024	250mg	Polycron®
PS-225	1g	Polyram®
PS-2203	250mg	Polytrin®
PS-21	1g	Pomarsol Z®
PS-24	1g	Pomarsol®
PS-24	1g	Pomasol®
PS-2125	1g	Poseidon®
PS-1063	250mg	Posse®
PS-289	1g	Potassium cyanate
PS-2020	100mg	Potassium dimethyldithiocarbamate
PS-2019	100mg	Potassium-N-hydroxymethyl-N-methyldithiocarbamate
PS-2153	250mg	Powmyl®
PS-2109	10mg	Prallethrin
PS-386	250mg	Pramitol®
PS-379	1g	Prebane®
PS-2174	250mg	Precision®
PS-366	1g	Preeglone®
PS-425	250mg	Prefar®
PS-431	1g	Preforan®
PS-2175	250mg	Prelude®
PS-2210	250mg	Premalin®
PS-56	100mg	Premerge®
PS-2168	250mg	Premier® Herbicide
PS-1211	5ml	Premier® Herbicide (100ug/ml in Acetone)
PS-425	250mg	Pre-San®
PS-17	1g	Preservit®
PS-2111	500mg	Preside®
PS-6	1g	Preventol G-D®
PS-2167	250mg	Prevex®
PS-2167	250mg	Previcur-N®
PS-385	500mg	Primatol P®
PS-384	1g	Primatol Q®
PS-58	500mg	Primatol S®
PS-386	250mg	Primatol®
PS-2168	250mg	Prime®
PS-1211	5ml	Prime® (100ug/ml in Acetone)
PS-643	250mg	Primicid®
PS-2169	500mg	Primisulfuron
PS-2169	500mg	Primisulfuron-methyl
PS-2237	100mg	Primo®
PS-58	500mg	Princep®
PS-2045	100mg	Prism®
PS-2260	100mg	Pristine®
PS-2082	500mg	Probenazole
PS-2175	250mg	Prochloraz
PS-2121	1g	Procure®

Chem Service Pesticide Standards - Alphabetical Listing

Catalog#	Size	Description
PS-402	1g	Procyazine
PS-2126	250mg	Procymidone
PS-2133	500mg	Prodiamine
PS-1024	250mg	Profenofos
PS-399	1g	Profluoralin®
PS-49	100mg	Pro-Gibb
PS-1045	1g	Prograss®
PS-2226	100mg	Prohexadione-Calcium
PS-57	1g	Prokarbol®
PS-653	1g	Prolate
PS-104	1g	Prolin®
PS-2027	100mg	Promecarb
PS-386	250mg	Prometon
PS-384	1g	Prometryne
PS-349	1g	Pronamide®
PS-2276	100mg	Prop-2-ynyl (R)-2-[4-(5-chloro-3-fluoropyridin-2-yloxy)phenoxy]propionate
PS-355	1g	Propachlor
PS-324	250mg	Propal®
PS-2167-1	250mg	Propamocarb
PS-2167	250mg	Propamocarb HCl
PS-2167	250mg	Propamocarb Hydrochloride
PS-356	500mg	Propanil
PS-858	1g	Propargite®
PS-385	500mg	Propazine
PS-1076	100mg	Propetamphos
PS-53	1g	Propham
PS-672	1g	Prophos
PS-1075	250mg	Propiconazole
PS-2062	250mg	Propineb
PS-324	250mg	Proponex-Plus®
PS-551	1g	Propoxur
PS-2285	POR	Propoxycarbazone-sodium
PS-2167-1	250mg	Propyl (3-(dimethylamino) propyl)carbamate
PS-2175	250mg	1-(N-Propyl-N-(2-(2,4,6-trichlorophenoxy)ethyl) carbamoyl)imidazole
PS-2051	100mg	2-Propynyl-(E,E)-3,7,11-trimethyl-2,4-dodecadienoate
PS-349	1g	Propyzamide
PS-2123	500mg	Prosulfuron
PS-1048	500mg	Protect®
PS-99	250mg	Protex®
PS-1094	100mg	Prothiophos
PS-401	1g	Prowl®
PS-2223	100mg	Puma®
PS-2041	100mg	Punch®
PS-24	1g	Puralin®
PS-2178	250mg	Purivel®
PS-2039	100mg	Pursuit®
PS-1032	250mg	Pydrin®
PS-1032	500mg	Pydrin®
PS-2189	250mg	Pymetrozine
PS-2046	50mg	Pyraclofos
PS-2235	100mg	Pyraclostrobin
PS-430	1g	Pyramine
PS-2125	1g	Pyramite®
PS-430	1g	Pyrazon
PS-2049	100mg	Pyrazophos
PS-2105	100mg	Pyrazosulfuron ethyl
PS-2064	1g	Pyrazoxyfen
PS-96	5ml	Pyresyn® (0.1mg/ml in Methylene chloride)
PS-97	100mg	Pyrethrum
PS-2125	1g	Pyridaben
PS-2155	250mg	Pyridaphenthion
PS-2081	500mg	Pyridate
PS-1059	100mg	1-(3-Pyridylmethyl)-3-(4-nitrophenyl)urea
PS-2251	100mg	Pyrimethanil
PS-1059	100mg	Pyriminil
PS-674	1g	Pyrinex®
PS-2110	100mg	Pyriproxyfen
PS-2145	500mg	Pyrithiobac-Sodium
PS-2181	50mg	Pyrophos

Q

Catalog #	Size	Description
PS-2141	250mg	Quadris®
PS-1008	1g	Quel®
PS-655	500mg	Queleton®
PS-655	500mg	Queletox®
PS-389	1g	Quilan®
PS-2010	250mg	Quinalphos
PS-2010	250mg	Quinatox®
PS-2098	500mg	Quinclorac
PS-2091	500mg	Quinolate®
PS-18	1g	8-Quinolinol
PS-860	250mg	Quinomethionate
PS-18	1g	Quinophenol
PS-2284	100mg	Quinoxyfen
PS-150	1g	Quintozene
PS-1080	100mg	Quizalofop ethyl
PS-2151	500mg	Quizalofop-P-ethyl

R

Catalog #	Size	Description
PS-611	1g	Rabon®
PS-2093	250mg	Racumin®
PS-1102	100mg	Racuza®
PS-32	1g	Radapon®
PS-51	500mg	Rad-E-Cate 35®
PS-2119	500mg	Radiant®
PS-2225	250mg	Ragadan®
PS-355	1g	Ramrod®
PS-351	1g	Randox®
PS-2162	500mg	Raptor®
PS-2143	100mg	Ratak®
PS-2185	250mg	Rattler®
PS-2185	1g	Rattler®
PS-106	1g	Rattrack®
PS-2085	500mg	Raviac®
PS-1091	100mg	Raxil®
PS-1008	1g	Reducymol®
PS-2102	500mg	Reflex®
PS-2207	100mg	Regal gel
PS-561	1g	Regim-8®
PS-365	1g	Reglone®
PS-65	1g	Regulox
PS-418	250mg	Reldan®
PS-2124	250mg	Rely®
PS-2083	250mg	Renegade®
PS-656	100mg	Resitox®
PS-1000	250mg	Resmethrin
PS-2080	500mg	d-trans-Resmethrin
PS-2119	500mg	Resource®
PS-611	1g	Revap®
PS-24	1g	Rezifilm®
PS-33	1g	Rid®
PS-1099	100mg	Ridomil®
PS-2169	500mg	Rifle®
PS-2253	100mg	Rimon®
PS-2118	100mg	Rimsulfuron
PS-14	1g	Riogen®
PS-2203	250mg	Ripcord®
PS-2156	500mg	Risolex®
PS-2175	250mg	Rival®
PS-2180	1g	Rodanin S-62®
PS-2029	1g	Rodex®
PS-659	250mg	Rogor®
PS-356	500mg	Rogue®
PS-502	1g	Ro-Neet
PS-1049	1g	Ronilan®
PS-657	100mg	Ronnel®
PS-1050	1g	Ronstar®
PS-28	1g	Rootone®
PS-857	1g	Rospin®
PS-99	250mg	Rotenone
PS-72	1g	Rothane®
PS-2185	250mg	Roundup®
PS-2185	1g	Roundup®
PS-1052	1g	Rovral®
PS-659	250mg	Roxion®
PS-65	1g	Royal MH-30
PS-2085	500mg	Rozol®
PS-1014	250mg	Rubenal®
PS-1045	1g	Rubetram®
PS-1073	100mg	Rubigan®
PS-682	1g	Rubitox
PS-607	50mg	Ruelene®
PS-2199	100mg	Rugby®

S

Catalog #	Size	Description
PS-2040	100mg	Sacemid®
PS-391	1g	SADH®
PS-1076	100mg	Safrotin®
PS-2115	100mg	Saga®
PS-411	100mg	Sancap®
PS-2137	100mg	Sandofan®
PS-2219	100mg	Saniprid®
PS-1032	250mg	Sanmarton
PS-1032	500mg	Sanmarton
PS-2125	1g	Sanmite®
PS-7	1g	Santophen 20®
PS-432	250mg	Santoquin®
PS-1087	100mg	Sapecron®
PS-2172	100mg	Saphire®
PS-2014	100mg	Saprol®
PS-90	1g	Sarolex®
PS-1017	1g	Saturn®
PS-1017	1g	Saturno®
PS-1079	100mg	Savey miticide®
PS-1000	250mg	SBP 1382
PS-2053	100mg	Scepter®
PS-840	1g	Schering 36268
PS-2173	100mg	Scoop®
PS-2111	500mg	Scorpion®
PS-2115	100mg	Scout®
PS-14	1g	Scutl®
PS-2289	100mg	9,10-Secocholesta-5,7,10(19)-trien-3-beta-ol
PS-1024	250mg	Selecron®
PS-2045	100mg	Select®
PS-2012	250mg	Semevin®
PS-2108	100mg	Sempra®
PS-398	1g	Sencor®
PS-551	1g	Sendran®
PS-2130	50mg	Sentinel®
PS-2216	100mg	Sequel®
PS-419	1g	N-Serve®
PS-313	1g	SES
PS-313	1g	Sesone®
PS-2013	100mg	Sethoxydim
PS-84	1g	Sevin®
PS-2184	250mg	Sha chong shuang
PS-2170	100mg	Shark®
PS-2209	250mg	Sherman®
PS-2203	250mg	Sherpa®
PS-2273	30mg	Shinoma®
PS-2249	100mg	Shogun®
PS-65	1g	Shucker-Stuff
PS-1093	100mg	Sibutol®
PS-373	1g	Siduron
PS-230	1g	Sigma
PS-2223	100mg	Silverado®
PS-47	250mg	Silvex
PS-329	1g	Silvex 2-ethylhexyl ester
PS-329	1g	Silvex isooctyl ester
PS-342	250mg	Silvex methyl ester
PS-51	500mg	Silvisar®

Chem Service Pesticide Standards - Alphabetical Listing

Catalog #	Size	Description
PS-58	500mg	Simazine
PS-381	50mg	Simetryn
PS-375	1g	Sinbar®
PS-57	1g	Sinox®
PS-2105	100mg	Sirius®
PS-65	1g	Slo-Gro
PS-221	500mg	SMDC
PS-1202	5ml	Snip® (100ug/ml in Methylene chloride)
PS-95	500mg	SNP®
PS-281	500mg	Sodar®
PS-428	1g	Sodium arsenate
PS-2246	100mg	Sodium 2,6-bis(4,6-dimethoxypyrimidin-2-yloxy)benzoate
PS-2145	500mg	Sodium 2-Chloro-6-(4,6-dimethoxypyrimidin-2-ylthio)benzoate
PS-2236	250mg	Sodium Dalapon
PS-313	1g	Sodium 2.4-dichlorophenoxyethyl sulfate
PS-105	1g	Sodium fluoroacetate
PS-221	500mg	Sodium methyl dithiocarbamate
PS-255	1g	Soil Fungicide 1823®
PS-154	1g	Soilbrom-85®
PS-2094	POR	Solacol®
PS-2281	POR	Solan®
PS-1090	250mg	Solfac®
PS-1044	100mg	Solicam®
PS-610	100mg	Soluglaucit
PS-408	1g	Sonalan®
PS-1070	100mg	Sonar®
PS-8	100mg	Sontox 6®
PS-7	1g	Sontox®
PS-2182	250mg	Sovran®
PS-1213	5ml	Spark®
PS-90	1g	Spectacide®
PS-11	1g	Spergon®
PS-407	1g	Spike®
PS-1014	250mg	Spin-Aid®
PS-2211	100mg	Spinosad
PS-2211	100mg	Spinosyn A, 131929-60-7:Spinisyn D, 131929-63-0
PS-2211	100mg	SpinTor Naturalyte®
PS-2293	POR	Spiroxamine
PS-2135	500mg	Splendor®
PS-2175	250mg	Sporgon®
PS-2175	250mg	Sportak®
PS-2152	100mg	Spotless®
PS-24	1g	Spotrete®
PS-2175	250mg	Sprint®
PS-1071	100mg	Spur®
PS-908	1g	Stabilene®
PS-2173	100mg	Stakeout®
PS-356	500mg	Stam®
PS-1055	10mg	Standak®
PS-170	1g	Stanophen No. 1®
PS-2145	500mg	Staple®
PS-2191	100mg	Starane 250®
PS-2046	50mg	Starlex®
PS-2176	100mg	Starycide®
MET-222B	500mg	STB
PS-1087	100mg	Steladone®
PS-611	1g	Stirifos
PS-401	1g	Stomp®
PS-432	250mg	Stop-Scald
PS-2149	10mg	Storm®
PS-2149	10mg	Stratagem®
PS-2263	250mg	Streptomycin A sulfate
PS-2263	250mg	Streptomycin sesquisulfate
PS-2263	250mg	Streptomycin sulfate
PS-2263	250mg	Streptomycin sulfate (2:3) salt
PS-71	1g	Streunex®
PS-2023	100mg	Strobane®
PS-2182	250mg	Stroby®
PS-2208	250mg	Strongarm®
PS-1099	100mg	Subdue®
PS-2211	100mg	Success Naturalyte®
PS-391	1g	Succinic acid 2.2-dimethylhydrazide
PS-280	1g	Succinic acid cadmium salt
PS-903	1g	Succinic acid dibutyl ester
PS-2278	250mg	Sudine®
PS-2079	100mg	Suffix®
PS-2178	250mg	Sulerex®
PS-2278	250mg	Sulfadimethoxine
PS-19	250mg	Sulfallate
PS-2056	10mg	2-Sulfanilamido quinoxaline
PS-66	1g	Sulfasan®
PS-2132	250mg	Sulfentrazone
PS-1074	100mg	Sulfometuron methyl
PS-2056	10mg	Sulfoquinoxaline
PS-2224	500mg	Sulfosulfuron
PS-2024	50mg	Sulfotep
PS-976	100mg	Sulfox-Ade
PS-976	100mg	Sulfox-cide
PS-976	100mg	Sulfoxide
PS-976	100mg	Sulfoxone sodium
PS-976	100mg	Sulfoxyl®
PS-1018	100mg	Sulprofos
PS-2278	250mg	Sulxin®
PS-2076	10mg	Sumagic®
PS-2152	100mg	Sumi-8®
PS-1032	250mg	Sumicidin®
PS-1032	500mg	Sumicidin®
PS-1032	250mg	Sumifly
PS-1032	500mg	Sumifly
PS-2126	250mg	Sumilex®
PS-1032	250mg	Sumipower
PS-1032	500mg	Sumipower
PS-2126	250mg	Sumisclex®
PS-2245	100mg	Sumisoya®
PS-678	500mg	Sumithion®
PS-1030	50mg	Sumithrin®
PS-2119	500mg	Sumiverde®
PS-551	1g	Suncide®
PS-2224	500mg	Sundance®
PS-2069	500mg	Suntap®
PS-2069	500mg	Sunvex®
PS-264	1g	Super X
PS-1038	100mg	Super-Caid
PS-2203	250mg	Supercypermethrin®
PS-1038	100mg	Super-Rozol
PS-1087	100mg	Supona®
PS-679	1g	Supracide®
PS-356	500mg	Surcopur®
PS-410	1g	Surflan®
PS-2040	100mg	Surpass®
PS-503	1g	Sutan
PS-1031	500mg	Suzu H®
PS-1021	1g	Suzu®
PS-665	100mg	Swebate®
PS-1098	50mg	Swep
PS-1000	250mg	Synthrin®
PS-2006	100mg	Systhane®
PS-661/662	100mg	Systox

T

Catalog #	Size	Description
PS-45	250mg	2.4.5-T®
PS-296	1g	2.4.5-T-amine
PS-330	1g	2.3.6-TBA®
PS-309	1g	2.4.5-T butoxyethyl ester
PS-303	1g	2.4.5-T n-butyl ester
PS-47	250mg	2.4.5-TCPPA
PS-297-1	250mg	2.4.5-T 2-ethylhexyl ester
PS-297	100mg	2.4.5-T isooctyl ester
PS-46	100mg	2.4.5-T isopropyl ester
PS-339	250mg	2.4.5-T methyl ester
PS-47	250mg	2.4.5-TP®
PS-1004	500mg	Tabamex®
PS-903	1g	Tabatrex®
PS-2186	25mg	Tachigaren®
PS-2142	250mg	Tairel®
PS-1056	50mg	Talon®
PS-2003	100mg	Talstar®
PS-676	100mg	Tamaron®
PS-1004	500mg	Tamex®
PS-1014	250mg	Tanex®
PS-2199	100mg	Taredan®
PS-2151	500mg	Targa Super®
PS-2151	500mg	Tarzazan®
PS-282	1g	TBTO®
PS-334	1g	2,4,5-T butoxypolypropylene glycol ester
PS-1057	1g	TBZ®
PS-34	1g	TCA
PS-2021	100mg	TCMTB
PS-151	1g	TCNB®
PS-72	1g	TDE
PS-1091	100mg	Tebuconazole®
PS-2188	100mg	Tebufenozide
PS-2192	100mg	Tebupirimfos
PS-2192	100mg	Tebupirimphos
PS-2255	250mg	Tebutam
PS-407	1g	Tebuthiuron
PS-151	1g	Tecnazene
PS-1057	1g	Tecto®
PS-80	1g	Tedion V-18®
PS-2247	250mg	Teflubenzuron
PS-2247	250mg	Tefludate®
PS-2238	1ml	Tefluthrin
PS-704	10mg	Telodrin®
PS-152	1g	Telone®
PS-59	1g	Telvar®
PS-665	100mg	Temephos
PS-734	1g	Temik®
PS-551	1g	Tendex®
PS-6	1g	Teniathane®
PS-6	1g	Teniatol®
PS-376	1g	Tenoran®
PS-601	500mg	TEPP
PS-375	1g	Terbacil
PS-550	100mg	Terbucarb
PS-680	500mg	Terbufos
PS-2120	1g	Terbumeton
PS-413	50mg	Terbuthylazine
PS-550	100mg	Terbutol
PS-379	1g	Terbutryne
PS-2023	100mg	Terpene polychlorinates
PS-731	1g	Terpinyl thiocyanoacetate
PS-150	1g	Terraclor®
PS-667	100mg	Terracur P®
PS-2200	250mg	Terramycin hydrochloride®
PS-264	1g	Terrazole®
PS-255	1g	Tersan SP®
PS-24	1g	Tersan®
PS-2228	250mg	2,3,5,6-Tetrachloroaniline
PS-80	1g	2.4.4'.5-Tetrachlorodiphenyl sulfone
PS-260	1g	N-(1.1.2.2.-Tetrachloroethyl thio)-4-cyclohexene-1.2-dicarboximide thiadiazol-2-yl)oxyl)acetamide
PS-151	1g	2,3,5,6-Tetrachloro nitrobenzene
PS-1020	1g	Tetrachloroisophthalonitrile
PS-11	1g	Tetrachloro-p-benzoquinone

Chem Service Pesticide Standards - Alphabetical Listing

Catalog#	Size	Description
PS-151	1g	1,2,4,5-Tetrachloro-3-nitrobenzene
PS-8	100mg	2.3.4.6-Tetrachlorophenol
PS-611	1g	Tetrachlorvinphos
PS-80	1g	Tetradifon
PS-2024	50mg	O,O,O',O'-Tetraethyl dithiopyrophosphate
PS-2181	50mg	Tetraethyl ester thiodiphosphoric acid
PS-2181	50mg	Tetraethyl monothiopyrophosphate
PS-601	500mg	Tetraethylpyrophosphate
PS-665	100mg	Tetrafenphos
PS-2238	1ml	2,3,5,6-Tetrafluoro-4-methylbenzyl(Z)-(1RS,3RS)-3-(2-chloro-3,3,3-trifluoroprop-1-enyl)-2,2-dimethylcyclo propanecarboxylate
PS-2288	POR	1-(Tetrahydrodi cyclopentadienyl) -3,3-dimethylurea
PS-17	1g	Tetrahydro-3.5-dimethyl-2H-1.3.5-thiadiazine-2-thione
PS-1001	100mg	Tetrahydro-5.5-dimethyl-2(1H)-pyrimidinone [3-[4-(trifluoromethyl)phenyl]-1-[2-[4-(trifluoromethyl) phenyl] ethenyl]-2-propenylidene]hydrazone
PS-65	1g	1.2.3.6-Tetrahydro-3.6-dioxopyridazine
PS-99	250mg	1.2.12.12a-Tetrahydro-2-isopropenyl-8.9-dimethoxy-[1]benzopyrano-[3.4-b]furo[2.3-h][1]benzopyran-6[6aH]-one
PS-2033	500mg	3a,4,7,7a-Tetrahydro-4,7-methane-1H-indene
PS-1042	100mg	3,4,5,6-Tetrahydro phthalimidomethyl chrysanthemate
PS-1042	100mg	Tetramethrin
PS-2012	250mg	3,7,9,13-Tetramethyl-5,11-dioxa-2,8,14-trithia-4,7,9,12-tetraazapentadeca-3,12-diene-6,10-dione
PS-665	100mg	O,O,O',O'-Tetramethyl-O.O'-thio-di-p-phenylene phosphorothioate
PS-24	1g	Tetramethylthiuram disulfide
PS-2200	250mg	Tetranhydrochloride®
PS-663	50mg	Tetra-n-propyl dithionopyrophosphate
PS-663	50mg	O.O.O'.O'-Tetrapropyl dithiopyrophosphate
PS-601	500mg	Tetron
PS-804	1g	Thallium sulfate
PS-804	1g	Thallous sulfate
PS-731	1g	Thanite®
PS-1057	1g	Thiabendazole®
PS-2262	100mg	Thiacloprid
PS-2215	100mg	Thiamethoxam
PS-2163	500mg	Thiazophyr
PS-2163	500mg	Thiazopyr
PS-1057	1g	2-(4'-Thiazolyl)-benzimidazole
PS-1057	1g	Thibenzole®
PS-2044	1g	Thidiazuron
PS-2011	100mg	Thifensulfuron-methyl
PS-81	500mg	Thifor®
PS-654	100mg	Thimet®
PS-81	500mg	Thimul®
PS-1017	1g	Thiobencarb
PS-2021	100mg	2-(Thiocyanomethylthio) benzothiazole

Catalog #	Size	Description
PS-81	500mg	Thiodan®
PS-652	1g	Thiodemeton®
PS-2012	250mg	Thiodicarb
PS-733	1g	Thiodiphenylamine
PS-2233	50mg	Thiometon
PS-668	100mg	Thionazin
PS-26	1g	Thiophal®
PS-223	1g	Thiophanate
PS-230	1g	Thiophanate-methyl
PS-95	500mg	Thiophos®
PS-24	1g	Thiosan®
PS-2184	250mg	Thiosulfuric acid S,S'-[2-(dimethylamino)-1,3-propanediyl]ester
PS-2184	250mg	Thiosultap-sodium
PS-2024	50mg	Thiotepp®
PS-2233	50mg	Thiotox®
PS-24	1g	Thiram
PS-307	100mg	Thistrol®
PS-24	1g	Thiurad®
PS-24	1g	Thylate®
PS-561	1g	TIBA®
PS-655	500mg	Tiguvon®
PS-55	1g	Tillam®
PS-1075	250mg	Tilt®
PS-2118	100mg	Titus®
PS-24	1g	Tiuramyl®
PS-24	1g	TMTD®
PS-1004	500mg	Tobago®
PS-1057	1g	Tobaz®
PS-282	1g	T-O-Biostat®
PS-394	100mg	TOK®
PS-1094	100mg	Tokuthion®
PS-399	1g	Tolban®
PS-2156	500mg	Tolclofos-Methyl
PS-2000	1g	Tolkan®
PS-2060	500mg	Tolylfluanid
PS-50	1g	N-m-Tolylphthalamic acid
PS-2207	100mg	Topaz®
PS-223	1g	Topsin E
PS-230	1g	Topsin M®
PS-274	250mg	Tordon®
PS-2117	500mg	Tornado®
PS-2078	250mg	Toro®
PS-1060	1g	Torque®
PS-2174	250mg	Torus®
PS-2081	500mg	Tough®
PS-79	1g	Toxakil®
PS-79	1g	Toxaphene®
PS-75	1g	Toxichlor®
PS-342	250mg	2,4,5-TP methyl ester
PS-1021	1g	TPTA
PS-1031	500mg	TPTH
PS-1031	500mg	TPTOH
PS-2211	100mg	Tracer Naturalyte®
PS-2115	100mg	Tracker®
PS-2115	100mg	Tralate®
PS-2135	500mg	Tralkoxydim
PS-2115	100mg	Tralomethrin
PS-2115	100mg	Tralox®
PS-1045	1g	Tramat®
PS-2237	100mg	Trebon®
PS-393	1g	Treflan®
PS-1213	5ml	Trelka®
PS-71	1g	Tri-6
PS-1013	500mg	Triadimefon
PS-1064	250mg	Triadimenol
PS-506	1g	Tri-allate
PS-2042	100mg	Triasulfuron
PS-388	250mg	Triazine®
PS-1213	5ml	Triazophos
PS-2139	100mg	Triazophos
PS-905	250mg	Tri-Ban®
PS-2099	250mg	Tribenuron-methyl
PS-562	1g	Tribufos

Catalog #	Size	Description
PS-2048	100mg	Tribunil®
PS-67	50mg	Tributyl[2.4-dichlorobenzyl]phosphonium chloride
PS-562	1g	S.S.S-Tributyl phosphorotrithioate
PS-68	250mg	Tributylphosphorotrithioite
PS-68	1g	Tributylphosphorotrithioite
PS-608	1g	Trichlorfon
PS-34	1g	Trichloroacetic acid
PS-506	1g	S-(2.3.3-Trichloroallyl) diisopropyl thiocarbamate
PS-506	1g	2.3.3-Trichloroallyl-N.N-diisopropylthiolcarbamate
PS-330	1g	2.3.6-Trichlorobenzoic acid
PS-698	50mg	1.1.1-Trichloro-2-(o-chlorophenyl)-2-(p-chlorophenyl)ethane
PS-699	1g	1.1.1-Trichloro-2.2-bis(p-chlorophenyl)ethane
PS-74	1g	1.1.1-Trichloro-2.2-di(4-chlorophenyl)ethane
PS-2112	250mg	(R)-1,2-O-(2,2,2-Trichloroethylidene)-a-D-glucofuranose
PS-608	1g	(2,2,2-Trichloro-1-hydroxyethyl)phosphonic acid dimethyl ester
PS-83	1g	1.1.1-Trichloro-2.2-bis(p-methoxyphenyl)ethane
PS-224	1g	Trichloromethane sulfenyl chloride
PS-224	1g	Trichloromethanesulphenyl chloride
PS-224	1g	Trichloromethylsulfenyl chloride
PS-224	1g	Trichloromethylsulphenyl chloride
PS-25	1g	N-(Trichloromethylthio)-4-cyclohexene -1.2-dicarboximide
PS-26	1g	N-(Trichlormethylthio) phthalimide
PS-2007	100mg	Trichloronate
PS-4	1g	Trichloronitromethane
PS-45	250mg	(2.4.5-Trichlorophenoxy) acetic acid
PS-309	1g	(2,4,5-Trichlorophenoxy) acetic acid butoxyethyl ester
PS-334	1g	(2,4,5-Trichlorophenoxy) acetic acid butoxy polypropylene glycol ester
PS-303	1g	(2,4,5-Trichlorophenoxy) acetic acid n-butyl ester
PS-46	100mg	(2,4,5-Trichlorophenoxy) acetic acid isopropyl ester
PS-329	1g	(2,4,5-Trichlorophenoxy) propionic acid 2-ethylhexyl ester
PS-329	1g	(2.4.5-Trichlorophenoxy) propionic acid isooctyl ester
PS-297	100mg	(2.4.5-Trichlorophenoxy) acetic acid isooctyl ester (3, 4 or 5-methylheptyl groups)
PS-339	250mg	(2.4.5-Trichlorophenoxy) acetic acid methyl ester
PS-296	1g	(2.4.5-Trichlorophenoxy) acetic acid triethyl amine salt
PS-9	1g	2.4.5-Trichlorophenol
PS-437	250mg	2.4.5-Trichlorophenol ethanolamine salt
PS-437	1g	2.4.5-Trichlorophenol ethanolamine salt

Chem Service Pesticide Standards - Alphabetical Listing

Catalog #	Size	Description
PS-10	1g	2.4.6-Trichlorophenol
PS-47	250mg	2-(2.4.5-Trichlorophenoxy) propionic acid
PS-342	250mg	2-(2,4,5-Trichlorophenoxy) propionic acid methyl ester
PS-308	1g	2.3.6-Trichlorophenylacetic acid
PS-1110	100mg	[(3,5,6-Trichloro-2-pyridinyl)oxy]acetic acid methyl ester
PS-417	1g	[(3.5.6-Trichloro-2-pyridinyl)oxy]acetic acid
PS-674	1g	Trichlorpyrphos
PS-417	1g	Triclopyr
PS-1110	100mg	Triclopyr methyl ester
PS-1083	100mg	Tricyclazole
PS-2063	250mg	1-(Tricyclohexylstannyl)-1H-1,2,4-triazole
PS-107	250mg	Tricyclohexyltin hydroxide
PS-2242	100mg	Tridemorph
PS-2095	500mg	Tridex® Fungicide
PS-66	1g	Tridex® Herbicide
PS-2107	100mg	Trietazine
PS-2196	100mg	Trifloxystrobin
PS-2121	1g	Triflumizole
PS-2176	100mg	Triflumuron
PS-393	1g	a.a.a-Trifluoro-2.6-dinitro-N.N-dipropyl-p-toluidine
PS-2057	1g	a,a,a-Trifluoro-3'-isopropoxy-o-toluanilide
PS-2290	POR	4-Trifluoromethyl nicotinamide
PS-2290	POR	N-(4-Trifluoromethyl nicotinoyl) -glycine
PS-1205	5ml	(RS)-2-[4-(5-Trifluoromethyl-2-pyridyloxy)phenoxy] propionic acid (100ug/ml in Acetonitrile)
PS-1097	100mg	R-2-[4-(5-Trifluoromethyl-2-pyridyloxy)phenoxy] propionic acid, butyl ester
PS-393	1g	Trifluralin
PS-2176	100mg	Trifluron
PS-2147	500mg	Triflusilfuron-methyl
PS-2121	1g	Trifmine®
PS-57	1g	Trifocide®
PS-2014	100mg	Triforine
PS-57	1g	Trifrina®
PS-2073	500mg	Trigard®
PS-561	1g	2.3.5-Triiodobenzoic acid
PS-2095	500mg	Trimanoc®
PS-221	500mg	Trimaton®
PS-2050	100mg	Trim-Cut®
PS-541	50mg	2,3,5-Trimethacarb
PS-542	50mg	3,4,5-Trimethacarb
PS-905	250mg	2-Trimethylacetyl-1.3-indandione
PS-541	50mg	2.3.5-Trimethylphenyl methyl carbamate
PS-542	50mg	3,4,5-Trimethylphenyl methyl carbamate
PS-2158	250mg	Trinexapac-ethyl
PS-309	1g	Trinoxol
PS-1021	1g	Triphenyltin acetate
PS-1031	500mg	Triphenyltin hydroxide
PS-88	1g	Trithion®
PS-150	1g	Tritisan®
PS-657	100mg	Trolene
PS-2040	100mg	Trophy®
PS-960	1g	Tropital®
PS-307	100mg	Tropotox®
PS-2187	100mg	Trucidor®
PS-1213	5ml	Try®
PS-330	1g	Trysben®
PS-24	1g	Tuads®
PS-1031	500mg	Tubotin®
PS-608	1g	Tugon®
PS-24	1g	Tulisan®
PS-373	1g	Tupersan®
PS-2223	100mg	Twister®
PS-1092	100mg	Tycor®

U

PS-951	1g	2-Undecanone
PS-551	1g	Unden®
PS-2076	10mg	Uniconazole-P
PS-858	1g	Uniroyal DO 14
PS-2147	500mg	Upbeet®
PS-364	1g	Urab®
PS-371	1g	Urox®
PS-2061	100mg	Ustilan®

V

PS-1059	100mg	Vacor
PS-2266	500mg	Valeo®
PS-2094	POR	Validacin®
PS-2094	POR	Validamycin
PS-2094	POR	Valimun®
PS-911	250mg	Valone®
PS-2187	100mg	Vamidoate®
PS-2187	100mg	Vamidothion
PS-962	250mg	Van Dyke 264®
PS-21	1g	Vancide® MZ-96
PS-24	1g	Vancide® TM Fungicide
PS-2144	500mg	Vangard®
PS-227	1g	Vanicide-20S®
PS-2013	100mg	Vantage®
PS-904	1g	Vanzoate®
PS-221	500mg	Vapam®
PS-89	1g	Vapona®
PS-601	500mg	Vapotone®
PS-2174	250mg	Varikill®
PS-2177	100mg	Vaspact®
PS-19	250mg	Vegadex®
PS-2030	1g	Vegfru Snailkil®
PS-314	250mg	Vegiben®
PS-416	1g	Velpar
PS-75	1g	Velsicol 1068®
PS-2233	50mg	Veltin®
PS-1060	1g	Vendex®
PS-415	1g	Venzar®
PS-904	1g	Venzonate®
PS-733	1g	Vermitin
PS-504	250mg	Vernam®
PS-504	250mg	Vernolate
PS-41	1g	Verton®
PS-2239	1ml	Vigil®
PS-1049	1g	Vinclozolin
PS-2184	250mg	Vinetox®
PS-657	100mg	Viozene®
PS-2163	500mg	Visor®
PS-2191	100mg	Vista®
PS-2289	100mg	Vitamin D3
PS-294	1g	Vitavax®
PS-2226	100mg	Viviful®
PS-2100	1g	Volaton®
PS-2046	50mg	Voltage®
PS-2143	100mg	Vorex®
PS-2059	100mg	Voronit®
PS-221	500mg	VPM®
PS-2245	100mg	Vulcan®
PS-11	1g	Vulklor®

W

PS-671	1g	Warbex®
PS-104	1g	Warf Compound 42®
PS-104	1g	Warf®
PS-104	1g	Warfarin
PS-553	1g	Waylay®
PS-1056	50mg	WeatherBlok®
PS-41	1g	Weedar®
PS-382	1g	Weedazol®
PS-337	1g	Weedicide Amine®
PS-366	1g	Weedol®
PS-45	250mg	Weedone
PS-1088	100mg	Whip®

Y

PS-2029	1g	Yanock®
PS-1207	250mg	Yomesan® (100ug/ml in Methanol)

Z

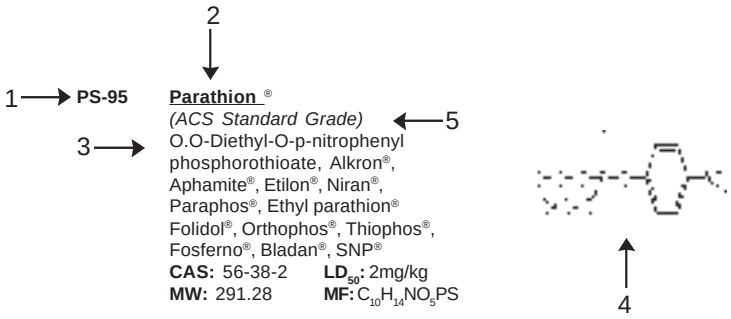
PS-2092	500mg	Zardex®
PS-756	500mg	Zectran®
PS-2068	100mg	Zephyr®
PS-21	1g	Zerlate®
PS-2244	250mg	zeta-Cypermethrin
PS-21	1g	Zimate®
PS-2220	100mg	Zimecterin®
PS-2095	500mg	Zinc and Manganese ethylene bisdithiocarbamate coordination product
PS-21	1g	Zinc dimethyl dithiocarbamate
PS-23	1g	Zinc ethylene bis (dithiocarbamate)
PS-803	1g	Zinc phosphate
PS-23	1g	Zineb®
PS-668	100mg	Zinophos®
PS-21	1g	Ziram
PS-21	1g	Zirbek®
PS-682	1g	Zolone®
PS-104	1g	Zoocoumarin
PS-1044	100mg	Zorial®



Numerical Listing
Pesticide Standards

This section contains the numerical listing of all Chem Service Pesticide standards along with their chemical structure.

This listing also contains, where available, MW, MF, LD_{50} and CAS numbers.



1 **Catalog number for the pesticide standard**

2 **Description for the pesticide standard**

3 Other descriptions for the pesticide standard, with synonyms and trade names

4 Structure for the pesticide standard

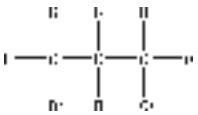
5 *This product meets or exceeds the requirements set forth by the American Chemical Society for Standard Grade products.*

ORDERS
Phone: 1-610-692-3026 or 1-800-452-9994
Fax: 1-610-692-8729

TECHNICAL INQUIRIES & CUSTOMER SERVICE
Phone: 1-610-692-3026 or 1-800-452-9994
Fax: 1-610-692-8729

Chem Service Pesticide Standards - Numerical Listing

PS-1 **1.2-Dibromo-3-chloropropane**
DBCP®, Fumazone®, Nemafume®, Nemagon®
CAS: 96-12-8 **LD_{50}:** 170mg/kg
MW: 236.35 **MF:** $C_3H_5Br_2Cl$



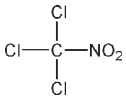
PS-2 **o-Dichlorobenzene**
1,2-Dichlorobenzene
CAS: 95-50-1 **LD_{50}:** 500mg/kg
MW: 147.00 **MF:** $C_6H_4Cl_2$



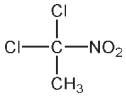
PS-3 **p-Dichlorobenzene**
Di-chloricide®, Paramoth, PDB®, Paracide®, 1,4-Dichlorobenzene
CAS: 106-46-7 **LD_{50}:** 250mg/kg
MW: 147.00 **MF:** $C_6H_4Cl_2$



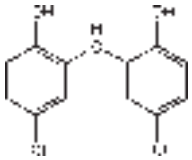
PS-4 **Trichloronitromethane**
Chloropicrin, Nitrochloroform®, Picfume®, Chlor-O-Pic®,Acquinite®, Nemax®, Larvacide®
CAS: 76-06-2 **LD_{50}:** 250mg/kg
MW: 164.37 **MF:** CCl_3NO_2



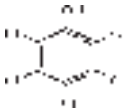
PS-5 **1.1-Dichloro-1-nitroethane**
Ethide®
CAS: 594-72-9 **LD_{50}:** 410mg/kg
MW: 143.96 **MF:** $C_2H_3Cl_2NO_2$



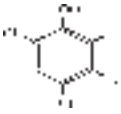
PS-6 **Dichlorophen**
2.2'-Methylene bis(4-chlorophenol), Anthiphen®, Dicestal®, Didroxane®, Hyosan®, Parabis®, Plath-Lyse®, Preventol G-D®, Di-phenthane-70®, Teniathane®, Teniatol®
CAS: 97-23-4 **LD_{50}:** 2,690mg/kg
MW: 269.13 **MF:** $C_{13}H_{10}Cl_2O_2$



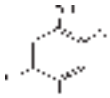
PS-7 **Pentachlorophenol**
Penta®, Santophen 20®, PCP®, Penchlorol, Dowicide 7®, Chlorophen®, Sontox®
CAS: 87-86-5 **LD_{50}:** 27mg/kg
MW: 266.32 **MF:** $C_6HC_{15}O$



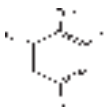
PS-8 **2.3.4.6-Tetrachlorophenol**
Dowicide 6®, Sontox 6®
CAS: 58-90-2 **LD_{50}:** 140mg/kg
MW: 231.88 **MF:** $C_6H_2Cl_4O$



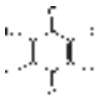
PS-9 **2.4.5-Trichlorophenol**
Collunosol, Dowicide 2®
CAS: 95-95-4 **LD_{50}:** 820mg/kg
MW: 197.44 **MF:** $C_6H_3Cl_3O$



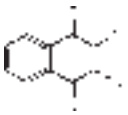
PS-10 **2.4.6-Trichlorophenol**
Dowicide 2S®, Omal
CAS: 88-06-2 **LD_{50}:** 820mg/kg
MW: 197.44 **MF:** $C_6H_3Cl_3O$



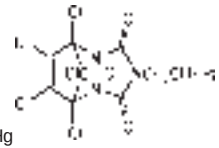
PS-11 **Chloranil**
Tetrachloro-p-benzoquinone, Spergon®, Vulklor®
CAS: 118-75-2 **LD_{50}:** 4,000mg/kg
MW: 245.86 **MF:** $C_6Cl_4O_2$



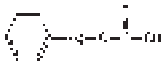
PS-12 **Dichlone**
2.3-Dichloro-1.4-naphthaquinone, Phygon®, Phygon Paste®, Phygon XL®
CAS: 117-80-6 **LD_{50}:** 1,300mg/kg
MW: 227.04 **MF:** $C_{10}H_4Cl_2O_2$



PS-13 **1.4.5.6.7.7-Hexachloro-N-(ethylmercuri)-5-norbornene-2.3-dicarboximide**
1.4.5.6.7.7-Hexachloro-N-(ethylmercuri)-5-norbornene-2.3-dicarboximide
CAS: **LD_{50}:** N/A
MW: 599.37 **MF:** $C_9H_4Cl_6N_3O_2Hg$



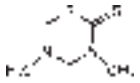
PS-14 **Phenyl mercuric acetate**
Nylmerate®, PMA®, PMAC®, PMAS®, Riogen®, Scutl®, Metasol 30®, Liquiphene®, Phix®, Gallotox®
CAS: 62-38-4 **LD_{50}:** 22mg/kg
MW: 336.75 **MF:** $C_8H_8HgO_2$



PS-15 **Phenyl mercuric benzoate**
CAS: 94-43-9 **LD_{50}:** N/A
MW: 199.21 **MF:** $C_{11}H_9NO_2$



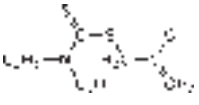
PS-17 **Dazomet**
Tetrahydro-3.5-dimethyl-2H-1.3.5-thiadiazine-2-thione, DMTT, Preservit®, Biocide N521®, Crage Fungicide 974®, Mylone®, Basamid®
CAS: 533-74-4 **LD_{50}:** 363mg/kg
MW: 162.29 **MF:** $C_5H_{10}N_2S_2$



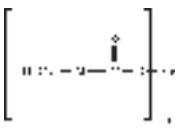
PS-18 **8-Hydroxyquinoline**
Bioquin, 8-Quinolinol, Quinophenol
CAS: 148-24-3 **LD_{50}:** 1,200mg/kg
MW: 145.17 **MF:** C_9H_7NO



PS-19 **2-Chloroallyl diethyldithiocarbamate**
Diethyldithiocarbamic acid, 2-chloroallyl ester, CDEC®, Sulfallate, Vegadex®
CAS: 95-06-7 **LD_{50}:** 850mg/kg
MW: 223.80 **MF:** $C_8H_{14}ClNS_2$

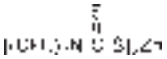


PS-20 **Ferbam**
Dimethyldithiocarbamic acid, ferric, salt, Carbamate®, Fermate®, Ferradow®, Ferric dimethyldithio carbamate, Karbam black®, Ferberk®
CAS: 14484-64-1 **LD_{50}:** 4,000mg/kg
MW: 416.51 **MF:** $C_9H_{18}N_3S_6Fe$



Chem Service Pesticide Standards - Numerical Listing

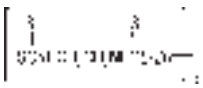
PS-21 **Ziram**
Dimethyldithiocarbamic acid, zinc salt, Corozate®, Fuclasine®, Fuklasin®, Karbam white®, Methasan®, Zerlate®, Zimate®, Zinc dimethyldithiocarbamate, Zirbek®, Pomarsol Z®, Vancide® MZ-96, Milbam®
CAS: 137-30-4 **LD_{50}:** 1,400mg/kg
MW: 305.81 **MF:** $C_6H_{12}N_2S_4Zn$



PS-22 **Maneb**
Ethylene bis(dithiocarbamic acid) manganese salt, MEB, Dithane M-22® Manganese ethylene bis(dithiocarbamate), Chem Neb®
CAS: 12427-38-2 **LD_{50}:** 6,750mg/kg
MW: 265.3 **MF:** $C_4H_6MnN_2S_4$



PS-23 **Zineb** ®
Ethylene bis(dithiocarbamic acid) zinc salt, Dithane Z-78®, Lonacol®, Parzate®, Zinc ethylene bis (dithiocarbamate), Parzate zineb®,
CAS: 12122-67-7 **LD_{50}:** 5,200mg/kg
MW: 275.73 **MF:** $C_4H_6N_2S_4.Zn$



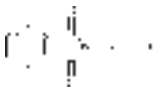
PS-24 **Tetramethylthiuram disulfide**
Dimethyl thiuram disulfide, Bis(dimethylthiocarbamyl) disulfide, Thiram, Nomersan®, Pomarsol®, Pomasol®, Puralin®, Rezifilm®, Thiosan®, Thiurad®, Thylate®, Tiuramyl®, TMTD®, Tuads®, Tulisan®, Tersan®, Mercuram®, Arasan®, Spotrete®, Delsan®, Vancide® TM Fungicide
CAS: 137-26-8 **LD_{50}:** 640mg/kg
MW: 240.44 **MF:** $C_6H_{12}N_2S_4$



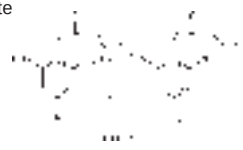
PS-25 **Captan**
N-(Trichloromethylthio)-4-cyclohexene-1.2-dicarboximide
CAS: 133-06-2 **LD_{50}:** 9,000mg/kg
MW: 300.59 **MF:** $C_9H_8Cl_3NO_2S$



PS-26 **Folpet**
N-(Trichlormethylthio)phthalimide, Phaltan®, Thiophal®
CAS: 133-07-3 **LD_{50}:** 10,000mg/kg
MW: 296.55 **MF:** $C_9H_4Cl_3NO_2S$



PS-27 **Dinocap**
2,4-Dinitro-6-octylphenyl crotonate :2,6-Dinitro-4-octylphenyl crotonate (2:1), Isocothane®, Karathane®, Mildex®, Crotothane®
CAS: 39300-45-3 **LD_{50}:** 980mg/kg
MW: 364.44 **MF:** $C_{18}H_{24}N_2O_6$



PS-28 **1-Naphthaleneacetamide**
Rootone®
CAS: 86-86-2 **LD_{50}:** 1,000mg/kg
MW: 185.24 **MF:** $C_{12}H_{11}NO$



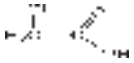
PS-29 **1-Naphthaleneacetic acid**
NAA®, Planofix, Fruit Fax®
CAS: 86-87-3 **LD_{50}:** 1,000mg/kg
MW: 186.22 **MF:** $C_{12}H_{10}O_2$



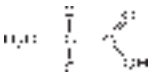
PS-30 **Methyl-1-naphthalene acetate**
1-Naphthaleneacetic acid methyl ester
CAS: 2876-78-0 **LD_{50}:** 2,140mg/kg
MW: 200.25 **MF:** $C_{13}H_{12}O_2$



PS-31 **Chloroacetic acid**
Monochloroacetic acid
CAS: 79-11-8 **LD_{50}:** 76mg/kg
MW: 94.50 **MF:** $C_2H_3ClO_2$



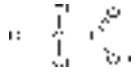
PS-32 **Dalapon**
2.2-Dichloropropionic acid, Dowpon®, Radapon®
CAS: 75-99-0 **LD_{50}:** 970mg/kg
MW: 142.97 **MF:** $C_3H_4Cl_2O_2$



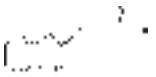
PS-33 **Chlorthal**
(ACS Standard Grade)
Dimethyl-2.3.5.6-tetrachloroterephthalate Dacthal®, Rid®, Chlorthal-Methyl®, DCPA methyl ester®, Fatal®
CAS: 1861-32-1 **LD_{50}:** 3,000mg/kg
MW: 331.96 **MF:** $C_{10}H_6Cl_4O_4$



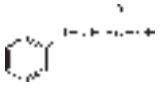
PS-34 **Trichloroacetic acid**
TCA
CAS: 76-03-9 **LD_{50}:** 3,320mg/kg
MW: 163.38 **MF:** $C_2HCl_3O_2$



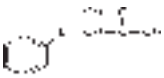
PS-35 **2-Naphthoxyacetic acid**
CAS: 120-23-0 **LD_{50}:** 600mg/kg
MW: 202.22 **MF:** $C_{12}H_{10}O_3$



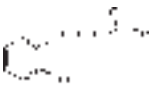
PS-36 **Phenoxyacetic acid**
Phenylium®, Phenoxyethanoic acid, o-Phenylglycolic acid, Phenyl ether glycolic acid
CAS: 122-59-8 **LD_{50}:** 3,700mg/kg
MW: 152.16 **MF:** $C_8H_8O_3$



PS-37 **2-Phenoxypropionic acid**
CAS: 940-31-8 **LD_{50}:** N/A
MW: 166.19 **MF:** $C_9H_{10}O_3$



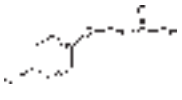
PS-38 **o-Chlorophenoxy acetic acid**
CAS: 614-61-9 **LD_{50}:** 960mg/kg
MW: 186.60 **MF:** $C_8H_7ClO_3$



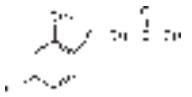
Numerical Listing

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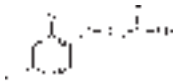
PS-39 **p-Chlorophenoxy acetic acid**
4-CPA
CAS: 122-88-3 **LD_{50}:** 850mg/kg
MW: 186.60 **MF:** $C_8H_7ClO_3$



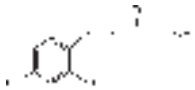
PS-40 **4-Chloro-o-tolyloxyacetic acid**
(4-Chloro-2-methylphenoxy)acetic acid, MCP, MCPA®, Mephanance®, 4-Chloro-o-cresoxyacetic acid, Agroxone®, Cornox M®
CAS: 94-74-6 **LD_{50}:** 700mg/kg
MW: 200.63 **MF:** $C_9H_9ClO_3$



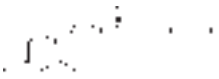
PS-41 **2.4-D**
(2.4-Dichlorophenoxy)acetic acid, Weedar®, Verton®
CAS: 94-75-7 **LD_{50}:** 370mg/kg
MW: 221.04 **MF:** $C_8H_6Cl_2O_3$



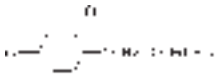
PS-41-1 **2.4-D methyl ester**
(2.4-Dichlorophenoxy)acetic acid methyl ester
CAS: 1928-38-7 **LD_{50}:** N/A
MW: 235.07 **MF:** $C_9H_8Cl_2O_3$



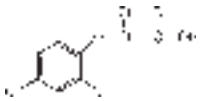
PS-42 **2.4-D butyl ester**
(2.4-Dichlorophenoxy)acetic acid butyl ester, Butyl-2.4-dichloro phenoxyacetate, Lironox®
CAS: 94-80-4 **LD_{50}:** 150mg/kg
MW: 277.16 **MF:** $C_{12}H_{14}Cl_2O_3$



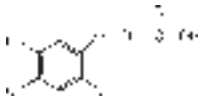
PS-43 **2.4-D isopropyl ester**
(2.4-Dichlorophenoxy)acetic acid isopropyl ester, Isopropyl-2.4-dichlorophenoxy acetate
CAS: 94-11-1 **LD_{50}:** 700mg/kg
MW: 263.13 **MF:** $C_{11}H_{12}Cl_2O_3$



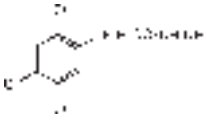
PS-44 **Dichlorprop**
2-(2.4-Dichlorophenoxy)propionic acid, 2.4-DP®
CAS: 120-36-5 **LD_{50}:** 800mg/kg
MW: 235.07 **MF:** $C_9H_8Cl_2O_3$



PS-45 **2.4.5-T** ®
(2.4.5-Trichlorophenoxy)acetic acid, Weedone
CAS: 93-76-5 **LD_{50}:** 300mg/kg
MW: 255.48 **MF:** $C_8H_5Cl_3O_3$



PS-46 **2.4.5-T isopropyl ester**
Isopropyl-(2.4.5-trichlorophenoxy) acetate, (2,4,5-Trichlorophenoxy) acetic acid isopropyl ester
CAS: 93-78-7 **LD_{50}:** N/A
MW: 297.57 **MF:** $C_{11}H_{11}Cl_3O_3$



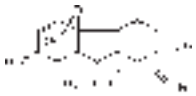
PS-47 **Silvex**
2-(2.4.5-Trichlorophenoxy)propionic acid, 2.4.5-TCPPA, 2.4.5-TP®, Fenoprop®, Kuron®
CAS: 93-72-1 **LD_{50}:** 650mg/kg
MW: 269.51 **MF:** $C_9H_7Cl_3O_3$



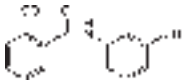
PS-48 **3-Indolebutyric acid**
Hormodin
CAS: 133-32-4 **LD_{50}:** 100mg/kg
MW: 203.26 **MF:** $C_{12}H_{13}NO_2$



PS-49 **Gibberellic acid**
Gibberellin X, Pro-Gibb
CAS: 77-06-5 **LD_{50}:** N/A
MW: 346.41 **MF:** $C_{19}H_{22}O_6$



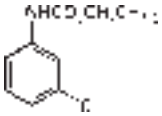
PS-50 **N-m-Tolylphthalamic acid**
3'-Methylphthalanilic acid, Duraset®, Duraset 20W®
CAS: 85-72-3 **LD_{50}:** 5,230mg/kg
MW: 255.29 **MF:** $C_{15}H_{13}NO_3$



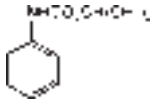
PS-51 **Dimethylarsinic acid**
Cacodylic acid, Hydroxydimethyl-arsine oxide, Phytar®, Ansar®, Silvisar®, Rad-E-Cate 35®
CAS: 75-60-5 **LD_{50}:** 644mg/kg
MW: 138.01 **MF:** $C_2H_7AsO_2$



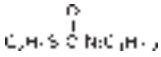
PS-52 **Chlorpropham**
Isopropyl-N-[m-chlorophenyl] carbamate, CIPC®, Chloro IPC®, Isopropyl-m-chlorocarbanilate
CAS: 101-21-3 **LD_{50}:** 1,200mg/kg
MW: 213.68 **MF:** $C_{10}H_{12}ClNO_2$



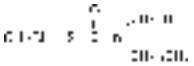
PS-53 **Propham**
Isopropyl-N-phenylcarbamate, INPC®, IPC®, Iso-PPC®
CAS: 122-42-9 **LD_{50}:** 5,000mg/kg
MW: 179.24 **MF:** $C_{10}H_{13}NO_2$



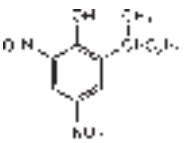
PS-54 **S-Ethyl dipropylthiocarbamate**
EPTC, Eptam®
CAS: 759-94-4 **LD_{50}:** 1,630mg/kg
MW: 189.35 **MF:** $C_9H_{19}NOS$



PS-55 **S-Propyl butylethylthiocarbamate**
Tillam®, Pebulate, S-Propyl n-butyl thiolcarbamate, PEBC
CAS: 1114-71-2 **LD_{50}:** 921mg/kg
MW: 203.38 **MF:** $C_{10}H_{21}NOS$

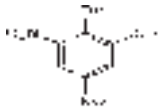


PS-56 **Dinoseb**
2.4-Dinitro-6-sec-butylphenol, DNBP, Premerge®, NNOSBP®, Elgetol 318®
CAS: 88-85-7 **LD_{50}:** 40mg/kg
MW: 240.24 **MF:** $C_{10}H_{12}N_2O_5$

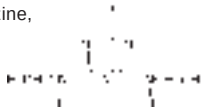


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PS-57 **4.6-Dinitro-o-cresol**
Dekrysil®, Detal®, Dinitrol®, DNC, Ditrosol®, Effusan®, Elgetol® 30, Lipan®, Prokarbol®, Sinox®, Antinonnin®, DNOC, Ibertox®, Trifrina®, Trifocide®
CAS: 534-52-1 **LD_{50}:** 10mg/kg
MW: 198.15 **MF:** $C_7H_6N_2O_5$



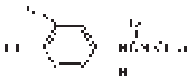
PS-58 **Simazine**
2-Chloro-4.6-bis(ethylamino)-s-triazine, Princep®, Gesatop®, Primatol S®, Gesapun, Amizine, CDT®, CET®
CAS: 122-34-9 **LD_{50}:** 971mg/kg
MW: 201.69 **MF:** $C_7H_{12}ClN_5$



PS-59 **Monuron**
3-(4-Chlorophenyl)-1.1-dimethylurea, CMU®, Telvar®, Chlorea®
CAS: 150-68-5 **LD_{50}:** 3,600mg/kg
MW: 198.67 **MF:** $C_9H_{11}ClN_2O$



PS-60 **Diuron**
3-(3.4-Dichlorophenyl)-1.1-dimethyl urea, Karmex®, DCMU, Direx
CAS: 330-54-1 **LD_{50}:** 3,400mg/kg
MW: 233.11 **MF:** $C_9H_{10}Cl_2N_2O$



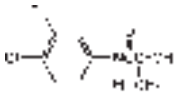
PS-61 **1.1-Dimethyl-3-phenylurea**
Fenuron, Dybar®, PDU®
CAS: 101-42-8 **LD_{50}:** 6,400mg/kg
MW: 164.23 **MF:** $C_9H_{12}N_2O$



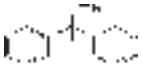
PS-62 **Bromacil**
5-Bromo-3-sec-butyl-6-methyluracil, Hyvar®
CAS: 314-40-9 **LD_{50}:** 5,200mg/kg
MW: 261.15 **MF:** $C_9H_{13}BrN_2O_2$



PS-63 **Chloranocryl**
N-(3.4-Dichlorophenyl)methyl acrylamide, Dicryl®, 3'.4'-Dichloro-2-methylacrylanilide
CAS: 2164-09-2 **LD_{50}:** 3,160mg/kg
MW: 230.10 **MF:** $C_{10}H_9Cl_2NO$



PS-64 **Diphenylacetonitrile**
Diphenatrile
CAS: 86-29-3 **LD_{50}:** 3,500mg/kg
MW: 193.26 **MF:** $C_{14}H_{11}N$



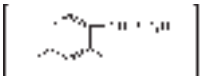
PS-65 **Maleic hydrazide**
1.2.3.6-Tetrahydro-3.6-dioxopyridazine, MH, Malazide, Royal MH-30, Slo-Gro, Regulox, Shucker-Stuff, 6-Hydroxy-3-[2H]-pyridazinone, 1.2-Dihydro-pyridazine-3.6-dione
CAS: 123-33-1 **LD_{50}:** 38mg/kg
MW: 112.10 **MF:** $C_4H_4N_2O_2$



PS-66 **Diethyl dithiobis(thionoformate)**
EXD, Auligen, Aulinogen, Herbisan 5®, Leniscarin, Bexide®, Herbisan®, Sulfasan®, Tridex® Herbicide
CAS: 502-55-6 **LD_{50}:** 480mg/kg
MW: 242.40 **MF:** $C_6H_{10}O_2S_4$



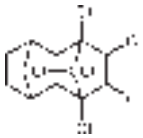
PS-67 **Phosphan**
Phosphon, Tributyl[2.4-dichlorobenzyl] phosphonium chloride, Phosfon®, Chlorphonium chloride
CAS: 115-78-6 **LD_{50}:** 178mg/kg
MW: 397.83 **MF:** $C_{19}H_{32}Cl_2PCl$



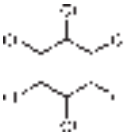
PS-68 **Tributylphosphoro-trithioite**
Folex®, Merphos, Deleaf Defolliant
CAS: 150-50-5 **LD_{50}:** 1,272mg/kg
MW: 298.54 **MF:** $C_{12}H_{27}PS_3$



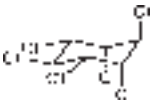
PS-69 **Aldrin ®**
(ACS Standard Grade)
1.2.3.4.10.10-Hexachloro-1.4.4a.5.8.8a.-hexahydro-endo-exo-1.4:5.8-dimethanonaphthalene, 1.2.3.4.10.10-Hexachloro-1.4.4a.5.8.8a-hexahydro-1.4-endo-exo-5.8-dimethylnaphthalene
CAS: 309-00-2 **LD_{50}:** 39mg/kg
MW: 364.90 **MF:** $C_{12}H_8Cl_6$



PS-70 **BHC (mixed isomers)**
1.2.3.4.5.6-Hexachlorocyclohexane, Benzene hexachloride
CAS: 608-73-1 **LD_{50}:** 88mg/kg
MW: 290.82 **MF:** $C_6H_6Cl_6$



PS-71 **Lindane**
(ACS Standard Grade)
g-BHC, Tri-6, Aparasin®, Aphtiria, Ben-Hex®, HCH®, Gammexane, Gexane, Jucutin®, Kewll®, Lorexane®, Streunex®, HGI®, Isotox®, Lintox®, gamma-Benzenehexachloride, BHC gamma isomer, gamma-BHC, gamma-Hexachlorocyclohexane, 1.2.3.4.5.6-Hexachlorocyclohexane [g-isomer], gamma-HCH
CAS: 58-89-9 **LD_{50}:** 76mg/kg
MW: 290.82 **MF:** $C_6H_6Cl_6$

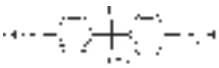


PS-72 **p.p'-DDD**
(ACS Standard Grade)
1.1-Bis(p-chlorophenyl)-2.2-dichloroethane, TDE, Rothane®, Dichlorodiphenyl dichloroethane, 2.2-Bis(p-chlorophenyl)-1.1-dichloroethane
CAS: 72-54-8 **LD_{50}:** 113mg/kg
MW: 320.04 **MF:** $C_{14}H_{10}Cl_4$



Chem Service Pesticide Standards - Numerical Listing

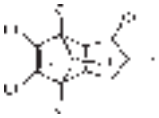
PS-73 **Perthane** ®
1.1-Dichloro-2.2-bis(p-ethylphenyl) ethane, 2.2-Bis(p-ethylphenyl)-1.1-dichloroethane
CAS: 72-56-0 **LD_{50}:** 8,170mg/kg
MW: 307.28 **MF:** $C_{18}H_{20}Cl_2$



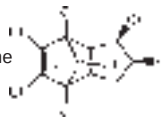
PS-74 **DDT (mixture p,p' & o,p')**
DDT, Dichlorodiphenyltrichloroethane, Chlorophenothan, Dicophane®, Gesarol®, Neocid®, Pentachlorin®
1.1.1-Trichloro-2.2-di(4-chlorophenyl)ethane
Guesarol®, Genitox®, Anofex®
CAS: 8017-34-3 **LD_{50}:** 50mg/kg
MW: 354.48 **MF:** $C_{14}H_9Cl_5$



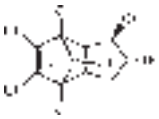
PS-75 **Chlordane**
1.2.4.5.6.7.8.8-Octachloro-3a.4.7.7a-tetrahydro-4.7-methanoindene, CD-68®, Toxichlor®, Velsicol 1068®, Octachlor®, Octa-Klor®, 1.2.4.5.6.7.8.8-Octachloro-4.7-methane-3a.4.7.7a-tetrahydroindane
CAS: 57-74-9 **LD_{50}:** 367mg/kg
MW: 409.76 **MF:** $C_{10}H_6Cl_8$



PS-75-1 **cis-Chlordane**
(ACS Standard Grade)
alpha-Chlordane, alpha(cis)-Chlordane
CAS: 5103-71-9 **LD_{50}:** 500mg/kg
MW: 409.76 **MF:** $C_{10}H_6Cl_8$



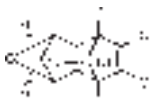
PS-75-2 **trans-Chlordane**
(ACS Standard Grade)
beta-Chlordane
CAS: 5103-74-2 **LD_{50}:** 275mg/kg
MW: 409.76 **MF:** $C_{10}H_6Cl_8$



PS-76 **Dieldrin**
(ACS Standard Grade)
1.2.3.4.10.10-Hexachloro-6.7-epoxy-1.4.4a.5.6.7.8.8a-octahydro-endo-exo-1.4:5.8-dimethanonaphthalene, HEOD, Octalox®
CAS: 60-57-1 **LD_{50}:** 50mg/kg
MW: 380.90 **MF:** $C_{12}H_8Cl_6O$



PS-77 **Endrin**
(ACS Standard Grade)
1.2.3.4.10.10-Hexachloro-6.7-epoxy-1.4.4a.5.6.7.8.8a-octahydro-1.4-endo-endo-5.8-dimethano naphthalene
CAS: 72-20-8 **LD_{50}:** 7mg/kg
MW: 380.90 **MF:** $C_{12}H_8Cl_6O$



PS-77-1 **Endrin aldehyde**
(ACS Standard Grade)
2.2a.3.3.4.7-Hexachlorodecahydro-1.2.4-metheno-cyclopenta(c.d) pentalene-5-carboxaldehyde
CAS: 7421-93-4 **LD_{50}:** 500mg/kg
MW: 380.91 **MF:** $C_{12}H_8Cl_6O$



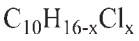
PS-77-2 **Endrin ketone**
(ACS Standard Grade)
3b.4.5.6.6.6a-Hexachlorodecahydro-2.5.7-metheno-3H-cyclopenta(a) pentalene-3-one
CAS: 53494-70-5 **LD_{50}:** N/A
MW: 380.90 **MF:** $C_{12}H_8Cl_6O$



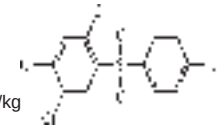
PS-78 **Heptachlor**
(ACS Standard Grade)
1.4.5.6.7.8.8-Heptachloro-3a.4.7.7a-tetrahydro-4.7-methanoindene, Drinox®
CAS: 76-44-8 **LD_{50}:** 40mg/kg
MW: 373.30 **MF:** $C_{10}H_5Cl_7$



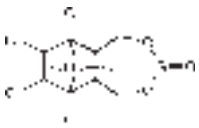
PS-79 **Toxaphene** ®
Camphechlor, Chlorinated camphene, Geniphene®, Penphene®, Phenacide®, Phenetox®, Toxakil®, Alltex®, Polychlorobicyclic terpenes
CAS: 8001-35-2 **LD_{50}:** 69mg/kg
MW: 413.80 **MF:** $C_{10}H_{16-x}Cl_x$



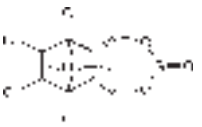
PS-80 **Tetradifon**
p-Chlorophenyl-2.4.5-trichloro phenyl sulfone, Tedion V-18®, Duphar®, 2.4.4'.5-Tetrachloro diphenyl sulfone
CAS: 116-29-0 **LD_{50}:** 14,700mg/kg
MW: 356.04 **MF:** $C_{12}H_6Cl_4O_2S$



PS-81 **Endosulfan**
1.4.5.6.7.7-Hexachloro-5-norbornene-2.3-dimethanol cyclic sulfite, Chlorthiepin®, Malix®, Thiodan®, Cyclodan®, Beosit®, Thimul®, Thifor®, 6.7.8.9.10.10-Hexachloro-1,5,5a,6,9,9a-hexahydro-6,9-methano-2,4,3-benzo-dioxathiepin -3-oxide
CAS: 115-29-7 **LD_{50}:** 23mg/kg
MW: 406.91 **MF:** $C_9H_6Cl_6O_3S$



PS-81-1 **Endosulfan (alpha isomer)**
(ACS Standard Grade)
6.7.8.9.10.10-Hexachloro-1.5.5a.6.9.9a-hexahydro-6.9-methano-2.4.3-benzodioxathiepin -3-oxide, alpha isomer, Endosulfan I
CAS: 959-98-8 **LD_{50}:** 76mg/kg
MW: 406.91 **MF:** $C_9H_6Cl_6O_3S$



PS-81-2 **Endosulfan (beta isomer)**
(ACS Standard Grade)
6.7.8.9.10.10-Hexachloro-1.5.5a.6.9.9a-hexahydro-6.9-methano-2.4.3-benzodioxathiepin -3-oxide, beta isomer, Endosulfan II
CAS: 33213-65-9 **LD_{50}:** 240mg/kg
MW: 406.91 **MF:** $C_9H_6Cl_6O_3S$

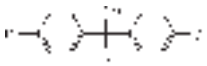


Chem Service Pesticide Standards - Numerical Listing

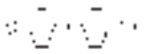
PS-81-3 **Endosulfan sulfate**
(ACS Standard Grade)
6.7.8.9.10.10-Hexachloro-1.5.5a.6.9.9a-hexahydro-6.9-methano-2.4.3-benzodioxathiepin-3.3-dioxide
CAS: 1031-07-8 **LD_{50}:** 18mg/kg
MW: 422.93 **MF:** $C_9H_6Cl_6O_4S$



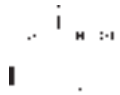
PS-82 **Kelthane ®**
(ACS Standard Grade)
4.4'-Dichloro-a-[trichloromethyl] benzhydrol, Dicofol, 1.1-Bis (p-chlorophenyl)-2.2.2-trichloro ethanol, Di(p-chlorophenyl)trichlor omethylcarbinol
CAS: 115-32-2 **LD_{50}:** 668mg/kg
MW: 370.48 **MF:** $C_{14}H_9Cl_5O$



PS-83 **Methoxychlor**
(ACS Standard Grade)
1.1.1-Trichloro-2.2-bis(p-methoxy phenyl)ethane, DMTD, Marlate®, Methoxy-DDT®, Dimethoxy-DT®, Dianisyl trichloroethane
CAS: 72-43-5 **LD_{50}:** 1,855mg/kg
MW: 345.66 **MF:** $C_{16}H_{15}Cl_3O_2$



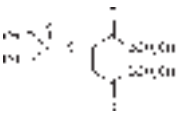
PS-84 **Carbaryl**
1-Naphthyl-N-methylcarbamate, Sevin®, Arylam®
CAS: 63-25-2 **LD_{50}:** 250mg/kg
MW: 201.24 **MF:** $C_{12}H_{11}NO_2$



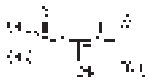
PS-85 **Nicotine**
1-Methyl-2-[3-pyridyl]pyrrolidine, Black Leaf 40
CAS: 54-11-5 **LD_{50}:** 50mg/kg
MW: 162.26 **MF:** $C_{10}H_{14}N_2$



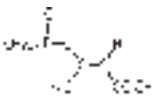
PS-86 **Malathion**
(ACS Standard Grade)
S-[1.2-Dicarbethoxyethyl]-O.O-dimethyl-dithiophosphate, Cythion®, Phosphothion®, Malathon®, Malathiozol®, Malathiozoo®, Malaspray®, Chemathion®
CAS: 121-75-5 **LD_{50}:** 290mg/kg
MW: 330.38 **MF:** $C_{10}H_{19}O_6PS_2$



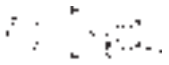
PS-87 **Phosdrin ®**
2-Carbomethoxy-1-methylvinyl dimethyl-phosphate, Mevinphos, 3-Hydroxy-crotonic acid methyl ester dimethyl phosphate
CAS: 7786-34-7 **LD_{50}:** 3mg/kg
MW: 224.17 **MF:** $C_7H_{13}O_6P$



PS-87-1 **cis-Mevinphos**
cis-Duraphos®, cis-Mevidrin®, alpha-Mevinphos, (E)-Mevinphos, cis-Phosdrin®, (E)-Methyl ester-3-((dimethoxyphosphinyl)oxy)-2-Butenoic acid
CAS: 26718-65-0 **LD_{50}:** 3mg/kg
MW: 224.17 **MF:** $C_7H_{13}O_6P$



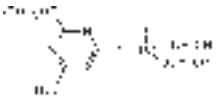
PS-88 **Carbophenothion**
S-[[(4-chlorophenyl)thio]methyl] O,O-Diethyl phosphorodithioate, Trithion®, Garrathion®, Phencapton®, S([(p-Chlorophenyl) thio]methyl)-O.O-diethyl phosphorodithioate
CAS: 786-19-6 **LD_{50}:** 7mg/kg
MW: 342.87 **MF:** $C_{11}H_{16}ClO_2PS_3$



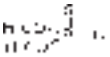
PS-89 **Dichlorvos**
(ACS Standard Grade)
2.2-Dichlorovinyl dimethylphosphate, DDVP®, Nerkol®, Vapona®, DDVF®, Nogos®, Nuvan®, Dedevap®, Herkol®, Oko®, Mafu®
CAS: 62-73-7 **LD_{50}:** 17mg/kg
MW: 220.98 **MF:** $C_4H_7Cl_2O_4P$



PS-90 **Diazinon**
(ACS Standard Grade)
O.O-Diethyl-O-[2-isopropyl-4-methyl-6-pyrimidyl]phosphorothioate, Sarolex®, Basudin®, Neocidol, Alfa-Tox®, Spectacide®, Nucidol®
CAS: 333-41-5 **LD_{50}:** 66mg/kg
MW: 304.38 **MF:** $C_{12}H_{21}N_2O_3PS$



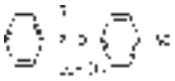
PS-91 **O.O-Dimethyl phosphorochloridothioate**
Dimethyl phosphorochloridothioate, Dimethyl chlorothiophosphate
CAS: 2524-03-0 **LD_{50}:** 340mg/kg
MW: 160.56 **MF:** $C_2H_6ClO_2PS$



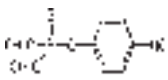
PS-92 **Ethion**
S.S'-Methylene bis[O.O-diethyl phosphorodithioate], Nialate®, Ethyl methylene phosphorodithioate
CAS: 563-12-2 **LD_{50}:** 13mg/kg
MW: 384.49 **MF:** $C_9H_{22}O_4P_2S_4$



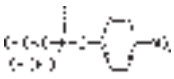
PS-93 **EPN**
O-Ethyl-O-p-nitrophenyl phenyl thiophosphonate, O-Ethyl-O-p-nitro phenyl phenylphosphonothioate
CAS: 2104-64-5 **LD_{50}:** 8mg/kg
MW: 323.32 **MF:** $C_{14}H_{14}NO_4PS$



PS-94 **Methyl parathion**
(ACS Standard Grade)
O.O-Dimethyl-O-p-nitrophenyl phosphorothioate, Dimethyl parathion Nitrox 80®, Dalf®, Folidol-M®, Metacide®, MPT®, Paridol®, Metron®, Nitran, Parton®,
CAS: 298-00-0 **LD_{50}:** 6mg/kg
MW: 263.22 **MF:** $C_8H_{10}NO_5PS$



PS-95 **Parathion ®**
(ACS Standard Grade)
O.O-Diethyl-O-p-nitrophenyl phosphorothioate, Alkron®, Aphamite®, Etilon®, Niran®, Paraphos®, Ethyl parathion® Folidol®, Orthophos®, Thiophos®, Fosferno®, Bladan®, SNP®
CAS: 56-38-2 **LD_{50}:** 2mg/kg
MW: 291.28 **MF:** $C_{10}H_{14}NO_5PS$



Chem Service Pesticide Standards - Numerical Listing

PS-96 **Allethrin (0.1mg/ml in Methylene chloride)**
2.2-Dimethyl-3-[2-methylpropenyl] cyclopropane carboxylic acid ester) of 2-allyl-4-hydroxy-3-methyl-2'-cyclopenten-1-on, Pyresyn®
CAS: 584-79-2 **LD_{50}:** 920mg/kg
MW: 302.45 **MF:** $C_{19}H_{26}O_3$

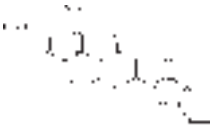


PS-97 **Pyrethrum**
CAS: 8003-34-7 **LD_{50}:** 584mg/kg
MW: N/A **MF:** N/A
Structure Not Available

PS-98 **Benzyl thiocyanate**
Benzyl rhodanide
CAS: 3012-37-1 **LD_{50}:** 40mg/kg
MW: 149.22 **MF:** C_8H_7NS



PS-99 **Rotenone**
Protex®, 1.2.12.12a-Tetrahydro-2-isopropenyl-8.9-dimethoxy-[1] benzopyrano-[3.4-b]furo[2.3-h] [1]benzopyran-6[6aH]-one
CAS: 83-79-4 **LD_{50}:** 60mg/kg
MW: 394.45 **MF:** $C_{23}H_{22}O_6$



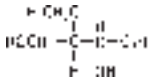
PS-100 **Piperonyl butoxide**
Butacide®, Butoxide®, 3.4-Methylene-dioxy-6-propylbenzyl n-butyl diethylene glycol ether
CAS: 51-03-6 **LD_{50}:** 6,150mg/kg
MW: 338.49 **MF:** $C_{19}H_{30}O_5$



PS-101 **2-Butyl-2-ethyl-1.3-propanediol**
2-Ethyl-2-butyl-1,3-propanediol
CAS: 115-84-4 **LD_{50}:** N/A
MW: 160.29 **MF:** $C_9H_{20}O_2$



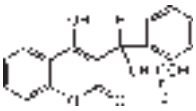
PS-102 **2-Ethyl-1.3-hexanediol**
Ethyl hexanediol, Octylene glycol®, Ethohexadiol®
CAS: 94-96-2 **LD_{50}:** 1,400mg/kg
MW: 146.26 **MF:** $C_8H_{18}O_2$



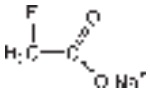
PS-103 **Dichlofenthion**
O-(2.4-Dichlorophenyl)-O.O-diethylphosphorothioate, Nemacide VC-13®, Mobilawn®
CAS: 97-17-6 **LD_{50}:** 270mg/kg
MW: 315.16 **MF:** $C_{10}H_{13}Cl_2O_3PS$



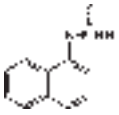
PS-104 **Warfarin**
3-(a-Acetonylbenzyl)-4-hydroxy-coumarin, Warf®, Coumadin®, Warf Compound 42®, Athrombine-K®, Coumafene®, Coumaphene®, Dethmor®, Zoocoumarin, Prolin®, Kypfarin®
CAS: 81-81-2 **LD_{50}:** 3mg/kg
MW: 308.35 **MF:** $C_{19}H_{16}O_4$



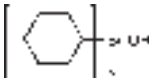
PS-105 **Sodium fluoroacetate**
Fluoroacetic acid sodium salt, Fratol
CAS: 62-74-8 **LD_{50}:** N/A
MW: 100.03 **MF:** $C_2H_2FO_2Na$



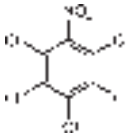
PS-106 **a-Naphthylthiourea**
ANTU, Chemical 109®, a-Naphthylthiocarbamide, Anturat®, Bantu®, Rattrack®
CAS: 86-88-4 **LD_{50}:** 6mg/kg
MW: 202.29 **MF:** $C_{11}H_{10}N_2S$



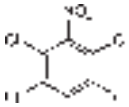
PS-107 **Tricyclohexyltin hydroxide**
Plictran®, Cyhexatin
CAS: 13121-70-5 **LD_{50}:** 190mg/kg
MW: 385.21 **MF:** $C_{18}H_{34}OSn$



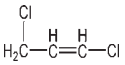
PS-150 **Pentachloronitrobenzene**
Quintozene, PCNB®, Brassicol®, Terraclor®, Tritisan®, Folosan®
CAS: 82-68-8 **LD_{50}:** 1,650mg/kg
MW: 295.32 **MF:** $C_6Cl_5NO_2$



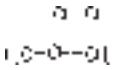
PS-151 **1,2,4,5-Tetrachloro-3-nitrobenzene**
2,3,5,6-Tetrachloronitrobenzene, Tecnazene, Fusarex®, TCNB®, Fumite®
CAS: 117-18-0 **LD_{50}:** 7,500mg/kg
MW: 260.88 **MF:** $C_6HCl_4NO_2$



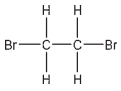
PS-152 **1.3-Dichloropropene**
Telone®, Dichloropropylene, Dichloropropene, a-Chloroallyl chloride
CAS: 542-75-6 **LD_{50}:** 250mg/kg
MW: 110.97 **MF:** $C_3H_4Cl_2$



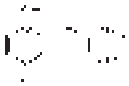
PS-153 **1.2-Dichloropropane**
CAS: 78-87-5 **LD_{50}:** 1,947mg/kg
MW: 112.9 **MF:** $C_3H_6C_{12}$



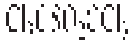
PS-154 **1.2-Dibromoethane**
Ethylenedibromide, EDB, Bromofume®, Dibromoethane, Pestmaster EDB-85®, Soilbrom-85®
CAS: 106-93-4 **LD_{50}:** 108mg/kg
MW: 187.88 **MF:** $C_2H_4Br_2$
CAS: 533-74-4 **LD_{50}:** 363mg/kg
MW: 162.29 **MF:** $C_5H_{10}N_2S_2$



PS-170 **o-Benzyl-p-chlorophenol**
o-Benzyl-p-chlorophenol, Stanophen No. 1®
CAS: 120-32-1 **LD_{50}:** 2,800mg/kg
MW: 218.69 **MF:** $C_{13}H_{11}ClO$

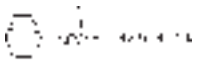


PS-171 **Hexachlorodimethyl sulfone**
Bis(trichloromethyl)sulfone
CAS: 3064-70-8 **LD_{50}:** N/A
MW: 300.7 **MF:** $C_2SO_2Cl_6$

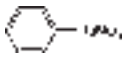


Chem Service Pesticide Standards - Numerical Listing

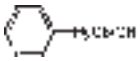
PS-199 **Phenylmercuric oleate**
CAS: 104-60-9 **LD_{50}:** N/A
MW: 559.21 **MF:** $C_{24}H_{38}HgO_2$



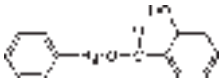
PS-202 **Phenylmercury nitrate**
Merphenyl nitrate, Phermernite®, Phenmerzyl nitrate®,
CAS: 55-68-5 **LD_{50}:** 63mg/kg
MW: 339.71 **MF:** $C_6H_5HgNO_3$



PS-203 **Phenylmercury borate**
[Dihydrogen borato]phenyl mercury, Corubex®, Famosept®, Merfen®, Phenyl mercuric borate, Phenylmercuriborate
CAS: 102-98-7 **LD_{50}:** N/A
MW: 338.53 **MF:** $C_6H_5BHgO_{3\cdot2}H$



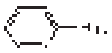
PS-205 **Phenylmercury salicylate**
Phenyl[salicyloyloxy]mercury
CAS: 28086-13-7 **LD_{50}:** N/A
MW: 414.72 **MF:** $C_{13}H_{10}O_3Hg$



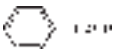
PS-209 **Ethylmercuric chloride**
Chloroethylmercury, Ceresan®
CAS: 107-27-7 **LD_{50}:** 40mg/kg
MW: 265.11 **MF:** C_2H_5ClHg



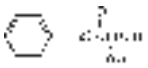
PS-214 **Phenyl mercuric chloride**
CAS: 100-56-1 **LD_{50}:** 60mg/kg
MW: 313.14 **MF:** C_6H_5ClHg



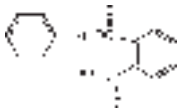
PS-215 **Phenyl mercuric hydroxide**
CAS: 100-57-2 **LD_{50}:** 18mg/kg
MW: 294.71 **MF:** C_6H_6HgO



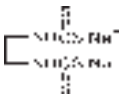
PS-216 **Phenyl mercuric lactate**
(Lactoyloxy)phenylmercury
CAS: N/A **LD_{50}:** 24mg/kg
MW: 366.68 **MF:** $C_9H_{10}O_3Hg$



PS-217 **Phenyl mercuric phthalate**
CAS: N/A **LD_{50}:** N/A
MW: 442.82 **MF:** $C_{14}H_{10}O_4Hg$



PS-220 **Nabam**
Disodium ethylene bis[dithiocarbamate]
Dithane S®, Parzate Liquid®, Chem Bam®
CAS: 142-59-6 **LD_{50}:** 395mg/kg
MW: 256.34 **MF:** $C_4H_6N_2S_{4\cdot2}Na$



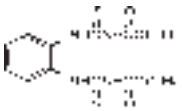
PS-221 **Metham sodium**
Sodium methyl dithiocarbamate, Vapam®, VPM®, Metam®, SMDC, Trimaton®
CAS: 6734-80-1 **LD_{50}:** 820mg/kg
MW: 165.22 **MF:** $C_2H_4NS_2Na._2H_2O$



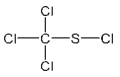
PS-222 **Benomyl**
Methyl-1-[butylcarbamoyl]-2-benzimidazole carbamate, Benlate®
CAS: 17804-35-2 **LD_{50}:** 9,590mg/kg
MW: 290.36 **MF:** $C_{14}H_{18}N_4O_3$



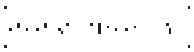
PS-223 **Thiophanate**
Diethyl 4.4'-o-phenylenebis (3-thioallophanate), Topsin E, Cercobin, 1.2-Bis(3-ethoxycarbonyl -2-thioureido) benzene
CAS: 23564-06-9 **LD_{50}:** 15,000mg/kg
MW: 370.48 **MF:** $C_{14}H_{18}N_4O_4S_2$



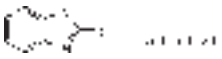
PS-224 **Perchloromethyl mercaptan**
Clairsit®, Mercaptan methylique perchlore, Trichloromethylsulfenyl chloride, Perchlormethylmerkaptan, Trichloromethane sulfenyl chloride, Trichloromethanesulphenyl chloride, Trichloromethylsulphenyl chloride
CAS: 594-42-3 **LD_{50}:** 83mg/kg
MW: 185.87 **MF:** CCl_4S



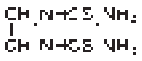
PS-225 **Polyram** ®
Metiram
CAS: 9006-42-2 **LD_{50}:** 10,000mg/kg
MW: N/A **MF:** $(C_4H_6N_2S_4Zn)n$



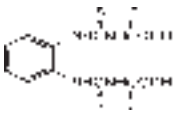
PS-227 **Vanicide-20S** ®
2-Mercaptobenzothiazole monoethanolamine salt
CAS: N/A **LD_{50}:** 3,120mg/kg
MW: 228.35 **MF:** $C_7H_5NS_2.C_2H_7NO$



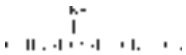
PS-228 **Amobam** ®
Ethylene bis(dithiocarbamic acid) diammonium salt, Chem-O-Bam®
CAS: 3566-10-7 **LD_{50}:** 395mg/kg
MW: 246.46 **MF:** $C_4H_8N_2S_{4\cdot2}H_3N$



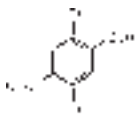
PS-230 **Thiophanate-methyl**
Dimethyl([1.2-phenylene]bis (iminocarbonothioyl))bis(carbamate), Dimethyl-4.4'-o-phenylenebis-(3-thioallophanate), Cercobin-M®, Fungitox®, Labilite®, Mildothane, Sigma, Topsin M®
CAS: 23564-05-8 **LD_{50}:** 7,500mg/kg
MW: 342.42 **MF:** $C_{12}H_{14}N_4O_4S_2$



PS-250 **Dodine**
n-Dodecylguanidine acetate, Cyprex®, Melprex®, Cupene®, Laurylguanidine acetate
CAS: 2439-10-3 **LD_{50}:** 1,000mg/kg
MW: 287.51 **MF:** $C_{13}H_{29}N_3.C_2H_4O_2$



PS-255 **Chloroneb**
(ACS Standard Grade)
1.4-Dichloro-2.5-dimethoxybenzene, Demosan®, Tersan SP®, Soil Fungicide 1823®
CAS: 2675-77-6 **LD_{50}:** 11,000mg/kg
MW: 207.06 **MF:** $C_8H_8Cl_2O_2$

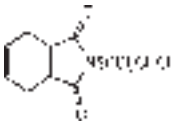


Numerical Listing

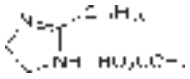
For new pesticides and custom mixtures contact us at +1-610-692-3026 or www.chemservice.com

PestCat05_Mid.pmd 35 1/3/06, 11:33 AM

PS-260 **Captafol**
N-(1.1.2.2.-Tetrachloroethylthio)-4-cyclohexene-1.2-dicarboximide, Difolatan®, Folcid®
CAS: 2425-06-1 **LD_{50}:** 5,000mg/kg
MW: 349.06 **MF:** $C_{10}H_9Cl_4NO_2S$



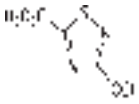
PS-261 **Glyodin**
2-Heptadecyl-2-imidazoline acetate, Glyoxide®, Crag Fruit Fungicide 341®
CAS: 556-22-9 **LD_{50}:** 4,600mg/kg
MW: 368.68 **MF:** $C_{20}H_{40}N_2.C_2H_4O_2$



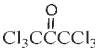
PS-262 **Dexon** ®
p-Dimethylaminobenzenediazo sulfonic acid, sodium salt, Fenaminosulf
CAS: 140-56-7 **LD_{50}:** 60mg/kg
MW: 251.26 **MF:** $C_8H_{10}N_3O_3S.Na$



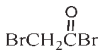
PS-264 **Terrazole** ®
5-Ethoxy-3-trichloromethyl-1.2.4-thiadiazole, Super X, Etridiazole
CAS: 2593-15-9 **LD_{50}:** 1,077mg/kg
MW: 247.53 **MF:** $C_5H_5Cl_3N_2OS$



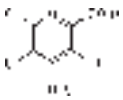
PS-272 **Hexachloroacetone**
Hexachloro-2-propanone, HCA
CAS: 116-16-5 **LD_{50}:** 1,550mg/kg
MW: 264.73 **MF:** C_3Cl_6O



PS-273 **Bromoacetyl bromide**
CAS: 598-21-0 **LD_{50}:** N/A
MW: 201.8 **MF:** $C_2H_2Br_20$



PS-274 **Picloram**
4-Amino-3.5.6-trichloropicolinic acid, Tordon®
CAS: 1918-02-1 **LD_{50}:** 2,898mg/kg
MW: 241.46 **MF:** $C_6H_3Cl_3N_2O_2$



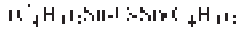
PS-280 **Cadmium succinate**
Cadminate®, Succinic acid cadmium salt
CAS: 141-00-4 **LD_{50}:** 660mg/kg
MW: 228.48 **MF:** $C_4H_4O_4.Cd$



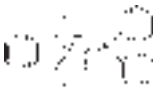
PS-281 **Disodium methyl arsonate**
DSMA, Ansar 8100, Methanearsonic acid disodium salt, Methar, Ditac®, MAA®, Arsinyl®, Namate®, Sodar®
CAS: 144-21-8 **LD_{50}:** 1,800mg/kg
MW: 291.9 **MF:** $CH_3AsNa_2O_3X_6H_2O$



PS-282 **Bis[tri-n-butyltin]oxide**
Oxybis(tributyltin), Car-Ban®, TBTO®, T-O-Biostat®, Bis(tributyltin)oxide
CAS: 56-35-9 **LD_{50}:** 87mg/kg
MW: 596.16 **MF:** $C_{24}H_{54}OSn_2$



PS-288 **Diphacinone**
2-Diphenylacetyl-1.3-indandione
CAS: 82-66-6 **LD_{50}:** 2mg/kg
MW: 340.39 **MF:** $C_{23}H_{16}O_3$

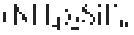


PS-289 **Potassium cyanate**
CAS: 590-28-3 **LD_{50}:** 841mg/kg
MW: 81.12 **MF:** CNOK



PS-290 **Lead arsenate**
CAS: 7784-40-9 **LD_{50}:** 100mg/kg
MW: 347.12 **MF:** $PbAsHO_4$

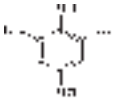
PS-291 **Ammonium fluosilicate**
CAS: 16919-19-0 **LD_{50}:** 100mg/kg
MW: 178.19 **MF:** $F_6Si.2NH_4$



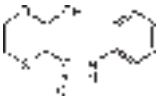
PS-292 **Copper oxychloride**
CAS: 1332-65-6 **LD_{50}:** 1,440mg/kg
MW: 427.1 **MF:** $Cu_4H_6O_6Cl_2$



PS-293 **Dicloran**
2.6-Dichloro-4-nitroaniline, Botran®, Allisan®, Dichloran®, Ditranil®,DCNA
CAS: 99-30-9 **LD_{50}:** 4,000mg/kg
MW: 207.02 **MF:** $C_6H_4Cl_2N_2O_2$



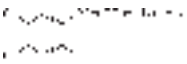
PS-294 **Carboxin**
5.6-Dihydro-2-methyl-1.4-oxathiin-3-carboxanilide, Vitavax®
CAS: 5234-68-4 **LD_{50}:** 3,820mg/kg
MW: 235.3 **MF:** $C_{12}H_{13}NO_2S$



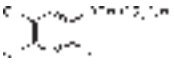
PS-295 **Oxycarboxin**
2.3-Dihydro-5-carboxanilide-6-methyl-1.4-oxathiin-4.4-dioxide, Plantvax®, 5,6-Dihydro-2-methyl-1.4-oxathin-3-carboxanilide-4.4-dioxide
CAS: 5259-88-1 **LD_{50}:** 2,000mg/kg
MW: 267.32 **MF:** $C_{12}H_{13}NO_4S$



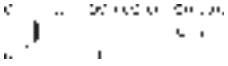
PS-296 **2.4.5-T-amine**
(2.4.5-Trichlorophenoxy)acetic acid triethyl amine salt
CAS: N/A **LD_{50}:** 300mg/kg
MW: 255.48 **MF:** $C_8H_5Cl_3O_3$



PS-297 **2.4.5-T isooctyl ester**
(2.4.5-Trichlorophenoxy)acetic acid isooctyl ester (3, 4 or 5-methylheptyl groups)
CAS: 25168-15-4 **LD_{50}:** 569mg/kg
MW: 367.72 **MF:** $C_{16}H_{21}Cl_3O_3$



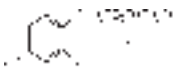
PS-297-1 **2.4.5-T 2-ethylhexyl ester**
CAS: 1928-47-8 **LD_{50}:** N/A
MW: 367.72 **MF:** $C_{16}H_{21}Cl_3O_3$



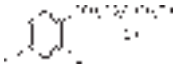
PS-299 **2.4-D isopropylamine salt**
(2.4-Dichlorophenoxy)acetic acid, isopropylamine salt
CAS: N/A **LD$_{50}$:** N/A
MW: 280.15 **MF:** $C_{11}H_{15}Cl_2NO_3$



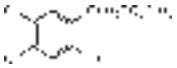
PS-301 **2.4-D sec-butyl ester**
(2.4-Dichlorophenoxy)acetic acid, sec-butyl ester
CAS: N/A **LD$_{50}$:** 150mg/kg
MW: 276.90 **MF:** $C_{12}H_{14}Cl_2O_3$



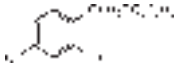
PS-302 **2.4-D propylene glycol ester**
(2.4-Dichlorophenoxy)acetic acid, propylene glycol ester
CAS: N/A **LD$_{50}$:** 350mg/kg
MW: 279.12 **MF:** $C_{11}H_{12}Cl_2O_4$



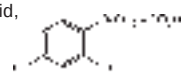
PS-303 **2.4.5-T n-butyl ester**
(2,4,5-Trichlorophenoxy)acetic acid n-butyl ester
CAS: 93-79-8 **LD$_{50}$:** 619mg/kg
MW: 311.60 **MF:** $C_{12}H_{13}Cl_3O_3$



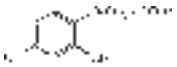
PS-304 **2.4-D ethyl ester**
(2.4-Dichlorophenoxy)acetic acid, ethyl ester
CAS: 533-23-3 **LD$_{50}$:** 320mg/kg
MW: 249.10 **MF:** $C_{10}H_{10}Cl_2O_3$



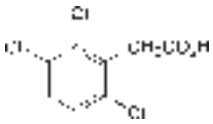
PS-306 **2.4-DB**
4-(2.4-Dichlorophenoxy)butyric acid, Butoxone®, Butyrac®, Embutox®
CAS: 94-82-6 **LD$_{50}$:** 700mg/kg
MW: 249.10 **MF:** $C_{10}H_{10}Cl_2O_3$



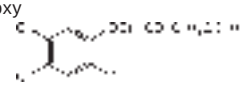
PS-307 **MCPB**
4-(2-Methyl-4-chlorophenoxy) butyric acid, Thistrol®, Cantrol, Tropotox®
CAS: 94-81-5 **LD$_{50}$:** 680mg/kg
MW: 228.69 **MF:** $C_{11}H_{13}ClO_3$



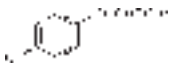
PS-308 **Fenac**
2.3.6-Trichlorophenylacetic acid, Chlorfenac, Fenatrol
CAS: 85-34-7 **LD$_{50}$:** 576mg/kg
MW: 239.48 **MF:** $C_8H_5Cl_3O_2$



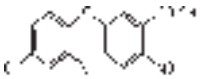
PS-309 **2.4.5-T butoxyethyl ester**
Butoxyethyl-2.4.5-trichlorophenoxy -acetate, Trinoxol, Brambicide®, (2,4,5-Trichlorophenoxy)acetic acid butoxyethyl ester
CAS: 2545-59-7 **LD$_{50}$:** N/A
MW: 355.66 **MF:** $C_{14}H_{17}Cl_3O_4$



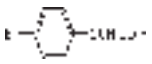
PS-310 **p-Chloromandelic acid**
CAS: 492-86-4 **LD$_{50}$:** N/A
MW: 186.45 **MF:** $C_8H_7ClO_3$



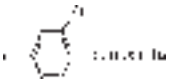
PS-311 **Bifenox**
Methyl-5-(2.4-dichlorophenoxy)-2-nitrobenzoate, Modown®
CAS: 42576-02-3 **LD$_{50}$:** 6,400mg/kg
MW: 342.14 **MF:** $C_{14}H_9Cl_2NO_5$



PS-312 **p-Bromophenoxy acetic acid**
CAS: 1878-91-7 **LD$_{50}$:** N/A
MW: 212.66 **MF:** $C_8H_7BrO_3$



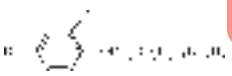
PS-313 **Sesone ®**
Sodium 2.4-dichlorophenoxyethyl sulfate, SES, Crag SES, Crag Herbicide 1®, Crag 1®, Disul-Na®
CAS: 149-26-8 **LD$_{50}$:** 730mg/kg
MW: 309.10 **MF:** $C_8H_7Cl_2O_5S.Na$



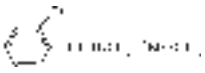
PS-314 **3-Amino-2.5-dichlorobenzoic acid**
Chloramben, Amiben®, Vegiben®
CAS: 133-90-4 **LD$_{50}$:** 5,620mg/kg
MW: 206.03 **MF:** $C_7H_5Cl_2NO_2$



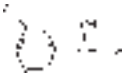
PS-315 **2.4-D butoxyethyl ester**
Butoxyethyl-2.4-dichlorophenoxy acetate, Aqua-Kleen®
CAS: 1929-73-3 **LD$_{50}$:** N/A
MW: 321.22 **MF:** $C_{14}H_{18}Cl_2O_4$



PS-316 **2.4-DB dimethylamine salt**
Dimethylamine-4-(2.4-dichloro phenoxy)-butyrate
CAS: N/A **LD$_{50}$:** 700mg/kg
MW: 293.17 **MF:** $C_{12}H_{16}Cl_2NO_3$



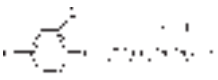
PS-317 **2-(3-Chlorophenoxy)propionic acid**
Fruitone® CPA, 3-(3-Chlorophenoxy) propionic acid, Amdol 3CP®, Amchem 3CP®, Cloprop
CAS: 101-10-0 **LD$_{50}$:** 750mg/kg
MW: 200.63 **MF:** $C_9H_9ClO_3$



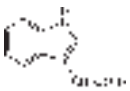
PS-319 **2.4-D isooctyl ester**
Isooctyl-2.4-dichlorophenoxy acetate
CAS: 25168-26-7 **LD$_{50}$:** 150mg/kg
MW: 333.28 **MF:** $C_{16}H_{22}Cl_2O_3$



PS-319-1 **2-Ethylhexyl-2.4-dichlorophenoxy acetate**
2,4-D 2-ethylhexyl ester, (2,4-Dichlorophenoxy)acetic acid, 2-ethylhexyl ester
CAS: 1928-43-4 **LD$_{50}$:** N/A
MW: 333.28 **MF:** $C_{16}H_{22}Cl_2O_3$

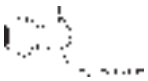


PS-320 **3-Indoleacetic acid**
Heteroauxin
CAS: 87-51-4 **LD$_{50}$:** N/A
MW: 175.20 **MF:** $C_{10}H_9NO_2$

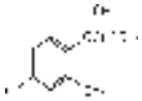


Chem Service Pesticide Standards - Numerical Listing

PS-321 **3-Indolepropionic acid**
CAS: 830-96-6 **LD_{50}:** N/A
MW: 189.23 **MF:** $C_{11}H_{11}NO_2$



PS-324 **Mecoprop**
(ACS Standard Grade)
2-(4-Chloro-2-methylphenoxy) propanoic acid, MCPP®, Compitox®, Hedonal MCPP®, Iso-Cornox®, Kilprop®, Mepro®, Propal®, Proponex-Plus®, BH® Mecoprop, Compitox Plus®
CAS: 7085-19-0 **LD_{50}:** 930mg/kg
MW: 214.66 **MF:** $C_{10}H_{11}ClO_3$



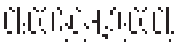
PS-325 **(2-Chloroethyl)phosphonic acid**
Ethrel®, CEPHA®, Ethephon, Bromeflor®
CAS: 16672-87-0 **LD_{50}:** 4,229mg/kg
MW: 144.50 **MF:** $C_2H_6ClO_3P$



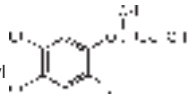
PS-326 **Ethyl-3-amino-2.5-dichlorobenzoate**
3-Amino-2.5-dichlorobenzoic acid, ethyl ester, Chloramben ethyl ester
CAS: N/A **LD_{50}:** N/A
MW: 234.08 **MF:** $C_9H_9Cl_2NO_2$



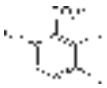
PS-328 **EGT**
Ethylene glycol bis[trichloroacetate], Glytac®, Ethylene bistrichloroacetate
CAS: 2514-53-6 **LD_{50}:** 7,000mg/kg
MW: 352.80 **MF:** $C_6H_4Cl_6O_4$



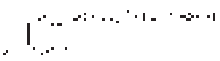
PS-329 **Silvex isooctyl ester**
Silvex 2-ethylhexyl ester, (2.4.5-Trichlorophenoxy)propionic acid isooctyl ester, (2,4,5-Trichloro phenoxy)propionic acid 2-ethylhexyl ester
CAS: 32534-95-5 **LD_{50}:** 500mg/kg
MW: 381.75 **MF:** $C_{17}H_{23}Cl_3O_3$



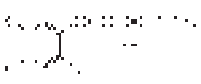
PS-330 **2.3.6-Trichlorobenzoic acid**
2.3.6-TBA®, Trysben®
CAS: 50-31-7 **LD_{50}:** 1,500mg/kg
MW: 225.45 **MF:** $C_7H_3Cl_3O_2$



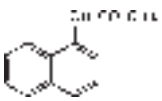
PS-332 **2.4-D isopropanol amine salt**
(2.4-Dichlorophenoxy)acetic acid, isopropanolamine salt
CAS: N/A **LD_{50}:** 700mg/kg
MW: 296.17 **MF:** $C_8H_6Cl_2O_3.C_3H_9NO$



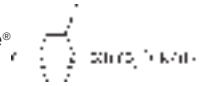
PS-334 **(2.4.5-Trichlorophenoxy)acetic acid butoxypolypropylene glycol ester**
2,4,5-T butoxypolypropylene glycol ester
CAS: N/A **LD_{50}:** 500mg/kg
MW: 369.69 **MF:** $C_{15}H_{19}Cl_3O_4$



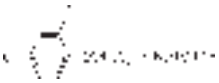
PS-335 **Ethyl-1-naphthalene acetate**
CAS: 2122-70-5 **LD_{50}:** 3,580mg/kg
MW: 214.28 **MF:** $C_{14}H_{14}O_2$



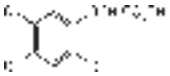
PS-337 **2.4-D dimethylamine salt**
(2.4-Dichlorophenoxy)acetic acid, dimethylamine salt, Weedicide Amine®
CAS: 2008-39-1 **LD_{50}:** 300mg/kg
MW: 386.24 **MF:** $C_{18}H_6Cl_2O_3.C_2H_7N$



PS-338 **2.4-D ethanolamine salt**
(2,4-Dichlorophenoxy)acetic acid, ethanolamine salt
CAS: 3599-58-4 **LD_{50}:** 300mg/kg
MW: 282.14 **MF:** $C_8H_6Cl_2O_3.C_2H_7NO$

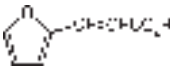


PS-339 **(2.4.5-Trichlorophenoxy)acetic acid methyl ester**
2.4.5-T methyl ester
CAS: 1928-37-6 **LD_{50}:** 500mg/kg
MW: 269.51 **MF:** $C_9H_7Cl_3O_3$

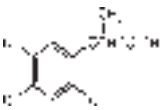


PS-340 **N.N-Dimethylsuccinamic acid**
CAS: 2564-95-6 **LD_{50}:** N/A
MW: 130 **MF:** $C_5H_8O_3N$

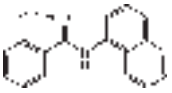
PS-341 **2-Furanacrylic acid**
B-Furylacrylic acid, Furacrylic acid, 2-Furalacetic acid, Fururylidene acetic acid
CAS: 539-47-9 **LD_{50}:** N/A
MW: 138.13 **MF:** $C_7H_6O_3$



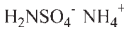
PS-342 **Silvex methyl ester**
2,4,5-TP methyl ester, 2-(2,4,5-Trichlorophenoxy)propionic acid methyl ester
CAS: 4841-20-7 **LD_{50}:** N/A
MW: 283.5 **MF:** $C_{10}H_9Cl_3O_3$



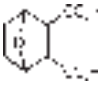
PS-343 **N-1-Naphthylphthalamic acid**
Naptalam, Alanap®, NPA
CAS: 132-66-1 **LD_{50}:** 8,200mg/kg
MW: 291.32 **MF:** $C_{18}H_{13}NO_3$



PS-344 **Ammonium sulfamate**
Ammonium amidosulphate, AMS, Amcide®
CAS: 7773-06-0 **LD_{50}:** 3,900mg/kg
MW: 114.14 **MF:** $H_3NO_3S.H_3N$



PS-345 **Endothal**
7-Oxabicyclo[2.2.1]heptane-2.3-dicarboxylic acid, Endothal (unstated stereochemistry)
CAS: 62059-43-2 **LD_{50}:** 51mg/kg
MW: 204.18 **MF:** $C_8H_{10}O_5.H_2O$

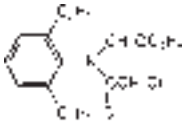


PS-346 **Dicamba**
(ACS Standard Grade)
2-Methoxy-3.6-dichlorobenzoic acid, Banvel®, Mediben®, 3.6-Dichloro -o-anisic acid
CAS: 1918-00-9 **LD_{50}:** 1,040mg/kg
MW: 221.04 **MF:** $C_8H_6Cl_2O_3$

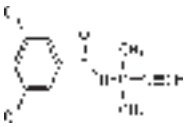


Chem Service Pesticide Standards - Numerical Listing

PS-348 **Butachlor**
(ACS Standard Grade)
2-Chloro-2',6'-diethyl-N-(butoxymethyl)acetanilide, N-(Butoxymethyl)-2-chloro-2',6'-diethylacetanilide, Machete®
CAS: 23184-66-9 **LD_{50}:** 1,740mg/kg
MW: 311.89 **MF:** $C_{17}H_{26}ClNO_2$



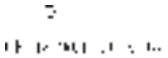
PS-349 **Propyzamide**
N-[1.1-Dimethylpropynyl]-3.5-dichlorobenzamide, Kerb®, Pronamide®, 3.5-Dichloro-N-(1.1-dimethyl-2-propynyl)benzamide
CAS: 23950-58-5 **LD_{50}:** 8,350mg/kg
MW: 256.14 **MF:** $C_{12}H_{11}Cl_2NO$



PS-350 **Diphenamid**
N.N-Dimethyl-2.2-diphenylacetamide, Dymid®, Enide®, 2.2-Diphenyl-N.N-dimethylacetamide
CAS: 957-51-7 **LD_{50}:** 700mg/kg
MW: 239.34 **MF:** $C_{16}H_{17}NO$



PS-351 **N.N-Diallyl-2-chloroacetamide**
Allidochlor, CDAA, Randox®, a-Chloro-N.N-diallylacetamide
CAS: 93-71-0 **LD_{50}:** 700mg/kg
MW: 173.66 **MF:** $C_8H_{12}ClNO$



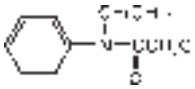
PS-352 **N-Methyl-N-1-naphthyl acetamide**
CAS: N/A **LD_{50}:** 50mg/kg
MW: 199.25 **MF:** $C_{13}H_{13}NO$



PS-354 **N-1-Naphthylacetamide**
CAS: N/A **LD_{50}:** N/A
MW: 185.23 **MF:** $C_{12}H_{11}NO$



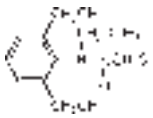
PS-355 **Propachlor**
(ACS Standard Grade)
2'-Chloro-N-isopropyl acetanilide, Ramrod®, N-Isopropyl-a-chloroacetanilide, 2-Chloro-N-isopropyl-N-phenylacetamide
CAS: 1918-16-7 **LD_{50}:** 710mg/kg
MW: 211.71 **MF:** $C_{11}H_{14}ClNO$



PS-356 **3'.4'-Dichloropropionanilide**
Propanil, Surcopur®, Stam®, Rogue®
CAS: 709-98-8 **LD_{50}:** 1,384mg/kg
MW: 218.09 **MF:** $C_9H_9Cl_2NO$



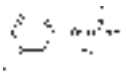
PS-357 **Alachlor**
2-Chloro-2',6'-diethyl-N-[methoxy methyl]acetanilide, Lasso®, Lazo®, 2'-Chloro-N-[2.6-diethyl phenyl]-N-methoxy methylacetamide
CAS: 15972-60-8 **LD_{50}:** 1,200mg/kg
MW: 269.8 **MF:** $C_{14}H_{20}ClNO_2$



PS-358 **Nitralin**
4-[Methylsulfonyl]-2.6-dinitro-N.N-di-propylaniline, Planavin®
CAS: 4726-14-1 **LD_{50}:** N/A
MW: 345.41 **MF:** $C_{13}H_{19}N_3O_6S$



PS-359 **2-[3-Chlorophenoxy]propionamide**
CAS: 5825-87-6 **LD_{50}:** N/A
MW: 199.64 **MF:** $C_9H_{10}ClNO_2$



PS-360 **Allyl trimethylammonium bromide**
CAS: N/A **LD_{50}:** N/A
MW: 179.90 **MF:** $C_6H_{14}NBr$



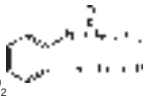
PS-361 **(2-Bromoethyl)trimethyl ammonium bromide**
CAS: 2758-06-7 **LD_{50}:** 190mg/kg
MW: 246.97 **MF:** $C_5H_{13}Br_2N$



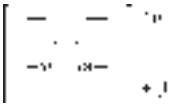
PS-363 **Chlormequat chloride**
[2-Chloroethyl]trimethylammonium chloride, Chlorocholine chloride, Cycocel®, Cyclocel®
CAS: 999-81-5 **LD_{50}:** 560mg/kg
MW: 158.09 **MF:** $C_5H_{13}ClN.Cl$



PS-364 **Fenuron TCA**
1.1-Dimethyl-3-phenylurea trichloroacetate, Urab®
CAS: 4482-55-7 **LD_{50}:** 4,000mg/kg
MW: 327.61 **MF:** $C_9H_{12}N_2O.C_2HCl_3O_2$



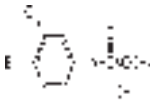
PS-365 **Diquat Dibromide monohydrate**
6.7-Dihydrodipyrido[1.2-a:2'1'-c] pyrazinediium dibromide, Reglone®, Aquacide®, 9.10-Dihydro-8a,10a-diazoniaphenanthrene ion, 1.1'-Ethylene-2.2-bipyridylium ion
CAS: 6385-62-2 **LD_{50}:** 231mg/kg
MW: 362.1 **MF:** $C_{12}H_{14}Br_2N_2O$



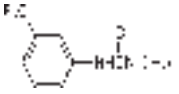
PS-366 **Paraquat CL tetrahydrate**
1.1'-Dimethyl-4.4'-bipyridinium dichloride, Gramoxone®, Methyl viologen, Preeglone®, Weedol®, Arial Gramoxone®, Dextrone X®
CAS: 1910-42-5 **LD_{50}:** 57mg/kg
MW: 329.2 **MF:** $C_{12}H_{14}Cl_2N_2 \times {}_4H_2O$



PS-368 **Chlorbromuron**
3-[4-Bromo-3-chlorophenyl]-1-methoxy-1-methylurea, Maloran®
CAS: 13360-45-7 **LD_{50}:** N/A
MW: 293.57 **MF:** $C_9H_{10}BrClN_2O_2$

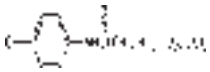


PS-369 **Fluometuron**
CIBA 2059®, Cotoran®, 1,1-Dimethyl-3-(a,a,a-trifluoro-m-tolyl) urea
CAS: 2164-17-2 **LD_{50}:** 6,419mg/kg
MW: 232.23 **MF:** $C_{10}H_{11}F_3N_2O$

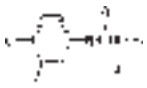


Chem Service Pesticide Standards - Numerical Listing

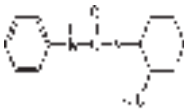
PS-371 **Monuron TCA**
3-[4-Chlorophenyl]-1.1-dimethyl urea trichloroacetate, Urox®
CAS: 140-41-0 **LD_{50}:** N/A
MW: 362.05 **MF:** $C_2HCl_3O_2.C_9H_{11}ClN_2O$



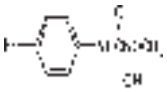
PS-372 **Linuron**
3-(3.4-Dichlorophenyl)-1-methoxy-1-methylurea, Lorox®, Afalon®
CAS: 330-55-2 **LD_{50}:** 4,000mg/kg
MW: 249.11 **MF:** $C_9H_{10}Cl_2N_2O_2$



PS-373 **Siduron**
1-(2-Methylcyclohexyl)-3-phenyl urea, Tupersan®
CAS: 1982-49-6 **LD_{50}:** N/A
MW: 232.36 **MF:** $C_{14}H_{20}N_2O$



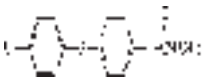
PS-374 **Metobromuron**
3-(p-Bromophenyl)-1-methyl-1-methoxyurea, Patoran, CIBA 3126, 3-(p-Bromophenyl)-1-methoxy-1-methylurea
CAS: 3060-89-7 **LD_{50}:** 2,000mg/kg
MW: 259.13 **MF:** $C_9H_{11}BrN_2O_2$



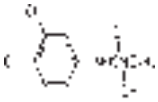
PS-375 **Terbacil**
3-tert-Butyl-5-chloro-6-methyluracil, Sinbar®
CAS: 5902-51-2 **LD_{50}:** N/A
MW: 216.69 **MF:** $C_9H_{13}ClN_2O_2$



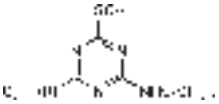
PS-376 **Chloroxuron**
3-[p-(p-Chlorophenoxy)phenyl]1.1-dimethylurea, Tenoran®
CAS: 1982-47-4 **LD_{50}:** 3,000mg/kg
MW: 290.77 **MF:** $C_{15}H_{15}ClN_2O_2$



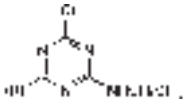
PS-377 **Neburon**
1-n-Butyl-3-[3.4-dichlorophenyl]-1-methylurea, Kloben®
CAS: 555-37-3 **LD_{50}:** 11,000mg/kg
MW: 275.20 **MF:** $C_{12}H_{16}Cl_2N_2O$



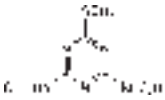
PS-379 **Terbutryne**
2-tert-Butylamino-4-ethylamino-6-methyl-thio-s-triazine, Prebane®, GS 14260, Igran®
CAS: 886-50-0 **LD_{50}:** 2,000mg/kg
MW: 241.40 **MF:** $C_{10}H_{19}N_5S$



PS-380 **Atrazine**
2-Chloro-4-ethylamino-6-isopropyl amino-s-triazine, Aatrex®, Gesaprim®, Atratol®
CAS: 1912-24-9 **LD_{50}:** 1,750mg/kg
MW: 215.72 **MF:** $C_8H_{14}ClN_5$



PS-381 **Simetryn**
2,4-Bis(ethylamino)-6-methylthio-1,3,5-triazine, N,N'-Diethyl-6-(methyl thio)-1,3,5-triazine-2,4-diamine, Gybon®
CAS: 1014-70-6 **LD_{50}:** 750mg/kg
MW: 213.34 **MF:** $C_8H_{15}N_5S$



PS-382 **Aminotriazole**
3-Amino-1.2.4-triazole, Amigol®, Amitrole®, Amizol®, Cytrol®, Weedazol®, ATA®
CAS: 61-82-5 **LD_{50}:** 1,100mg/kg
MW: 84.10 **MF:** $C_2H_4N_4$



PS-383 **Ametryne**
2-Ethylamino-4-isopropylamino-6-methylthio-s-triazine, Gesapax®, EVIK®
CAS: 834-12-8 **LD_{50}:** 1,100mg/kg
MW: 227.37 **MF:** $C_9H_{17}N_5S$



PS-384 **Prometryne**
2.4-Bis(isopropylamino)-6-methyl thio-s-triazine, Caparol®, Gesagard®, Primatol Q®
CAS: 7287-19-6 **LD_{50}:** 3,150mg/kg
MW: 241.40 **MF:** $C_{10}H_{19}N_5S$



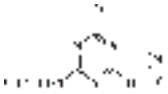
PS-385 **Propazine**
2-Chloro-4.6-bis(isopropylamino)-s-triazine, Milogard®, Gesamil®, Primatol P®
CAS: 139-40-2 **LD_{50}:** 3,840mg/kg
MW: 229.75 **MF:** $C_9H_{16}ClN_5$



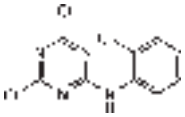
PS-386 **Prometon**
2-Methoxy-4.6-bis(isopropylamino) -s-triazine, Pramitol®, Primatol®
CAS: 1610-18-0 **LD_{50}:** 3,000mg/kg
MW: 225.34 **MF:** $C_{10}H_{19}N_5O$



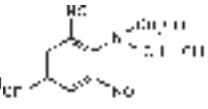
PS-387 **Bladex**
2-[(4-Chloro-6-ethylamino-s-triazin -2-yl)amino]-2-methylpropionitrile, Payze®, Cyanazine
CAS: 21725-46-2 **LD_{50}:** 182mg/kg
MW: 240.73 **MF:** $C_9H_{13}ClN_6$



PS-388 **Anilazine**
2.4-Dichloro-6-o-chloroanilino-s-triazine, Dyrene®, B-622, Kemate®, Triazine®
CAS: 101-05-3 **LD_{50}:** 2,710mg/kg
MW: 275.53 **MF:** $C_9H_5Cl_3N_4$



PS-389 **Benfluralin**
N-Butyl-N-ethyl-a.a.a-trifluoro-2.6-dinitro-p-toluidine, Quilan®, Binnell®, Benefin®, Balan®
CAS: 1861-40-1 **LD_{50}:** 10,000mg/kg
MW: 335.32 **MF:** $C_{13}H_{16}F_3N_3O_4$

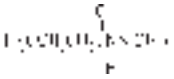


Chem Service Pesticide Standards - Numerical Listing

PS-390 **N-[(2.4-Dichlorophenoxy)acetyl]-DL-methionine**
CAS: N/A **LD_{50}:** N/A
MW: 352.24 **MF:** $C_{13}H_{15}Cl_2NO_4S$



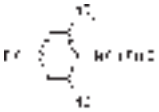
PS-391 **Daminozide**
Succinic acid 2.2-dimethylhydrazide, Alar®, B-Nine®, SADH®, Aminozide®
CAS: 1596-84-5 **LD_{50}:** 8,400mg/kg
MW: 160.17 **MF:** $C_6H_{12}N_2O_3$



PS-392 **2.6-Dichlorobenzonitrile**
Casoron®, Dichlobenil
CAS: 1194-65-6 **LD_{50}:** 2,710mg/kg
MW: 172.01 **MF:** $C_7H_3Cl_2N$



PS-393 **Trifluralin**
a.a.a-Trifluoro-2.6-dinitro-N.N-dipropyl-p-toluidine, Treflan®, 4-Dipropylamino-3.5-dinitrobenzo trifluoride
CAS: 1582-09-8 **LD_{50}:** 500mg/kg
MW: 335.32 **MF:** $C_{13}H_{16}F_3N_3O_4$



PS-394 **Nitrofen**
TOK®, NIP®, Niclofen®
CAS: 1836-75-5 **LD_{50}:** 638mg/kg
MW: 284.10 **MF:** $C_{12}H_7Cl_2NO_3$



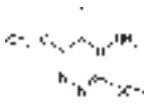
PS-395 **Atraton**
2-[Ethylamino]-4-[isopropylamino]-6-methoxy-s-triazine, Gesatamin, 2-Methoxyatrazine
CAS: 1610-17-9 **LD_{50}:** 1,465mg/kg
MW: 211.31 **MF:** $C_9H_{17}N_5O$



PS-397 **3.5-Diiodo-4-hydroxybenzonitrile**
Ioxynil, Bantrol®, 4-Hydroxy-3,5-diiodobenzonitrile, ACP 63303®, Certrol®, Actril®, 4-Hydroxy-3,5-diiodophenyl cyanide
CAS: 1689-83-4 **LD_{50}:** 110mg/kg
MW: 370.91 **MF:** $C_7H_3I_2NO$



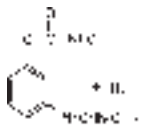
PS-398 **Metribuzin**
4-Amino-6-tert-butyl-3-[methylthio]-1.2.4-triazine-5[4H]-one, Sencor®, DIC 1468®, Lexone®
CAS: 21087-64-9 **LD_{50}:** 2,200mg/kg
MW: 214.32 **MF:** $C_8H_{14}N_4OS$



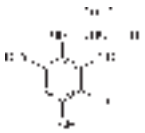
PS-399 **Profluoralin ®**
N-Propyl-N-cyclopropylmethyl-2.6-dinitro-4-(a,a,a-trifluoro)toluidine, Tolban®
CAS: 26399-36-0 **LD_{50}:** 10,000mg/kg
MW: 347.33 **MF:** $C_{14}H_{16}F_3N_3O_4$



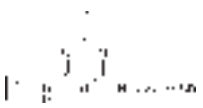
PS-400 **Formetanate hydrochloride**
N.N-Dimethyl-N'-[3-[[(methylamino)-carbonyl]oxy]phenyl] methanimidamide, Carzol SP®
CAS: 23422-53-9 **LD_{50}:** 21mg/kg
MW: 257.75 **MF:** $C_{11}H_{15}N_3O_2.HCl$



PS-401 **Prowl ®**
N-[1-Ethylpropyl]-3.4-dimethyl-2.6-dinitrobenzeneamine, Horbadox®, Stomp®, Pendimethalin
CAS: 40487-42-1 **LD_{50}:** 1,250mg/kg
MW: 281.35 **MF:** $C_{13}H_{19}N_3O_4$



PS-402 **Procyazine**
2-[[-4-Chloro-6-(cyclopropylamino)-1.3.5-triazin-2-yl]-amino]-2-methylpropanenitrile, Cycle®
CAS: 32889-48-8 **LD_{50}:** 290mg/kg
MW: 252.74 **MF:** $C_{10}H_{13}ClN_6$



PS-403 **Metolachlor**
(ACS Standard Grade)
2-Chloro-N-[2-ethyl-6-methylphenyl] -N-[2-methoxy-1-methylethyl] acetamide,
Dual
CAS: 51218-45-2 **LD_{50}:** 2,780mg/kg
MW: 283.83 **MF:** $C_{15}H_{22}ClNO_2$



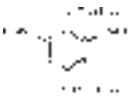
PS-403-1 **S-Metolachlor**
Mix of [(aRS,1S)-2-Chloro-6'-ethyl-N-(2-methoxy-1-methylethyl)aceto-o-toluidide and (aRS,1R)-2-Chloro-6'-ethyl-N-(2-methoxy-1-methylethyl)ac
CAS: 87392-12-9 **LD_{50}:** 2,672mg/kg
MW: 283.83 **MF:** $C_{15}H_{22}ClNO_2$



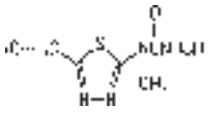
PS-404 **Difenzoquat methylsulfate**
1.2-Dimethyl-3.5-diphenyl-1H-pyrazolium methyl sulfate, Avenge®
CAS: 43222-48-6 **LD_{50}:** 470mg/kg
MW: 348.45 **MF:** $C_{16}H_{17}N_2.CH_3O_4S$



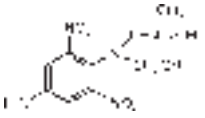
PS-406 **Isopropalin**
2.6-Dinitro-N.N-di-n-propyl cumidine, Paarlan®
CAS: 33820-53-0 **LD_{50}:** 5,000mg/kg
MW: 309.41 **MF:** $C_{15}H_{23}N_3O_4$



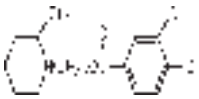
PS-407 **Tebuthiuron**
N-[5-(1.1-Dimethylethyl)-1.3.4-thiadiazol-2-yl]-N.N'-dimethylurea, Spike®
CAS: 34014-18-1 **LD_{50}:** 644mg/kg
MW: 228.35 **MF:** $C_9H_{16}N_4OS$



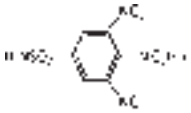
PS-408 **Ethalfluralin**
N-Ethyl-N-(2-methyl-2-propenyl)-2.6-dinitro-4-(trifluoromethyl) benzenamine, Sonalan®
CAS: 55283-68-6 **LD_{50}:** N/A
MW: 333.30 **MF:** $C_{13}H_{14}F_3N_3O_4$



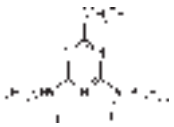
PS-409 **Piperalin**
3-(2-Methylpiperidino)propyl-3.4-dichlorobenzoate, Pipron®
CAS: 3478-94-2 **LD_{50}:** 2,500mg/kg
MW: 330.28 **MF:** $C_{16}H_{21}Cl_2NO_2$



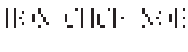
PS-410 **Oryzalin**
3.5-Dinitro-N4,N4-dipropyl sulfanilamide, Surflan®
CAS: 19044-88-3 **LD_{50}:** N/A
MW: 346.40 **MF:** $C_{12}H_{18}N_4O_6S$



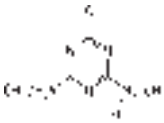
PS-411 **Dipropetryn**
2-Ethylthio-4.6-di(isopropylamino)-1.3.5-triazine, Sancap®
CAS: 4147-51-7 **LD_{50}:** 3,900mg/kg
MW: 255.43 **MF:** $C_{11}H_{21}N_5S$



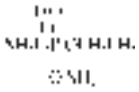
PS-412 **Ethanedial dioxime**
Glyoxime, Pik-off®
CAS: 557-30-2 **LD_{50}:** 119mg/kg
MW: 88.08 **MF:** $C_2H_4N_2O_2$



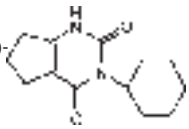
PS-413 **Terbuthylazine**
2-tert-Butylamino-4-chloro-6-ethylamino-1.3.5-triazine, Gardoprim®
CAS: 5915-41-3 **LD_{50}:** 2,000mg/kg
MW: 229.75 **MF:** $C_9H_{16}ClN_5$



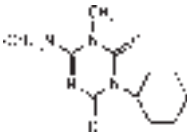
PS-414 **Fosamine Ammonium**
Ammonium ethyl carbamoyl phosphonate, Krenite®
CAS: 25954-13-6 **LD_{50}:** 10,125mg/kg
MW: 170.13 **MF:** $H_4N.C_3H_7NO_4P$



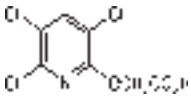
PS-415 **Lenacil**
3-Cyclohexyl-5.6-trimethyleneuracil, Venzar®, 3-Cyclohexyl-6,7-dihydro-1(H)-cyclopentapyrimidine-2,4-(3H,5H)-dione
CAS: 2164-08-1 **LD_{50}:** N/A
MW: 234.33 **MF:** $C_{13}H_{18}N_2O_2$



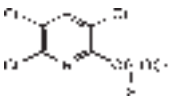
PS-416 **Velpar**
3-Cyclohexyl-6-(dimethylamino)-1-methyl-1.3.5-triazine-2.4-(1H.3H)-dione, Hexazinone
CAS: 51235-04-2 **LD_{50}:** 1,690mg/kg
MW: 252.36 **MF:** $C_{12}H_{20}N_4O_2$



PS-417 **Triclopyr**
[(3.5.6-Trichloro-2-pyridinyl)oxy] acetic acid, Garlon®
CAS: 55335-06-3 **LD_{50}:** 713mg/kg
MW: 256.47 **MF:** $C_7H_4Cl_3NO_3$



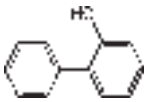
PS-418 **Chlorpyrifos Methyl**
O.O-Dimethyl O-(3,5,6-trichloro-2-pyridinyl) phosphorothioate, Methyl Dursban, Reldan®
CAS: 5598-13-0 **LD_{50}:** 1,828mg/kg
MW: 322.53 **MF:** $C_7H_7Cl_3NO_3PS$



PS-419 **Nitrapyrin**
2-Chloro-6-(trichloromethyl)pyridine, N-Serve®
CAS: 1929-82-4 **LD_{50}:** 1,072mg/kg
MW: 230.90 **MF:** $C_6H_3Cl_4N$



PS-420 **o-Phenylphenol**
Dowicide 1®, 2-Hydroxybiphenyl
CAS: 90-43-7 **LD_{50}:** 2,480mg/kg
MW: 170.22 **MF:** $C_{12}H_{10}O$



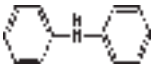
PS-425 **Bensulide**
S-2-Benzenesulfonamidoethyl-O,O-di-isopropylphosphorodithioate, Betasan®, Prefar®, Bensumec®, Pre-San®
CAS: 741-58-2 **LD_{50}:** 271mg/kg
MW: 397.54 **MF:** $C_{14}H_{24}NO_4PS_3$



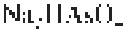
PS-426 **Bromoxynil**
3.5-Dibromo-4-hydroxybenzonitrile, Brominal®, Brominil®, Buctril®, 3.5-Dibromo-4-hydroxyphenyl cyanide
CAS: 1689-84-5 **LD_{50}:** 190mg/kg
MW: 276.93 **MF:** $C_7H_3Br_2NO$



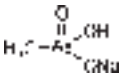
PS-427 **Diphenylamine**
CAS: 122-39-4 **LD_{50}:** 300mg/kg
MW: 169.24 **MF:** $C_{12}H_{11}N$



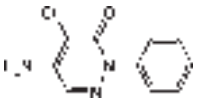
PS-428 **Sodium arsenate**
CAS: 7778-43-0 **LD_{50}:** 10mg/kg
MW: 185.91 **MF:** Na_2AsHO_4



PS-429 **Monosodium acid methane arsonate sesquihydrate**
MSMA sesquihydrate, Daconate®, Bueno®, Ansar 170®, Diamond Arsonate Liquid®, Mesamate®
CAS: 2163-80-6 **LD_{50}:** 700mg/kg
MW: 189.0 **MF:** $CH_4AsNaO_3.1.5H_2O$



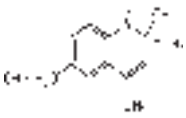
PS-430 **Pyrazon**
5-Amino-4-chloro-2-phenyl-3(2H)-pyridazinone, Pyramine, PCA, Chloridazon
CAS: 1698-60-8 **LD_{50}:** 2,424mg/kg
MW: 221.66 **MF:** $C_{10}H_8ClN_3O$



PS-431 **Fluorodifen**
p-Nitrophenyl-2-nitro-4-[trifluoro methyl]phenyl ether, Preforan®
CAS: 15457-05-3 **LD_{50}:** 9,000mg/kg
MW: 328.22 **MF:** $C_{13}H_7F_3N_2O_5$



PS-432 **Ethoxyquin**
1.2-Dihydro-6-ethoxy-2.2.4-trimethyl-quinoline, Stop-Scald, Santoquin®
CAS: 91-53-2 **LD_{50}:** 1,920mg/kg
MW: 217.34 **MF:** $C_{14}H_{19}NO$

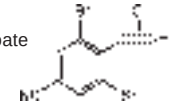


Chem Service Pesticide Standards - Numerical Listing

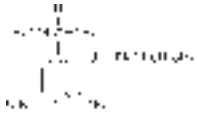
PS-433 **4.6-Dinitro-2-sec-butylphenol ethanolamine salt**
2-sec-Butyl-4.6-dinitrophenol, ethanolamine salt
CAS: N/A **LD_{50}:** 58mg/kg
MW: 300.29 **MF:** $C_{12}H_{18}N_3O_6$



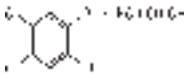
PS-434 **Bromoxynil octanoic acid ester**
2,6-Dibromo-4-cyanophenyl octanoate
CAS: 1689-99-2 **LD_{50}:** 250mg/kg
MW: 403.15 **MF:** $C_{15}H_{17}Br_2NO_2$



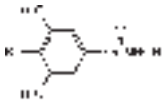
PS-436 **2-sec-Butyl-4,6-dinitrophenol triethanolamine salt**
Gebotox®
CAS: 6420-47-9 **LD_{50}:** 37mg/kg
MW: 389.46 **MF:** $C_{10}H_{12}N_2O_5.C_6H_{15}NO_3$



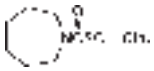
PS-437 **2.4.5-Trichlorophenol ethanolamine salt**
CAS: N/A **LD_{50}:** N/A
MW: 274.53 **MF:** $C_8H_{10}Cl_3NO_2$



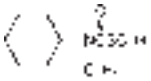
PS-450 **BDMC**
4-Bromo-3.5-dimethyl phenyl-N-methyl carbamate
CAS: N/A **LD_{50}:** N/A
MW: 258.12 **MF:** $C_{10}H_{12}BrNO_2$



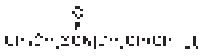
PS-501 **Molinate**
S-Ethylhexahydro-1H-azepine-1-carbothioate, Ordram®, Hydram, Ethyl-1-hexamethylene imine carbothiolate
CAS: 2212-67-1 **LD_{50}:** 369mg/kg
MW: 187.33 **MF:** $C_9H_{17}NOS$



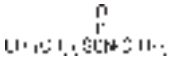
PS-502 **Cycloate**
S-Ethyl cyclohexyl(ethyl)thio carbamate, Ro-Neet, Eurex, S-Ethyl-N-ethyl-N-cyclohexylthiol carbamate
CAS: 1134-23-2 **LD_{50}:** 2,000mg/kg
MW: 215.39 **MF:** $C_{11}H_{21}NOS$



PS-503 **Butylate**
S-Ethyl diisobutylthiocarbamate, Sutan, S-Ethyl-N,N-diisobutylthiol carbamate
CAS: 2008-41-5 **LD_{50}:** 3,500mg/kg
MW: 217.41 **MF:** $C_{11}H_{23}NOS$



PS-504 **Vernolate**
S-Propyl-N.N-dipropylthiolcarbamate, Vernam®, S-Propyl dipropylthio carbamate
CAS: 1929-77-7 **LD_{50}:** 1,500mg/kg
MW: 203.38 **MF:** $C_{10}H_{21}NOS$



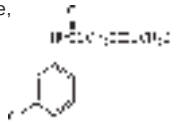
PS-506 **Tri-allate**
S-(2.3.3-Trichloroallyl)diisopropyl thiocarbamate, Avadex BW®, 2.3.3-Trichloroallyl-N.N-diisopropyl thiolcarbamate, Fargo®
CAS: 2303-17-5 **LD_{50}:** 1,675mg/kg
MW: 304.68 **MF:** $C_{10}H_{16}Cl_3NOS$



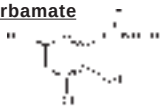
PS-507 **Di-allate**
S-[2.$_3$-Dichloroallyl]-N.N'-diisopropyl thiocarbamate, Avadex®, DATC
CAS: 2303-16-4 **LD_{50}:** 395mg/kg
MW: 270.24 **MF:** $C_{10}H_{17}Cl_2NOS$



PS-540 **Barban**
4-Chloro-2-butynyl-m-chlorocarbanilate, 4-Chloro-2-butynyl-N-[3-chloro phenyl]-carbamate, Barbamate®, Carbyne®
CAS: 101-27-9 **LD_{50}:** 600mg/kg
MW: 258.11 **MF:** $C_{11}H_9Cl_2NO_2$

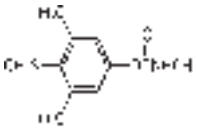


PS-541 **2.3.5-Trimethylphenyl methyl carbamate**
2,3,5-Trimethacarb
CAS: 2655-15-4 **LD_{50}:** 208mg/kg
MW: 193.27 **MF:** $C_{11}H_{15}NO_2$

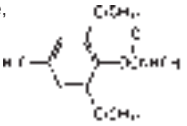


PS-542 **3,4,5-Trimethylphenyl methyl carbamate**
3,4,5-Trimethacarb
CAS: 2686-99-9 **LD_{50}:** 178mg/kg
MW: 193.27 **MF:** $C_{11}H_{15}NO_2$
Structure Not Available

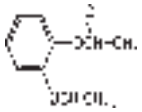
PS-543 **Methiocarb**
3.5-Dimethyl-4-[methylthio]phenyl methylcarbamate, 4-[Methylthio]-3.5-xylyl-N-methylcarbamate, Mesurol®, Mercaptodimethur
CAS: 2032-65-7 **LD_{50}:** 10mg/kg
MW: 225.33 **MF:** $C_{11}H_{15}NO_2S$



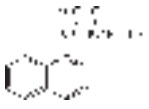
PS-550 **Terbutol**
2.6-Di-t-butyl-p-tolyl-methylcarbamate, 2.6-Di-t-butyl-4-methylphenyl N-methylcarbamate, Terbucarb, Azak®
CAS: 1918-11-2 **LD_{50}:** 34,000mg/kg
MW: 277.45 **MF:** $C_{17}H_{27}NO_2$



PS-551 **Baygon ®**
O-Isopropoxyphenyl methyl carbamate, 2-Isopropoxyphenyl-N-methylcarbamate, Propoxur, Blattanex®, Unden®, Aprocarb®, Sendran®, Tendex®, Suncide®
CAS: 114-26-1 **LD_{50}:** 83mg/kg
MW: 209.27 **MF:** $C_{11}H_{15}NO_3$



PS-553 **Devrinol ®**
2-(a-Naphthoxy)-N.N-diethyl propionamide, Napropamide®, Waylay®
CAS: 15299-99-7 **LD_{50}:** 500mg/kg
MW: 271.39 **MF:** $C_{17}H_{21}NO_2$

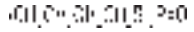


PS-561 **2.3.5-Triiodobenzoic acid**
TIBA®, Floraltone, Regim-8®
CAS: 88-82-4 **LD_{50}:** 813mg/kg
MW: 499.80 **MF:** $C_7H_3I_3O_2$



Chem Service Pesticide Standards - Numerical Listing

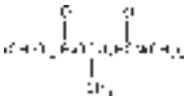
PS-562 **S.S.S-Tributylphosphorotrithioate**
Degreen, DEF®, Fos-Fall "A", E-Z Off D, Chemagro B-1776, Tribufos
CAS: 78-48-8 **LD_{50}:** 200mg/kg
MW: 314.54 **MF:** $C_{12}H_{27}OPS_3$



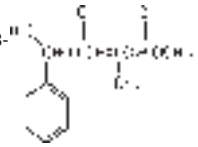
PS-601 **Tetraethylpyrophosphate**
TEPP, Nifos T®, Mortopal®, Killaz, Tetron, Ethyl pyrophosphate, Vapotone®, HETP
CAS: 107-49-3 **LD_{50}:** 1mg/kg
MW: 290.22 **MF:** $C_8H_{20}O_7P_2$



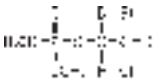
PS-602 **Dicrotophos**
Carbicron, Ektafos®, (E)-2-Dimethylcarbamoyl-1-methylvinyldimethyl phosphate
CAS: 141-66-2 **LD_{50}:** 16mg/kg
MW: 237.22 **MF:** $C_8H_{16}NO_5P$



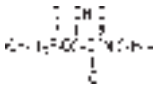
PS-603 **Crotoxyphos**
a-Methylbenzyl-3-hydroxycrotonate dimethylphosphate, 1-Methylbenzyl-3-[dimethoxyphosphinyloxy]cis-crotonate, Ciodrin®
CAS: 7700-17-6 **LD_{50}:** 53mg/kg
MW: 314.30 **MF:** $C_{14}H_{19}O_6P$



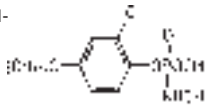
PS-605 **Naled**
Dibrom, 1.2-Dibromo-2.2-dichloro ethyl dimethylphosphate
CAS: 300-76-5 **LD_{50}:** 250mg/kg
MW: 380.80 **MF:** $C_4H_7Br_2Cl_2O_4P$



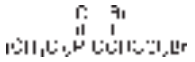
PS-606 **Phosphamidon**
Dimecron®, CIBA 570, 2-Chloro-2-diethylcarbamoyl-1-methylvinyl dimethyl phosphate, 2-Chlorodiethyl carbamoyl methyl vinyl dimethyl phosphate
CAS: 13171-21-6 **LD_{50}:** 17mg/kg
MW: 299.72 **MF:** $C_{10}H_{19}ClNO_5P$



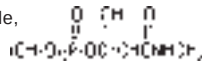
PS-607 **Ruelene ®**
4-tert-Butyl-2-chlorophenylmethyl-N-methyl-phosphoramidate, Montrel, Crufomate
CAS: 299-86-5 **LD_{50}:** 770mg/kg
MW: 291.74 **MF:** $C_{12}H_{19}ClNO_3P$



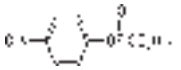
PS-608 **Dylox ®**
Dimethyl-[2.2.2-trichloro-1-hydroxy ethyl]phosphonate, Anthon, Dipterex®, Dyrex®, Neguvon®, Trichlorfon, Tugon®, Chlorofos, Metrifonate, (2,2,2-Trichloro-1-hydroxyethyl)phosphonic acid dimethyl ester
CAS: 52-68-6 **LD_{50}:** 150mg/kg
MW: 257.44 **MF:** $C_4H_8Cl_3O_4P$



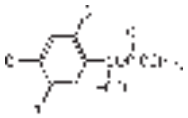
PS-609 **Monocrotophos**
Dimethyl phosphate ester of 3-hydroxy-N-methyl-cis-crotonamide, cis-3-[Dimethoxyphosphinyloxy]-N-methyl-crotonamide, Nuvacron®, Azodrin
CAS: 6923-22-4 **LD_{50}:** 8mg/kg
MW: 223.19 **MF:** $C_7H_{14}NO_5P$



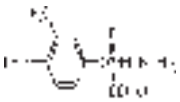
PS-610 **Paraoxon**
(ACS Standard Grade)
Diethyl-p-nitrophenylphosphate, Eticol, Fosfakol, Mintacol, Miotisal A, Soluglaucit, O.O-Diethylphosphoric acid-o-p-nitrophenyl ester, Phosphacol, Parathion O-analog
CAS: 311-45-5 **LD_{50}:** 2mg/kg
MW: 275.22 **MF:** $C_{10}H_{14}NO_6P$



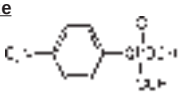
PS-611 **Tetrachlorvinphos**
2-Chloro-1-[2.4.5-trichlorophenyl] vinyl-dimethylphosphate, Gardona®, Rabon®, Revap®, Stirifos, Dimethyl-1-[2.4.5-trichlorophenyl]-2-chlorovinyl phosphate
CAS: 961-11-5 **LD_{50}:** 4,000mg/kg
MW: 365.96 **MF:** $C_{10}H_9Cl_4O_4P$



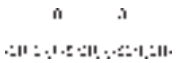
PS-612 **Phenamiphos**
Ethyl-3-methyl-4-[methylthio]phenyl[1-methylethyl]phosphoramidate, Ethyl-4-[methylthio]-m-tolyl isopropylphosphoroamidate, Nemacur®, Fenamiphos
CAS: 22224-92-6 **LD_{50}:** 8mg/kg
MW: 303.39 **MF:** $C_{13}H_{22}NO_3PS$



PS-613 **Dimethyl-p-nitrophenylphosphate**
Methyl paraoxon, Parathion methyl O-analog
CAS: 950-35-6 **LD_{50}:** 3mg/kg
MW: 247.16 **MF:** $C_8H_{10}NO_6P$



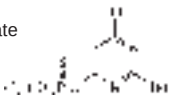
PS-641 **Oxydemeton-methyl**
O.O-Dimethyl-S-(2-ethylsulfinylethyl) phosphorothioate, Metasystox-R®, Demeton-S-methyl sulfoxide
CAS: 301-12-2 **LD_{50}:** 65mg/kg
MW: 246.30 **MF:** $C_6H_{15}O_4PS_2$



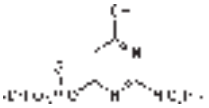
PS-642 **Dioxydemeton-S-methyl**
O.O-Dimethyl-S-(2-ethylsulfonyl ethyl)phosphorothioate, Metasystox R sulfone, Oxydemeton-methyl sulfone, Demeton-S-methyl sulfone
CAS: 17040-19-6 **LD_{50}:** 40mg/kg
MW: 262.30 **MF:** $C_6H_{15}O_5PS_2$



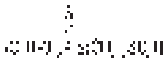
PS-643 **Pirimiphos-ethyl**
O.O-Diethyl-O-[2-(diethylamino)-6-methyl-4-pyrimidinyl]phosphorothioate Primicid®
CAS: 23505-41-1 **LD_{50}:** 140mg/kg
MW: 333.43 **MF:** $C_{13}H_{24}N_3O_3PS$



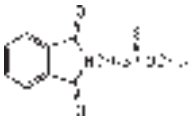
PS-644 **Pirimiphos-methyl**
(ACS Standard Grade)
O.O-Dimethyl-O-[2-(diethylamino)-6-methyl-4-pyrimidinyl]phosphoro thioate, Actellic®
CAS: 29232-93-7 **LD_{50}:** 2,000mg/kg
MW: 305.37 **MF:** $C_{11}H_{20}N_3O_3PS$



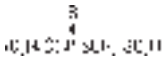
PS-652 **Disulfoton**
O.O-Diethyl-S-[2-(ethylthio)ethyl] phosphorodithioate, Di-Syston®, Dithio-Systox®, Thiodemeton®, Dithiodemeton®
CAS: 298-04-4 **LD_{50}:** 2mg/kg
MW: 274.42 **MF:** $C_8H_{19}O_2PS_3$



PS-653 **Imidan** ®
O.O-Dimethyl-S-phthalimido methyl phosphorodithioate, O.O-Dimethyl phthalimido-methyl phosphoro thiolothionate, Phosmet, Prolate, Phthalophos, N-[Mercaptomethyl] phthalimide-S-[O.O-dimethyl phosphorodithioate]
CAS: 732-11-6 **LD_{50}:** 113mg/kg
MW: 317.33 **MF:** $C_{11}H_{12}NO_4PS_2$



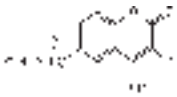
PS-654 **Phorate**
(ACS Standard Grade)
O.O-Diethyl-S-[(ethylthio)methyl] phosphorodithioate, Thimet®
CAS: 298-02-2 **LD_{50}:** 2mg/kg
MW: 260.39 **MF:** $C_7H_{17}O_2PS_3$



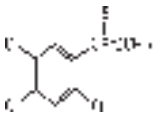
PS-655 **Fenthion**
(ACS Standard Grade)
O.O-Dimethyl-O-[4-(methylthio)-m-tolyl]-phosphorothioate, Baytex®, Entex®, Lebaycid®, Mercaptophos®, Tiguvon®, Queleton®, Baycid®, Queletox®, Fenthion-methyl
CAS: 55-38-9 **LD_{50}:** 180mg/kg
MW: 278.34 **MF:** $C_{10}H_{15}O_3PS_2$



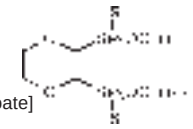
PS-656 **Coumaphos**
O.O-Diethyl-O-[3-chloro-4-methyl-2-oxo-2H-1-benzopyran-7-yl] phosphorothioate, Muscatox®, Resitox®, Asuntol®, 7-Co-Ral®
CAS: 56-72-4 **LD_{50}:** 13mg/kg
MW: 362.78 **MF:** $C_{14}H_{16}ClO_5PS$



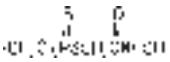
PS-657 **Fenchlorphos**
O.O-Dimethyl-O-[2.4.5-trichloro phenyl]phosphorothioate, Etrolene, Korlan®, Nankor®, Ronnel®, Trolene, Viozene®
CAS: 299-84-3 **LD_{50}:** 625mg/kg
MW: 321.54 **MF:** $C_8H_8Cl_3O_3PS$



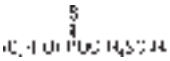
PS-658 **Dioxathion**
S,S'-(p-Dioxane-2.3-diyl)O,O,O',O'-tetraethyl di(phosphorodithioate), Delnav®, Navadel®, S,S'-p-Dioxane-2,3-bis[O.O-diethyl phosphorodithioate]
CAS: 78-34-2 **LD_{50}:** 23mg/kg
MW: 456.56 **MF:** $C_{12}H_{26}O_6P_2S_4$



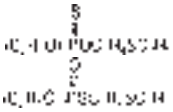
PS-659 **Dimethoate**
(ACS Standard Grade)
O.O-Dimethyl-S-(N-methylcarbamoyl methyl)phosphorodithioate, Cygon®, Rogor®, Fostion MM®, Dimetate®, Roxion®, Perfekthion®
CAS: 60-51-5 **LD_{50}:** 215mg/kg
MW: 229.27 **MF:** $C_5H_{12}NO_3PS_2$



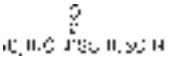
PS-661 **Demeton O**
Di-septon, O,O-Diethyl O-2-(ethylthio)ethyl phosphorothioate, Diethyl 2-eththioethyl thionophosphate
CAS: 298-03-3 **LD_{50}:** 2mg/kg
MW: 258.341 **MF:** $C_8H_{19}O_3PS_2$



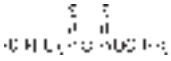
PS-661/662 **Demeton O&S**
Systox
CAS: 8065-48-3 **LD_{50}:** 2mg/kg
MW: 258.341 **MF:** $C_8H_{19}O_3PS_2$



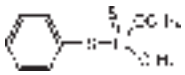
PS-662 **Demeton S**
O.O-Diethyl-S-[2-(ethylthio)ethyl] phosphorothioate
CAS: 126-75-0 **LD_{50}:** 2mg/kg
MW: 258.36 **MF:** $C_8H_{19}O_3PS_2$



PS-663 **Aspon** ®
O.O.O'.O'-Tetrapropyl dithiopyro phosphate, Asp-51, Tetra-n-propyl dithionopyrophosphate
CAS: 3244-90-4 **LD_{50}:** 891mg/kg
MW: 378.46 **MF:** $C_{12}H_{28}O_5P_2S_2$



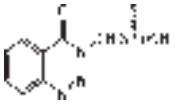
PS-664 **Dyfonate** ®
O-Ethyl-S-phenylethylphosphono dithioate, Fonofos,
CAS: 944-22-9 **LD_{50}:** 3mg/kg
MW: 246.34 **MF:** $C_{10}H_{15}OPS_2$



PS-665 **Abate** ®
O,O,O',O'-Tetramethyl-O.O'-thio-di-p-phenylene phosphorothioate, Abathion®, Abat®, Swebate®, Nimitex®, Biothion®, Temephos, Tetrafenphos, Abaphos®
CAS: 3383-96-8 **LD_{50}:** 1,300mg/kg
MW: 466.48 **MF:** $C_{16}H_{20}O_6P_2S_3$



PS-666 **Guthion** ®
O.O-Dimethyl-S-[4-oxo-1.2.3-benzotriazin-3(4H)-ylmethyl]phos phorodithioate, Azinphos methyl, Barben®, Gusathion M®
CAS: 86-50-0 **LD_{50}:** 7mg/kg
MW: 317.34 **MF:** $C_{10}H_{12}N_3O_3PS_2$

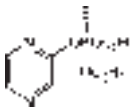


Chem Service Pesticide Standards - Numerical Listing

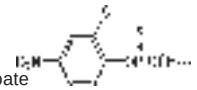
PS-667 **Fensulfothion**
O.O-Diethyl[p-(methylsulfinyl) phenyl]phosphorothioate, Dasanit®, Terracur P®
CAS: 115-90-2 **LD_{50}:** 5mg/kg
MW: 308.37 **MF:** $C_{11}H_{17}O_4PS_2$



PS-668 **Zinophos ®**
Namafos®, Thionazin, Cynem®, O,O-Diethyl-O-2-pyrazinylphos phorothioate
CAS: 297-97-2 **LD_{50}:** 4mg/kg
MW: 248.26 **MF:** $C_8H_{13}N_2O_3PS$



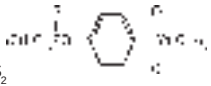
PS-669 **Dicapthon**
O.O-Dimethyl-O-(2-chloro-4-nitro phenyl)phosphorothioate, Di-Captan®, O-(2-Chloro-4-nitro phenyl)-O.O-dimethyl phosphorothioate
CAS: 2463-84-5 **LD_{50}:** 330mg/kg
MW: 297.66 **MF:** $C_8H_9ClNO_5PS$



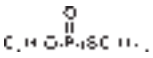
PS-670 **O.O-Diethyl phosphorochloridothioate**
CAS: 2524-04-1 **LD_{50}:** 1,000mg/kg
MW: 188.62 **MF:** $C_4H_{10}ClO_2PS$



PS-671 **Famphur**
O.O-Dimethyl-O-p-(dimethylsulfamoyl) phenyl phosphorothioate, Warbex®, Famophos®
CAS: 52-85-7 **LD_{50}:** 28mg/kg
MW: 325.36 **MF:** $C_{10}H_{16}NO_5PS_2$



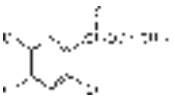
PS-672 **Prophos**
O-Ethyl-S.S-dipropylphosphorodithioate, Mocap®, Ethoprop®, Phophos®, Phosethoprop, Ethoprophos®
CAS: 13194-48-4 **LD_{50}:** 62mg/kg
MW: 242.36 **MF:** $C_8H_{19}O_2PS_2$



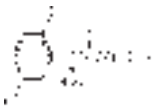
PS-673 **Guthion Ethyl**
O.O-Diethyl-S-[4-oxo-1.2.3-benzo triazin-3-[4H]-ylmethyl]phosphoro dithioate, Azinphos ethyl, Gusathion A®
CAS: 2642-71-9 **LD_{50}:** 12mg/kg
MW: 345.40 **MF:** $C_{12}H_{16}N_3O_3PS_2$



PS-674 **Chlorpyrifos**
(ACS Standard Grade)
O.O-Diethyl-O-[3.5.6-trichloro-2-pyridyl]-phosphorothioate, Dursban®, Trichlorpyrphos, Pyrinex®
CAS: 2921-88-2 **LD_{50}:** 82mg/kg
MW: 350.59 **MF:** $C_9H_{11}Cl_3NO_3PS$



PS-675 **Akton ®**
O.O-Diethyl-O-[2-chloro-1-[2.5-dichlorophenyl]vinyl]phosphoro thioate, O-[2-Chloro-1-[2.5-dichloro phenyl]vinyl]O.O-diethyl phosphoro thioate
CAS: 1757-18-2 **LD_{50}:** 146mg/kg
MW: 375.64 **MF:** $C_{12}H_{14}Cl_3O_3PS$



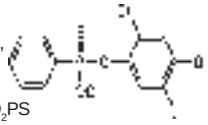
PS-676 **Methamidophos**
(ACS Standard Grade)
O.S-Dimethyl phosphoramidothioate, Monitor®, Tamaron®
CAS: 10265-92-6 **LD_{50}:** 30mg/kg
MW: 141.14 **MF:** $C_2H_8NO_2PS$



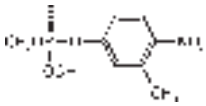
PS-676-1 **N-Methyl-methamidophos**
CAS: 28167-49-9 **LD_{50}:** N/A
MW: 155.0 **MF:** $C_3H_{10}NO_2PS$



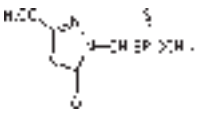
PS-677 **Leptophos**
O-(4-Bromo-2.5-dichlorophenyl)-O-methylphenyl phosphonothioate, Phosvel®, Abar®, Lepton®
CAS: 21609-90-5 **LD_{50}:** 43mg/kg
MW: 412.07 **MF:** $C_{13}H_{10}BrCl_2O_2PS$



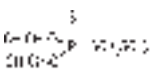
PS-678 **Fenitrothion**
O.O-Dimethyl-O-(4-nitro-m-tolyl) phosphorothioate, Accothion®, Folithion®, Sumithion®, Cytel®, Cyfen®
CAS: 122-14-5 **LD_{50}:** 250mg/kg
MW: 277.24 **MF:** $C_9H_{12}NO_5PS$



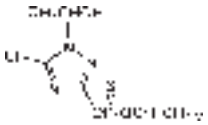
PS-679 **Methidathion**
O.O-Dimethyl phosphorodithioate, S-ester with 4-[mercaptomethyl]-2-methoxy-delta² -1.3.4-thiadiazolin-5-one, Supracide®
CAS: 950-37-8 **LD_{50}:** 43mg/kg
MW: 302.34 **MF:** $C_6H_{11}N_2O_4PS_3$



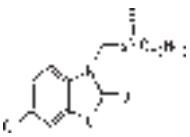
PS-680 **Terbufos**
(ACS Standard Grade)
S-[(1.1-Dimethylethylthio)methyl]-O.O-diethyl phosphorodithioate, Counter®
CAS: 13071-79-9 **LD_{50}:** 5mg/kg
MW: 288.45 **MF:** $C_9H_{21}O_2PS_3$



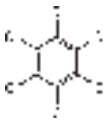
PS-681 **Isazophos**
O.O-Diethyl-O-[1-isopropyl-5-chloro -1.2.4-triazolyl-[3]]-phosphorothioate, Miral®
CAS: 42509-80-8 **LD_{50}:** 40mg/kg
MW: 313.77 **MF:** $C_9H_{17}ClN_3O_3PS$



PS-682 **Phosalone**
O.O-Diethyl-S-[-(6-chloro-2-oxo-benzoxazolin-3-yl)-methyl]-phos phorodithioate, Zolone®, Azofene, Rubitox
CAS: 2310-17-0 **LD_{50}:** 120mg/kg
MW: 367.82 **MF:** $C_{12}H_{15}ClNO_4PS_2$

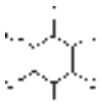


PS-690 **Hexachlorobenzene**
Perchlorobenzene, Anticarie®, Bunt-cure®, Bunt-no-more®, HCB®, Julin's carbon chloride
CAS: 118-74-1 **LD_{50}:** 10,000mg/kg
MW: 284.76 **MF:** C_6Cl_6

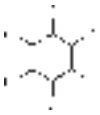


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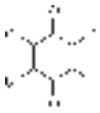
PS-691 **BHC beta isomer**
(ACS Standard Grade)
1.2.3.4.5.6-Hexachlorocyclohexane [b-isomer], b-BHC, beta-Benzenehexachloride, beta-BHC, beta-Hexachloro cyclohexane, beta-HCH
CAS: 319-85-7 **LD_{50}:** 6,000mg/kg
MW: 290.82 **MF:** $C_6H_6Cl_6$



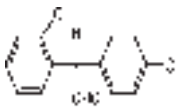
PS-692 **BHC alpha isomer**
(ACS Standard Grade)
1.2.3.4.5.6-Hexachlorocyclohexane [a-isomer], alpha-Hexachloro cyclohexane, alpha-Benzenehexa chloride, a-BHC, alpha-BHC, alpha-HCH
CAS: 319-84-6 **LD_{50}:** 177mg/kg
MW: 290.82 **MF:** $C_6H_6Cl_6$



PS-693 **BHC delta isomer**
(ACS Standard Grade)
delta-Hexachlorocyclohexane, delta-Benzenehexachloride, d-BHC, delta-BHC, 1.2.3.4.5.6-Hexachlorocyclohexane [d-isomer], delta-HCH
CAS: 319-86-8 **LD_{50}:** 1,000mg/kg
MW: 290.82 **MF:** $C_6H_6Cl_6$



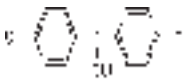
PS-694 **o.p'-DDD**
(ACS Standard Grade)
1.1-Dichloro-2-(o-chlorophenyl)-2-(p-chlorophenyl)ethane
CAS: 53-19-0 **LD_{50}:** 10,000mg/kg
MW: 320.04 **MF:** $C_{14}H_{10}Cl_4$



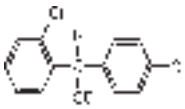
PS-695 **o.p'-DDE**
(ACS Standard Grade)
1.1-Dichloro-2-(p-chlorophenyl)-2-(o-chlorophenyl)ethylene
CAS: 3424-82-6 **LD_{50}:** 880mg/kg
MW: 318.02 **MF:** $C_{14}H_8Cl_4$



PS-696 **p.p'-DDE**
(ACS Standard Grade)
1.1-Dichloro-2.2-bis(p-chlorophenyl) ethylene
CAS: 72-55-9 **LD_{50}:** 880mg/kg
MW: 318.02 **MF:** $C_{14}H_8Cl_4$



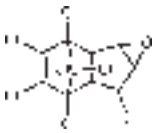
PS-698 **o.p'-DDT**
(ACS Standard Grade)
1.1.1-Trichloro-2-(o-chlorophenyl)-2-(p-chlorophenyl)ethane
CAS: 789-02-6 **LD_{50}:** 1,000mg/kg
MW: 354.48 **MF:** $C_{14}H_9Cl_5$



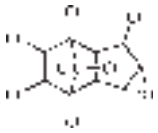
PS-699 **p.p'-DDT**
(ACS Standard Grade)
1.1.1-Trichloro-2.2-bis (p-chlorophenyl)ethane
CAS: 50-29-3 **LD_{50}:** 87mg/kg
MW: 354.48 **MF:** $C_{14}H_9Cl_5$



PS-700 **Heptachlor epoxide (Isomer B)**
(ACS Standard Grade)
1.4.5.6.7.8.8-Heptachloro-2.3-epoxy-3a.4.7.7a-tetrahydro-4.7-methanoindan
CAS: 1024-57-3 **LD_{50}:** 15mg/kg
MW: 389.30 **MF:** $C_{10}H_5Cl_7O$



PS-700-1 **trans-Heptachlor epoxide**
trans-Heptachlor epoxide (Isomer A), 1,4,5,6,7,8,8-Heptachloro-2,3-epoxy-3a,4,7,7a-tetrahydro-4,7-methanoindan
CAS: 28044-83-9 **LD_{50}:** 15mg/kg
MW: 389.30 **MF:** $C_{10}H_5Cl_7O$



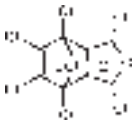
PS-701 **Kepone** ®
(ACS Standard Grade)
Decachloro octahydro-1.3.4-metheno-2H-cyclobuta[cd]pentalen -2-one, Chlordecone
CAS: 143-50-0 **LD_{50}:** 114mg/kg
MW: 490.60 **MF:** $C_{10}Cl_{10}O$



PS-702 **Mirex**
(ACS Standard Grade)
Dodecachloro octahydro-1.3.4-metheno-2H-cyclobuta[cd] pentalene, Perchloropentacyclodecane Dechlorane®
CAS: 2385-85-5 **LD_{50}:** 306mg/kg
MW: 545.50 **MF:** $C_{10}Cl_{12}$



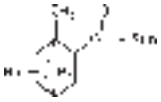
PS-704 **Isobenzan**
1.3.4.5.6.7.8.8-Octachloro-1.3.3a.4.7.7a-hexahydro-4.7-methanoisobenzofuran,Telodrin®, Omtan
CAS: 297-78-9 **LD_{50}:** 2mg/kg
MW: 411.73 **MF:** $C_9H_4Cl_8O$



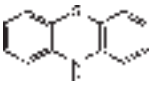
PS-730 **2-[2-Butoxyethoxy]ethyl thiocyanate**
Lethane 384®, Lethane®
CAS: 112-56-1 **LD_{50}:** 90mg/kg
MW: 203.33 **MF:** $C_9H_{17}NO_2S$



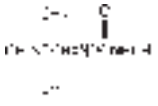
PS-731 **Isobornyl thiocyanoacetate**
Thanite®, Terpinyl thiocyanoacetate
CAS: 115-31-1 **LD_{50}:** 1,000mg/kg
MW: 253.39 **MF:** $C_{13}H_{19}NO_2S$



PS-733 **Phenothiazine**
Dibenzo-1.4-thiazine, Thiodiphenylamine, Phenoxur, Vermitin
CAS: 92-84-2 **LD_{50}:** 5,000mg/kg
MW: 199.28 **MF:** $C_{12}H_9NS$

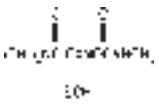


PS-734 **Aldicarb**
2-Methyl-2-[methylthio]propion aldehyde-O-[methylcarbamoyl]oxime, Temik®
CAS: 116-06-3 **LD_{50}:** 1mg/kg
MW: 190.3 **MF:** $C_7H_{14}N_2O_2S$

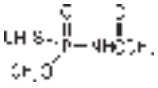


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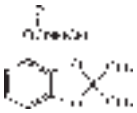
PS-737 **Oxamyl**
N,N-Dimethyl-2-methylcarbamoyl oxyimino-2-(methythio)acetamide, S-methyl-N',N'-dimethyl-N-(methylcarbamoyloxy)-1-thio-oxamimidate
CAS: 23135-22-0 **LD_{50}:** 5mg/kg
MW: 219.29 **MF:** $C_7H_{13}N_3O_3S$



PS-738 **Acephate**
(ACS Standard Grade)
O,S-Dimethyl acetylphosphoramido thioate, Orthene®
CAS: 30560-19-1 **LD_{50}:** 700mg/kg
MW: 183.18 **MF:** $C_4H_{10}NO_3PS$



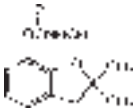
PS-739 **Bendiocarb**
2.2-Dimethylbenzo-1.3-dioxol-4-yl methylcarbamate, Ficam®
CAS: 22781-23-3 **LD_{50}:** 40mg/kg
MW: 223.25 **MF:** $C_{11}H_{13}NO_4$



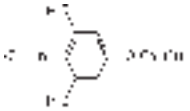
PS-751 **Aminocarb**
4-Dimethylamino-m-tolyl-methyl carbamate, Matacil®
CAS: 2032-59-9 **LD_{50}:** 30mg/kg
MW: 208.29 **MF:** $C_{11}H_{16}N_2O_2$



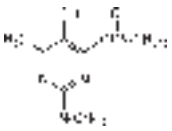
PS-754 **Carbofuran**
2.3-Dihydro-2.2-dimethyl-benzofuran-7-yl methylcarbamate, Furadan®, 4-Dimethylamino-3,5-xylyl-methylcarbamate
CAS: 1563-66-2 **LD_{50}:** 8mg/kg
MW: 221.28 **MF:** $C_{12}H_{15}NO_3$



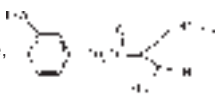
PS-756 **Zectran**
4-(Dimethylamino)-3,5-dimethyl phenyl methylcarbamate, Mexacarbate
CAS: 315-18-4 **LD_{50}:** 24mg/kg
MW: 222.32 **MF:** $C_{12}H_{18}N_2O_2$



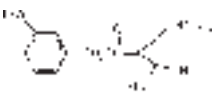
PS-757 **Pirimicarb**
Pirimor®, 2-[Dimethylamino]-5.6-dimethyl-4-pyrimidinyl dimethyl carbamate
CAS: 23103-98-2 **LD_{50}:** 147mg/kg
MW: 238.33 **MF:** $C_{11}H_{18}N_4O_2$



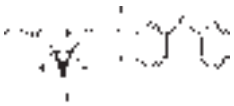
PS-758 **Permethrin**
[3-Phenoxyphenyl] methyl-[+]-cis, trans-3-[2.2-dichloroethenyl]-2.2-dimethylcyclopropane carboxylate, Ambush
CAS: 52645-53-1 **LD_{50}:** 383mg/kg
MW: 391.31 **MF:** $C_{21}H_{20}Cl_2O_3$



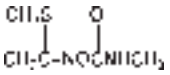
PS-758-1 **cis-Permethrin**
(3-Phenoxyphenyl)methyl-cis-3-(2,2-dichloroethenyl)-2,2-dimethyl cyclopropanecarboxylate
CAS: 52341-33-0 **LD_{50}:** N/A
MW: 391.31 **MF:** $C_{21}H_{20}Cl_2O_3$



PS-758-2 **trans-Permethrin (Isomeric Mix)**
Trans-meta-Phenoxybenzyl, 3-(2,2-dichlorovinyl)-2,2-dimethyl cyclopropanecarboxylate
CAS: 61949-77-7 **LD_{50}:** 800mg/kg
MW: 391.31 **MF:** $C_{21}H_{20}Cl_2O_3$



PS-775 **Methomyl**
S-Methyl-N-[(methylcarbamoyl)oxy] thioacetimidate, Lannate®
CAS: 16752-77-5 **LD_{50}:** 17mg/kg
MW: 162.23 **MF:** $C_5H_{10}N_2O_2S$



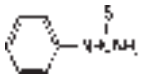
PS-790 **S-Bioallethrin**
d-2-Allyl-4-hydroxy-3-methyl-2-cyclopentene-1-one, d-trans-chrysanthemummonocarboxylic acid ester, Esbiol®,
CAS: 28434-00-6 **LD_{50}:** 430mg/kg
MW: 302.4 **MF:** $C_{19}H_{26}O_3$



PS-791 **Bioallethrin**
d-trans-Allethrin
CAS: 28057-48-9 **LD_{50}:** 425mg/kg
MW: 302.45 **MF:** $C_{19}H_{26}O_3$



PS-801 **Phenyl-2-thiourea**
Phenylthiocarbamide
CAS: 103-85-5 **LD_{50}:** 3mg/kg
MW: 152.23 **MF:** $C_7H_8N_2S$



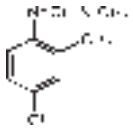
PS-803 **Zinc phosphate**
CAS: N/A **LD_{50}:** N/A
MW: 458.11 **MF:** $Zn_3H_8O_{12}P_2$



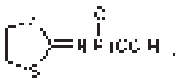
PS-804 **Thallium sulfate**
Thallous sulfate
CAS: 7446-18-6 **LD_{50}:** 16mg/kg
MW: 504.80 **MF:** $O_4S.2Tl$



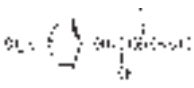
PS-840 **Chlordimeform**
N.N-Dimethyl-N'-(2-methyl-4-chlorophenyl)-formanidine, N'-(4-Chloro-o-tolyl)-N.N-dimethyl formamidine, Chlorphenamidine®, Fundal®, Chlorophedine®, Glaecron®, Schering 36268
CAS: 6164-98-3 **LD_{50}:** 340mg/kg
MW: 196.70 **MF:** $C_{10}H_{13}ClN_2$



PS-842 **Phosfolan**
Cyclic ethylene[diethoxy phosphinyl] dithio-imidocarbonate, Cyolane®, Cyolan®, Cyalane®, Cylan®
CAS: 947-02-4 **LD_{50}:** 10mg/kg
MW: 255.31 **MF:** $C_7H_{14}NO_3PS_2$

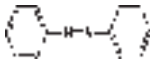


PS-850 **Aramite (0.1mg/ml in Hexane)**
2[p-tert-Butylphenoxy]iso-propyl-2-chloroethyl sulfite, Niagarmite®, Aracide®, Ortho-mite®
CAS: 140-57-8 **LD_{50}:** 2,000mg/kg
MW: 334.89 **MF:** $C_{15}H_{23}ClO_4S$

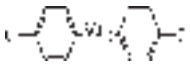


Chem Service Pesticide Standards - Numerical Listing

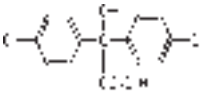
PS-851 **Azobenzene**
Diphenyl diimide, Azobenzide®, Bensofume®, Azofume®
CAS: 103-33-3 **LD_{50}:** 1,000mg/kg
MW: 182.24 **MF:** $C_{12}H_{10}N_2$



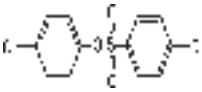
PS-853 **Chlorbenside**
p-Chlorobenzyl-p-chlorophenyl sulfide, Chloroparacide®, Mitox® Chlorsulphacide®
CAS: 103-17-3 **LD_{50}:** 2,000mg/kg
MW: 269.19 **MF:** $C_{13}H_{10}Cl_2S$



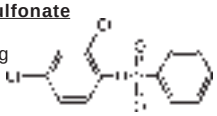
PS-854 **Chlorobenzilate**
(ACS Standard Grade)
Ethyl-4.4'-dichlorobenzilate, Acarben®, Akar®, Folbex®
CAS: 510-15-6 **LD_{50}:** 700mg/kg
MW: 325.20 **MF:** $C_{16}H_{14}Cl_2O_3$



PS-855 **Ovex**
p-Chlorophenyl-p-chlorobenzene sulfonate, Chlorfenson®, Ovotran®, Ovotox®, Mitran®, Lethalaire®, Estonmite®, Orthotran®
CAS: 80-33-1 **LD_{50}:** 2,000mg/kg
MW: 303.16 **MF:** $C_{12}H_8Cl_2O_3S$



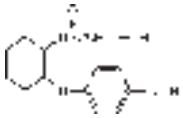
PS-856 **2.4-Dichlorophenyl benzenesulfonate**
Genite®, Genitol®
CAS: 97-16-5 **LD_{50}:** 1,400mg/kg
MW: 303.16 **MF:** $C_{12}H_8Cl_2O_3S$



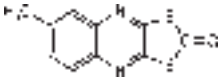
PS-857 **Isopropyl-4.4'-dichlorobenzilate**
Chloropropylate, Acaralate®, Rospin®, Chlorpropylat
CAS: 5836-10-2 **LD_{50}:** N/A
MW: 339.23 **MF:** $C_{17}H_{16}Cl_2O_3$



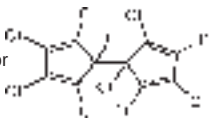
PS-858 **Omite ®**
2-[p-tert-Butylphenoxy]cyclohexyl -2-propynyl sulfite, Propargite®, Uniroyal DO 14
CAS: 2312-35-8 **LD_{50}:** 2,200mg/kg
MW: 350.51 **MF:** $C_{19}H_{26}O_4S$



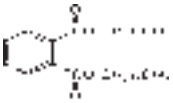
PS-860 **Quinomethionate**
6-Methyl-2.3-quinoxalinedithiol cyclic-S.S.-dithiocarbonate, Morestan R®, Oxythioquinox Chinomethionate, 6-Methyl-1,3-dithiolo[4,5-b]quinoxalin-2-one, S,S-(6-Methylquinoxaline-2,3-diyl) dithiocarbonate, 6-Methyl-1,3-dithiolo[4,5-b]quinoxalin-2-one
CAS: 2439-01-2 **LD_{50}:** 1,100mg/kg
MW: 234.30 **MF:** $C_{10}H_6N_2OS_2$



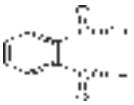
PS-862 **Pentac ®**
Decachlorobis(2.4-cyclo pentadiene-1-yl), Bis(pentachloro-2.4-cyclopentadien-1-yl), Dienochlor
CAS: 2227-17-0 **LD_{50}:** 3,160mg/kg
MW: 474.60 **MF:** $C_{10}Cl_{10}$



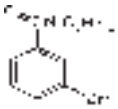
PS-900 **Di-n-butylphthalate**
Dibutylphthalate, DBP®
CAS: 84-74-2 **LD_{50}:** 8,000mg/kg
MW: 278.38 **MF:** $C_{16}H_{22}O_4$



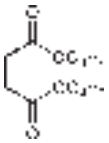
PS-901 **Dimethylphthalate**
Avolin®, Fermine, Mipax®, DMP®, Palatinol M®, Phthalic acid dimethyl ester, Methyl phthalate, Dimethyl 1.2-benzendicarboxylate
CAS: 131-11-3 **LD_{50}:** 8,200mg/kg
MW: 194.20 **MF:** $C_{10}H_{10}O_4$



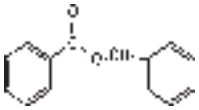
PS-902 **N.N-Diethyl-m-toluamide**
DEET, Delphene®, Detamide®, Dieltamid®, Feypel®, Meta-delphene® OFF®, m-Toluic Acid diethylamide
CAS: 134-62-3 **LD_{50}:** 2,000mg/kg
MW: 191.27 **MF:** $C_{12}H_{17}NO$



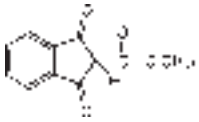
PS-903 **Dibutyl succinate**
Di-n-butyl succinate, Succinic acid dibutyl ester, Tabatrex®,
CAS: 141-03-7 **LD_{50}:** 8,000mg/kg
MW: 230.34 **MF:** $C_{12}H_{22}O_4$



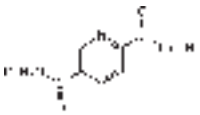
PS-904 **Benzyl benzoate**
Ascabin, Ascabiol®, Benylate®, Vanzoate®, Venzonate®, Benzoic acid benzyl ester, Benzyl benzenecarboxylate,
CAS: 120-51-4 **LD_{50}:** 500mg/kg
MW: 212.26 **MF:** $C_{14}H_{12}O_2$



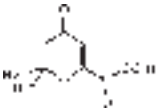
PS-905 **2-Pivaloyl-1.3-indandione**
2-Trimethylacetyl-1.3-indandione, Pindone, 2-Pivalyl-1.3-indandione, Pival®, Tri-Ban®, Pivalyl Valone®, Pivalyn®, Pivalyl indandione®,
CAS: 83-26-1 **LD_{50}:** 280mg/kg
MW: 230.28 **MF:** $C_{14}H_{14}O_3$



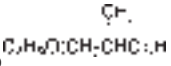
PS-906 **Di-n-propyl isocinchomeronate**
MGK Repellent 326®, MGK 326®
CAS: 136-45-8 **LD_{50}:** 5,230mg/kg
MW: 251.31 **MF:** $C_{13}H_{17}NO_4$



PS-907 **Butylmesityl oxide oxalate**
Butyl-3.4-dihydro-2.2-dimethyl-4-oxo-1.2-H-pyran-[6-carboxylate], Butopyronoxyl, Indalone®, Dihydropyrone®
CAS: 532-34-3 **LD_{50}:** 7,840mg/kg
MW: 226.30 **MF:** $C_{12}H_{18}O_4$



PS-908 **Butoxypolypropylene glycol**
Crag Fly Repellent®, Stabilene®
CAS: 9003-13-8 **LD_{50}:** 11,200mg/kg
MW: N/A **MF:** $(C_3H_6O)n.C_4H_{10}O$



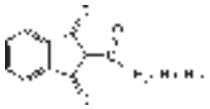
Numerical Listing

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PS-910 **MGK R-11** ®
2.3:4.5-Bis(2-butylene)tetrahydro -2-furaldehyde
CAS: 126-15-8 **LD_{50}:** 2,500mg/kg
MW: 204.29 **MF:** $C_{13}H_{16}O_2$



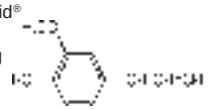
PS-911 **2-Isovaleryl-1.3-indanedione**
PMP®, Valone®
CAS: 83-28-3 **LD_{50}:** 250mg/kg
MW: 230.28 **MF:** $C_{14}H_{14}O_3$



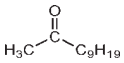
PS-926 **9.10-Anthraquinone**
Anthraquinone, Corbit®
CAS: 84-65-1 **LD_{50}:** N/A
MW: 208.22 **MF:** $C_{14}H_8O_2$



PS-940 **4-Allyl-2-methoxyphenol**
Eugenol, Allylguaiacol®, Eugenic acid®
Caryophyllic acid®
CAS: 97-53-0 **LD_{50}:** 2,680mg/kg
MW: 164.22 **MF:** $C_{10}H_{12}O_2$



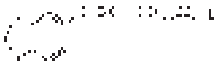
PS-951 **2-Undecanone**
CAS: 112-12-9 **LD_{50}:** 5,000mg/kg
MW: 170.33 **MF:** $C_{11}H_{22}O$



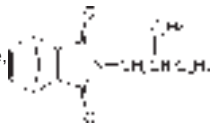
PS-952 **2-Hydroxyethyl-n-octyl sulphide**
2-(Octylthio)ethanol, MGK Repellent 874®
Phillips R-874®,
CAS: 3547-33-9 **LD_{50}:** 8,530mg/kg
MW: 190.38 **MF:** $C_{10}H_{22}OS$



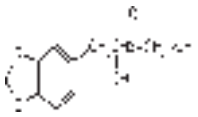
PS-960 **Piprotal**
Piperonal bis[2-(2'-n-butoxyethoxy) ethyl] acetal, Tropital®
CAS: 5281-13-0 **LD_{50}:** 4,400mg/kg
MW: 456.64 **MF:** $C_{24}H_{40}O_8$



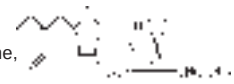
PS-962 **MGK 264** ®
N-[2-Ethylhexyl]bicyclo-[2.2.1]-5-heptene-2.3-dicarboximide,
N-Octylbicycloheptene dicarboximide,
Van Dyke 264®, Octacide 264®
CAS: 113-48-4 **LD_{50}:** 2,800mg/kg
MW: 275.43 **MF:** $C_{17}H_{25}NO_2$



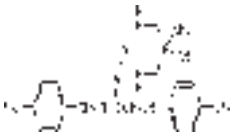
PS-976 **Sulfoxide**
1.2-Methylenedioxy-4-[2-(octyl sulfinyl)propyl]benzene,
Sulfox-cide, Sulfoxone sodium,
Sulfoxyl®, n-Octyl sulphoxide of isosafrole, Sulfox-Ade
CAS: 120-62-7 **LD_{50}:** 2,000mg/kg
MW: 324-52 **MF:** $C_{18}H_{28}O_3S$



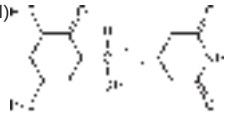
PS-1000 **Resmethrin**
(5-Benzyl-3-furyl)methyl-2.2-dimethyl-3-(2-methylpropenyl) cyclopropanecarboxylate,
Chrysron®, Synthrin®, Benzofuroline,
SBP 1382
CAS: 10453-86-8 **LD_{50}:** 0mg/kg
MW: 338.48 **MF:** $C_{22}H_{26}O_3$



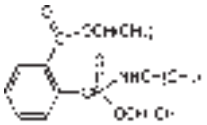
PS-1001 **Amdro**
Tetrahydro-5.5-dimethyl-2(1H)-pyrimidinone [3-[4-(trifluoromethyl) phenyl]-1-[2-[4-(trifluoromethyl) phenyl]ethenyl]-2-propenylidene] hydrazone, Hydramethylnon
CAS: 67485-29-4 **LD_{50}:** 1,131mg/kg
MW: 494.53 **MF:** $C_{25}H_{24}F_6N_4$



PS-1002 **Cycloheximide**
3-[2(3.5-Dimethyl-2-oxocyclohexyl)-2-hydroxyethyl]-glutarimide,
Acti-Aid®
CAS: 66-81-9 **LD_{50}:** 2mg/kg
MW: 281.39 **MF:** $C_{15}H_{23}NO_4$



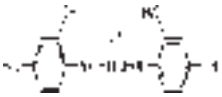
PS-1003 **Isofenphos**
1-Methylethyl-2-[[ethoxy[(1-methyl ethyl)amino]phosphinothioyl] -oxy]benzoate, Amaze®, Oftanol
CAS: 25311-71-1 **LD_{50}:** 28mg/kg
MW: 345.43 **MF:** $C_{15}H_{24}NO_4PS$



PS-1004 **Butralin**
Amex®, Tabamex®, Tamex®, Tobago®,
4-(1.1-Dimethylethyl)-N-(1-methyl propyl)-2.6-dinitrobenzenamine
CAS: 33629-47-9 **LD_{50}:** 2,000mg/kg
MW: 295.34 **MF:** $C_{14}H_{21}N_3O_4$



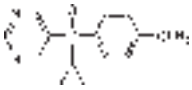
PS-1005 **Amitraz**
N'-(2.4-Dimethylphenyl)-N-[(2.4-dimethylphenyl)imino]methyl]-N-methylmethanimidamide,
N-Methyl-N'-2.4-xylyl-N-(N-2.4-xylylformimidoyl)formamidine,
Mitac®, BAAM®, BTS 27419
CAS: 33089-61-1 **LD_{50}:** 800mg/kg
MW: 293.45 **MF:** $C_{19}H_{23}N_3$



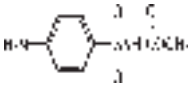
PS-1006 **Diethatyl ethyl**
N-Chloroacetyl-N-(2.6-diethylphenyl) -glycine ethyl ester, Antor®,
CAS: 38727-55-8 **LD_{50}:** 2,300mg/kg
MW: 311.84 **MF:** $C_{16}H_{22}ClNO_3$



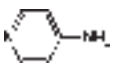
PS-1008 **Ancymidol**
a-Cyclopropyl-a(p-methoxyphenyl) -5-pyrimidine methanol, A-Rest®, Reducymol®, Quel®
CAS: 12771-68-5 **LD_{50}:** 4,500mg/kg
MW: 256.33 **MF:** $C_{15}H_{16}N_2O_2$



PS-1009 **Asulam**
Methyl sulfanilylcarbamate, Asulox®, Jonnix®, Asulox 40®, Asulox F®
CAS: 3337-71-1 **LD_{50}:** 5,000mg/kg
MW: 230.26 **MF:** $C_8H_{10}N_2O_4S$



PS-1010 **4-Ap**
4-Aminopyridine, Avitrol®
CAS: 504-24-5 **LD_{50}:** 20mg/kg
MW: 94.13 **MF:** $C_5H_6N_2$



WARNING - READ YOUR MATERIAL SAFETY DATA SHEET BEFORE HANDLING OR USING ANY CHEMICALS

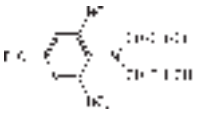
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Chem Service Pesticide Standards - Numerical Listing

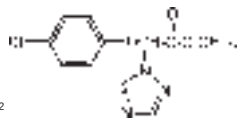
PS-1011 **Bentazon**
3-(1-Methylethyl)-1H-2.1.3-benzothiadiazin-4(3H)-one-2.2-dioxide, Basagran®
CAS: 25057-89-0 **LD_{50}:** 1,100mg/kg
MW: 240.30 **MF:** $C_{10}H_{12}N_2O_3S$



PS-1012 **Fluchloralin**
CAS: 33245-39-5 **LD_{50}:** 6,400mg/kg
MW: 355.73 **MF:** $C_{12}H_{13}ClF_3N_3O_4$



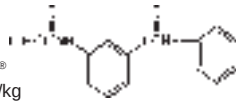
PS-1013 **Triadimefon**
1-(4-Chlorophenoxy)-3.3-dimethyl-1-(1H-1.2.4-triazol-1-yl)-2-butanone, Bayleton®, Amiral®
CAS: 43121-43-3 **LD_{50}:** 363mg/kg
MW: 293.78 **MF:** $C_{14}H_{16}ClN_3O_2$



PS-1014 **Phenmedipham**
Methyl 3-(3-methylcarbaniloyloxy) carbanilate, Phenmedipham, Betapost®, Medifene®, Arrat®, Rubenal®, Tanex®, Spin-Aid®, Betanal®, Kemifam®, 3-methoxy-carbonylaminophenyl 3-methyl-carbanilate, Methyl-m-hydroxy-carbanilate m-methylcarbanilate, Methyl 3-(3-methylcarbaniloyloxy) carbanilate
CAS: 13684-63-4 **LD_{50}:** 4mg/kg
MW: 300.34 **MF:** $C_{16}H_{16}N_2O_4$



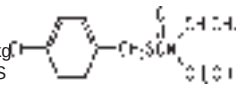
PS-1015 **Desmedipham**
Ethyl-m-hydroxycarbanilate carbanilate(ester), 3-Ethoxy-carbonylaminophenyl-N-phenyl-carbamate, Betanex®, Betanal AM®
CAS: 13684-56-5 **LD_{50}:** 10,250mg/kg
MW: 300.34 **MF:** $C_{16}H_{16}N_2O_4$



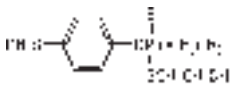
PS-1016 **Acifluorfen**
5-[2-Chloro-4-(trifluoromethyl) phenoxy]-2-nitrobenzoic acid, Blazer®,
CAS: 50594-66-6 **LD_{50}:** 137mg/kg
MW: 361.67 **MF:** $C_{14}H_7ClF_3NO_5$



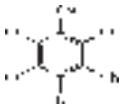
PS-1017 **Benthiocarb**
S-(4-Chlorophenyl)methyl diethylcarbamothioate, Bolero®, Saturn®, Saturno®, Thiobencarb
CAS: 28249-77-6 **LD_{50}:** 1,300mg/kg
MW: 257.80 **MF:** $C_{12}H_{16}ClNOS$



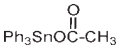
PS-1018 **Sulprofos**
O-Ethyl-O-[4-(methylthio)phenyl]-S-propyl phosphorodithioate, Bolstar®, Helothion®
CAS: 35400-43-2 **LD_{50}:** 107mg/kg
MW: 322.46 **MF:** $C_{12}H_{19}O_2PS_3$



PS-1020 **Chlorothalonil**
Tetrachloroisophthalonitrile, Bravo®, Daconil 2787®
CAS: 1897-45-6 **LD_{50}:** N/A
MW: 265.90 **MF:** $C_8Cl_4N_2$



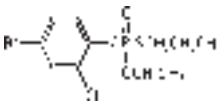
PS-1021 **Phentinoacetate**
Triphenyltin acetate, Brestan®, Batasan®, Suzu®, TPTA, Fentin acetate Acetoxy-triphenylstannane
CAS: 900-95-8 **LD_{50}:** 125mg/kg
MW: 409.07 **MF:** $C_{20}H_{18}O_2Sn$



PS-1022 **Chlorflurecol-methyl ester**
Methyl 2-chloro-9-hydroxyfluorene-9-carboxylate, Chlorflurenol methyl ester, Curbiset®, Maintain A®, Maintain CF 125®
CAS: 2536-31-4 **LD_{50}:** 12,500mg/kg
MW: 274.71 **MF:** $C_{15}H_{11}ClO_3$



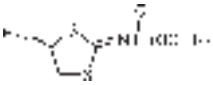
PS-1024 **Profenofos**
O-(4-Bromo-2-chlorophenyl)-O-ethyl-S-propyl phosphorothioate, Curacron®, Polycron®, Selecron®
CAS: 41198-08-7 **LD_{50}:** 358mg/kg
MW: 373.65 **MF:** $C_{11}H_{15}BrClO_3PS$



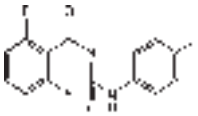
PS-1025 **Cythioate**
CL 26691, O.O-Dimethyl-O-p-sulfamoylphenylphosphorothioate, Cythioate®, Cyflee®
CAS: 115-93-5 **LD_{50}:** 160mg/kg
MW: 297.30 **MF:** $C_8H_{12}NO_5PS_2$



PS-1026 **Mephosfolan**
2-(Diethoxyphosphinylimino)-4-methyl-1.3-dithiolane, Diethyl-N-(4-methyl-1.3-dithiolan-2-ylidene)-phosphoramidate,Cytrolane®
CAS: 950-10-7 **LD_{50}:** 4mg/kg
MW: 269.34 **MF:** $C_8H_{16}NO_3PS_2$



PS-1028 **Diflubenzuron**
Dimilin®, 1-(4-Chlorophenyl)-3-(2,6-difluorobenzoyl)urea
CAS: 35367-38-5 **LD_{50}:** 4,640mg/kg
MW: 310.70 **MF:** $C_{14}H_9ClF_2N_2O_2$



PS-1030 **d-(cis-trans)-Phenothrin**
3-Phenoxybenzyl d-cis.trans-chrysanthemate, d-Phenothrin®, Sumithrin®
CAS: 26002-80-2 **LD_{50}:** 10,000mg/kg
MW: 350.49 **MF:** $C_{23}H_{26}O_3$



PS-1031 **Fentin hydroxide**
Triphenyltin hydroxide, Du-Ter®, Duter®, Suzu H®, Tubotin®, TPTH, TPTOH
CAS: 76-87-9 **LD_{50}:** 171mg/kg
MW: 367.03 **MF:** $C_{18}H_{16}OSn$



Chem Service Pesticide Standards - Numerical Listing

PS-1032 **Sanmarton**
Cyano(3-phenoxyphenyl)-methyl-4-chloro-alpha-(1-methylethyl) benzeneacetate, Fenvalerate®, Belmark®, Pydrin®, Sumicidin®, Sumifly, Sumipower
CAS: 51630-58-1 **LD_{50}:** 451mg/kg
MW: 419.93 **MF:** $C_{25}H_{22}ClNO_3$



PS-1033 **Oxyfluorfen**
2-Chloro-1-(3-ethoxy-4-nitrophenoxy)-4-(trifluoromethyl) benzene, Goal 2EC, Koltar®
CAS: 42874-03-3 **LD_{50}:** 5,000mg/kg
MW: 361.72 **MF:** $C_{15}H_{11}ClF_3NO_4$



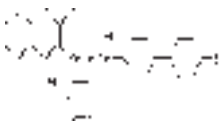
PS-1035 **Hexachlorophene**
(ACS Standard Grade)
2.2'-Methylene bis(3.4.6-trichloro phenol), Hexide®, Nabac®
CAS: 70-30-4 **LD_{50}:** 56mg/kg
MW: 406.89 **MF:** $C_{13}H_6Cl_6O_2$



PS-1036 **Diclofop methyl**
(ACS Standard Grade)
Methyl-2-[4-(2'.4'-dichlorophenoxy) phenoxy] propanoate, 2-[4-(2'.4'-Dichlorophenoxy)phenoxy]-methyl-propanoate, Hoe-Grass®, Hoelon®, Illoxan®, Hoxan®
CAS: 51338-27-3 **LD_{50}:** 563mg/kg
MW: 341.20 **MF:** $C_{16}H_{14}Cl_2O_4$



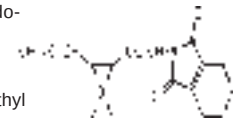
PS-1038 **Super-Rozol**
3-[3-(4'-Bromo[1.1'biphenyl]-4-yl)-3-hydroxy-1-phenylpropyl]-4-hydroxy-2H-1-benzopyran-2-one, Maki®, Super-Caid, Bromadiolone
CAS: 28772-56-7 **LD_{50}:** 1mg/kg
MW: 527.44 **MF:** $C_{30}H_{23}BrO_4$



PS-1040 **Methoprene** ®
Isopropyl (2E-4E)-11-methoxy-3.7.11-trimethyl-2.4-dodecadienoate, Altosid®
CAS: 40596-69-8 **LD_{50}:** 25,000mg/kg
MW: 310.53 **MF:** $C_{19}H_{34}O_3$



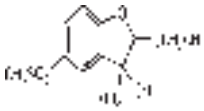
PS-1042 **Tetramethrin**
Neo-Pynamin®, Phthalthrin, Cyclohex-1-ene-1,2-dicarboximido-methyl-(1RS,3RS;1RS,3SR)-2,2-dimethyl-3-(2-methylprop-1-enyl) cyclopropanecarboxylate, 3,4,5,6-Tetrahydrophthalimidomethyl chrysanthemate
CAS: 7696-12-0 **LD_{50}:** 4,640mg/kg
MW: 331.45 **MF:** $C_{19}H_{25}NO_4$



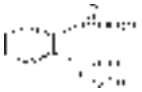
PS-1044 **Norflurazon** ®
4-Chloro-5-(methylamino)-2-(a.a.a-trifluoro-m-tolyl)-3(2H)-pyridazinone, Evital®, Solicam®, Zorial®
CAS: 27314-13-2 **LD_{50}:** N/A
MW: 303.69 **MF:** $C_{12}H_9ClF_3N_3O$



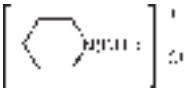
PS-1045 **Ethofumesate**
(+/-)-2-Ethoxy-2,3-dihydro-3,3-dimethyl-5-benzofuranyl methanesulfonate, Nortron®, Tramat®, Prograss®, Kemiron®, Rubetram®
CAS: 26225-79-6 **LD_{50}:** 5,650mg/kg
MW: 286.3 **MF:** $C_{13}H_{18}O_5S$



PS-1046 **Baycarb** ®
2-sec-Butylphenyl-N-methyl-carbamate, Osbac®, Bassa®, Carvil®, Hopcin®, BPMC, Fenobucarb
CAS: 3766-81-2 **LD_{50}:** 410mg/kg
MW: 207.30 **MF:** $C_{12}H_{17}NO_2$



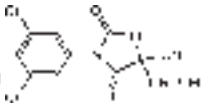
PS-1047 **Mepiquat chloride**
N.N-Dimethyl-piperidinium chloride, Pix® BAS 08300W
CAS: 24307-26-4 **LD_{50}:** 1,420mg/kg
MW: 149.69 **MF:** $C_7H_{16}N.Cl$



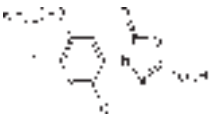
PS-1048 **1,8-Naphthalic anhydride**
Protect®
CAS: 81-84-5 **LD_{50}:** 12,300mg/kg
MW: 198.18 **MF:** $C_{12}H_6O_3$



PS-1049 **Vinclozolin**
3-(3.5-Dichlorophenyl)-5-ethenyl-5-methyl-2.4-oxazolidinedione, Ronilan®
CAS: 50471-44-8 **LD_{50}:** 10,000mg/kg
MW: 286.12 **MF:** $C_{12}H_9Cl_2NO_3$



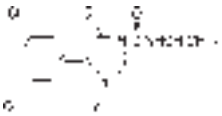
PS-1050 **Oxadiazon**
2-tert-Butyl-4-(2.4-dichloro-5-isopropoxyphenyl)- 2-1.3.4-oxadiazolin-5-one,Ronstar®,
CAS: 19666-30-9 **LD_{50}:** 3,500mg/kg
MW: 345.25 **MF:** $C_{15}H_{18}Cl_2N_2O_3$



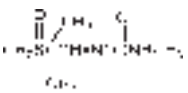
PS-1051 **Glyphosate**
N-(Phosphonomethyl) glycine
CAS: 1071-83-6 **LD_{50}:** 4,873mg/kg
MW: 169.09 **MF:** $C_3H_8NO_5P$



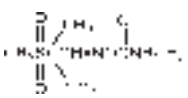
PS-1052 **Iprodione**
1-Isopropylcarbamoyl-3(3.5-dichlorophenyl)-hydantoin, Rovral®, Glycophene, Chipco 26019
CAS: 36734-19-7 **LD_{50}:** 3,500mg/kg
MW: 330.19 **MF:** $C_{13}H_{13}Cl_2N_3O_3$



PS-1054 **Aldicarb sulfoxide**
2-Methyl-2-(methylsulfoxo)propanal-O-[(methylamino)carbonyl]oxime
CAS: 1646-87-3 **LD_{50}:** 490mg/kg
MW: 206.29 **MF:** $C_7H_{14}N_2O_3S$



PS-1055 **Aldoxycarb**
2-Methyl-2-(methylsulfonyl) propanal-O-[(methylamino)carbonyl] oxime, Standak®, Aldicarb sulfone
CAS: 1646-88-4 **LD_{50}:** 27mg/kg
MW: 222.29 **MF:** $C_7H_{14}N_2O_4S$

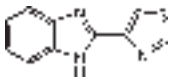


Chem Service Pesticide Standards - Numerical Listing

PS-1056 **Brodifacoum**
Nofar®, Klerat®, Talon®, WeatherBlok®, 3-[3-(4'-Bromo[1,1'-biphenyl]-4-yl]) -1,2,3,4-tetrahydro-1-naphthalenyl] -4-hydroxy-2H-benzopyran-2-one
CAS: 56073-10-0 **LD_{50}:** N/A
MW: 523.45 **MF:** $C_{31}H_{23}BrO_3$



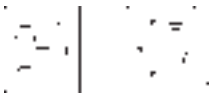
PS-1057 **Thiabendazole** ®
2-(4'-Thiazolyl)-benzimidazole, Apl-Luster®, Mertect®, TBZ®, Tecto®, Thibenzole®, Bioguard®, Tobaz®, Arbotec®
CAS: 148-79-8 **LD_{50}:** 3,100mg/kg
MW: 201.26 **MF:** $C_{10}H_7N_3S$



PS-1059 **Vacor**
1-(3-Pyridylmethyl)-3-(4-nitrophenyl)urea, Pyriminil
CAS: 53558-25-1 **LD_{50}:** 7mg/kg
MW: 272.29 **MF:** $C_{13}H_{12}N_4O_3$



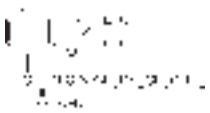
PS-1060 **Fenbutatin-oxide**
Fenbutatin-oxide, Hexakis-(2-methyl-2-phenylpropyl) -distannoxane, Vendex®, Torque®,
CAS: 13356-08-6 **LD_{50}:** 2,630mg/kg
MW: 1052.76 **MF:** $C_{60}H_{78}OSn_2$



PS-1062 **Acarol** ®
Isopropyl-4.4'-dibromobenzilate, Neoron®, Bromopropylate
CAS: 18181-80-1 **LD_{50}:** N/A
MW: 428.15 **MF:** $C_{17}H_{16}Br_2O_3$



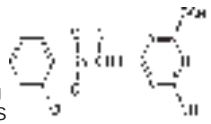
PS-1063 **Carbosulfan**
2,3-Dihydro-2,2-dimethyl-7-benzo furanyl [(dibutylamino)thio]methyl carbamate, Advantage®, Gazelle®, Marshal®, Posse®
CAS: 55285-14-8 **LD_{50}:** 209mg/kg
MW: 380.60 **MF:** $C_{20}H_{32}N_2O_3S$



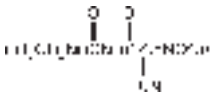
PS-1064 **Baytan** ®
1-(4-Chlorophenoxy)-3.3-dimethyl -1-(1H-1.2.4-triazol-1-yl)butan-2-ol, Triadimenol
CAS: 55219-65-3 **LD_{50}:** 3,800mg/kg
MW: 295.80 **MF:** $C_{14}H_{18}ClN_3O_2$



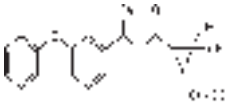
PS-1065 **Chlorsulfuron**
2-Chloro-N-[[4-methoxy-6-methyl-1.3.5-triazin-2-yl)amino]carbonyl] benzenesulfonamide, Glean®
CAS: 64902-72-3 **LD_{50}:** 5,545mg/kg
MW: 357.80 **MF:** $C_{12}H_{12}ClN_5O_4S$



PS-1067 **Cymoxanil**
2-Cyano-N-[(ethylamino)carbonyl] -2-methoxyimino)acetamide, Curzate®
CAS: 57966-95-7 **LD_{50}:** 1,196mg/kg
MW: 198.21 **MF:** $C_7H_{10}N_4O_3$



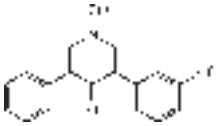
PS-1068 **Cypermethrin**
(+/-)(a)-Cyano-3-phenoxybenzyl (+) cis,trans-3-(2.2-dichlorovinyl) -2.2-dimethylcyclopropane carboxylate, Ammo®, Barricide®, Cymbush, Cyperkill, Flocord®, Imperator, Kafil Super
CAS: 52315-07-8 **LD_{50}:** 58mg/kg
MW: 416.32 **MF:** $C_{22}H_{19}C_{12}NO_3$



PS-1069 **Lontrel** ®
3.6-Dichloro-2-pyridinecarboxylic acid, Clopyralid, 3.6-Dichloropicolinic acid
CAS: 1702-17-6 **LD_{50}:** 4,300mg/kg
MW: 192.00 **MF:** $C_6H_3Cl_2NO_2$



PS-1070 **Sonar** ®
1-Methyl-3-phenyl-5-(3-trifluoro methyl)phenyl)-4(1H)-pyridinone, Fluridone
CAS: 59756-60-4 **LD_{50}:** N/A
MW: 329.3 **MF:** $C_{19}H_{14}F_3NO$



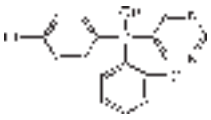
PS-1071 **tau-Fluvalinate**
Mavrik®, (a-RS,2R)-Fluvalinate, Mavrik Aquaflow®, (RS)-a-Cyano-3-phenoxybenzyl (R)-2-[2-chloro-4-(trifluoromethyl)anilino]-3-methylbutanoate, Klartan®, Spur®, Apistan®
CAS: 102851-06-9 **LD_{50}:** 261mg/kg
MW: 502.95 **MF:** $C_{26}H_{22}ClF_3N_2O_3$



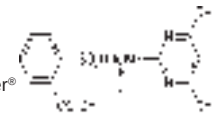
PS-1072 **Flucythrinate**
Aastar®, CyBolt®, Cythrin®, Funchiong jujr®, Pay-Off®, (+-)-Cyano(3-phenoxyphenyl) methyl(+)-4-(difluoromethoxy)-alpha-(1-methylethyl)benzene acetate
CAS: 70124-77-5 **LD_{50}:** 67mg/kg
MW: 451.50 **MF:** $C_{26}H_{23}F_2NO_4$



PS-1073 **Fenarimol**
a-(2-Chlorophenyl)-a-(4-chlorophenyl)-5-(pyrimidine methanol), Bloc®, Rubigan®
CAS: 60168-88-9 **LD_{50}:** 2,000mg/kg
MW: 331.21 **MF:** $C_{17}H_{12}Cl_2N_2O$



PS-1074 **Sulfometuron methyl**
Methyl 2(((((4.6-dimethyl-2-pyrimidinyl)amino)carbonyl)amino) sulfonyl)benzoate, Oust Weed Killer®
CAS: 74222-97-2 **LD_{50}:** N/A
MW: 364.4 **MF:** $C_{15}H_{16}N_4O_5S$



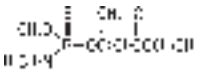
PS-1075 **Tilt** ®
1-[2-(2.4-Dichlorophenyl)-4-propyl-1.3-dioxolan-2-ylmethyl]-1H-1.2.4-triazole, Propiconazole
CAS: 60207-90-1 **LD_{50}:** 1,517mg/kg
MW: 342.25 **MF:** $C_{15}H_{17}Cl_2N_3O_2$



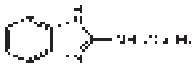
Numerical Listing

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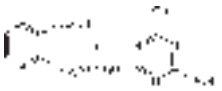
PS-1076 **Safrotin** ®
(E)-O,2-Isopropoxy-carbonyl-1-methylvinyl O-methyl-ethyl phosphoramidothioate, Propetamphos
CAS: 31218-83-4 **LD_{50}:** 75mg/kg
MW: 281.34 **MF:** $C_{10}H_{20}NO_4PS$



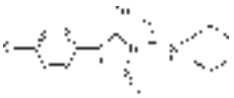
PS-1077 **Carbendazim**
2-(Methoxycarbonylamino)-benzimidazole, Bavistin®, Delsene®, Derosal®
CAS: 10605-21-7 **LD_{50}:** 6,400mg/kg
MW: 191.21 **MF:** $C_9H_9N_3O_2$



PS-1078 **Metsulfuron methyl**
Methyl 2[[[[(4-methoxy-6-methyl-1.3.5-triazin-2-yl)amino]carbonyl] amino]sulfonyl]benzoate, Ally 60 DF Weed Killer®
CAS: 74223-64-6 **LD_{50}:** N/A
MW: 381.40 **MF:** $C_{14}H_{15}N_5O_6S$



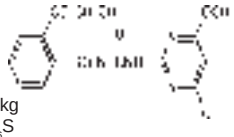
PS-1079 **Hexythiazox**
trans-5-(4-Chlorophenyl-N-cyclohexyl-4-methyl-2-oxo-3-thiazolidine carboxamide, Nissorun, Savey miticide®
CAS: 78587-05-0 **LD_{50}:** N/A
MW: 352.91 **MF:** $C_{17}H_{21}ClN_2O_2S$



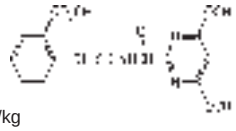
PS-1080 **Quizalofop ethyl**
Ethyl-2-[4-[(6-chloro-2-quinoxalinyl) oxyl]-phenoxy]propionate, Quizalofop ethyl, Assure Weed Killer®
CAS: 76578-14-8 **LD_{50}:** 1,670mg/kg
MW: 372.83 **MF:** $C_{19}H_{17}ClN_2O_4$



PS-1081 **Chlorimuron ethyl**
Ethyl-2-[[[[(4-chloro-6-methoxy-2-pyrimidinyl)amino]carbonyl]amino] sulfonyl] benzoate, Classic 25 DF Weed Killer®
CAS: 90982-32-4 **LD_{50}:** 40,000mg/kg
MW: 414.85 **MF:** $C_{15}H_{15}ClN_4O_6S$



PS-1082 **Bensulfuron-methyl**
Methyl 2-[[[[[(4.6-dimethoxy-2-pyrimidinyl)amino]carbonyl]amino] sulfonyl]methyl]benzoate, Londax®, Escuri®, Bensulfuron-methyl, Pilardax®, Bendas®
CAS: 83055-99-6 **LD_{50}:** 10,985mg/kg
MW: 410.44 **MF:** $C_{16}H_{18}N_4O_7S$



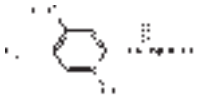
PS-1083 **Beam** ®
5-Methyl-1.2.4-triazolo-[3.4.b] -benzothiazole, Bim®, Tricyclazole
CAS: 41814-78-2 **LD_{50}:** 314mg/kg
MW: 189.25 **MF:** $C_9H_7N_3S$



PS-1084 **MCPB methyl ester**
4-(4-Chloro-2-methylphenoxy) butyric acid, methyl ester
CAS: 57153-18-1 **LD_{50}:** N/A
MW: 242.70 **MF:** $C_{12}H_{15}ClO_3$



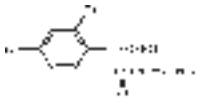
PS-1085 **Banol**
6-Chloro-3.4-xylyl-methyl carbamate, Carbanolate
CAS: 671-04-5 **LD_{50}:** 30mg/kg
MW: 213.68 **MF:** $C_{10}H_{12}ClNO_2$



PS-1086 **Dodemorph**
4-Cyclododecyl-2,6-dimethyl morpholine, Milban®, Meltatox®,
CAS: 1593-77-7 **LD_{50}:** 2,645mg/kg
MW: 281.54 **MF:** $C_{18}H_{35}NO$



PS-1087 **Chlorfenvinphos**
2-Chloro-1-(2,4-dichlorophenyl) vinyl diethyl phosphate, Birlane®, Supona®, Sapecron®, Steladone®
CAS: 470-90-6 **LD_{50}:** 10mg/kg
MW: 359.58 **MF:** $C_{12}H_{14}Cl_3O_4P$



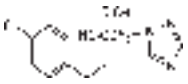
PS-1088 **Fenoxaprop ethyl**
(+/-)-Ethyl-2-[4-(6-chloro-2-benzoxazolyloxy)phenoxy] propanoate, Acclaim, Depon®, Excel®, Furore®, Option®, Whip®
CAS: 66441-23-4 **LD_{50}:** 2,357mg/kg
MW: 361.80 **MF:** $C_{18}H_{16}ClNO_5$



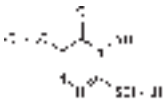
PS-1090 **Baythroid** ®
Cyano-(4-fluoro-3-phenoxyphenyl) methyl-3-(2,2-dichloroethenyl)-2,2-dimethylcyclopropane carboxylate, Cyfluthrin, Solfac®
CAS: 68359-37-5 **LD_{50}:** 600mg/kg
MW: 434.31 **MF:** $C_{22}H_{18}Cl_2FNO_3$



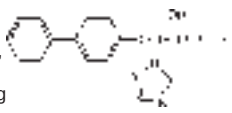
PS-1091 **Folicur** ®
a-[2-(4-Chlorophenyl)ethyl]-a-(1,1-dimethylethyl)-1H-1,2,4-triazole-1-ethanol, Tebuconazole®, Elite®, Lynx®, Raxil®
CAS: 107534-96-3 **LD_{50}:** 3,933mg/kg
MW: 308.87 **MF:** $C_{16}H_{23}ClN_3O$



PS-1092 **Tycor** ®
4-Amino-6-(1,1-dimethylethyl)-3-(ethylthio)-1,2,4-triazin-5(4H)-one®, Ethiozin®, Ebuzin®, Lektan®
CAS: 64529-56-2 **LD_{50}:** 1,280mg/kg
MW: 228.35 **MF:** $C_9H_{16}N_4OS$

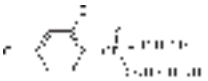


PS-1093 **Baycor** ®
Baycor®, B-([1,1'-Biphenyl]-4-yloxy)-a-(1,1-dimethylethyl)-1H-1,2,4-triazole-1-ethanol, Bitertanol, Baymat®, Sibutol®
CAS: 55179-31-2 **LD_{50}:** 4,200mg/kg
MW: 337.46 **MF:** $C_{20}H_{23}N_3O_2$

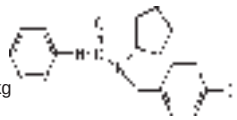


Chem Service Pesticide Standards - Numerical Listing

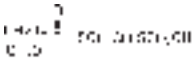
PS-1094 **Tokuthion** ®
O-(2,4-Dichlorophenyl)-O-ethyl-S-propylphosphorodithioate, Prothiophos
CAS: 34643-46-4 **LD_{50}:** 875mg/kg
MW: 345.25 **MF:** $C_{11}H_{15}Cl_2O_2PS_2$



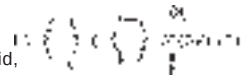
PS-1095 **Monceren** ®
N-[(4-Chlorophenyl)methyl]-N-cyclopentyl-N'-phenylurea, Pencycuron
CAS: 66063-05-6 **LD_{50}:** 5,000mg/kg
MW: 328.87 **MF:** $C_{19}H_{21}ClN_2O$



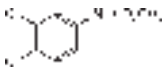
PS-1096 **Metasystox I** ®
S-[2-(Ethylthio)ethyl]-O,O-dimethyl phosphorothioate, Demeton-S-methyl, MSI®, Duratox®,
CAS: 919-86-8 **LD_{50}:** 30mg/kg
MW: 230.30 **MF:** $C_6H_{15}O_3PS_2$



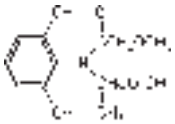
PS-1097 **Fluazifop-p-butyl**
R,S-Butyl-2-[4-(5-trifluoromethyl-2-pyridyloxy)phenoxy]propinoate, Fusilade® 5, Fusilade® 2000, R-2-[4-(5-Trifluoromethyl-2-pyridyloxy)phenoxy]propionic acid, butyl ester, Fusilade® DX, Fusilade® Super
CAS: 79241-46-6 **LD_{50}:** 2,451mg/kg
MW: 383.40 **MF:** $C_{19}H_{20}F_3NO_4$



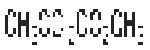
PS-1098 **Swep**
Methyl-N-(3,4-dichlorophenyl) carbamate
CAS: 1918-18-9 **LD_{50}:** 522mg/kg
MW: 220.06 **MF:** $C_8H_7Cl_2NO_2$



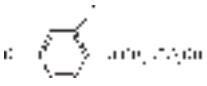
PS-1099 **Metalaxyl**
N-(2,6-Dimethylphenyl)-N-(methoxyacetyl)-alanine methyl ester, Apron®, Ridomil®, Subdue®,
CAS: 57837-19-1 **LD_{50}:** 669mg/kg
MW: 279.37 **MF:** $C_{15}H_{21}NO_4$



PS-1100 **Dalapon methyl ester**
Methyl-2,2-dichloropropionate
CAS: 17640-02-07 **LD50:** 970mg/kg
MW: 156.9 **MF:** $C_4H_6ClO_2$



PS-1101 **2,4-DB methyl ester**
Methyl-4-(2,4-dichlorophenoxy) butyrate
CAS: 18625-12-2 **LD_{50}:** 700mg/kg
MW: 263.12 **MF:** $C_{11}H_{12}Cl_2O_3$



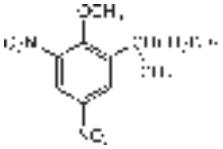
PS-1102 **Dicamba methyl ester**
2-Methoxy-3,6-dichloromethyl benzoate, Disugran, Racuza®
CAS: 6597-78-0 **LD_{50}:** N/A
MW: 235.07 **MF:** $C_9H_8Cl_2O_3$



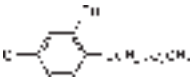
PS-1103 **Dichlorprop methyl ester**
Methyl-2-(2,4-dichlorophenoxy) propionate
CAS: 57153-17-0 **LD_{50}:** 800mg/kg
MW: 252.12 **MF:** $C_{10}H_{13}Cl_2O_3$



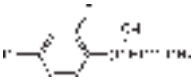
PS-1104 **Dinoseb methyl ether**
2,4-Dinitro-6-sec-butylanisole
CAS: 6099-79-2 **LD_{50}:** 25mg/kg
MW: 254.24 **MF:** $C_{11}H_{14}N_2O_5$



PS-1105 **4-Chloro-o-tolyloxyacetic acid methyl ester**
MCPA methyl ester
CAS: 2436-73-9 **LD_{50}:** N/A
MW: 214.66 **MF:** $C_{10}H_{11}ClO_3$



PS-1106 **Mecoprop methyl ester**
MCPP methyl ester, 2-(4-Chloro-2-methylphenoxy)propanoic acid methyl ester
CAS: 23844-56-6 **LD_{50}:** 650mg/kg
MW: 228.68 **MF:** $C_{11}H_{13}ClO_3$



PS-1107 **3,5-Dichlorobenzoic acid**
CAS: 51-36-5 **LD_{50}:** N/A
MW: 191.01 **MF:** $C_7H_4Cl_2O_2$



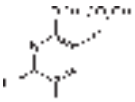
PS-1108 **Picloram methyl ester**
4-Amino-3.5.6-trichloropicolinic acid methyl ester
CAS: 14143-55-6 **LD_{50}:** N/A
MW: 255.49 **MF:** $C_7H_5Cl_3N_2O_2$



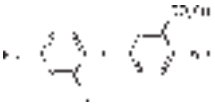
PS-1109 **Pentachloroanisole**
(ACS Standard Grade)
Pentachlorophenyl methyl ether, 2,3,4,5,6-Pentachloroanisole
CAS: 1825-21-4 **LD_{50}:** 318mg/kg
MW: 280.35 **MF:** $C_7H_3Cl_5O$



PS-1110 **Triclopyr methyl ester**
[(3,5,6-Trichloro-2-pyridinyl)oxy] acetic acid methyl ester
CAS: 60825-26-5 **LD_{50}:** N/A
MW: 270.50 **MF:** $C_8H_6Cl_3NO_3$



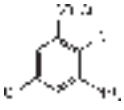
PS-1111 **Acifluorfen methyl ester**
5-[2-Chloro-4-(trifluoromethyl) phenoxy]-2-nitrobenzoic acid methyl ester, Blazer methyl ester
CAS: 50594-67-7 **LD_{50}:** N/A
MW: 375.69 **MF:** $C_{15}H_9ClF_3NO_5$



PS-1112 **Bentazon methyl derivative**
CAS: **LD_{50}:** N/A
MW: 254.31 **MF:** $C_{11}H_{14}N_2O_3S$



PS-1113 **Chloramben methyl ester**
3-Amino-2,5-dichlorobenzoic acid methyl ester, Methyl-3-amino-2,5-dichlorobenzoate
CAS: 7286-84-2 **LD_{50}:** N/A
MW: 220.06 **MF:** $C_8H_7Cl_2NO_2$



Chem Service Pesticide Standards - Numerical Listing

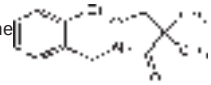
PS-1114 **3.5-Dichlorobenzoic acid methyl ester**
Methyl-3,5-dichlorobenzoate,
CAS: 2905-67-1 **LD_{50}:** N/A
MW: 205.04 **MF:** $C_8H_6Cl_2O_2$



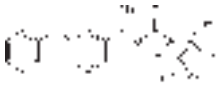
PS-2000 **Isoproturon**
3-(4-Isopropylphenyl)-1,1-dimethyl urea, 3-p-Cumenyl-1,1-dimethylurea, N,N-Dimethyl-N'-[4-(1-methylethyl) phenyl]urea, Isoproturon, Alon®, Arelon®, Graminon®, Tolkan®
CAS: 34123-59-6 **LD_{50}:** 1,826mg/kg
MW: 206.32 **MF:** $C_{12}H_{18}N_2O$



PS-2001 **Command**
Clomazone, 2-(2-Chlorophenyl) methyl-4,4-dimethyl-3-isoxazolidinone
CAS: 81777-89-1 **LD_{50}:** 2,077mg/kg
MW: 239.72 **MF:** $C_{12}H_{14}ClNO_2$



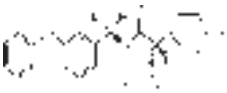
PS-2002 **Fenpropathrin**
CAS: 64257-84-7 **LD_{50}:** 26mg/kg
MW: 349.46 **MF:** $C_{22}H_{23}NO_3$



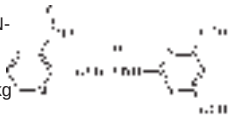
PS-2003 **Bifenthrin**
2-Methylbiphenyl-3yl-methyl (Z)-(1RS)-cis-3-(2-chloro-3,3,3-trifluoroprop-1-enyl)-2,2-dimethylcyclopropane carboxylate, Brigade®, Talstar®
CAS: 82657-04-3 **LD_{50}:** 545mg/kg
MW: 422.90 **MF:** $C_{23}H_{22}ClF_3O_2$



PS-2004 **Asana ®**
Esfenvalerate, (S)-a-Cyano-3-phenoxy benzyl-(S)-2-(4-chloro phenyl)-3-methylbutyrate
CAS: 66230-04-4 **LD_{50}:** 325mg/kg
MW: 419.93 **MF:** $C_{25}H_{22}ClNO_3$



PS-2005 **Accent ®**
2-[[(4,6-Dimethoxypyrimidin-2-yl) aminocarbonyl]amino sulfonyl]-N,N-dimethyl-3-pyridine carboxamide, Nicosulfuron
CAS: 111991-09-4 **LD_{50}:** 5,000mg/kg
MW: 410.4 **MF:** $C_{15}H_{18}N_6O_6S$



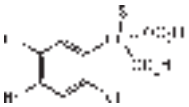
PS-2006 **Systhane ®**
a,n-Butyl-a-(4-chlorophenyl)-1H-1,2,4-triazole-1-propanenitrile, Myclobutanil
CAS: 88671-89-0 **LD_{50}:** 1,600mg/kg
MW: 288.81 **MF:** $C_{15}H_{17}ClN_4$



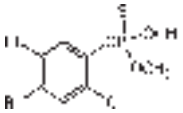
PS-2007 **Trichloronate**
O-Ethyl-O-(2,4,5-trichlorophenyl) ethyl phosphonothioate, Agritox®, Phytosol®, Agrisil®
CAS: 327-98-0 **LD_{50}:** 15mg/kg
MW: 333.60 **MF:** $C_{10}H_{12}Cl_3O_2PS$



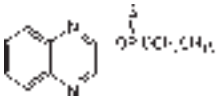
PS-2008 **Bromophos ethyl**
Nexagan®, Cela S-2225, O-(4-Bromo-2,5-dichlorophenyl)-O,O-diethylphosphorothioate
CAS: 4824-78-6 **LD_{50}:** 52mg/kg
MW: 394.06 **MF:** $C_{10}H_{12}BrCl_2O_3PS$



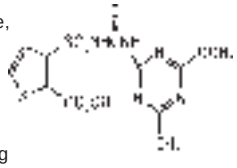
PS-2009 **Bromophos methyl**
Bromophos, O-(4-Bromo-2,5-dichlorophenyl)-O,O-dimethyl phosphorothioate
CAS: 2104-96-3 **LD_{50}:** 1,600mg/kg
MW: 366.00 **MF:** $C_8H_8BrCl_2O_3PS$



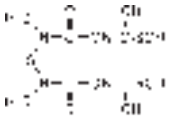
PS-2010 **Quinalphos**
O,O-Diethyl-O-quinoxalin-2-yl phosphorothioate, Bayrusil®, Ekalux®, Quinatox®, Kinalux®
CAS: 13593-03-8 **LD_{50}:** 62mg/kg
MW: 298.32 **MF:** $C_{12}H_{15}N_2O_3PS$



PS-2011 **Pinnacle ®**
Methyl 3-(4-methoxy-6-methyl-1,3,5-triazin-2-yl-carbamoyl) sulfamoyl)-thiophen-2-carboxylate, Pinnacle®, Thifensulfuron-methyl, Methyl 3-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl] amino]sulfonyl]-2-thiophene carboxylate
CAS: 79277-27-3 **LD_{50}:** 5,000mg/kg
MW: 387.42 **MF:** $C_{12}H_{13}N_5O_6S_2$



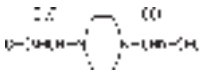
PS-2012 **Thiodicarb**
3,7,9,13-Tetramethyl-5,11-dioxa-2,8,14-trithia-4,7,9,12-tetraaza pentadeca-3,12-diene-6,10-dione, Larvin®, Semevin®
CAS: 59669-26-0 **LD_{50}:** 66mg/kg
MW: 354.50 **MF:** $C_{10}H_{18}N_4O_4S_3$



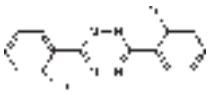
PS-2013 **Sethoxydim**
(±)-(EZ)-2-(1-Ethoxyiminobutyl)-5-[2-(ethylthio)propyl]-3-hydroxy cyclohex-2-enone, Nabu®, Poast®, Fenvinal®, Checkmate®, Vantage®
CAS: 74051-80-2 **LD_{50}:** 3,200mg/kg
MW: 327.53 **MF:** $C_{17}H_{29}NO_3S$



PS-2014 **Triforine**
N,N'-[Piperazine-1,4- diylbis [(trichloromethyl)methylene]] diformamide, Denarin®, Fundinex®, Saprol®, Cela W524
CAS: 26644-46-2 **LD_{50}:** 6,000mg/kg
MW: 434.98 **MF:** $C_{10}H_{14}Cl_6N_4O_2$

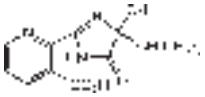


PS-2015 **Clofentezine**
Apollo®, Acaristop®, 3,6-Bis(2-chlorophenyl)-1,2,4,5-tetrazine
CAS: 74115-24-5 **LD_{50}:** 3,200mg/kg
MW: 303.16 **MF:** $C_{14}H_8Cl_2N_4$



Chem Service Pesticide Standards - Numerical Listing

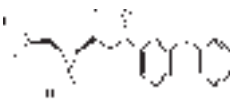
PS-2016 **Imazapyr** ®
2-(4-Isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-nicotinic acid, Arsenal®
CAS: 81334-34-1 **LD_{50}:** 5,000mg/kg
MW: 261.31 **MF:** $C_{13}H_{15}N_3O_3$



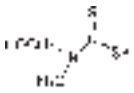
PS-2017 **Omethoate**
O,O-Dimethyl-S-methylcarbamoyl methyl phosphorothioate, Folimat®, Dimethoate-O-analog
CAS: 1113-02-6 **LD_{50}:** 30mg/kg
MW: 213.21 **MF:** $C_5H_{12}NO_4PS$



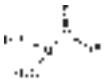
PS-2018 **lambda-Cyhalothrin**
Karate®, Commodore®, Matador®, Icon®, (1:1) mix of (S)-a-Cyano-3-phenoxybenzyl(Z)-(1R)-cis-3-(2-chloro-3,3,3-trifluoropropenyl)-2-, 2-dimethylcyclopropane carboxylate
CAS: 91465-08-6 **LD_{50}:** 56mg/kg
MW: 449.88 **MF:** $C_{23}H_{19}ClF_3NO_3$



PS-2019 **Busan 40**
Potassium-N-hydroxymethyl-N-methyldithiocarbamate
CAS: 51026-28-9 **LD_{50}:** 590mg/kg
MW: 175.32 **MF:** $C_3H_6NOS_2.K$



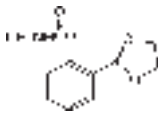
PS-2020 **Busan 85**
Potassium dimethyldithiocarbamate
CAS: 128-03-0 **LD_{50}:** 2,030mg/kg
MW: 177.34 **MF:** $C_3H_6NS_2.K.H_2O$



PS-2021 **TCMTB**
Busan 30A, 2-(Thiocyanomethyl thio)benzothiazole
CAS: 21564-17-0 **LD_{50}:** 1,000mg/kg
MW: 238.35 **MF:** $C_9H_6N_2S_3$



PS-2022 **Dioxacarb**
2-(1,3-Dioxolan-2-yl)phenyl methylcarbamate, Elocron®, Famid®
CAS: 6988-21-2 **LD_{50}:** 72mg/kg
MW: 223.25 **MF:** $C_{11}H_{13}NO_4$



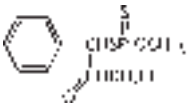
PS-2023 **Strobane** ®
Heptachloro-2,2-dimethyl-3-methylenenorbornane, Terpene polychlorinates
CAS: 8001-50-1 **LD_{50}:** 220mg/kg
MW: N/A **MF:** Isomer Mix

Structure Not Available

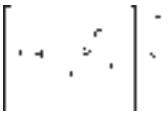
PS-2024 **Sulfotep**
O,O,O',O'-Tetraethyldithiopyro phosphate, Bladafum®, Dithio®, Dithione®, Thiotepp®
CAS: $_3$689-24-5 **LD_{50}:** 10mg/kg
MW: 322.34 **MF:** $C_8H_{20}O_5P_2S_2$



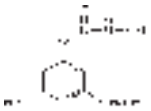
PS-2025 **Phenthoate**
(ACS Standard Grade)
Ethyl-2-dimethoxyphosphinothioyl thio(phenyl)acetate, Cidial®, Elsan®, Papthion®, Kap®
CAS: 2597-03-7 **LD_{50}:** 71mg/kg
MW: 320.38 **MF:** $C_{12}H_{17}O_4PS_2$



PS-2026 **Fosetyl-Aluminum**
Aluminum tris(O-ethyl phosphonate), Aliette®, Mikal®
CAS: 39148-24-8 **LD_{50}:** 5,000mg/kg
MW: 354.13 **MF:** $C_6H_{18}O_9P_3.Al$



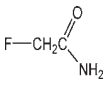
PS-2027 **Promecarb**
3-Isopropyl-5-methyl phenyl methyl carbamate
CAS: 2631-37-0 **LD_{50}:** 60mg/kg
MW: 207.30 **MF:** $C_{12}H_{17}NO_2$



PS-2028 **Copper Naphthenates**
Naphthenic acid copper salt, Cuprinol®, CNC, Coppo W®, Copper Uversol®, Cunapsol®, Curap 20®, Perm E-8®
CAS: N/A **LD_{50}:** N/A
MW: N/A **MF:** N/A

Structure Not Available

PS-2029 **2-Fluoroacetamide**
Fluorakil 100®, Navron®, Yanock®, Rodex®, Baron®, Fussol®
CAS: 640-19-7 **LD_{50}:** 6mg/kg
MW: 77.07 **MF:** C_2H_4FNO



PS-2030 **Metaldehyde**
Metacetaldehyde, C-8-Tetramethyl-1,3,5,7-tetroxocane, Antimilace®, Metason®, Namekil®, Vegfru Snailkil®, Limatox®
CAS: 9002-91-9 **LD_{50}:** 630mg/kg
MW: 176.214 **MF:** $(C_2H_4O)_4$



PS-2031 **Formaldehyde (in water)**
Formalin
CAS: 50-00-0 **LD_{50}:** 100mg/kg
MW: 30.03 **MF:** CH_2O

HCHO

PS-2032 **Biphenyl**
Phenyl benzene, Diphenyl
CAS: 92-52-4 **LD_{50}:** 3,280mg/kg
MW: 154.22 **MF:** $C_{12}H_{10}$



PS-2033 **Dicyclopentadiene**
Cyclopentadiene dimer, 3a,4,7,7a-Tetrahydro-4,7-methane -1H-indene
CAS: 77-73-6 **LD_{50}:** 353mg/kg
MW: 132.22 **MF:** $C_{10}H_{12}$



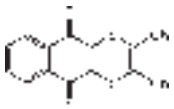
Numerical Listing

Chem Service Pesticide Standards - Numerical Listing

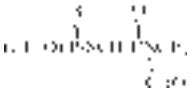
PS-2034 **Cyanophos**
Cyanox®, O-4-Cyanophenyl-O,O-dimethylphosphorothioate
CAS: 2636-26-2 **LD_{50}:** 580mg/kg
MW: 243.23 **MF:** $C_9H_{10}NO_3PS$



PS-2035 **Dithianon**
Delan®, 5,10-Dihydro-5,10-dioxo naphtho[2,3-b]-1,4-dithi-in-2,3-dicarbonitrile, 5,10-Dihydro-5,10-dioxonaphtho[2,3-b]-p-dithiin-2,3-dicarbonitril
CAS: 3347-22-6 **LD_{50}:** 638mg/kg
MW: 296.32 **MF:** $C_{14}H_4N_2O_2S_2$



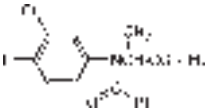
PS-2036 **Formothion**
Anthio®, Aflix®, S-[2-(Formylmethyl amino-2-oxoethyl]-O,O-dimethyl-phosphorodithionate
CAS: 2540-82-1 **LD_{50}:** 250mg/kg
MW: 257.28 **MF:** $C_6H_{12}NO_4PS_2$



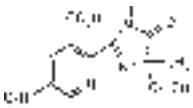
PS-2037 **Flamprop isopropyl**
CAS: 52756-22-6 **LD_{50}:** 3,000mg/kg
MW: 363.84 **MF:** $C_{19}H_{19}ClFNO_3$



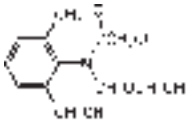
PS-2038 **Flamprop-methyl**
Mataven®, Methyl N-benzoyl-N-(3-chloro-4-fluorophenyl)-DL-ananinate
CAS: 52756-25-9 **LD_{50}:** 1,200mg/kg
MW: 335.78 **MF:** $C_{17}H_{15}ClFNO_3$



PS-2039 **Imazethapyr**
Pursuit®, (RS)-5-Ethyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-nicotinic acid, Pivot®
CAS: 81335-77-5 **LD_{50}:** 5,000mg/kg
MW: 289.37 **MF:** $C_{15}H_{19}N_3O_3$



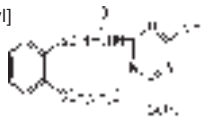
PS-2040 **Acetochlor**
Harness Plus®, Surpass®, Trophy®, 2-Chloro-N-ethoxymethyl -6'-ethylacet-o-toluidide, Acenite®, Erunite®, Sacemid®
CAS: 34256-82-1 **LD_{50}:** 763mg/kg
MW: 269.80 **MF:** $C_{14}H_{20}ClNO_2$



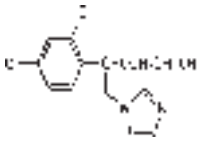
PS-2041 **Flusilazole**
Punch®, Bis(4-fluorophenyl)(methyl) (1H-1,2,4-triazol-1-ylmethyl)silane, Nustar®, Olymp®
CAS: 85509-19-9 **LD_{50}:** 674mg/kg
MW: 315.43 **MF:** $C_{16}H_{15}F_2N_3Si$



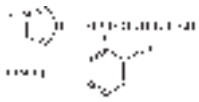
PS-2042 **Triasulfuron**
1-[2-(2-Chloroethoxy)phenylsulfonyl] -3-(4-methoxy-6-methyl)-1,3,5-triazin-2-yl)urea, Logran®, Amber®
CAS: 82097-50-5 **LD_{50}:** 5,050mg/kg
MW: 401.86 **MF:** $C_{14}H_{16}ClN_5O_5S$



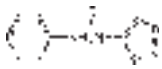
PS-2043 **Imazalil**
(+/-)-1-(B-Allyloxy-2,4-dichloro phenylethyl)imidazole, Deccozil®, Flo-Pro®, Florasan®, Freshgard®, Fungaflor®, Fungazil®, Fecundal®, Chloramizol®, 1-[2-(2,4-Dichlorophenyl)-2-(2-propenyloxy)ethyl]-1H-imidazole
CAS: 35554-44-0 **LD_{50}:** 227mg/kg
MW: 297.20 **MF:** $C_{14}H_{14}Cl_2N_2O$



PS-2043-1 **Imazalil sulfate**
Imazalil hydrogensulfate
CAS: 60534-80-7 **LD_{50}:** 550mg/kg
MW: 363.20 **MF:** $C_{14}H_{16}Cl_2N_2O_5S$



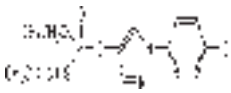
PS-2044 **Thidiazuron**
1-Phenyl-3-(1,2,3-thiadiazol-5-yl) urea, Dropp®
CAS: 51707-55-2 **LD_{50}:** 4,000mg/kg
MW: 220.27 **MF:** $C_9H_8N_4OS$



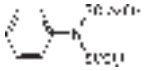
PS-2045 **Clethodim**
Select®, Prism®, E,E-(±)-2[1-[[3-Chloro-2-propenyl)oxy]imino] [propyl]5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexen-1-one
CAS: 99129-21-2 **LD_{50}:** 1,360mg/kg
MW: 359.95 **MF:** $C_{17}H_{26}ClNO_3S$



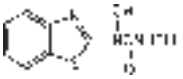
PS-2046 **Pyraclofos**
Voltage®, Boltage®, Starlex®, (RS)-[O-1-(4-Chlorophenyl) pyrazole-4-yl O-ethyl S-propyl phosphorothioate
CAS: 77458-01-6 **LD_{50}:** 237mg/kg
MW: 360.82 **MF:** $C_{14}H_{18}ClN_2O_3PS$



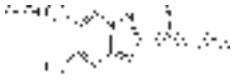
PS-2047 **Dichlofluanid**
N-Dichlorofluoromethylthio-N',N'-dimethyl-N-phenylsulfamide, Euparen®
CAS: 1085-98-9 **LD_{50}:** 5,000mg/kg
MW: 333.24 **MF:** $C_9H_{11}Cl_2FN_2O_2S_2$



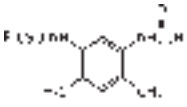
PS-2048 **Methabenzthiazuron**
Tribunil®, 1-(1,3-Benzothiazol-2-yl) -1,3-dimethylurea
CAS: 18691-97-9 **LD_{50}:** 5,000mg/kg
MW: 221.30 **MF:** $C_{10}H_{11}N_3OS$



PS-2049 **Pyrazophos**
Afugan®, Ethyl-2-diethoxyphos phinothioyloxy-5-methylpyrazolo [1,5-a]-pyrimidine-6-carboxylate
CAS: 13457-18-6 **LD_{50}:** 151mg/kg
MW: 373.40 **MF:** $C_{14}H_{20}N_3O_5PS$



PS-2050 **Mefluidide**
Embark®, Trim-Cut®, N-2,4-Dimethyl-5-[[(trifluoromethyl) sulfonyl]amino]phenyl] acetamide
CAS: 53780-34-0 **LD_{50}:** 1,920mg/kg
MW: 310.32 **MF:** $C_{11}H_{13}F_3N_2O_3S$

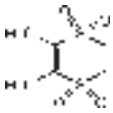


Chem Service Pesticide Standards - Numerical Listing

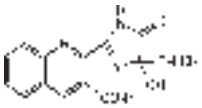
PS-2051 **Kinoprene**
Enstar®, 2-Propynyl-(E,E)-3,7,11-trimethyl-2,4-dodecadienoate
CAS: 42588-37-4 **LD_{50}:** 4,900mg/kg
MW: 276.46 **MF:** $C_{18}H_{28}O_2$



PS-2052 **Dimethipin**
Harvade®, 2,3-Dihydro-5,6-dimethyl-1,4-dithi-ine-1,1,4,4-tetraoxide
CAS: 55290-64-7 **LD_{50}:** 500mg/kg
MW: 210.28 **MF:** $C_6H_{10}O4S_2$



PS-2053 **Imazaquin**
Scepter®, (+/-)-2-[4,5-Dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-quinolinecarboxylic acid
CAS: 81335-37-7 **LD_{50}:** 2,363mg/kg
MW: 311.37 **MF:** $C_{17}H_{17}N_3O_3$



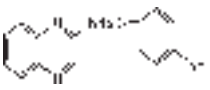
PS-2054 **Dichlormid**
N,N-Diallyl-2,2-dichloroacetamide
CAS: 37764-25-3 **LD_{50}:** 2,146mg/kg
MW: 208.10 **MF:** $C_8H_{11}Cl_2NO$



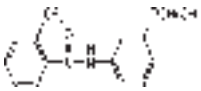
PS-2055 **Methyl anthranilate**
2-Aminobenzoic acid methyl ester
CAS: 134-20-3 **LD_{50}:** 2,910mg/kg
MW: 151.18 **MF:** $C_8H_9NO_2$



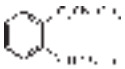
PS-2056 **Sulfaquinoxaline**
N'-2-Quinoxalyl sulfanilamine, Anti-K®, 2-Sulfanilamidoquinoxaline
CAS: 59-40-5 **LD_{50}:** 1,370mg/kg
MW: 300.36 **MF:** $C_{14}H_{12}N_4O_2S$



PS-2057 **Flutolanil**
Moncut®, a,a,a-Trifluoro-3'-isopropoxy-o-toluanilide
CAS: 66332-96-5 **LD_{50}:** 10,000mg/kg
MW: 323.34 **MF:** $C_{17}H_{16}F_3NO_2$



PS-2058 **Ethiofencarb**
Croneton®, a-Ethylthio-o-tolylmethyl carbamate
CAS: 29973-13-5 **LD_{50}:** 200mg/kg
MW: 225.33 **MF:** $C_{11}H_{15}NO_2S$



PS-2059 **Fuberidazole**
Voronit®, 2-(2-Furanyl)-1H-benzimidazole
CAS: 3878-19-1 **LD_{50}:** 500mg/kg
MW: 184.21 **MF:** $C_{11}H_8N_2O$



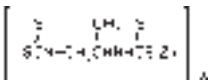
PS-2060 **Tolylfluanid**
Euparen M®, 1,1-Dichloro-N-[dimethylamino)sulfonyl]-1-fluoro-N-(4-methylphenyl)methane sulfenamide
CAS: 731-27-1 **LD_{50}:** 1,000mg/kg
MW: 347.27 **MF:** $C_{10}H_{13}Cl_2FN_2O_2S_2$



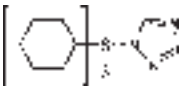
PS-2061 **Ethidimuron**
Ustilan®, 1-(5-Ethylsulfonyl-1,3,4-thiadiazol-2-yl)-1,3-dimethylurea
CAS: 30043-49-3 **LD_{50}:** 5,000mg/kg
MW: 264.35 **MF:** $C_7H_{12}N_4O_3S_2$



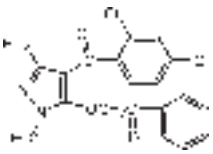
PS-2062 **Propineb**
Antracol®, Airone®, Agrocol®, [[(1-Methyl-1,2-ethanediyl)bis [carbamodithioato]](2-)]zinc homopolymer
CAS: 9016-72-2 **LD_{50}:** 5,000mg/kg
MW: (289.6)n **MF:** $(C_5H_8N_2S_4Zn)n$



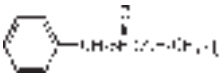
PS-2063 **Azocyclotin**
Peropal®, Clermait®, 1-(Tricyclohexylstannyl)-1H-1,2,4-triazole
CAS: 41083-11-8 **LD_{50}:** 209mg/kg
MW: 436.27 **MF:** $C_{20}H_{35}N_3Sn$



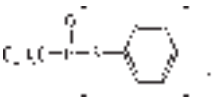
PS-2064 **Pyrazoxyfen**
Paicer®, Mondaris®, 2-[4-(2,4-Dichlorobenzoyl)-1,3-dimethylpyrazol-5-yloxy] acetophenone
CAS: 71561-11-0 **LD_{50}:** 1,644mg/kg
MW: 403.28 **MF:** $C_{20}H_{16}Cl_2N_2O_3$



PS-2065 **Iprobenfos**
Kitazin®, IBP, S-Benzyl O,O-di-isopropyl phosphorothioate
CAS: 26087-47-8 **LD_{50}:** 490mg/kg
MW: 288.37 **MF:** $C_{13}H_{21}O_3PS$



PS-2066 **Edifenphos**
Hinosan®, O-Ethyl S,S-diphenyl phosphorodithioate
CAS: 17109-49-8 **LD_{50}:** 100mg/kg
MW: 310.38 **MF:** $C_{14}H_{15}O_2PS_2$



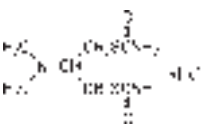
PS-2067 **Buprofezin**
2-tert-Butylamino-3-isopropyl-5-phenyl-1,3,5-thiadiazinan-4-one, Applaud®
CAS: 69327-76-0 **LD_{50}:** 2,198mg/kg
MW: 305.48 **MF:** $C_{16}H_{23}N_3OS$



PS-2068 **Abamectin**
Avermectin B1, Dynamec®, Agri-Mek®, Avid®, Zephyr®
CAS: 71751-41-2 **LD_{50}:** 10mg/kg
MW: 873./860.1 **MF:** $C_{48}H_{72}O_{14}$ /$C_{47}H_{70}O_{14}$

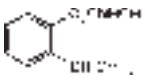


PS-2069 **Cartap hydrochloride**
S,S'-2-Dimethylaminotrimethylene bis(thiocarbamate) hydrochloride, Suntap®, Padan®, Sunvex®
CAS: 22042-59-7 **LD_{50}:** 325mg/kg
MW: 273.83 **MF:** $C_7H_{15}N_3O_2S_2.HCl$

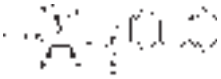


Chem Service Pesticide Standards - Numerical Listing

PS-2070 **Isoprocarb**
MIPC, 2-(1-Methylethyl)phenyl methylcarbamate
CAS: 2631-40-5 **LD_{50}:** 178mg/kg
MW: 193.27 **MF:** $C_{11}H_{15}NO_2$



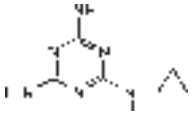
PS-2071 **Deltamethrin**
Butox®, Decis®, K-Othrin®, (S)-a-Cyano-3-phenoxybenzyl (1R,3R)-3-(2,2-dibromovinyl)-2,2-dimethylcyclopropane carboxylate
CAS: 52918-63-5 **LD_{50}:** 535mg/kg
MW: 505.24 **MF:** $C_{22}H_{19}Br_2NO_3$



PS-2072 **Fenbuconazole**
Indar®, Enable®, Govern®, 4-(4-Chlorophenyl)-2-phenyl-2-[1H-1,2,4-triazol-1-yl)methyl] butanenitrile, alpha-(3-(4-Chloro phenyl)ethyl-alpha-phenyl-(1H-1,2,4-triazole)-1-propanenitrile
CAS: 114369-43-6 **LD_{50}:** 2,000mg/kg
MW: 336.85 **MF:** $C_{19}H_{17}ClN_4$



PS-2073 **Cyromazine**
Cypromazine, Trigard®, Armor®, N-Cyclopropyl-1,3,5-triazine-2,4,6-triamine
CAS: 66215-27-8 **LD_{50}:** 3,387mg/kg
MW: 166.22 **MF:** $C_6H_{10}N_6$



PS-2074 **Hexaflumuron**
Consult®, 1-[3,5-Dichloro-4-(1,1,2,2-tetrafluoroethoxy)phenyl]3-(2,6-difluorobenzoyl)urea
CAS: 86479-06-3 **LD_{50}:** 5,000mg/kg
MW: 471.26 **MF:** $C_{16}H_{18}Cl_2F_6N_2O_3$



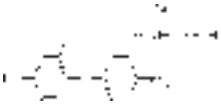
PS-2075 **Azadirachtin**
Azatin®
CAS: 11141-17-6 **LD_{50}:** 5,000mg/kg
MW: 720.7 **MF:** $C_{35}H_{44}O_{16}$



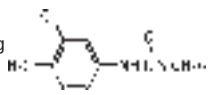
PS-2076 **Uniconizole-P**
Sumagic®, (E)-(RS)-1-(4-Chlorophenyl)-4,4-dimethyl-2-(1H-1,2,4-triazol-1-yl) pent-1-en-3-ol
CAS: 83657-17-4 **LD_{50}:** 1,790mg/kg
MW: 291.81 **MF:** $C_{15}H_{18}ClN_3O$



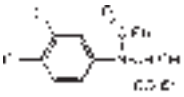
PS-2077 **Lactofen**
Cobra®, Ethyl O-[5-(2-chloro-a,a,a-trifluoro-p-tolyloxy)-2-nitro benzenzoyl]-DL-lactate
CAS: 77501-63-4 **LD_{50}:** 5,000mg/kg
MW: 461.80 **MF:** $C_{19}H_{15}ClF_3NO_7$



PS-2078 **Chlorotoluron**
Dicuran®, Lentipur®, Toro®,
CAS: 15545-48-9 **LD_{50}:** 10,000mg/kg
MW: 212.70 **MF:** $C_{10}H_{13}ClN_2O$



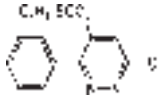
PS-2079 **Benzoylprop ethyl**
Suffix®, Ethyl N-benzoyl-N-(3,4-dichlorophenyl)-DL-alaninate
CAS: 22212-55-1 **LD_{50}:** 1,550mg/kg
MW: 366.26 **MF:** $C_{18}H_{17}Cl_2NO_3$



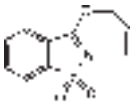
PS-2080 **Bioresmethrin**
d-trans-Resmethrin
CAS: 28434-01-7 **LD_{50}:** 1,244mg/kg
MW: 338.48 **MF:** $C_{22}H_{26}O_3$



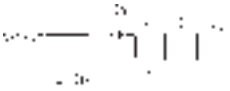
PS-2081 **Pyridate**
Lentagran®, Tough®, O-(6-Chloro-3-phenyl-4-pyridazinyl) S-octyl carbonothioate
CAS: 55512-33-9 **LD_{50}:** 1,970mg/kg
MW: 378.95 **MF:** $C_{19}H_{23}ClN_2O_2S$



PS-2082 **Probenazole**
Oryzamate®, 3-Allyloxy-1,2-benz [d]isothiazole 1,1-dioxide
CAS: 27605-76-1 **LD_{50}:** 2,030mg/kg
MW: 223.26 **MF:** $C_{10}H_9NO_3S$



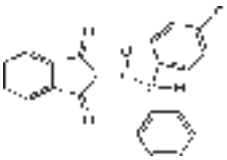
PS-2083 **alpha-Cypermethrin**
Fastac®, Bestox®, Alphamethrin®, Fendona®, Renegade®, Dominex®, [1a(S®),3a]-(+/-)-Cyano-(3-phenoxyphenyl)methyl-3-(2,2-dichlorovinyl)-2,2-dimethyl cyclopropanecarboxylate
CAS: 67375-30-8 **LD_{50}:** 79mg/kg
MW: 416.32 **MF:** $C_{22}H_{19}Cl_2NO_3$



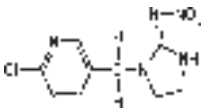
PS-2084 **Bitrex ®**
Bitterguard®, Denatonium benzoate, Benzyldiethyl [(2,6-xylylcarbamoyl) ammonium benzoate
CAS: 3734-33-6 **LD_{50}:** 584mg/kg
MW: 446.64 **MF:** $C_{21}H_{29}N_2O.C_7H_5O_2$



PS-2085 **Chlorophacinone**
Caid®, Liphadione®, Raviac®, Rozol®, 2-[2-(4-Chlorophenyl)-2-phenylacetyl]indan-1,3-dione, 2-[(4-Chlorophenyl)phenylacetyl]-1H-indene-1,3(2H)-dione
CAS: 3691-35-8 **LD_{50}:** 2mg/kg
MW: 374.83 **MF:** $C_{23}H_{15}ClO_3$



PS-2086 **Imidacloprid**
Admire®, Confidor®, Gaucho®, Merit®, 1-[(6-Chloro-3-pyridinyl) methyl]-N-nitro-2-imidazolidinimine
CAS: 138261-41-3 **LD50:** 450mg/kg
MW: 255.69 **MF:** $C_9H_{10}ClN_5O_2$

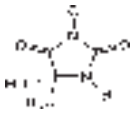


PS-2087 **Binapacryl**
Morocide®, 2-sec-Butyl-4,6-dinitrophenyl 3-methylcrotonate
CAS: 485-31-4 **LD_{50}:** 58mg/kg
MW: 322.35 **MF:** $C_{15}H_{18}N_2O_6$



Chem Service Pesticide Standards - Numerical Listing

PS-2089 **Agribrom**
1-Bromo-3-chloro-5,5-dimethyl-2,4-imidazolidinedione
CAS: 16079-88-2 **LD_{50}:** 1,390mg/kg
MW: 241.49 **MF:** $C_5H_6BrClN_2O_2$



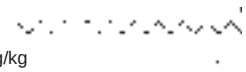
PS-2090 **Chloroxynil**
3,5-Dichloro-4-hydroxybenzonitrile
CAS: 1891-95-8 **LD_{50}:** N/A
MW: 188.01 **MF:** $C_7H_3Cl_2NO$



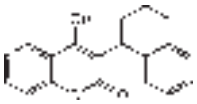
PS-2091 **Copper-8-Quinolinolate**
Oxine-copper, Quinolate®
CAS: 10380-28-6 **LD_{50}:** 9,930mg/kg
MW: 351.86 **MF:** $C_{18}H_{12}CuN_2O_2$



PS-2092 **Cycloprate**
Zardex®, Hexadecyl cyclopropanecarboxylate
CAS: 54460-46-7 **LD_{50}:** 12,200mg/kg
MW: 310.58 **MF:** $C_{20}H_{38}O_2$



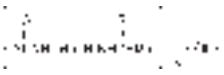
PS-2093 **Coumatetralyl**
Racumin®, 4-Hydroxy-3-(1,2,3,4-tetrahydro-1-naphtalenyl)-2H-1-benzopyran-2-one
CAS: 5836-29-3 **LD_{50}:** 17mg/kg
MW: 292.35 **MF:** $C_{19}H_{16}O_3$



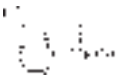
PS-2094 **Validamycin**
Solacol®, Validacin®, Valimun®, 1L-(1,3,4/2,6)-2,3-Dihydroxy-6-hydroxymethyl-4-[(1S,4R,5S,6S)-4,5,6-trihydroxy-3-hydroxymethylcyclohex-2-enylamino]cyclohexyl beta-D-gluco##
CAS: 37248-47-8 **LD_{50}:** 20,000mg/kg
MW: 497.56 **MF:** $C_{20}H_{35}NO_{13}$



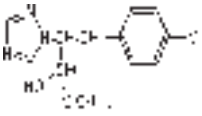
PS-2095 **Mancozeb**
Manzate®, Pennfluid®, Trimanoc®, Penncozeb®, Tridex® Fungicide, Dithane®, Fore®, Zinc and Manganese ethylene bisdithiocarbamate coordination product
CAS: 8018-01-7 **LD_{50}:** 5,000mg/kg
MW: 541.03 **MF:** $[C_4H_6MnN_2S_4]_xZn_y$



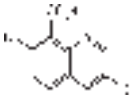
PS-2096 **Metolcarb**
MTMC, Metacrate®, m-Tolyl methyl carbamate
CAS: 1129-41-5 **LD_{50}:** 268mg/kg
MW: 165.21 **MF:** $C_9H_{11}NO_2$



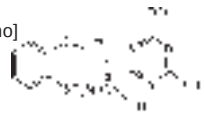
PS-2097 **Paclobutrazol**
Bonzi®, Clipper®, Cultar®, Parlay, (2RS,3RS)-1-(4-Chlorophenyl)-4,4-dimethyl-2-(1H-1,2,4-triazol-1-yl)pentan-3-ol
CAS: 76738-62-0 **LD_{50}:** 1,300mg/kg
MW: 293.83 **MF:** $C_{15}H_{20}ClN_3O$



PS-2098 **Quinclorac**
Facet®, 3,7-Dichloro-8-quinoline carboxylic acid
CAS: 84087-01-4 **LD_{50}:** 2,190mg/kg
MW: 242.06 **MF:** $C_{10}H_5Cl_2NO_2$



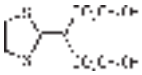
PS-2099 **Tribenuron methyl**
Express®, Methyl 2-[[[[4-methoxy-6-methyl-1,3,5-triazin-2- yl)methylamino]carbonyl]amino]sulfonyl]benzoate
CAS: 101200-48-0 **LD_{50}:** 5,000mg/kg
MW: 395.43 **MF:** $C_{15}H_{17}N_5O_6S$



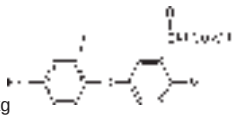
PS-2100 **Phoxim**
Baythion®, Volaton®, alpha-[[(Diethoxyphosphinothioyl)oxy]imino]benzene-acetonitrile
CAS: 14816-18-3 **LD_{50}:** 300mg/kg
MW: 298.32 **MF:** $C_{12}H_{15}N_2O_3PS$



PS-2101 **Isoprothiolane**
Fuji-One®, Di-isopropyl 1,3-dithiolan-2-ylindenemalonate
CAS: 50512-35-1 **LD_{50}:** 1,190mg/kg
MW: 290.42 **MF:** $C_{12}H_{18}O_4S_2$



PS-2102 **Fomesafen**
Flex®, Reflex®, Flexstar, 5-[2-Chloro-4-(trifluoromethyl)phenoxy]-N-(methylsulfonyl)-2-nitrobenzamide
CAS: 72178-02-0 **LD_{50}:** 1,250mg/kg
MW: 438.78 **MF:** $C_{15}H_{10}ClF_3N_2O_6S$



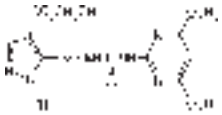
PS-2103 **Isodrin**
(ACS Standard Grade)
CAS: 465-73-6 **LD_{50}:** 7mg/kg
MW: 364.90 **MF:** $C_{12}H_8Cl_6$



PS-2104 **Cyprazine**
2-Chloro-4-(cyclopropylamino)-6-(isopropylamino)-s-triazine
CAS: 22936-86-3 **LD_{50}:** 1,200mg/kg
MW: 227.73 **MF:** $C_9H_{14}ClN_5$



PS-2105 **Pyrazosulfuron-ethyl**
Acord®, Agreen®, Sirius®, Ethyl 5-(4,6-dimethoxypyrimidin-2-ylcarbamoylsulfamoyl)-1-methylpyrazole-4-carboxylate
CAS: 93697-74-6 **LD_{50}:** 5,000mg/kg
MW: 414.44 **MF:** $C_{14}H_{18}N_6O_7S$



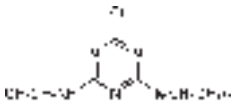
PS-2106 **Bensultap**
Bancol®, S,S'-2-Dimethylamino trimethylene di (benzenethiosulfonate)
CAS: 17606-31-4 **LD_{50}:** 1,105mg/kg
MW: 431.63 **MF:** $C_{17}H_{21}NO_4S_4$



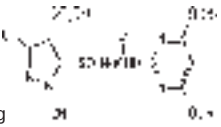
Numerical Listing

Chem Service Pesticide Standards - Numerical Listing

PS-2107 **Trietazine**
2-Chloro-4-diethylamino-6-ethylamino-1,3,5-triazine
CAS: 1912-26-1 **LD_{50}:** 594mg/kg
MW: 229.75 **MF:** $C_9H_{16}ClN_5$



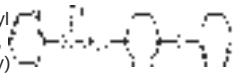
PS-2108 **Halosulfuron-methyl**
Permit®, Battalion®, Manage®, Sempra®, Methyl 5-{[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonylamino sulfonyl}-3-chloro-1-methyl-1H-pyrazole-4-carboxylate
CAS: 100784-20-1 **LD_{50}:** 8,865mg/kg
MW: 434.85 **MF:** $C_{13}H_{15}ClN_6O_7S$



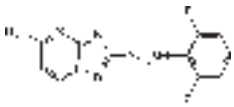
PS-2109 **Prallethrin**
Etoc®, Nylar®, (S)-2-Methyl-4-oxo-3-(2-propynyl)-cyclopenten-1-yl (1R)-cis-trans-chrysanthemate
CAS: 23031-36-9 **LD_{50}:** 460mg/kg
MW: 300.43 **MF:** $C_{19}H_{24}O_3$



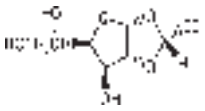
PS-2110 **Pyriproxyfen**
Admiral®, Knack®, Adeal®, Atominal®, Epingle®, Juvinal®, Lano®, Nemesis®, 4-Phenoxyphenyl (RS)-2-(2-pyridyloxy)propyl ether, 2-[1-Methyl-2-(4-phenoxyphenoxy) ethoxy]pyridine
CAS: 95737-68-1 **LD_{50}:** 5,000mg/kg
MW: 321.40 **MF:** $C_{20}H_{19}NO_3$



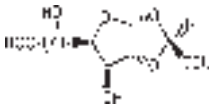
PS-2111 **Flumetsulam**
Broadstrike®, Preside®, Scorpion®, 2-(2,6-Difluorophenylsulphamoyl)-5-methyl[1,2,4]-triazolo[1,5-a] pyridine, N-(2,6-Difluorophenyl)-5-methyl-[1,2,4]triazolo[1,5-a] pyrimidine-2-sulfonamide
CAS: 98967-40-9 **LD_{50}:** 5,000mg/kg
MW: 325.32 **MF:** $C_{12}H_9F_2N_5O_2S$



PS-2112 **a-Chloralose**
Alfa-4®, Alfa Z®, Alfamat®, (R)-1,2-O-(2,2,2-Trichloroethyl idene)-a-D-glucofuranose
CAS: 15879-93-3 **LD_{50}:** 400mg/kg
MW: 309.54 **MF:** $C_8H_{11}Cl_3O_6$



PS-2113 **b-Chloralose**
CAS: 16376-36-6 **LD_{50}:** N/A
MW: 309.53 **MF:** $C_8H_{11}Cl_3O_6$



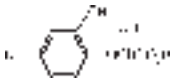
PS-2114 **Phthalanillic acid**
Nevirol®, Phenylphthalanic acid
CAS: 4727-29-1 **LD_{50}:** 8,837mg/kg
MW: 241.26 **MF:** $C_{14}H_{11}NO_3$



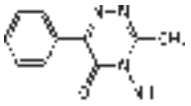
PS-2115 **Tralomethrin**
(S)-a-Cyano-3-phenoxybenzyl (1R,3S)-2,2-dimethyl-3-[(RS)-1,2,2,2-tetrabromoethyl]cyclopropane carboxylate, Saga®, Scout®, Tralox®, Tracker®, Tralate®
CAS: 66841-25-6 **LD_{50}:** 99mg/kg
MW: 665.06 **MF:** $C_{22}H_{19}Br_4NO_3$



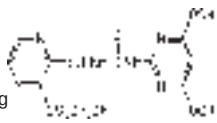
PS-2116 **Mecoprop-P**
Duplosan® KV, Optica®, (+)-(R)-2-(4-Chloro-2-methyl phenoxy)propionic acid, D(+)-Mecoprop, MCPP-P
CAS: 16484-77-8 **LD_{50}:** 1,050mg/kg
MW: 214.65 **MF:** $C_{10}H_{11}ClO_3$



PS-2117 **Metamitron**
4-Amino-4,5-dihydro-3-methyl-6-phenyl-1,2,4-triazin-5-one, Goltix®, Tornado®
CAS: 41394-05-2 **LD_{50}:** 1,200mg/kg
MW: 202.24 **MF:** $C_{10}H_{10}N_4O$



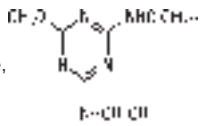
PS-2118 **Rimsulfuron**
1-(4,6-Dimethoxypyrimidin-2-yl)-3-(3-ethylsulfonyl-2-pyridylsulfonyl) urea, Titus®, Matrix®
CAS: 122931-48-0 **LD_{50}:** 5,000mg/kg
MW: 431.48 **MF:** $C_{14}H_{17}N_5O_7S_2$



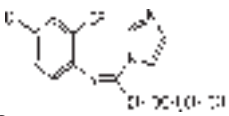
PS-2119 **Flumiclorac-pentyl**
Pentyl[2-chloro-5-(cyclohex-1-ene-1,2-dicarboximido)-4-fluoro phenoxy]acetate, Resource®, Radiant®, Sumiverde®
CAS: 87546-18-7 **LD_{50}:** N/A
MW: 403.843 **MF:** $C_{21}H_{19}O_4NClF$



PS-2120 **Terbumeton**
Caragard®, N-(1,1-Dimethylethyl)-N'-ethyl-6-methoxy-1,3,5-triazine-2,4-diamine, N2-tert-Butyl-N4-ethyl-6-methoxy-1,3,5-triazine-2,4-diamine, 2-tert-Butylamino-4-ethylamino-6-methoxy-s-triazine,
CAS: 33693-04-8 **LD_{50}:** 433mg/kg
MW: 225.34 **MF:** $C_{10}H_{19}N_5O$



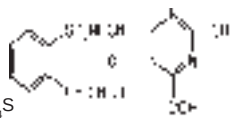
PS-2121 **Triflumizole**
Procure®, Trifmine®, 4-Chloro-a,a,a-trifluoro-N-(1-imidazol-1-yl-2-propoxyethyl idene)-o-toluidine
CAS: 68694-11-1 **LD_{50}:** 695mg/kg
MW: 345.78 **MF:** $C_{15}H_{15}ClF_3N_3O$



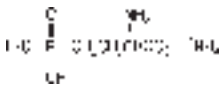
PS-2122 **Methoprotryne**
Gesaran®, Amethopterin®, N2-Isopropyl-N4-(3-methoxypropyl) -6-methylthio-1,3,5-triazine-2,4-diamine
CAS: 841-06-5 **LD_{50}:** 5,000mg/kg
MW: 271.43 **MF:** $C_{11}H_{21}N_5OS$



PS-2123 **Prosulfuron**
1-(4-Methoxy-6-methyl-1,3,5-triazin-2-yl)-3-[2-(3,3,3-trifluoro propyl)phenylsulfonyl]urea, Peak®
CAS: 94125-34-5 **LD_{50}:** 986mg/kg
MW: 419.38 **MF:** $C_{15}H_{16}F_3N_5O_4S$



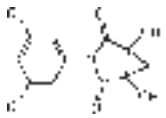
PS-2124 **Glufosinate-ammonium**
Ammonium-4-[hydroxy(methyl) phosphinoyl]-DL-homoalaninate, Basta®, Liberty®, Finale®, Rely®, Harvest®, Challenge®, Conquest®
CAS: 77182-82-2 **LD_{50}:** 1,620mg/kg
MW: 198.19 **MF:** $C_5H_{11}NO_4P.H_4N$



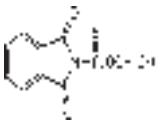
PS-2125 **Pyridaben**
2-tert-Butyl-5-(4-tert-butylbenzyl thio)-4-chloropyridazin-3(2H)-one, Sanmite®, Jarben®, Poseidon®, Nexter®, Pyramite®
CAS: 96489-71-3 **LD_{50}:** 570mg/kg
MW: 364.93 **MF:** $C_{19}H_{25}ClN_2OS$



PS-2126 **Procymidone**
N-(3,5-Dichlorophenyl)-1,2-dimethylcyclopropane-1,2-dicarboximide, Sumilex®, Marcidone®, Kimono®, Sumisclex®,
CAS: 32809-16-8 **LD_{50}:** 7,000mg/kg
MW: 284.15 **MF:** $C_{13}H_{11}Cl_2NO_2$



PS-2127 **Ditalimfos**
Laptran®, Plondrel®, O,O-Diethyl phthalimido phosphonothioate
CAS: 5131-24-8 **LD_{50}:** 4,930mg/kg
MW: 299.30 **MF:** $C_{12}H_{14}NO_4PS$



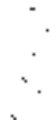
PS-2128 **Bronopol**
2-Bromo-2-nitro-1,3-propanediol
CAS: 52-51-7 **LD_{50}:** 180mg/kg
MW: 199.99 **MF:** $C_3H_6BrNO_4$



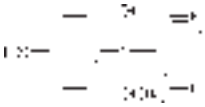
PS-2129 **Isoxaben**
N-[3-(1-Ethyl-1-methylpropyl) isoxazol-5-yl]-2,6-dimethoxy benzamide, Combat®, Gallery®, Flexidor®
CAS: 82558-50-7 **LD_{50}:** 10,000mg/kg
MW: 332.4 **MF:** $C_{18}H_{24}N_2O_4$



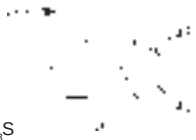
PS-2130 **Cyproconazole**
Sentinel®, Alto®, Atemi®, (2RS,3RS;2RS,3SR)-2-(4-Chloro phenyl)-3-cyclopropyl-1-(1H-1,2,4-triazol-1-yl)butan-2-ol
CAS: 113096-99-4 **LD_{50}:** 1,020mg/kg
MW: 291.81 **MF:** $C_{15}H_{18}ClN_3O$



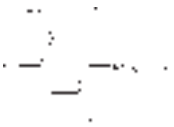
PS-2131 **Flurprimidol**
Cutless ®, a-(1-Methylethyl)-a-[4-trifluoromethoxy)phenyl]-5-pyrimidinemethanol
CAS: 56425-91-3 **LD_{50}:** 709mg/kg
MW: 312.3 **MF:** $C_{15}H_{15}F_3N_2O_2$



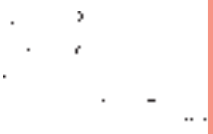
PS-2132 **Sulfentrazone**
Authority®, 2',4'-Dichloro-5'-(4-difluoromethyl-4,5-dihydro-3-methyl-5-oxo-1H-1,2,4-triazol-1-yl) methanesulfonanilide
CAS: 122836-35-5 **LD_{50}:** 2,855mg/kg
MW: 387.2 **MF:** $C_{11}H_{10}Cl_2F_2N_4O_3S$



PS-2133 **Prodiamine**
5-Dipropylamino-a,a,a-trifluoro-4,6-dinitro-o-toluidine, Barricade®, Endurance®, Marathon®
CAS: 29091-21-2 **LD_{50}:** 15,380mg/kg
MW: 350.3 **MF:** $C_{13}H_{17}F_3N_4O_4$



PS-2134 **Hydroprene**
GenTrol®, Ethyl-(2E,4E,7S)-3,7,11-trimethyl-2,4-dodecadienoate, Mator®,
CAS: 41096-46-2 **LD_{50}:** 34,000mg/kg
MW: 266.47 **MF:** $C_{17}H_{30}O_2$



PS-2135 **Tralkoxydim**
Grasp®, Achieve®, Splendor®, 2-[1-(Ethoxyimino) propyl]-3-hydroxy-5-mesitylcyclohex-2-enone
CAS: 87820-88-0 **LD_{50}:** 1,324mg/kg
MW: 329.4 **MF:** $C_{20}H_{27}NO_3$



PS-2136 **Fipronil**
5-Amino-[2,6-dichloro-4-(trifluoro methyl)phenyl]-4-[(1R,S)-(trifluoro methyl)sulfinyl]-1H-pyrazole-3-carbonitrile
CAS: 120068-37-3 **LD_{50}:** 100mg/kg
MW: 437.15 **MF:** $C_{12}F_4ClF_6N_4OS$



PS-2137 **Oxadixyl**
Anchor®, Sandofan®, 2-Methoxy-N-(2-oxo-1,3-oxazolidin-3-yl)aceto-2',6'-xylidide, N-(2,6-Dimethylphenyl)-2-methoxy -N-(2-oxo-3-oxazolidinyl)acetamide
CAS: 77732-09-3 **LD_{50}:** 3,480mg/kg
MW: 278.3 **MF:** $C_{14}H_{18}N_2O_4$



PS-2138 **Dimethomorph**
Acrobat®, (E,Z)-4-[3-(4-Chlorophenyl)-3-(3,4-dimethoxy phenyl)acryloyl]-morpholine
CAS: 110488-70-5 **LD_{50}:** 3,900mg/kg
MW: 387.9 **MF:** $C_{21}H_{22}ClNO_4$

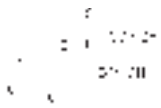


PS-2138-1Z-Dimethomorph
(Z)-4-[3-(4-Chlorophenyl)-3-(3,4-dimethoxyphenyl)acryloyl]-morpholine
CAS: N/A **LD_{50}:** 4,300mg/kg
MW: 387.9 **MF:** $C_{21}H_{22}ClNO_4$

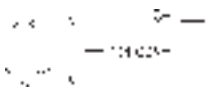


Chem Service Pesticide Standards - Numerical Listing

PS-2139 **Triazophos**
Hostathion, O,O-Diethyl O-1-Phenyl-1H-1,2,4-triazol-3-yl phosphorothioate, 1-Phenyl-1,2,4-triazolyl-3-(O,O-diethylthiono phosphate)
CAS: 24017-47-8 **LD_{50}:** 57mg/kg
MW: 313.31 **MF:** $C_{12}H_{16}N_3O_3PS$



PS-2140 **Mefenacet**
Hinochloa®, 2-(2-benzothiazolyl oxy)-N-methyl-N-phenylacetamide, 2-(1,3-benzothiazol-2-yloxy)-N-methylacetanilide
CAS: 73250-68-7 **LD_{50}:** 5,000mg/kg
MW: 298.4 **MF:** $C_{16}H_{14}N_2O_2S$



PS-2141 **Azoxystrobin**
Heritage®, Amistar®, Methyl (E)-2-2-6-(2-Cyanophenoxy) pyrimidin-4-yloxy-phenyl-3-methoxyacrylate
CAS: 131860-33-8 **LD_{50}:** 5,000mg/kg
MW: 403.39 **MF:** $C_{22}H_{17}N_3O_5$



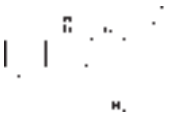
PS-2142 **Benalaxyl**
Galben®, Tairel®, Methyl N-phenylacetyl-N-2,6-xylyl-DL-alaninate
CAS: 71626-11-4 **LD_{50}:** 4,200mg/kg
MW: 325.4 **MF:** $C_{20}H_{23}NO_3$



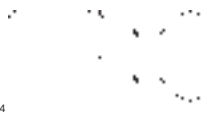
PS-2143 **Difenacoum**
Frunax-DS®, Matrak®, Ratak®, Castrix D®, Neosorexa®, Vorex®, 3-(3-Biphenyl-4-yl-1,2,3,4-tetra hydro-1-naphthyl)-4-hydroxy coumarin, 3-[3-(1,1'-Biphenyl)-4-yl-1,2,3,4-tetrahydro-1-naphthalenyl]-4-hydroxy-2H-1-benzopyran-2-one
CAS: 56073-07-5 **LD_{50}:** 2mg/kg
MW: 444.54 **MF:** $C_{31}H_{24}O_3$



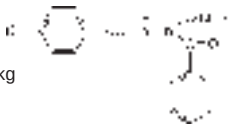
PS-2144 **Cyprodinil**
Vangard®, Chorus®, 4-Cyclopropyl-6-methyl-N-phenyl pyrimidin-2-amine
CAS: 121552-61-2 **LD_{50}:** 2,000mg/kg
MW: 225.3 **MF:** $C_{14}H_{15}N_3$



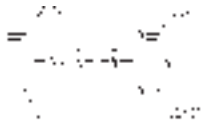
PS-2145 **Pyrithiobac-Sodium**
Staple®, Sodium 2-Chloro-6-(4,6-dimethoxypyrimidin-2-ylthio) benzoate
CAS: 123343-16-8 **LD_{50}:** 3,300mg/kg
MW: 225.3 **MF:** $C_{13}H_{10}ClN_2NaO_4$



PS-2146 **Halofenozide**
Mach 2, N-tert-butyl-N'-(4-Chloro benzoyl)benzohydrazide
CAS: 112226-61-6 **LD_{50}:** 2,850mg/kg
MW: 330.8 **MF:** $C_{18}H_{19}ClN_2O_2$



PS-2147 **Triflusulfuron-methyl**
Upbeet®, 2-[4-Dimethylamino-6-(2,2,2-trifluoroethoxy)-1,3,5-triazin-2-ylcarbamoylsulfamoyl]-m-toluic acid methyl ester
CAS: 126535-15-7 **LD_{50}:** 5,000mg/kg
MW: 492.4 **MF:** $C_{17}H_{19}F_3N_6O_6S$



PS-2148 **Diflufenzopyr**
2-{1-[4-(3,5-difluorophenyl)semi carbazono]ethyl}nicotinic acid
CAS: 109293-97-2 **LD_{50}:** 5,000mg/kg
MW: 334.3 **MF:** $C_{15}H_{12}F_2N_4O_3$

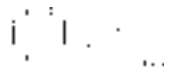


PS-2149 **Flocoumafen**
Storm®, Stratagem®, 4-Hydroxy-3-[1,2,3,4-tetrahydro-3-[4-(4-tri fluoromethylbenzyl-oxy)phenyl]-1-naphthyl] coumarin
CAS: 90035-08-8 **LD_{50}:** 1mg/kg
MW: 542.6 **MF:** $C_{33}H_{25}F_3O_4$



PS-2150 **Forchlorfenuron**
1-(2-Chloro-4-pyridyl)-3-phenylurea
CAS: 68157-60-8 **LD_{50}:** 4,918mg/kg
MW: 247.7 **MF:** $C_{12}H_{10}ClN_3O$

PS-2151 **Quizalofop-P-ethyl**
Assure II®, Matador®, Herban®, Mostar®, Co-Pilot®, Pilot Super®, Targa Super®, Tarzazan®, Ethyl (R)-2-[4-(6-chloroquinoxalin-2-yloxy)phenoxy]propionate
CAS: 100646-51-3 **LD_{50}:** 1,210mg/kg
MW: 372.83 **MF:** $C_{19}H_{17}ClN_2O_4$



PS-2152 **Diniconazole**
(E)-(RS)-1-(2,4-Dichlorophenyl-4,4-dimethyl-2-(1H-1,2,4-triazol-1-yl) pent-1-en-3-ol/, Spotless®, Sumi-8®, Embassador®
CAS: 83657-24-3 **LD_{50}:** 639mg/kg
MW: 326.25 **MF:** $C_{15}H_{17}Cl_2N_3O$



PS-2153 **Diethofencarb**
Isopropyl-3,4-diethoxycarbanilate, 1-Methylethyl (3,4-diethoxyphenyl) carbamate/Isopropyl 3,4-diethoxy phenylcarbamate, Powmyl®
CAS: 87130-20-9 **LD_{50}:** 5,000mg/kg
MW: 267.36 **MF:** $C_{14}H_{21}NO_4$



PS-2154 **Dimethachlon**
N-(3,5-Dichlorophenyl)succinimide, Ohric®, DSI®, 1-(3,5-Dichloro phenyl)-2,5-pyrrolidinedione, Dimetachlone
CAS: 24096-53-5 **LD_{50}:** 890mg/kg
MW: 244.08 **MF:** $C_{10}H_7Cl_2NO_2$



PS-2155 **Pyridaphenthion**
O-(1,6-Dihydro-6-oxo-1-phenyl pyridazin-3-yl) O,O-diethyl phosphorothioate, Ofunack®, Oreste®
CAS: 119-12-0 **LD_{50}:** 769mg/kg
MW: 340.36 **MF:** $C_{14}H_{17}N_2O_4PS$



PS-2156 **Tolclofos-Methyl**
O-2,6-Dichloro-p-tolyl O,O-dimethyl phosphorothioate, Risolex®, FortuneT2®, Basilex®
CAS: 57018-04-9 **LD_{50}:** 5,000mg/kg
MW: 301.13 **MF:** $C_9H_{11}Cl_2O_3PS$



PS-2157 **Hexaconazole**
Hexaconazole, (RS)-2-(2,4-Dichloro phenyl)-1-(1H-1,2,4-triazol-1-yl) hexan-2-ol, Anvil®, Planete Aster®, Bullet®, Amizol®, Canvil®
CAS: 79983-71-4 **LD_{50}:** 2,189mg/kg
MW: 314.2 **MF:** $C_{14}H_{17}Cl_2N_3O$



PS-2158 **Trinexapac-ethyl**
Ethyl 4-cyclopropyl(hydroxy) methylene-3,5-dioxocyclohexane carboxylate
CAS: 95266-40-3 **LD_{50}:** 4,460mg/kg
MW: 252.3 **MF:** $C_{13}H_{16}O_5$



PS-2159 **Difenoconazole**
CAS: 119446-68-3 **LD_{50}:** 1,453mg/kg
MW: 406.3 **MF:** $C_{19}H_{17}Cl_2N_3O_3$



PS-2160 **Mefenoxam**
Metalaxyl-M, R-Metalaxyl, Methyl N-(methoxyacetyl)-N-(2,6-xylyl)-D-alaninate
CAS: 70630-17-0 **LD_{50}:** 667mg/kg
MW: 279.3 **MF:** $C_{15}H_{21}NO_4$



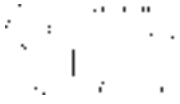
PS-2161 **Dimethenamid**
Frontier®, (RS)-2-Chloro-N-(2,4-dimethyl-3-thienyl)-N-(2-methoxy-1-methylethyl)acetamide
CAS: 87674-68-8 **LD_{50}:** 1,570mg/kg
MW: 275.8 **MF:** $C_{12}H_{18}ClNO_2S$



PS-2162 **Imazamox**
Raptor®, (RS)-2-(4-Isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-methoxy-methylnicotinic acid
CAS: 114311-32-9 **LD_{50}:** 5,000mg/kg
MW: 305.3 **MF:** $C_{15}H_{19}N_3O_4$



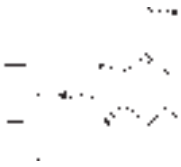
PS-2163 **Thiazopyr**
Thiazopyr, Visor®, Methyl 2-difluoro methyl-5-(4,5-dihydro-1,3-thiazol-2-yl)-4-isobutyl-6-trifluoromethyl nicotinate
CAS: 117718-60-2 **LD_{50}:** 5,000mg/kg
MW: 396.41 **MF:** $C_{16}H_{17}F_5N_2O_2S$



PS-2164 **Glyphosine**
Polaris®, N,N-Bis(phosphonomethyl) glycine, N-Carboxymethyl-N,N-bis (methylenephosphonic acid)-amine
CAS: 2439-99-8 **LD_{50}:** 3,925mg/kg
MW: 263.08 **MF:** $C_4H_{11}NO_8P_2$



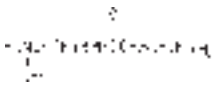
PS-2165 **Cloransulam-methyl**
FirstRate®, Methyl 3-chloro-2-(5-ethoxy-7-fluoro[1,2,4]triazolo [1,5-c]-pyrimidin-2-ylsulfonamido) benzoate
CAS: 147150-35-4 **LD_{50}:**
MW: 429.8 **MF:** $C_{15}H_{13}ClFN_5O_5S$



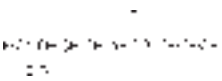
PS-2166 **Isoxaflutole**
Balance®, 5-Cyclopropyl-1,2-oxazol-4-yl a,a,a-trifluoro-2-mesyl-p-tolyl ketone
CAS: 141112-29-0 **LD_{50}:** 5,000mg/kg
MW: 359.3 **MF:** $C_{15}H_{12}F_3NO_4S$



PS-2167 **Propamocarb HCl**
Propamocarb Hydrochloride, Prevex®, Previcur-N®, Banol turf fungicide®, Filex®
CAS: 25606-41-1 **LD_{50}:** 2,000mg/kg
MW: 224.77 **MF:** $C_9H_{20}N_2O_2.HCl$



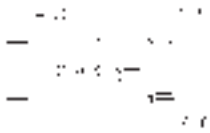
PS-2167-1 **Propamocarb**
Propyl (3-(dimethylamino)propyl) carbamate, Carbamic acid, (3-(dimethylamino)propyl)-, propyl ester
CAS: 24579-73-5 **LD_{50}:** 2,000mg/kg
MW: 188.31 **MF:** $C_9H_{20}N_2O_2$



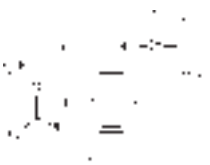
PS-2168 **Flumetralin**
Premier® Herbicide, Prime®, N-(2-Chloro-6-fluorobenzyl)-N-ethyl-a,a,a-trifluoro-2,6-dinitro-p-toluidine
CAS: 62924-70-3 **LD_{50}:** 3,100mg/kg
MW: 421.74 **MF:** $C_{16}H_{12}ClF_4N_3O_4$



PS-2169 **Primisulfuron-methyl**
Beacon®, Primisulfuron, Rifle®, 2-[4,6-bis(Difluoromethoxy) pyrimidin-2-ylcarbamoylsulfamoyl] benzoic acid methyl ester
CAS: 86209-51-0 **LD_{50}:** 5,050mg/kg
MW: 468.37 **MF:** $C_{15}H_{12}F_4N_4O_7S$

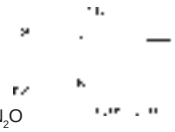


PS-2170 **Carfentrazone-ethyl**
Aim®, Shark®, Ethyl (RS)-2-chloro-3-[2-chloro-5-(4-difluoromethyl-4,5-dihydro-3-methyl-5-oxo-1H-1,2,4-triazol-1-yl) -4-fluorophenyl]propionate
CAS: 128639-02-1 **LD_{50}:** 5,143mg/kg
MW: 412.2 **MF:** $C_{15}H_{14}Cl_2F_3N_3O_3$

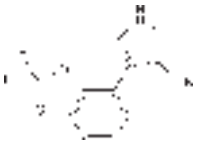


Chem Service Pesticide Standards - Numerical Listing

PS-2171 **Chlorfenapyr**
4-Bromo-2-(4-chlorophenyl)-1-ethoxymethyl-5-trifluoromethyl pyrrole-3-carbonitrile
CAS: 122453-73-0 **LD_{50}:** 441mg/kg
MW: 407.6 **MF:** $C_{15}H_{11}BrClF_3N_2O$



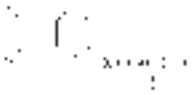
PS-2172 **Fludioxonil**
Celest®, Maxim®, Medallion®, Saphire®, 4-(2,2-Difluoro-1,3-benzodioxol-4-yl)-1H-pyrrole-3-carbonitrile, Celest Special®
CAS: 131341-86-1 **LD_{50}:** 5,000mg/kg
MW: 248.2 **MF:** $C_{12}H_6F_2N_2O_2$



PS-2173 **Dithiopyr**
Dimension®, Stakeout®, Dictran®, Scoop®, Lyton®, Lazo®, Kalcorn®, S,S'-Dimethyl 2-difluoromethyl-4-isobutyl-6-trifluoromethylpyridine-3,5-dicarbothioate
CAS: 97886-45-8 **LD_{50}:** 5,000mg/kg
MW: 401.44 **MF:** $C_{15}H_{16}F_5NO_2S_2$



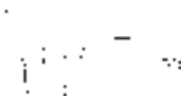
PS-2174 **Fenoxycarb**
Insegar®, Logic®, Pictyl®, Varikill®, Torus®, Precision®, Ethyl (2-(4-phenoxyphenoxy) ethyl)carbamate, (2-(4-Phenoxy phenoxy)ethyl)carbamic acid ethyl ester, Comply®,
CAS: 79127-80-3 **LD_{50}:** 16,800mg/kg
MW: 301.37 **MF:** $C_{17}H_{19}NO_4$



PS-2175 **Prochloraz**
Ascurit®, Dibavit®, Octave®, Omega®, Prelude®, Rival®, Sporgon®, Sportak®, Sprint®, 1-(N-Propyl-N-(2-(2,4,6-trichlorophenoxy)ethyl) carbamoyl)imidazole
CAS: 67747-09-5 **LD_{50}:** 1,600mg/kg
MW: 376.69 **MF:** $C_{15}H_{16}Cl_3N_3O_2$



PS-2176 **Triflumuron**
Alsystine®, Starycide®, Bolstar®, Baycidal®, Mascot®, Trifluron, 2-Chloro-N-(((4-(trifluoromethoxy) phenyl)amino)carbonyl)benzamide
CAS: 64628-44-0 **LD_{50}:** 5,000mg/kg
MW: 358.72 **MF:** $C_{15}H_{10}ClF_3N_2O_3$



PS-2177 **Flutriafol**
Armour®, Impact®, Vaspact®, Alpha-(2-Fluorophenyl)-alpha-(4-fluorophenyl)-1H-1,2,4-triazole-1-ethanol
CAS: 76674-21-0 **LD_{50}:** 1,140mg/kg
MW: 301.32 **MF:** $C_{16}H_{13}F_2N_3O$



PS-2178 **Metoxuron**
Deftor®, Dosaflo®, Dosagran® Dosanex®, Investt®, Purivel®, Sulerex®, N-(3-Chloro-4-methoxy phenyl)-N',N'-dimethylurea
CAS: 19937-59-8 **LD_{50}:** 3,200mg/kg
MW: 228.70 **MF:** $C_{10}H_{13}ClN_2O_2$



PS-2179 **Isopropylbenzene**
Cumol®, Cumene®, (1-Methylethyl)benzene, 2-Phenyl propane, Isopropylbenzene,
CAS: 28159-98-0 **LD_{50}:** N/A
MW: 120.21 **MF:** C_9H_{12}



PS-2180 **2-Imidazolidinethione**
N.N'-Ethylenethiourea, Rodanin S-62®
CAS: 96-45-7 **LD_{50}:** 545mg/kg
MW: 102.17 **MF:** $C_3H_6N_2S$



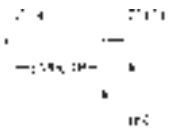
PS-2181 **Monothiono TEPP**
Tetraethyl monothiopyrophosphate, Fosarbin, MTST, Phosarbin, Pirofos, Pyrophos, Tetraethyl ester thiodiphosphoric acid
CAS: 645-78-3 **LD_{50}:** 1mg/kg
MW: 306.28 **MF:** $C_8H_{20}O_6P_2S$



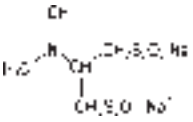
PS-2182 **Kresoxim-methyl**
Stroby®, Alliage®, Candit®, Cyngus®, Discus®, Sovran®, Methyl(E)-2-methoxyimino-[2-(o-tolyloxymethyl)phenyl]acetate
CAS: 143390-89-0 **LD_{50}:** 5,000mg/kg
MW: 313.4 **MF:** $C_{18}H_{19}NO_4$



PS-2183 **Ethametsulfuron-methyl**
Muster®, Methyl 2-((4-ethoxy-6-methylamino-1,3,5-triazin-2-yl) carbamoylsulfamoyl)benzoate
CAS: 97780-06-8 **LD_{50}:** 5,000mg/kg
MW: 410.4 **MF:** $C_{15}H_{18}N_6O_6S$



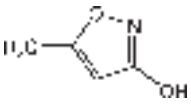
PS-2184 **Dimehypo**
Hope®, Vinetox®, Sha chong shuang, Disodium S,S'-(2-dimethylamino-1,3-propanediyl) bis(thiosulfate), Thiosulfuric acid S,S'-[2-(dimethylamino)-1,3-propanediyl]ester, Thiosultap-sodium
CAS: 52207-48-4 **LD_{50}:** 1,021mg/kg
MW: 355.39 **MF:** $C_5H_{11}NO_6S_{4\cdot2}Na$



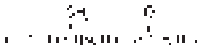
PS-2185 **Glyphosate-isopropylammonium**
Glyphosate-isopropylammonium Salt, Glycel®, Glyphosate isopropylamine salt, Nitosorg®, Rattler® ,Roundup®
CAS: 38641-94-0 **LD_{50}:** 10,537mg/kg
MW: 228.22 **MF:** $C_3H_9N.C_3H_8NO_5P$



PS-2186 **Hymexazole**
Bucid®, Butsid®, Hydroxyisoxazole, 3-Hydroxy-5-methylisoxazole, Itachigarden®, Tachigaren®, Hyzole, 5-methyl-1,2-oxazol-3-ol, 5-methyl-3(2H)-isoxazolone
CAS: 10004-44-1 **LD_{50}:** 4,678mg/kg
MW: 99.10 **MF:** $C_4H_5NO_2$



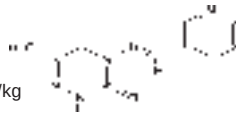
PS-2187 **Vamidothion**
O,O-Dimethyl S-2-(1-N-methyl carbamoylethylmercapto)ethyl thiophosphate, Kilval®, N-Methyl O,O-dimethylthiolo phosphoryl-5-thia-3-methyl-2-valeramide, Trucidor®, Vamidoate®
CAS: 2275-23-2 **LD_{50}:** 64mg/kg
MW: 287.36 **MF:** $C_8H_{18}NO_4PS_2$



PS-2188 **Tebufenozide**
Confirm®, Mimic®, N-tert-Butyl-N'-(4-ethylbenzoyl)-3,5-dimethyl benzohydrazide
CAS: 112410-23-8 **LD_{50}:** 5,000mg/kg
MW: 352.5 **MF:** $C_{22}H_{28}N_2O_2$



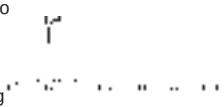
PS-2189 **Pymetrozine**
(E)-4,5-Dihydro-6-methyl-4-(3-pyridylmethyleneamino)-1,2,4-triazin-3(2H)-one
CAS: 123312-89-0 **LD_{50}:** 5,820mg/kg
MW: 217.2 **MF:** $C_{10}H_{11}N_5O$



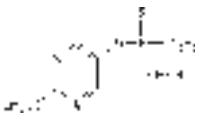
PS-2190 **Dikegulac acid**
2,3:4,6-di-O-Isopropylidene-a-L-xylo-2-hexulofuranosonic acid
CAS: 18467-77-1 **LD_{50}:** N/A
MW: 274.3 **MF:** $C_{12}H_{18}O_7$



PS-2191 **Fluroxypyr-meptyl**
Vista®, Dowco 433®, Starane 250®, Hurler®, Fluroxypyr-1-methyl heptyl ester, ((4-Amino-3,5-dichloro-6-fluoro-2-pyridinyl)oxy)acetic acid,1-methylheptyl ester acetic acid
CAS: 81406-37-3 **LD_{50}:** 3,738mg/kg
MW: 367.28 **MF:** $C_{15}H_{21}Cl_2FN_2O_3$



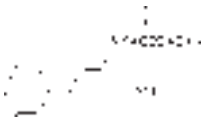
PS-2192 **Tebupirimfos**
BAY-MAT 7484®, O-(2-(1,1-Dimethyl ethyl)-5-pyrimidinyl) O-ethyl O-(1-methylethyl) phosphorothioate, Phostebupirim
CAS: 96182-53-5 **LD_{50}:** 3mg/kg
MW: 318.41 **MF:** $C_{13}H_{23}N_2O_3PS$



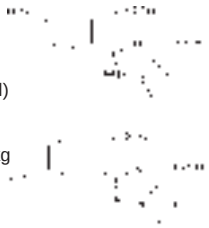
PS-2193 **Benazolin-ethyl**
Galtak®, Benazolin ethyl ester, 3-Benzothiazolineacetic acid, 4-chloro-2-oxo-, ethyl ester, Ethyl 4-chloro-2-oxo-3(2H)-benzothiazoleacetate
CAS: 25059-80-7 **LD_{50}:** 5,000mg/kg
MW: 271.73 **MF:** $C_{11}H_{10}ClNO_3S$



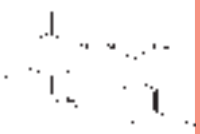
PS-2194 **Bifenazate**
Floramite®, Isopropyl 2-(4-methoxy biphenyl-3-yl)hydrazinoformate, 1-Methylethyl 2-(4-methoxy [1,1'-biphenyl]-3-yl)hydrazine carboxylate
CAS: 149877-41-8 **LD_{50}:** 5,000mg/kg
MW: 300.36 **MF:** $C_{17}H_{20}N_2O_3$



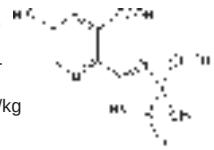
PS-2195 **Imazamethabenz-methyl**
Assert®, Dagger®, Methyl-2-(4,5-dihydro-4-methyl-4-(1-methylethyl) -5-oxo-1H-imidazol-2-yl)-4(or 5)-methyl ester benzoic acid
CAS: 81405-85-8 **LD_{50}:** 5,000mg/kg
MW: 288.38 **MF:** $C_{16}H_{20}N_2O_3$



PS-2196 **Trifloxystrobin**
Flint®
CAS: 141517-21-7 **LD_{50}:** 4,000mg/kg
MW: 408.4 **MF:** $C_{20}H_{19}F_3N_2O_4$



PS-2197 **Imazapic**
AC 263, 222®, Cadre®, Imazameth, Plateau®, (RS)-2-(4,5-Dihydro-4-isopropyl-4-methyl-5-oxoimidazol-2-yl)-5-methylnicotinic acid
CAS: 104098-48-8 **LD_{50}:** 5,000mg/kg
MW: 275.3 **MF:** $C_{14}H_{17}N_3O_3$



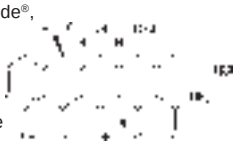
PS-2198 **d-trans-Cyphenothrin**
Gokilaht®, 2,2-Dimethyl-3-(2-methyl -1-propenyl)-cyano(3-phenoxy phenyl) methyl ester cyclopropane carboxylic acid
CAS: 39515-40-7 **LD_{50}:** 318mg/kg
MW: 375.50 **MF:** $C_{24}H_{25}NO_3$



PS-2199 **Cadusafos**
Apache®, Codusafos, Ebufos, Rugby®, Taredan®, O-Ethyl-S,S-bis(1-methylpropyl)phosphoro dithioate, O-Ethyl-S,S-di-sec-butyl phosphorodithioate
CAS: 95465-99-9 **LD_{50}:** 37mg/kg
MW: 270.42 **MF:** $C_{10}H_{23}O_2PS_2$



PS-2200 **Oxytetracycline hydrochloride**
Aquacycline®, Biosolvomycin®, Engemycin®, Hydrocyclin®, 5-Hydroxytetracycline hydrochloride®, Liquamycin injectable®, Mepatar®, Otetryn®, Oxlopar®, Oxyject 100®, Oxytetrin®, Terramycin hydrochloride®, Tetranhydrochloride®, 4-(Dimethylamino)-1,4,4a,5,5a,6, 11,12a-octahydro-3,5,6,10,12,12a - hexahydroxy-6-methyl-1,11-dioxo-2-Naphthacenecarboxamide monohydrochloride
CAS: 2058-46-0 **LD_{50}:** 6,696mg/kg
MW: 496.94 **MF:** $C_{22}H_{24}N_2O_9.HCl$



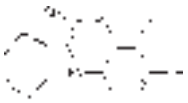
Numerical Listing

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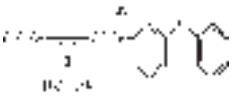
PS-2201 **Neomycin sulfate salt**
CAS: 1405-10-3 **LD_{50}:** 8,000mg/kg
MW: **MF:**



PS-2202 **Fenhexamid**
Elevate®, N-(2,3-dichloro-4-hydroxy phenyl)-1-methyl-cyclohexane carboxamide
CAS: 126833-17-8 **LD_{50}:** 2,000mg/kg
MW: 302.2 **MF:** $C_{14}H_{17}Cl_2NO_2$



PS-2203 **beta-Cypermethrin**
Agrothrin®, Ambush C®, Ammo®, Antiborer 3767®, Ardap®, Barricade®, Basathrin®, Betamethrate®, Chinmix®, Cymbush®, Cyperkill®, (1R,alpha-S)-cis-Cypermethrin, Cypermetryna®, Fendona®, Flectron®, Hilcyperin®, Kordon®, Ectopor®, Cypor®, Nurele®, Polytrin®, Ripcord®, Sherpa®, Supercypermethrin®, (+-)-alpha-Cyano-3-phenoxybenzyl 2,2-dimethyl-3-(2,2-dichlorovinyl) cyclopropane carboxylate
CAS: N/A **LD_{50}:** 178mg/kg
MW: 416.32 **MF:** $C_{22}H_{19}Cl_2NO_3$



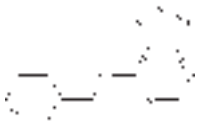
PS-2204 **beta-Cyfluthrin**
Beta-Baythroid®, Cyclopropane carboxylic acid, 3-(2,2-dichloro ethenyl)-2,2-dimethyl-, cyano (4-fluoro-3-phenoxyphenyl)methyl ester, (RS)-alpha-cyano-4-fluoro-3-phenoxybenzyl (1RS,3RS;1RS, 3SR)-3-(2,2-dichlorovinyl)2,2-dimethylcyclopropanecarboxylate
CAS: 68359-37-5 **LD_{50}:** 84mg/kg
MW: 434.31 **MF:** $C_{22}H_{18}Cl_2FNO_3$



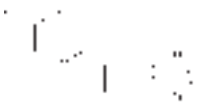
PS-2205 **Flufenacet**
Fluthiamide, BAY FOE 5043®, N-(4-Fluorophenyl)-N-(1-methyl ethyl)-2-((5-(trifluoromethyl)-1,3,4-thiadiazol-2-yl)oxyl)acetamide
CAS: 142459-58-3 **LD_{50}:** 589mg/kg
MW: 363.36 **MF:** $C_{14}H_{13}F_4N_3O_2S$



PS-2206 **6-Benzylaminopurine**
BAP, Paturyl®, N-Benzyladenine, 6-Benzyladenine, N(sup 6)-Benzyladenine
CAS: 1214-39-7 **LD_{50}:** 2,125mg/kg
MW: 225.28 **MF:** $C_{12}H_{11}N_5$



PS-2207 **Penconazole**
Ofir®, Onmex®, Pine gel, Regal gel, Topaz®, 1-(2-(2,4-Dichlorophenyl) pentyl)-1H-1,2,4-triazole
CAS: 66246-88-6 **LD_{50}:** 2,125mg/kg
MW: 284.21 **MF:** $C_{13}H_{15}Cl_2N_3$



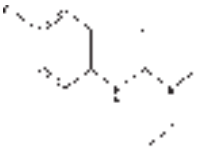
PS-2208 **Diclosulam**
Strongarm®, N-(2,6-Dichlorophenyl) -5-ethoxy-7-fluoro-[1,2,4]-triazolo-[1,5-c]pyrimidine-2-sulfonamide
CAS: 145701-21-9 **LD_{50}:** 5,000mg/kg
MW: 406.2 **MF:** $C_{13}H_{10}Cl_2FN_5O_3S$



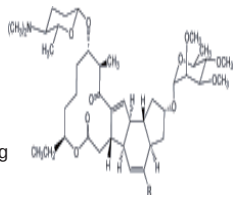
PS-2209 **Chlormephos**
Dotan®, Sherman®, S-(Chloromethyl) O,O-diethyl ester phosphorodithioic acid, S-(Chloromethyl) O,O-diethylphos phorodithioate, S-Chloromethyl-O,O-diethylphos phorothiolothionate
CAS: 24934-91-6 **LD_{50}:** 7mg/kg
MW: 234.71 **MF:** $C_5H_{12}ClO_2PS_2$



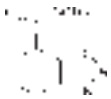
PS-2210 **Monolinuron**
Aresin®, Arezine®, Premalin®, 3-(4-Chlorphenyl)-1-methoxy-1-methylharnstoff, 3-(4-Chlorophenyl) -1-methoxy-1-methylurea
CAS: 1746-81-2 **LD_{50}:** 1,800mg/kg
MW: 214.67 **MF:** $C_9H_{11}ClN_2O_2$



PS-2211 **Spinosad**
SpinTor Naturalyte®, Success Naturalyte®, Tracer Naturalyte®,
CAS: Spinosyn A, 131929-60-7: Spinisyn D, 131929-63-0
LD_{50}: 2,000mg/kg
MW: 731.98:746 **MF:** $C_{41}H_{65}NO_{10}$: $C_{42}H_{67}NO_{10}$



PS-2212 **Acibenzolar-S-methyl**
Benzo(1,2,3)thiadiazole-7-carbothioic acid-S-methyl ester
CAS: 135158-54-2 **LD_{50}:** 2,000mg/kg
MW: 210.3 **MF:** $C_8H_6N_2OS_2$



PS-2213 **Flufenoxuron**
Cascade®, N-((4-(2-Chloro-4-(trifluoromethyl)phenoxy)-2-fluorophenyl)carbamoyl)-2,6-difluorobenzamide
CAS: 101463-69-8 **LD_{50}:** 3,000mg/kg
MW: 488.79 **MF:** $C_{21}H_{11}ClF_6N_2O_3$



PS-2214 **Cyclosulfamuron**
1-[2-(Cyclopropylcarbonyl)phenyl sulfamoyl]-3-(4,6- dimethoxy pyrimidin-2-yl)urea
CAS: 136849-15-5 **LD_{50}:** 5,000mg/kg
MW: 421.4 **MF:** $C_{17}H_{19}N_5O_6S$



PS-2215 **Thiamethoxam**
Actara®, 3-(2-Chloro-1,3-thiazol-5-ylmethyl)-5-methyl-1,3,5-oxadiazinan-4-ylidene(nitro)amine
CAS: 153719-23-4 **LD_{50}:** 5,000mg/kg
MW: 291.7 **MF:** $C_8H_{10}ClN_5O_3S$

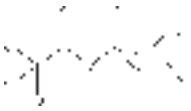


Chem Service Pesticide Standards - Numerical Listing

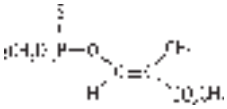
PS-2216 **Fenpyroximate**
Acaban®, Acaritan®, Asalto®, Danitron®, Dynamite®, Kendo®, Kiron®, Meteor®, Miro®, Naja®, Ortus®, Sequel®, t-Butyl (E)-alpha -(1,3-dimethyl-5-phenoxypyrazol-4-ylmethyleneaminooxy)-p-toluate
CAS: 134098-61-6 **LD_{50}:** 480mg/kg
MW: 421.54 **MF:** $C_{24}H_{27}N_3O_4$



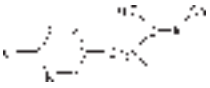
PS-2217 **Chlorethoxyfos**
Fortress®, O,O-Diethyl O-(1,2,2,2-tetrachloroethyl) phosphorothioate
CAS: 54593-83-8 **LD_{50}:** 4mg/kg
MW: 336.00 **MF:** $C_6H_{11}Cl_4O_3PS$



PS-2218 **Methacrifos**
Damfin®
CAS: 30864-28-9 **LD_{50}:** 678mg/kg
MW: 240.23 **MF:** $C_7H_{13}O_5PS$



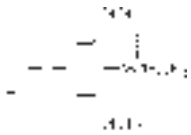
PS-2219 **Acetamiprid**
Mospilan®, Saniprid®, Acer®, Aspilan®, (E)-N-[(6-Chloro-3-pyridinyl)methyl]-N'-cyano-N-methylethanimidamide
CAS: 135410-20-7 **LD_{50}:** 217mg/kg
MW: 222.7 **MF:** $C_{10}H_{11}ClN_4$



PS-2220 **Ivermectin**
Cardomec®, Eqvalan®, Hyvermectin® Ivomec®, Mectizan®, Zimecterin®, 22,23-Dihydroavermectin B1, 22,23-Dihydroabamectin
CAS: 70288-86-7 **LD_{50}:** 10mg/kg
MW: **MF:**



PS-2221 **Diafenthiuron**
Pegasus®, Polo®, N-(2,6-Bis(1-methylethyl)-4-phenoxyphenyl)-N'-(1,1-dimethyl ethyl)thiourea
CAS: 80060-09-9 **LD_{50}:** 2,068mg/kg
MW: 384.63 **MF:** $C_{23}H_{32}N_2OS$



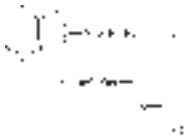
PS-2222 **BHC (epsilon isomer) (100ug/ml in Toluene)**
(ACS Standard Grade)
1,2,3,4,5,6-Hexachlorocyclohexane (epsilon isomer), HCH (epsilon isomer), epsilon-BHC, epsilon-Hexachloro cyclohexane
CAS: 6108-10-7 **LD_{50}:** 88mg/kg
MW: 290.82 **MF:** $C_6H_6Cl_6$



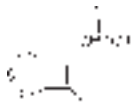
PS-2223 **Fenoxaprop-P-ethyl**
Acclaim®, Extra®, Puma®, Silverado®, Bugle®, Option®, Dakota®, Twister®, Ethyl(R)-2-[4-[(6-chloro-2-benzoxazolyl)oxy] phenoxy]propanoate
CAS: 71283-80-2 **LD_{50}:** 3,150mg/kg
MW: 361.8 **MF:** $C_{18}H_{16}ClNO_5$



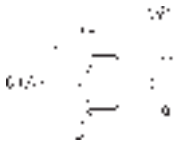
PS-2224 **Sulfosulfuron**
Sundance®, Monitor®, Outrider®, 1-(2-Ethylsulfonylimidazo[1,2a] pyridin-3-ylsulfonyl)-3-(4,6-dimethyoxypyrimidin-2-yl)urea, Maverick®
CAS: 141776-32-1 **LD_{50}:** 5,000mg/kg
MW: 470.48 **MF:** $C_{16}H_{18}N_6O_7S_2$



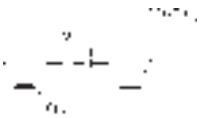
PS-2225 **Heptenophos**
Heptenofos, Hostaquick®, Hostavik®, Ragadan®, 7-Chlorobicyclo(3.2.0) hepta-2,6-dien-6-yl dimethyl phosphate
CAS: 23560-59-0 **LD_{50}:** 96mg/kg
MW: 250.63 **MF:** $C_9H_{12}ClO_4P$



PS-2226 **Prohexadione-Calcium**
Viviful®, Apogee®, Baseline®, Calcium 3-oxido-5-oxo-4-propionyl cyclohex-3-enecarboxylate
CAS: 127277-53-6 **LD_{50}:** 5,000mg/kg
MW: 250.3 **MF:** $C_{10}H_{10}CaO_5$



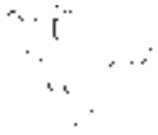
PS-2227 **Mepronil**
Basitac®, 3'-Isopropoxy-2-methylbenzanilide, 2-Methyl-N-(3 -(1-methylethoxy)phenyl) benzamide
CAS: 55814-41-0 **LD_{50}:** 10,000mg/kg
MW: 269.37 **MF:** $C_{17}H_{19}NO_2$



PS-2228 **2,3,5,6-Tetrachloroaniline**
CAS: 3481-20-7 **LD_{50}:** N/A
MW: 230.91 **MF:** $C_6H_3Cl_4N$



PS-2230 **Indoxacarb**
Methyl (S)-N-[7-chloro-2,3,4a,5-tetrahydro-4a-(methoxycarbonyl) indeno[1,2-e]-[1,3,4]oxadiazin-2-ylcarbonyl]-4'-(trifluoromethoxy) carbanilate
CAS: 144171-61-9 **LD_{50}:** 1,732mg/kg
MW: 527.8 **MF:** $C_{22}H_{17}ClF_3N_3O_7$



PS-2231 **Flucarbazone-sodium**
4,5-Dihydro-3-methoxy-4-methyl-5-oxo-N-(2-trifluoromethoxyphenyl sulfonyl)-1H-1,2,4-triazole-1-carboxamide sodium salt
CAS: 181274-17-9 **LD_{50}:** 5,000mg/kg
MW: 418.3 **MF:** $C_{12}H_{10}F_3N_4NaO_6S$

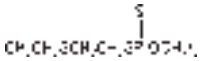


PS-2232 **Foramsulfuron**
2-[[[[(4,6-Dimethoxy-2-pyrimidinyl) amino]carbonyl]amino]sulfonyl]-4-(formylamino)-N,N-dimethylbenzamide, 1-(4,6-Dimethoxypyrimidin-2-yl)-3-[2-(dimethylcarbamoyl)-5-formamidophenylsulfonyl]urea
CAS: 173159-57-4 **LD_{50}:** N/A
MW: 452.4 **MF:** $C_{17}H_{20}N_6O_7S$

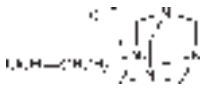


Chem Service Pesticide Standards - Numerical Listing

PS-2233 **Thiometon**
Dithiometon, Ebicid®, Ekatin®, Intrathion®, Luxistelm®, Thiotox®, Veltin®, S-(2-(Ethylthio)ethyl) O,O-dimethylphosphorodithionate, O,O-Dimethyl S-(2-ethylthio)ethyl ester phosphorodithioic acid
CAS: 640-15-3 **LD_{50}:** 40mg/kg
MW: 246.36 **MF:** $C_6H_{15}O_2PS_3$



PS-2234 **1-cis-3-Chloroallyl-3,5,7-triaza-1-azonia-adamantane chloride**
Dowicil 150®
CAS: 51229-78-8 **LD_{50}:** N/A
MW: N/A **MF:** N/A



PS-2235 **Pyraclostrobin**
Cabrio EG®, Methyl N-{2-[1-(4-chlorophenyl)-1H-pyrazol-3-yloxymethyl]phenyl}(N-methoxy) carbamate
CAS: 175013-18-0 **LD_{50}:** 2,000mg/kg
MW: 387.83 **MF:** $C_{19}H_{18}ClN_3O_4$



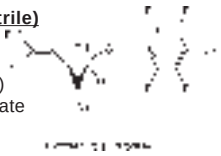
PS-2236 **Dalapon Sodium**
Dowpon S®, 2,2-Dichloropropionic acid, sodium salt, Sodium Dalapon
CAS: 127-20-8 **LD_{50}:** 3,860mg/kg
MW: 164.95 **MF:** $C_3H_3Cl_2NaO_2$



PS-2237 **Etofenprox**
Primo®, Trebon®, Ethofenprox®, 2-(4-Ethoxyphenyl)-2-methylpropyl 3-phenoxybenzyl ether
CAS: 80844-07-1 **LD_{50}:** 42,800mg/kg
MW: 376.53 **MF:** $C_{25}H_{28}O_3$



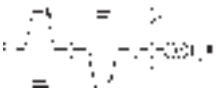
PS-2238 **Tefluthrin (100ug/ml in Acetonitrile)**
Force®, Komet®, 2,3,5,6-Tetrafluoro -4-methylbenzyl(Z)-(1RS,3RS)-3-(2-chloro-3,3,3-trifluoroprop-1-enyl) -2,2-dimethylcyclopropanecarboxylate
CAS: 79538-32-2 **LD_{50}:** 22mg/kg
MW: 418.76 **MF:** $C_{17}H_{14}ClF_7O_2$



PS-2239 **Diclobutrazol 100ug/ml in Toluene**
Vigil®, (2RS,3RS)-1-(2,4-Dichloro phenyl)-4,4-dimethyl-2-(1H-1,2,4-triazol-1-yl)pentan-3-ol
CAS: 75736-33-3 **LD_{50}:** 4,000mg/kg
MW: 328.27 **MF:** $C_{15}H_{19}Cl_2N_3O$



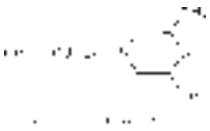
PS-2240 **Fluazifop-butyl**
Fusilade®, Hache Uno Super®, Halokon®, Onecide®, Butyl (RS)-2-[4-(5-trifluoromethyl-2-pyridyloxy)phenoxy]propionate
CAS: 69806-50-4 **LD_{50}:** 2,910mg/kg
MW: 383.40 **MF:** $C_{19}H_{20}F_3NO_4$



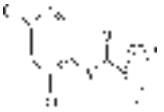
PS-2241 **Benfuracarb**
Furacon®, Oncol®, Ethyl N-[2,3-dihydro-2,2-dimethylbenzofuran-7-yloxy carbonyl(methyl)aminothio]-N-isopropyl-beta-alaninate
CAS: 82560-54-1 **LD_{50}:** 105mg/kg
MW: 410.58 **MF:** $C_{20}H_{30}N_2O_5S$



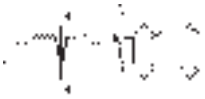
PS-2242 **Tridemorph**
Calixin®, Dimethyl-2,6 tridecyl-4 morpholine
CAS: 81412-43-3 **LD_{50}:** 650mg/kg
MW: 297.59 app **MF:** $C_{19}H_{39}NO$



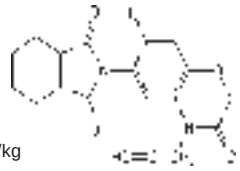
PS-2243 **Cyclanilide**
1-(((2,4-Dichlorophenyl)amino) carbonyl)-cyclopropanecarboxylic acid
CAS: 113136-77-9 **LD_{50}:** 315mg/kg
MW: 274.10 **MF:** $C_{11}H_9Cl_2NO_3$



PS-2244 **zeta-Cypermethrin**
Fury®, Mustang®, (+-)-alpha-Cyano-3-phenoxybenzyl 2,2-dimethyl-3-(2,2-dichlorovinyl) cyclopropane carboxylate
CAS: 52315-07-8 **LD_{50}:** 105mg/kg
MW: 416.32 **MF:** $C_{22}H_{19}Cl_2NO_3$



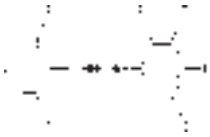
PS-2245 **Flumioxazin**
Flumyzin®, Pledge®, Sumisoya®, Vulcan®, N-(7-Fluoro-3,4-dihydro-3-oxo-4-prop-2-ynyl-2H-1,4-benzoxazin-6-yl)cyclohex-1-ene-1,2-dicarboxamide
CAS: 103361-09-7 **LD_{50}:** 5,000mg/kg
MW: 354.36 **MF:** $C_{19}H_{15}FN_2O_4$



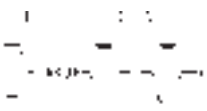
PS-2246 **Bispyribac Sodium**
Nominee®, Sodium 2,6-bis(4,6-dimethoxypyrimidin-2-yloxy) benzoate
CAS: 125401-92-5 **LD_{50}:** 2,635mg/kg
MW: 452.39 **MF:** $C_{19}H_{17}N_4O_8.Na$



PS-2247 **Teflubenzuron**
Nomolt®, Dart®, Diaract®, Tefludate®, 1-(3,5-Dichloro-2,4-difluorophenyl)-3-(2,6-difluoro benzoyl)urea
CAS: 83121-18-0 **LD_{50}:** 5,000mg/kg
MW: 381.12 **MF:** $C_{14}H_6Cl_2F_4N_2O_2$



PS-2248 **Chlorfluazuron**
Atabron®, Helix®, 1-[3,5-Dichloro-4-(3-chloro-5-trifluoromethyl-2-pyridyloxy)phenyl]-3-(2,6-difluoro-benzoyl)urea
CAS: 71422-67-8 **LD_{50}:** 445mg/kg
MW: 540.66 **MF:** $C_{20}H_9Cl_3F_5N_3O_3$



PS-2249 **Fluazinam**
Altima®, Frowncide®, Legacy®, Ohayo®, Omega®, Shogun®, 3-Chloro-N-(3-chloro-5-trifluoro methyl-2-pyridyl)-alpha,alpha,alpha -trifluoro-2,6-dinitro-p-toluidine
CAS: 79622-59-6 **LD_{50}:** 5,000mg/kg
MW: 465.11 **MF:** $C_{13}H_4Cl_2F_6N_4O_4$

PS-2250 **Ioxynil octanoate**
4-Cyano-2,6-di-iodophenyl octanoate
CAS: 3861-47-0 **LD_{50}:** 190mg/kg
MW: 497.13 **MF:** $C_{15}H_{17}I_2NO_2$

PS-2251 **Pyrimethanil**
N-(4,6-Dimethylpyrimidin-2-yl)aniline
CAS: 53112-28-0 **LD_{50}:** 4,150mg/kg
MW: 199.3 **MF:** $C_{12}H_{13}N_3$

PS-2252 **Lufenuron**
(RS)-1-[2,5-Dichloro-4-(1,1,2,3,3,3-hexafluoropropoxy)phenyl]-3-(2,6-difluoro-benzoyl)urea
CAS: 103055-07-8 **LD_{50}:** 2,000mg/kg
MW: 511.2 **MF:** $C_{17}H_8Cl_2F_8N_2O_3$

PS-2253 **Novaluron**
Rimon®, (+/-)-N-[[[3-Chloro-4-[1,1,2-trifluoro-2-(trifluoromethoxy) ethoxy]-phenyl]amino]carbonyl] -2,6-difluorobenzamide
CAS: 116714-46-6 **LD_{50}:** 5,000mg/kg
MW: 492.7 **MF:** $C_{17}H_9ClF_8N_2O_4$

PS-2254 **Capsaicin, Natural**
CAS: N/A **LD_{50}:** N/A
MW: **MF:**

PS-2255 **Tebutam**
Butam®, Colzor®, Comodor®, N-Benzyl-N-isopropylpivalamide
CAS: 35256-85-0 **LD_{50}:** 6,000mg/kg
MW: 233.39 **MF:** $C_{15}H_{23}NO$

PS-2257 **Etoxazole**
(RS)-5-tert-Butyl-2-[2-(2,6-difluoro phenyl)-4,5-dihydro-1,3-oxazol-4-yl]phenetole
CAS: 153233-91-1 **LD_{50}:** 5,000mg/kg
MW: 359.4 **MF:** $C_{21}H_{23}F_2NO_2$

PS-2258 **Fenazaquin**
4-tert-Butylphenethyl quinazolin-4-yl ether
CAS: 120928-09-8 **LD_{50}:** 136mg/kg
MW: 306.44 **MF:** $C_{20}H_{22}N_2O$

PS-2259 **Famoxadone**
3-Anilino-5-methyl-5-(4-phenoxy phenyl)-1,3-oxazolidine-2,4-dione
CAS: 131807-57-3 **LD_{50}:** 5,000mg/kg
MW: 374.40 **MF:** $C_{22}H_{18}N_2O_4$

PS-2260 **Boscalid**
CAS: 188425-85-6 **LD_{50}:** N/A
MW: 343.2 **MF:** $C_{18}H_{12}Cl_2N_2O$

PS-2261 **Clothianidin**
(E)-1-(2-Chloro-1,3-thiazol-5-ylmethyl)-3-methyl-2-nitroguanidine
CAS: 210880-92-5 **LD_{50}:** 5,000mg/kg
MW: 249.68 **MF:** N/A

PS-2262 **Thiacloprid**
(3-((6-Chloro-3-pyridinyl)methyl)-2-thiazolidinylidene)cyanamide
CAS: 111988-49-9 **LD_{50}:** 444mg/kg
MW: 252.74 **MF:** $C_{10}H_9ClN_4S$

PS-2263 **Streptomycin sulfate**
Streptomycin sulfate (2:3) salt, Streptomycin sesquisulfate, Streptomycin A sulfate
CAS: 3810-74-0 **LD_{50}:** 430mg/kg
MW: 1457.58 **MF:** $C_{42}H_{78}N_{14}O_{24}.H_6O_{12}S_3$

PS-2264 **Methoxyfenozide**
3-Methoxy-2-methylbenzoic acid 2-(3,5-dimethylbenzoyl)-2-(1,1-dimethylethyl)hydrazide
CAS: 161050-58-4 **LD_{50}:** 5,000mg/kg
MW: 368.48 **MF:** $C_{22}H_{28}N_2O_3$

PS-2265 **Emamectin**
CAS: 119791-41-2 **LD_{50}:** 76mg/kg
MW: 886.1(B1a) **MF:** $C_{49}H_{75}NO_{13}$
Structure Not Available

PS-2266 **Cinnamaldehyde**
Cinnacure®, Cinnamite®, Valeo®, Adios®, 3-Phenyl-2-propenal, Benzylideneacetaldehyde
CAS: 104-55-2 **LD_{50}:** 2,220mg/kg
MW: 132.17 **MF:** C_9H_8O

PS-2267 **2.3-Dichloronitrobenzene**
1.2-Dichloro-3-nitrobenzene
CAS: 3209-22-1 **LD_{50}:** N/A
MW: 192.00 **MF:** $C_6H_3Cl_2NO_2$

PS-2268 **2.4-Dichloronitrobenzene**
asym-Nitro-m-dichlorobenzene
CAS: 611-06-3 **LD_{50}:** N/A
MW: 192.00 **MF:** $C_6H_3C_{12}NO_2$

PS-2269 **2.5-Dichloronitrobenzene**
1,4-Dichloro-2-nitrobenzene
CAS: 89-61-2 **LD_{50}:** 1,210mg/kg
MW: 192.00 **MF:** $C_6H_3Cl_2NO_2$

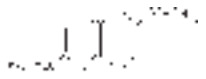
PS-2270 **3.4-Dichloronitrobenzene**
1.2-Dichloro-4-nitrobenzene
CAS: 99-54-7 **LD_{50}:** 643mg/kg
MW: 192.00 **MF:** $C_6H_3Cl_2NO_2$

Chem Service Pesticide Standards - Numerical Listing

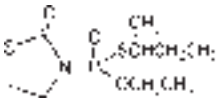
PS-2271 **3,5-Dichloronitrobenzene**
CAS: 618-62-2 **LD_{50}:** N/A
MW: 192.00 **MF:** $C_6H_3Cl_2NO_2$



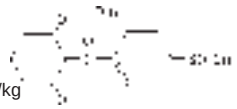
PS-2272 **2,6-Diisopropylnaphthalene**
CAS: 24157-81-1 **LD_{50}:** N/A
MW: 212.33 **MF:** $C_{16}H_{20}$



PS-2273 **Fosthiazate**
Cierto®, Nemathorin®, Shinoma®, S-sec-Butyl O-ethyl (2-oxo-1,3-thiazolidine-3-yl)phosphonothioate
CAS: 98886-44-3 **LD_{50}:** 57mg/kg
MW: 283.37 **MF:** $C_9H_{18}NO_3PS_2$



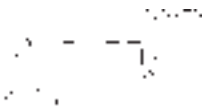
PS-2274 **Mesotrione**
2-(4-Mesyl-2-nitrobenzoyl) cyclohexane-1,3-dione
CAS: 104206-82-8 **LD_{50}:** 5,000mg/kg
MW: 339.3 **MF:** $C_{14}H_{13}NO_7S$



PS-2275 **Fenthion-ethyl**
O,O-Diethyl O-(3-methyl-4-(methylthio)phenyl)phosphorothioate
CAS: 1716-09-2 **LD_{50}:** 14mg/kg
MW: 306.40 **MF:** $C_{12}H_{19}O_3PS_2$



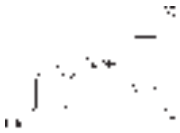
PS-2276 **Clodinafop-propargyl**
Prop-2-ynyl (R)-2-[4-(5-chloro-3-fluoropyridin-2-yloxy)phenoxy] propionate
CAS: 105512-06-9 **LD_{50}:** 1,829mg/kg
MW: 349.8 **MF:** $C_{17}H_{13}ClFNO_4$



PS-2277 **Ormetoprin**
5-(4,5-Dimethoxy-2-methylbenzyl) -2,4-diaminopyrimidine, 2,4-Diamino-5-(6-methylveratryl) pyrimidine
CAS: 6981-18-6 **LD_{50}:** N/A
MW: 274.33 **MF:** $C_{14}H_{18}N_4O_2$



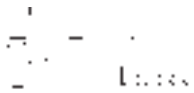
PS-2278 **Sulfadimethoxine**
Agribon®, Albon®, Bactrovet®, Madribon®, Neostrepal®, Sudine®, Sulxin®, 4-Amino-N-(2,6-dimethoxy-4-pyrimidinyl) benzenesulfonamide, 2,6-Dimethoxy-4-sulfanilamido pyrimidine, Dinosol®
CAS: 122-11-2 **LD_{50}:** 3,200mg/kg
MW: 310.36 **MF:** $C_{12}H_{14}N_4O_4S$



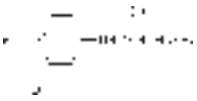
PS-2279 **Cybutryne**
Irgarol®, Fintryne®, N-Cyclopropyl -N'-(1,1-dimethylethyl)-6-(methyl thio)-1,3,5-Triazine-2,4-diamine
CAS: 28159-98-0 **LD_{50}:** N/A
MW: 253.37 **MF:** $C_{11}H_{19}N_5S$



PS-2280 **Cyhalofop-butyl**
Butyl (R)-2-[4-(4-cyano-2-fluorophenoxy)phenoxy]propionate
CAS: 122008-85-9 **LD_{50}:** 5,000mg/kg
MW: 357.4 **MF:** $C_{20}H_{20}FNO_4$



PS-2281 **Pentanochlor**
Solan®, N-(3-Chloro-4-methylphenyl) -2-methylpentanamide, 3'-Chloro-2-methylvalero-p-toluidide
CAS: 2307-68-8 **LD_{50}:** 5,100mg/kg
MW: 239.7 **MF:** $C_{13}H_{18}ClNO$



PS-2282 **2,4-D isobutyl ester**
Isobutyl 2,4-dichlorophenoxyacetate, (2,4-Dichlorophenoxy)acetic acid isobutyl ester
CAS: 1713-15-1 **LD_{50}:** 300mg/kg
MW: 277.16 **MF:** $C_{12}H_{14}Cl_2O_3$



PS-2283 **Mecarbam**
Afos®, Murfotox®, Pestan®, S-(N-Ethoxycarbonyl-N-methyl carbamoylmethyl) O,O-diethyl phosphorodithioate
CAS: 2595-54-2 **LD_{50}:** 31mg/kg
MW: 329.40 **MF:** $C_{10}H_{20}NO_5PS_2$



PS-2284 **Quinoxyfen**
5,7-Dichloro-4-quinolyl 4-fluoro phenyl ether, 5,7-Dichloro-4-(4-fluorophenoxy)quinoline
CAS: 124495-18-7 **LD_{50}:** 5,000mg/kg
MW: 308.14 **MF:** $C_{15}H_8Cl_2FNO$



PS-2285 **Propoxycarbazone-sodium**
CAS: 181274-15-7 **LD_{50}:** 5,000mg/kg
MW: 420.4 **MF:** $C_{15}H_{17}N_4NaO_7S$



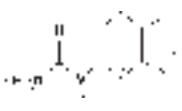
PS-2286 **Mesosulfuron-methyl**
2-[(4,6-Dimethoxypyrimidin-2-ylcarbamoyl)sulfamoyl]-a-(methanesulfonamido)-p-toluate
CAS: 208465-21-8 **LD_{50}:** 5,000mg/kg
MW: 503.5 **MF:** $C_{17}H_{21}N_5O_9S_2$



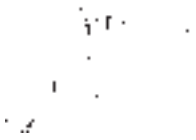
PS-2287 **Mefenpyr-diethyl**
Diethyl (RS)-1-(2,4-dichlorophenyl) -5-methyl-2-pyrazoline-3,5-dicarboxylate
CAS: 135590-91-9 **LD_{50}:** 5,000mg/kg
MW: 373.2 **MF:** $C_{16}H_{18}Cl_2N_2O_4$



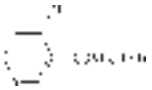
PS-2288 **Noruron**
Norea, Herban®, 3a,alpha,4alpha, 5alpha,7alpha,7a,alpha-N,N-Dimethyl-N'-(octahydro-4,7-methano-1H-inden-5-yl)urea, 3-(Hexahydro-4,7-methanoindan -5-yl)-1,1-dimethylurea, 1-(Tetrahydrodicyclopentadienyl) -3,3-dimethylurea
CAS: 18530-56-8 **LD_{50}:** 2,000mg/kg
MW: 222.3 **MF:** $C_{13}H_{22}N_2O$



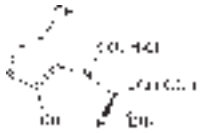
PS-2289 **Cholecalciferol**
Vitamin D3, Calciol, 9,10-Secocholesta-5,7,10(19)-trien-3-beta-ol
CAS: 67-97-0 **LD_{50}:** 42mg/kg
MW: 384.71 **MF:** $C_{27}H_{44}O$



PS-2290 **Flonicamid**
N-Cyanomethyl-4-(trifluoro methyl)nicotinamide
CAS: 158062-67-0 **LD_{50}:** 884mg/kg
MW: 229.2 **MF:** $C_9H_6F_3N_3O$



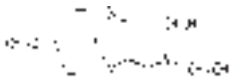
PS-2291 **Dimethenamid-P**
Outlook®, (S)-2-Chloro-N-(2,4-dimethyl-3-thienyl)-N-(2-methoxy-1-methylethyl)acetamide
CAS: 163515-14-8 **LD_{50}:** 466mg/kg
MW: 275.8 **MF:** $C_{12}H_{18}ClNO_2S$



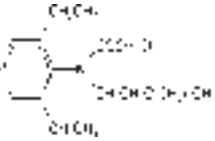
PS-2292 **Fenamidone**
(S)-1-Anilino-4-methyl-2-methylthio-4-phenylimidazolin-5-one, S-5-Methyl-2-methylthio-5-phenyl-3-phenylamino-3,5-dihydro-4H-imidazol-4 -one
CAS: 161326-34-7 **LD_{50}:** 2,028mg/kg
MW: 311.4 **MF:** $C_{17}H_{17}N_3OS$



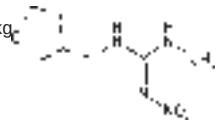
PS-2293 **Spiroxamine**
8-tert-Butyl-1,4-dioxaspiro[4.5] decan-2-ylmethyl(ethyl)(propyl) amine
CAS: 118134-30-8 **LD_{50}:** 595mg/kg
MW: 297.5 **MF:** $C_{18}H_{35}NO_2$



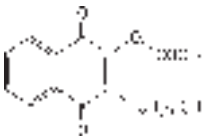
PS-2294 **Pretilachlor**
Rifit®, Solnet®, 2-Chloro-2',6'-diethyl-N-(2-propoxyethyl)acetanilide
CAS: 51218-49-6 **LD_{50}:** 6,099mg/kg
MW: 311.9 **MF:** $C_{17}H_{26}ClNO_2$



PS-2295 **Dinotefuran**
(RS)-1-methyl-2-nitro-3-(tetrahydro-3-furylmethyl)guanidine
CAS: 165252-70-0 **LD_{50}:** 2,804mg/kg
MW: 202.2 **MF:** $C_7H_{14}N_4O_3$



PS-2296 **Acequinocyl**
Kanemite®, AKD-2023®, 3-Dodecyl-1,4-dihydro-1,4-dioxo-2-naphthyl acetate,3-Acetoxy-2-dodecyl-1,4-naphthoquinone
CAS: 57960-19-7 **LD_{50}:** 5,000mg/kg
MW: 384.5 **MF:** $C_{24}H_{32}O_4$



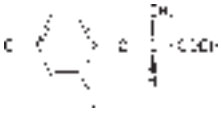
PS-2297 **Oxolinic acid**
Dioxacin®, Emyrenil®, Gramurin®, Prodoxol®, Uroxol®, 5-Ethyl-5,8-dihydro-8-oxo[1,3]dioxolo[4,5-g] quinoline-7-carboxylic acid
CAS: 14698-29-4 **LD_{50}:** 630mg/kg
MW: 261.2 **MF:** $C_{13}H_{11}NO_5$



PS-2299 **Tetraconazole**
(RS)-2-(2,4-dichlorophenyl)-3-(1H-1,2,4-triazol-1-yl)propyl 1,1,2,2-tetrafluoroethyl ether, Arpege®, Domark®, Emerald®, Eminent®, Greman®, Lospel®
CAS: 112281-77-3 **LD_{50}:** 1,248mg/kg
MW: 372.1 **MF:** $C_{13}H_{11}Cl_2F_4N_3O$



PS-2300 **Dichlorprop-P**
Duplosan®, Optica®, (+)-2,4-DP, R-2-(2,4-Dichlorophenoxy) propionic acid
CAS: 15165-67-0 **LD_{50}:** 825mg/kg
MW: 235.1 **MF:** $C_9H_8Cl_2O_3$





Solution Listing
Pesticide Standards

NEW

Chem Service now offers pesticide standard single component solutions in a HPLC solvent and a GC solvent for customers using these methods of analysis.

1 → **PS-95** **Parathion®** ← 2

3 → *F998JS* *100ug/ml in Acetonitrile*
F998RPS *100ug/ml in Acetonitrile* ← 4
PS-95JS *100ug/ml in Toluene* ← 5

1 **Pesticide catalog number (parent compound)**

2 **Description of the parent pesticide**

3 *Solution Pesticide standard (Catalog number, concentration and solvent)*

4 *Solution in HPLC Solvent*

5 *Solution in GC Solvent*

ORDERS
Phone: 1-610-692-3026 or 1-800-452-9994
Fax: 1-610-692-8729

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Phone: 1-610-692-3026 or 1-800-452-9994
Fax: 1-610-692-8729

Chem Service Pesticide Standards - Solution Listing

JS = 1ml RPS = 5x1ml

PS-1 **1.2-Dibromo-3-chloropropane**
F819JS 100ug/ml in Methanol
F819RPS 100ug/ml in Methanol

PS-2 **o-Dichlorobenzene**
F25JS 100ug/ml in Methanol
F25RPS 100ug/ml in Methanol

PS-3 **p-Dichlorobenzene**
F27JS 100ug/ml in Methanol
F27RPS 100ug/ml in Methanol

PS-4 **Trichloronitromethane**
F2023JS 100ug/ml in Acetone
F2023RPS 100ug/ml in Acetone

PS-5 **1.1-Dichloro-1-nitroethane**
PS-5JS 100ug/ml in Methylene chloride
PS-5AJS 100ug/ml in Methanol

PS-6 **Dichlorophen**
F2288JS 100ug/ml in Methanol
F2288S 100ug/ml in Methanol
F2288RPS 100ug/ml in Methanol

PS-7 **Pentachlorophenol**
F64JS 100ug/ml in Methanol
F64RPS 100ug/ml in Methanol

PS-8 **2.3.4.6-Tetrachlorophenol**
F1086JS 100ug/ml in Methanol
F1086RPS 100ug/ml in Methanol

PS-9 **2.4.5-Trichlorophenol**
F717JS 100ug/ml in Methanol
F717RPS 100ug/ml in Methanol

PS-10 **2.4.6-Trichlorophenol**
F21JS 100ug/ml in Methanol
F21RPS 100ug/ml in Methanol

PS-11 **Chloranil**
PS-11JS 100ug/ml in Toluene
PS-11AJS 100ug/ml in Methanol

PS-12 **Dichlone**
F2103JS 100ug/ml in Toluene
F2103RPS 100ug/ml in Toluene
PS-12JS 100ug/ml in Methanol

PS-13 **1.4.5.6.7.7-Hexachloro-N-(ethylmercuri)-5-norbornene-2.3-dicarboximide**
PS-13JS 100ug/ml in Toluene
PS-13AJS 100ug/ml in Methanol

PS-14 **Phenyl mercuric acetate**
PS-14JS 100ug/ml in Toluene
PS-14AJS 100ug/ml in Methanol

PS-15 **Phenyl mercuric benzoate**
PS-15JS 100ug/ml in Toluene
PS-15AJS 100ug/ml in Methanol

PS-17 **Dazomet**
PS-17JS 100ug/ml in Methanol

PS-18 **8-Hydroxyquinoline**
PS-18JS 100ug/ml in Methanol

JS = 1ml RPS = 5x1ml

PS-19 **2-Chloroallyl diethyldithiocarbamate**
F2136JS 100ug/ml in Methanol
F2136RPS 100ug/ml in Methanol

PS-20 **Ferbam**
PS-20JS 100ug/ml in Toluene
PS-20AJS 100ug/ml in Methanol

PS-21 **Ziram**
PS-21JS 100ug/ml in Toluene
F2368JS 100ug/ml in Acetonitrile
F2368RPS 100ug/ml in Acetonitrile

PS-22 **Maneb** *Not Available in Solution*

PS-23 **Zineb** ® *Not Available in Solution*

PS-24 **Tetramethylthiuram disulfide**
PS-24JS 100ug/ml in Toluene
PS-24AJS 100ug/ml in Methanol

PS-25 **Captan**
F2095JS 100ug/ml in Toluene
F2095RPS 100ug/ml in Toluene
PS-25AJS 100ug/ml in Methanol

PS-26 **Folpet**
PS-26JS 100ug/ml in Toluene
PS-26AJS 100ug/ml in Methanol

PS-27 **Dinocap**
F2109JS 100ug/ml in Methanol
F2109RPS 100ug/ml in Methanol

PS-28 **1-Naphthaleneacetamide**
PS-28JS 100ug/ml in Toluene
PS-28AJS 100ug/ml in Methanol

PS-29 **1-Naphthaleneacetic acid**
PS-29JS 100ug/ml in MTBE
PS-29AJS 100ug/ml in Methanol

PS-30 **Methyl-1-naphthalene acetate**
PS-30JS 100ug/ml in Toluene
PS-30AJS 100ug/ml in Methanol

PS-31 **Chloroacetic acid**
F2082JS 100ug/ml in MTBE
F2082RPS 100ug/ml in MTBE
PS-31AJS 100ug/ml in Methanol

PS-32 **Dalapon**
F956JS 100ug/ml in Acetone
F956RPS 100ug/ml in Acetone
PS-32AJS 100ug/ml in Methanol

PS-33 **Chlorthal**
F2040JS 100ug/ml in Acetone
F2040RPS 100ug/ml in Acetone
PS-33AJS 100ug/ml in Methanol

PS-34 **Trichloroacetic acid**
F2084JS 100ug/ml in MTBE
F2084RPS 100ug/ml in MTBE
PS-34AJS 100ug/ml in Methanol

PS-35 **2-Naphthoxyacetic acid**
PS-35JS 100ug/ml in MTBE
PS-35AJS 100ug/ml in Methanol

JS = 1ml RPS = 5x1ml

PS-36 **Phenoxyacetic acid**
PS-36JS 100ug/ml in MTBE
PS-36AJS 100ug/ml in Methanol

PS-37 **2-Phenoxypropionic acid**
PS-37JS 100ug/ml in MTBE
PS-37AJS 100ug/ml in Methanol

PS-38 **o-Chlorophenoxy acetic acid**
PS-38JS 100ug/ml in MTBE
PS-38AJS 100ug/ml in Methanol

PS-39 **p-Chlorophenoxy acetic acid**
PS-39JS 100ug/ml in MTBE
PS-39AJS 100ug/ml in Methanol

PS-40 **4-Chloro-o-tolyloxyacetic acid**
F966JS 100ug/ml in Acetone
F966RPS 100ug/ml in Acetone
PS-40AJS 100ug/ml in Methanol

PS-41 **2.4-D**
F954JS 100ug/ml in Acetone
F954RPS 100ug/ml in Acetone
PS-41AJS 100ug/ml in Methanol

PS-41-1 **2.4-D methyl ester**
F955JS 100ug/ml in Methanol
F955RPS 100ug/ml in Methanol

PS-42 **2.4-D butyl ester**
PS-42JS 100ug/ml in Toluene
PS-42AJS 100ug/ml in Acetonitrile

PS-43 **2.4-D isopropyl ester**
PS-43JS 100ug/ml in Toluene
PS-43AJS 100ug/ml in Acetonitrile

PS-44 **Dichlorprop**
F962JS 100ug/ml in Acetone
F962RPS 100ug/ml in Acetone
PS-44AJS 100ug/ml in Methanol

PS-45 **2.4.5-T** ®
F972JS 100ug/ml in Acetone
F972RPS 100ug/ml in Acetone
PS-45AJS 100ug/ml in Acetonitrile

PS-46 **2.4.5-T isopropyl ester**
PS-46JS 100ug/ml in MTBE
PS-46AJS 100ug/ml in Acetonitrile

PS-47 **Silvex**
F970JS 100ug/ml in Acetone
F970RPS 100ug/ml in Acetone
PS-47AJS 100ug/ml in Acetonitrile

PS-48 **3-Indolebutyric acid**
PS-48JS 100ug/ml in MTBE
PS-48AJS 100ug/ml in Acetonitrile

PS-49 **Gibberellic acid**
PS-49JS 100ug/ml in MTBE
PS-49AJS 100ug/ml in Acetonitrile

PS-50 **N-m-Tolylphthalamic acid**
PS-50JS 100ug/ml in MTBE
PS-50AJS 100ug/ml in Acetonitrile

PestCat05_Solutions.pmd 75 1/3/06, 11:45 AM

Chem Service Pesticide Standards - Solution Listing

JS = 1ml RPS = 5x1ml

PS-51 **Dimethylarsinic acid**
PS-50JS *100ug/ml in Toluene*
PS-50AJS *100ug/ml in H_2O*

PS-52 **Chlorpropham**
F2199JS *100ug/ml in MTBE*
F2199RPS *100ug/ml in MTBE*
PS-52AJS *100ug/ml in Acetonitrile*

PS-53 **Propham**
F2376JS *100ug/ml in Acetonitrile*
F2376RPS *100ug/ml in Acetonitrile*
PS-53JS *100ug/ml in Toluene*

PS-54 **S-Ethyl dipropylthiocarbamate**
F2229JS *100ug/ml in MTBE*
F2229RPS *100ug/ml in MTBE*
PS-54AJS *100ug/ml in Acetonitrile*

PS-55 **S-Propyl butylethylthiocarbamate**
F2233JS *100ug/ml in MTBE*
F2233RPS *100ug/ml in MTBE*
PS-55AJS *100ug/ml in Acetonitrile*

PS-56 **Dinoseb**
F964JS *100ug/ml in Acetone*
F964RPS *100ug/ml in Acetone*
PS-56AJS *100ug/ml in Acetonitrile*

PS-57 **4.6-Dinitro-o-cresol**
F60JS *1000ug/ml in Methanol*
F60RPS *1000ug/ml in Methanol*

PS-58 **Simazine**
F2073JS *100ug/ml in Methanol*
F2073RPS *100ug/ml in Methanol*

PS-59 **Monuron**
F2374JS *1000ug/ml in Acetonitrile*
F2374RPS *1000ug/ml in Acetonitrile*
PS-59AJS *1000ug/ml in Methanol*

PS-60 **Diuron**
F2371JS *1000ug/ml in Acetonitrile*
F2371RPS *1000ug/ml in Acetonitrile*
PS-60JS *100ug/ml in Toluene*

PS-61 **1.1-Dimethyl-3-phenylurea**
F2372JS *1000ug/ml in Acetonitrile*
F2372RPS *1000ug/ml in Acetonitrile*
PS-61JS *100ug/ml in Toluene*

PS-62 **Bromacil**
F2200JS *100ug/ml in MTBE*
F2200RPS *100ug/ml in MTBE*
PS-62AJS *100ug/ml in Acetonitrile*

PS-63 **Chloranocryl**
PS-63JS *100ug/ml in Toluene*
PS-63AJS *100ug/ml in Acetonitrile*

PS-64 **Diphenylacetonitrile**
PS-64JS *100ug/ml in Methanol*

PS-65 **Maleic hydrazide**
PS-65JS *100ug/ml in Methanol*

JS = 1ml RPS = 5x1ml

PS-66 **Diethyl dithiobis(thionoformate)**
PS-66JS *100ug/ml in Isooctane*
PS-66AJS *100ug/ml in Acetonitrile*

PS-67 **Phosphan**
PS-67JS *100ug/ml in Methanol*

PS-68 **Tributylphosphoro-trithioite**
Not Available in Solution

PS-69 **Aldrin ®**
F89JS *100ug/ml in Methanol*
F89RPS *100ug/ml in Methanol*

PS-70 **BHC (mixed isomers)**
PS-70JS *100ug/ml in Toluene*
PS-70AJS *100ug/ml in Acetonitrile*

PS-71 **Lindane**
F104JS *100ug/ml in Toluene*
F104RPS *100ug/ml in Toluene*
PS-71AJS *100ug/ml in Acetonitrile*

PS-72 **p.p'-DDD**
F94JS *100ug/ml in Isooctane*
F94RPS *100ug/ml in Isooctane*
PS-72AJS *100ug/ml in Acetonitrile*

PS-73 **Perthane ®**
F2295JS *1000ug/ml in Isooctane*
F2295RPS *1000ug/ml in Isooctane*
PS-73AJS *100ug/ml in Acetonitrile*

PS-74 **DDT (mixture p,p' & o,p')**
PS-74JS *100ug/ml in Methanol*

PS-75 **Chlordane**
F91JS *100ug/ml in Methanol*
F91RPS *100ug/ml in Methanol*

PS-75-1 **cis-Chlordane**
F907JS *100ug/ml in Methanol*
F907RPS *100ug/ml in Methanol*

PS-75-2 **trans-Chlordane**
F908JS *100ug/ml in Methanol*
F908RPS *100ug/ml in Methanol*

PS-76 **Dieldrin**
F90JS *100ug/ml in Methanol*
F90RPS *100ug/ml in Methanol*

PS-77 **Endrin**
F98JS *100ug/ml in Methanol*
F98RPS *100ug/ml in Methanol*

PS-77-1 **Endrin aldehyde**
F99JS *100ug/ml in Methanol*
F99S *100ug/ml in Methanol*
F99RPS *100ug/ml in Methanol*

PS-77-2 **Endrin ketone**
F2022JS *100ug/ml in Toluene*
F2022RPS *100ug/ml in Toluene*
PS-77-2AJS *100ug/ml in Acetonitrile*

PS-78 **Heptachlor**
F100JS *100ug/ml in Methanol*
F100RPS *100ug/ml in Methanol*

JS = 1ml RPS = 5x1ml

PS-79 **Toxaphene ®**
F106JS *100ug/ml in Methanol*
F106RPS *100ug/ml in Methanol*

PS-80 **Tetradifon**
F2282JS *500ug/ml in Acetone*
F2282RPS *500ug/ml in Acetone*
PS-80AJS *100ug/ml in Acetonitrile*

PS-81 **Endosulfan**
F95JS *100ug/ml in Hexane*
F95RPS *100ug/ml in Hexane*
PS-81AJS *100ug/ml in Acetonitrile*

PS-81-1 **Endosulfan (alpha isomer)**
F202JS *100ug/ml in Hexane*
F202RPS *100ug/ml in Hexane*
F202AJS *100ug/ml in MTBE*
F202ARPS *100ug/ml in MTBE*
PS-81-1AJS *100ug/ml in Acetonitrile*
PS-81-1AS *100ug/ml in Acetonitrile*
PS-81-1ARPS *100ug/ml in Acetonitrile*

PS-81-2 **Endosulfan (beta isomer)**
F203JS *100ug/ml in Hexane*
F203RPS *100ug/ml in Hexane*
PS-81-2AJS *100ug/ml in Acetonitrile*

PS-81-3 **Endosulfan sulfate**
F97JS *100ug/ml in Hexane*
F97RPS *100ug/ml in Hexane*
PS-81-3AJS *100ug/ml in Acetonitrile*

PS-82 **Kelthane ®**
F2281JS *5000ug/ml in Isooctane*
F2281RPS *5000ug/ml in Isooctane*
PS-82AJS *100ug/ml in Acetonitrile*

PS-83 **Methoxychlor**
F910JS *100ug/ml in Methanol*
F910RPS *100ug/ml in Methanol*

PS-84 **Carbaryl**
F2005JS *1000ug/ml in Acetonitrile*
F2005RPS *1000ug/ml in Acetonitrile*
PS-84JS *100ug/ml in Toluene*

PS-85 **Nicotine**
F2123JS *100ug/ml in Methanol*
F2123RPS *100ug/ml in Methanol*

PS-86 **Malathion**
F2118JS *100ug/ml in Toluene*
F2118RPS *100ug/ml in Toluene*
PS-86AJS *100ug/ml in Acetonitrile*

PS-87 **Phosdrin ®**
F2066JS *100ug/ml in Toluene*
F2066RPS *100ug/ml in Toluene*
PS-87AJS *100ug/ml in Acetonitrile*

PS-87-1 **cis-Mevinphos**
PS-87-1JS *100ug/ml in MTBE*
PS-87-1AJS *100ug/ml in Acetonitrile*

PS-88 **Carbophenothion**
F2096JS *100ug/ml in Methanol*
F2096RPS *100ug/ml in Methanol*

Solution Listing

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Chem Service Pesticide Standards - Solution Listing

JS = 1ml RPS = 5x1ml

PS-89 **Dichlorvos**
F2061JS *100ug/ml in Toluene*
F2061RPS *100ug/ml in Toluene*
PS-89AJS *100ug/ml in Acetonitrile*

PS-90 **Diazinon**
F2060JS *100ug/ml in Toluene*
F2060RPS *100ug/ml in Toluene*

PS-91 **O,O-Dimethyl phosphorochloridothioate**
PS-91JS *100ug/ml in Toluene*
PS-91AJS *100ug/ml in Acetonitrile*

PS-92 **Ethion**
F2113JS *100ug/ml in Methanol*
F2113RPS *100ug/ml in Methanol*

PS-93 **EPN**
F2112JS *100ug/ml in Hexane*
F2112RPS *100ug/ml in Hexane*
PS-93AJS *100ug/ml in Acetonitrile*

PS-94 **Methyl parathion**
F996JS *100ug/ml in Acetonitrile*
F996RPS *100ug/ml in Acetonitrile*
PS-94JS *100ug/ml in Toluene*

PS-95 **Parathion ®**
F998JS *100ug/ml in Acetonitrile*
F998RPS *100ug/ml in Acetonitrile*
PS-95JS *100ug/ml in Toluene*

PS-96 **Allethrin**
0.1mg/ml in Methylene chloride

PS-97 **Pyrethrum**
PS-97JS *100ug/ml in MTBE*
PS-97AJS *100ug/ml in Acetonitrile*

PS-98 **Benzyl thiocyanate**
PS-98JS *100ug/ml in Toluene*
PS-98AJS *100ug/ml in Acetonitrile*

PS-99 **Rotenone**
F2382JS *1000ug/ml in Methylene chloride*
F2382RPS *1000ug/ml in Methylene chloride*
PS-99AJS *100ug/ml in Acetonitrile*

PS-100 **Piperonyl butoxide**
PS-100JS *100ug/ml in Isooctane*
PS-100AJS *100ug/ml in Acetonitrile*

PS-101 **2-Butyl-2-ethyl-1.3-propanediol**
PS-101JS *100ug/ml in Methanol*

PS-102 **2-Ethyl-1.3-hexanediol**
F2283JS *2500ug/ml in Acetone*
F2283RPS *2500ug/ml in Acetone*
PS-102AJS *2500ug/ml in Acetonitrile*

PS-103 **Dichlofenthion**
F2422JS *100ug/ml in Hexane*
F2422RPS *100ug/ml in Hexane*
PS-103AJS *100ug/ml in Acetonitrile*

JS = 1ml RPS = 5x1ml

PS-104 **Warfarin**
PS-104JS *100ug/ml in Toluene*
PS-104AJS *100ug/ml in Acetonitrile*

PS-105 **Sodium fluoroacetate**
PS-105JS *100ug/ml in Toluene*
PS-105AJS *100ug/ml in H_2O*

PS-106 **a-Naphthylthiourea**
PS-106JS *100ug/ml in Toluene*
PS-106AJS *100ug/ml in Acetonitrile*

PS-107 **Tricyclohexyltin hydroxide**
PS-107JS *100ug/ml in Methanol*

PS-150 **Pentachloronitrobenzene**
F999JS *100ug/ml in Methanol*
F999RPS *100ug/ml in Methanol*

PS-151 **1,2,4,5-Tetrachloro-3-nitrobenzene**
PS-151JS *100ug/ml in Methanol*

PS-152 **1.3-Dichloropropene**
F33JS *100ug/ml in Methanol*
F33RPS *100ug/ml in Methanol*

PS-153 **1.2-Dichloropropane**
F32JS *100ug/ml in Methanol*
F32RPS *100ug/ml in Methanol*

PS-154 **1.2-Dibromoethane**
F820JS *100ug/ml in Methanol*
F820RPS *100ug/ml in Methanol*

PS-170 **o-Benzyl-p-chlorophenol**
PS-170JS *100ug/ml in Methanol*

PS-171 **Hexachlorodimethyl sulfone**
PS-171JS *100ug/ml in Toluene*
PS-171AJS *100ug/ml in Acetonitrile*

PS-199 **Phenylmercuric oleate**
PS-199JS *100ug/ml in Toluene*
PS-199AJS *100ug/ml in Acetonitrile*

PS-202 **Phenylmercury nitrate**
PS-202JS *100ug/ml in Toluene*
PS-202AJS *100ug/ml in Acetonitrile*

PS-203 **Phenylmercury borate**
PS-203JS *100ug/ml in Toluene*
PS-203AJS *100ug/ml in Acetonitrile*

PS-205 **Phenylmercury salicylate**
PS-205JS *100ug/ml in Toluene*
PS-205AJS *100ug/ml in Acetonitrile*

PS-209 **Ethylmercuric chloride**
Not Available in Solution

PS-214 **Phenyl mercuric chloride**
PS-214JS *100ug/ml in Toluene*
PS-214AJS *100ug/ml in Acetonitrile*

PS-215 **Phenyl mercuric hydroxide**
Not Available in Solution

PS-216 **Phenyl mercuric lactate**
Not Available in Solution

JS = 1ml RPS = 5x1ml

PS-217 **Phenyl mercuric phthalate**
PS-217JS *100ug/ml in Toluene*
PS-217AJS *100ug/ml in Acetonitrile*

PS-220 **Nabam**
PS-220JS *100ug/ml in Toluene*
PS-220AJS *100ug/ml in H_2O*

PS-221 **Metham sodium**
PS-221JS *100ug/ml in Toluene*
PS-221AJS *100ug/ml in H_2O*

PS-222 **Benomyl**
PS-222JS *100ug/ml in Toluene*
PS-222AJS *100ug/ml in Acetonitrile*

PS-223 **Thiophanate**
PS-223JS *100ug/ml in Toluene*
PS-223AJS *100ug/ml in Acetonitrile*

PS-224 **Perchloromethyl mercaptan**
PS-224JS *100ug/ml in Toluene*
PS-224AJS *100ug/ml in Acetonitrile*

PS-225 **Polyram ®**
Not Available in Solution

PS-227 **Vanicide-20S ®**
PS-227JS *100ug/ml in Toluene*
PS-227AJS *100ug/ml in Acetonitrile*

PS-228 **Amobam®**
Not Available in Solution

PS-230 **Thiophanate-methyl**
PS-230JS *100ug/ml in Toluene*
PS-230AJS *100ug/ml in Acetonitrile*

PS-250 **Dodine**
PS-250JS *100ug/ml in Methanol*

PS-255 **Chloroneb**
F2201JS *100ug/ml in MTBE*
F2201RPS *100ug/ml in MTBE*
PS-255AJS *100ugml in Acetonitrile*

PS-260 **Captafol**
F2094JS *100ug/ml in Toluene*
F2094RPS *100ug/ml in Tolune*
PS-260AJS *100ug/ml in Acetonitrile*

PS-261 **Glyodin**
PS-261JS *100ug/ml in Methanol*

PS-262 **Dexon ®**
PS-262JS *100ug/ml in Methanol*

PS-264 **Terrazole ®**
F2202JS *100ug/ml in MTBE*
F2202RPS *100ug/ml in MTBE*
PS-264AJS *100ug/ml in Acetonitrile*

PS-272 **Hexachloroacetone**
PS-272JS *100ug/ml in Hexane*
PS-272AJS *100ug/ml in Acetonitrile*

PS-273 **Bromoacetyl bromide**
PS-273JS *100ug/ml in Toluene*
PS-273AJS *100ug/ml in Acetonitrile*

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JS = 1ml RPS = 5x1ml

PS-274 **Picloram**
F2041JS *100ug/ml in Acetone*
F2041RPS *100ug/ml in Acetone*
PS-274AJS *100ug/ml in Acetonitrile*

PS-280 **Cadmium succinate**
PS-280JS *100ug/ml in Toluene*
PS-280AJS *100ug/ml in H_2O*

PS-281 **Disodium methyl arsonate**
PS-281JS *100ug/ml in Toluene*
PS-281AJS *100ug/ml in H_2O*

PS-282 **Bis[tri-n-butyltin]oxide**
PS-282JS *100ug/ml in Toluene*
PS-282AJS *100ug/ml in Acetonitrile*

PS-288 **Diphacinone**
PS-288JS *100ug/ml in Toluene*
PS-288AJS *100ug/ml in Acetonitrile*

PS-289 **Potassium cyanate**
PS-288JS *100ug/ml in Toluene*
PS-288AJS *100ug/ml in H_2O*

PS-290 **Lead arsenate**
Not Available in Solution

PS-291 **Ammonium fluosilicate**
PS-291JS *100ug/ml in Toluene*
PS-291AJS *100ug/ml in H_2O*

PS-292 **Copper oxychloride**
PS-292JS *100ug/ml in Toluene*
PS-292AJS *100ug/ml in H_2O*

PS-293 **Dicloran**
F2290JS *1000ug/ml in Toluene*
F2290RPS *1000ug/ml in Toluene*
PS-293AJS *100ug/ml in Acetonitrile*

PS-294 **Carboxin**
F2203JS *100ug/ml in MTBE*
F2203RPS *100ug/ml in MTBE*
PS-294AJS *100ug/ml in Acetonitrile*

PS-295 **Oxycarboxin**
PS-295JS *100ug/ml in Toluene*
PS-295AJS *100ug/ml in Acetonitrile*

PS-296 **2.4.5-T-amine**
PS-296JS *100ug/ml in Methanol*

PS-297 **2.4.5-T isooctyl ester**
PS-297JS *100ug/ml in MTBE*
PS-297AJS *100ug/ml in Acetonitrile*

PS-297-1 **2.4.5-T 2-ethylhexyl ester**
PS-297-1JS *100ug/ml in MTBE*
PS-297-1AJS *100ug/ml in Acetonitrile*

PS-299 **2.4-D isopropylamine salt**
PS-299JS *100ug/ml in Methanol*

PS-301 **2.4-D sec-butyl ester**
F2361JS *1000ug/ml in Acetonitrile*
F2361RPS *1000ug/ml in Acetonitrile*
PS-301JS *100ug/ml in Toluene*

JS = 1ml RPS = 5x1ml

PS-302 **2.4-D propylene glycol ester**
PS-302JS *100ug/ml in Hexane*
PS-302AJS *100ug/ml in Acetonitrile*

PS-303 **2.4.5-T n-butyl ester**
PS-303JS *100ug/ml in Hexane*
PS-303AJS *100ug/ml in Acetonitrile*

PS-304 **2.4-D ethyl ester**
PS-304JS *100ug/ml in Hexane*
PS-304AJS *100ug/ml in Acetonitrile*

PS-306 **2.4-DB**
F958JS *100ug/ml in Acetone*
F958RPS *100ug/ml in Acetone*
PS-306AJS *100ug/ml in Acetonitrile*

PS-307 **MCPB**
PS-307JS *100ug/ml in MTBE*
PS-307AJS *100ug/ml in Acetonitrile*

PS-308 **Fenac**
PS-308JS *100ug/ml in MTBE*
PS-308AJS *100ug/ml in Acetonitrile*

PS-309 **2.4.5-T butoxyethyl ester**
F2362JS *1000ug/ml in Acetonitrile*
F2362RPS *1000ug/ml in Acetonitrile*
PS-309JS *100ug/ml in Toluene*

PS-310 **p-Chloromandelic acid**
PS-310JS *100ug/ml in MTBE*
PS-310AJS *100ug/ml in Acetonitrile*

PS-311 **Bifenox**
PS-310JS *100ug/ml in Methanol*

PS-312 **p-Bromophenoxy acetic acid**
PS-312JS *100ug/ml in MTBE*
PS-312AJS *100ug/ml in Acetonitrile*

PS-313 **Sesone ®**
PS-313JS *100ug/ml in Toluene*
PS-313AJS *100ug/ml in H_2O*

PS-314 **3-Amino-2.5-dichlorobenzoic acid**
F2039JS *1000ug/ml in Acetone*
F2039RPS *1000ug/ml in Acetone*
PS-314AJS *100ug/ml in Acetonitrile*

PS-315 **2.4-D butoxyethyl ester**
F2360JS *1000ug/ml in Acetone*
F2360RPS *1000ug/ml in Acetone*
PS-315AJS *100ug/ml in Acetonitrile*

PS-316 **2.4-DB dimethylamine salt**
PS-316JS *100ug/ml in Methanol*

PS-317 **2-(3-Chlorophenoxy) propionic acid**
PS-317JS *100ug/ml in MTBE*
PS-317AJS *100ug/ml in Acetonitrile*

PS-319 **2.4-D isooctyl ester**
PS-319JS *100ug/ml in MTBE*
PS-319AJS *100ug/ml in Acetonitrile*

JS = 1ml RPS = 5x1ml

PS-319-1 **2-Ethylhexyl-2.4-dichloro phenoxy acetate**
PS-319-1JS *100ug/ml in Hexane*
PS-319-1AJS *100ug/ml in Acetonitrile*

PS-320 **3-Indoleacetic acid**
PS-320JS *100ug/ml in MTBE*
PS-320AJS *100ug/ml in Acetonitrile*

PS-321 **3-Indolepropionic acid**
PS-321JS *100ug/ml in MTBE*
PS-321AJS *100ug/ml in Acetonitrile*

PS-324 **Mecoprop**
F968JS *100ug/ml in Acetone*
F968RPS *100ug/ml in Acetone*
PS-324AJS *100ug/ml in Acetonitrile*

PS-325 **(2-Chloroethyl)phosphonic acid**
PS-325JS *100ug/ml in Toluene*
PS-325AJS *100ug/ml in H_2O*

PS-326 **Ethyl-3-amino-2.5-dichloro benzoate**
PS-326JS *100ug/ml in MTBE*
PS-326AJS *100ug/ml in Acetonitrile*

PS-329 **Silvex isooctyl ester**
PS-329JS *100ug/ml in MTBE*
PS-329AJS *100ug/ml in Acetonitrile*

PS-330 **2.3.6-Trichlorobenzoic acid**
PS-330JS *100ug/ml in MTBE*
PS-330AJS *100ug/ml in Acetonitrile*

PS-332 **2.4-D isopropanol amine salt**
PS-332JS *100ug/ml in Methanol*

PS-334 **(2.4.5-Trichlorophenoxy) acetic acidbutoxypoly propylene glycol ester**
PS-334JS *100ug/ml in MTBE*
PS-334AJS *100ug/ml in Acetonitrile*

PS-335 **Ethyl-1-naphthalene acetate**
PS-335JS *100ug/ml in MTBE*
PS-335AJS *100ug/ml in Acetonitrile*

PS-337 **2.4-D dimethylamine salt**
PS-337JS *100ug/ml in Methanol*

PS-338 **2.4-D ethanolamine salt**
PS-338JS *100ug/ml in Methanol*

PS-339 **(2.4.5-Trichlorophenoxy) acetic acid methyl ester**
F973JS *100ug/ml in Methanol*
F973RPS *100ug/ml in Methanol*

PS-340 **N.N-Dimethylsuccinamic acid**
PS-340JS *100ug/ml in MTBE*
PS-340AJS *100ug/ml in Acetonitrile*

PS-341 **2-Furanacrylic acid**
PS-340JS *100ug/ml in MTBE*
PS-340AJS *100ug/ml in Acetonitrile*

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JS = 1ml RPS = 5x1ml

PS-342 **Silvex methyl ester**
F971JS *100ug/ml in Methanol*
F971RPS *100ug/ml in Methanol*

PS-343 **N-1-Naphthylphthalamic acid**
PS-343JS *100ug/ml in MTBE*
PS-343AJS *100ug/ml in Acetonitrile*

PS-344 **Ammonium sulfamate**
PS-344JS *100ug/ml in Toluene*
PS-344AJS *100ug/ml in H_2O*

PS-345 **Endothal**
F2443JS *100ug/ml in Acetonitrile*
F2443RPS *100ug/ml in Acetonitrile*
F1100JS *50ug/ml in De-ionized Water*
F1100RPS *50ug/ml in De-ionized Water*
F1101JS *10ug/ml in De-ionized Water*
F1101RPS *10ug/ml in De-ionized Water*
PS-345JS *100ug/ml in Toluene*

PS-346 **Dicamba**
F960JS *100ug/ml in Acetone*
F960RPS *100ug/ml in Acetone*
PS-346AJS *100ug/ml in Actonitrile*

PS-348 **Butachlor**
F2204JS *100ug/ml in MTBE*
F2204RPS *100ug/ml in MTBE*
PS-348AJS *100ug/ml in Acetonitrile*

PS-349 **Propyzamide**
F1083JS *100ug/ml in Methanol*
F1083RPS *100ug/ml in Methanol*

PS-350 **Diphenamid**
F2228JS *100ug/ml in MTBE*
F2228RPS *100ug/ml in MTBE*
PS-350AJS *100ug/ml in Acetonitrile*

PS-351 **N.N-Diallyl-2-chloroacetamide**
PS-351JS *100ug/ml in Methanol*

PS-352 **N-Methyl-N-1-naphthyl acetamide**
PS-352JS *100ug/ml in Methanol*

PS-354 **N-1-Naphthylacetamide**
PS-354JS *100ug/ml in Methanol*

PS-355 **Propachlor**
F2205JS *100ug/ml in MTBE*
F2205RPS *100ug/ml in MTBE*
PS-355AJS *100ug/ml in Acetonitrile*

PS-356 **3'.4'-Dichloropropionanilide**
F2379JS *1000ug/ml in Acetonitrile: Acetone (90:10)*
F2379RPS *1000ug/ml in Acetonitrile: Acetone (90:10)*
PS-356JS *100ug/ml in Toluene*

PS-357 **Alachlor**
F2072JS *100ug/ml in Methanol*
F2072RPS *100ug/ml in Methanol*

PS-358 **Nitralin**
PS-358JS *100ug/ml in Hexane*
PS-358AJS *100ug/ml in Acetonitrile*

JS = 1ml RPS = 5x1ml

PS-359 **2-[3-Chlorophenoxy] propionamide**
PS-359JS *100ug/ml in Methanol*

PS-360 **Allyl trimethylammonium bromide**
PS-360JS *100ug/ml in Toluene*
PS-360AJS *100ug/ml in H_2O*

PS-361 **(2-Bromoethyl)trimethyl ammonium bromide**
PS-361JS *100ug/ml in Toluene*
PS-361AJS *100ug/ml in H_2O*

PS-363 **Chlormequat chloride**
PS-363JS *100ug/ml in Toluene*
PS-363AJS *100ug/ml in H_2O*

PS-364 **Fenuron TCA**
Not Available in Solution

PS-365 **Diquat Dibromide monohydrate**
F1102JS *100ug/ml in De-ionized Water*
F1102RPS *100ug/ml in De-ionized Water*
F1102AJS *1970ug/ml in De-ionized Water*
F1102ARPS *1970ug/ml in De-ionized Water*
PS-365JS *100ug/ml in Toluene*

PS-366 **Paraquat CL tetrahydrate**
F1103JS *100ug/ml in De-ionized Water*
F1103RPS *100ug/ml in De-ionized Water*
F1103AJS *1770ug/ml in De-ionized Water*
F1103ARPS *1770ug/ml in De-ionized Water*
PS-366JS *100ug/ml in Toluene*

PS-368 **Chlorbromuron**
PS-368JS *100ug/ml in Toluene*
PS-368AJS *100ug/ml in Acetonitrile*

PS-369 **Fluometuron**
F2373JS *100ug/ml in Acetonitrile*
F2373RPS *100ug/ml in Acetonitrile*
PS-369JS *100ug/ml in Toluene*

PS-371 **Monuron TCA**
Not Available in Solution

PS-372 **Linuron**
F2280JS *2500ug/ml in Acetonitrile*
F2280RPS *2500ug/ml in Acetonitrile*
PS-372JS *100ug/ml in Toluene*

PS-373 **Siduron**
F2377JS *1000ug/ml in Acetonitrile*
F2377RPS *1000ug/ml in Acetonitrile*
PS-373JS *100ug/ml in Toluene*

PS-374 **Metobromuron**
PS-374JS *100ug/ml in Toluene*
PS-374AJS *100ug/ml in Acetonitrile*

PS-375 **Terbacil**
F2206JS *100ug/ml in MTBE*
F2206RPS *100ug/ml in MTBE*
PS-375AJS *100ug/ml in Acetonitrile*

PS-376 **Chloroxuron**
PS-376JS *100ug/ml in Toluene*
PS-376AJS *100ug/ml in Acetonitrile*

JS = 1ml RPS = 5x1ml

PS-377 **Neburon**
F2375JS *1000ug/ml in Acetonitrile*
F2375RPS *1000ug/ml in Acetonitrile*
PS-377JS *100ug/ml in Toluene*

PS-379 **Terbutryne**
F2207JS *100ug/ml in MTBE*
F2207RPS *100ug/ml in MTBE*
PS-379AJS *100ug/ml in Acetonitrile*

PS-380 **Atrazine**
F2208JS *100ug/ml in MTBE*
F2208RPS *100ug/ml in MTBE*
PS-380AJS *100ug/ml in Acetonitrile*

PS-381 **Simetryn**
F2234JS *100ug/ml in MTBE*
F2234RPS *100ug/ml in MTBE*
PS-381AJS *100ug/ml in Acetonitrile*

PS-382 **Aminotriazole**
PS-382JS *100ug/ml in Acetone*
PS-382AJS *100ug/ml in Acetonitrile*

PS-383 **Ametryne**
F2209JS *100ug/ml in MTBE*
F2209RPS *100ug/ml in MTBE*
PS-383AJS *100ug/ml in Acetonitrile*

PS-384 **Prometryne**
F2235JS *100ug/ml in MTBE*
F2235RPS *100ug/ml in MTBE*
PS-384AJS *100ug/ml in Acetonitrile*

PS-385 **Propazine**
F2236JS *100ug/ml in MTBE*
F2236RPS *100ug/ml in MTBE*
PS-385AJS *100ug/ml in Acetonitrile*

PS-386 **Prometon**
F2210JS *100ug/ml in MTBE*
F2210RPS *100ug/ml in MTBE*
PS-386 AJS *100ug/ml in Acetonitrile*

PS-387 **Bladex**
F2487JS *1000ug/ml in MTBE*
F2487RPS *1000ug/ml in MTBE*
PS-387 AJS *100ug/ml in Acetonitrile*

PS-388 **Anilazine**
F2089JS *100ug/ml in Toluene*
F2089RPS *100ug/ml in Toluene*
PS-388AJS *100ug/ml in Acetonitrile*

PS-389 **Benfluralin**
F2364JS *1000ug/ml in Hexane*
F2364RPS *1000ug/ml in Hexane*
PS-389AJS *100ug/ml in Acetonitrile*

PS-390 **N-[(2.4-Dichlorophenoxy) acetyl]-DL-methionine**
PS-390JS *100ug/ml in MTBE*
PS-390AJS *100ug/ml in Acetonitrile*

PS-391 **Daminozide**
PS-391JS *100ug/ml in MTBE*
PS-391AJS *100ug/ml in Acetonitrile*

PS-392 **2.6-Dichlorobenzonitrile**
PS-392JS *100ug/ml in Methanol*

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JS = 1ml RPS = 5x1ml

PS-393 **Trifluralin**
F2140JS *100ug/ml in Toluene*
F2140RPS *100ug/ml in Toluene*
PS-393AJS *100ug/ml in Acetonitrile*

PS-394 **Nitrofen**
F2126JS *100ug/ml in Methanol*
F2126RPS *100ug/ml in Methanol*

PS-395 **Atraton**
F2211JS *100ug/ml in MTBE*
F2211RPS *100ug/ml in MTBE*
PS-395AJS *100ug/ml in Acetonitrile*

PS-397 **3.5-Diiodo-4-hydroxy benzonitrile**
PS-397JS *100ug/ml in Methanol*

PS-398 **Metribuzin**
F2237JS *100ug/ml in MTBE*
F2237RPS *100ug/ml in MTBE*
PS-398AJS *100ug/ml in Acetonitrile*

PS-399 **Profluoralin** ®
F2367JS *1000ug/ml in Hexane*
F2367RPS *1000ug/ml in Hexane*
PS-399AJS *100ug/ml in Acetonitrile*

PS-400 **Formetanate hydrochloride**
PS-400JS *100ug/ml in Toluene*
PS-400AJS *100ug/ml in Acetonitrile*

PS-401 **Prowl** ®
F2438JS *1000ug/ml in Isooctane*
F2438RPS *1000ug/ml in Isooctane*
PS-401AJS *100ug/ml in Acetonitrile*

PS-402 **Procyazine**
PS-402JS *100ug/ml in MTBE*
PS-402AJS *100ug/ml in Acetonitrile*

PS-403 **Metolachlor**
F2241JS *100ug/ml in MTBE*
F2241RPS *100ug/ml in MTBE*
PS-403AJS *100ug/ml in Acetonitrile*

PS-403-1 **S-Metolachlor**
PS-403-1JS *100ug/ml in MTBE*
PS-403-1AJS *100ug/ml in Acetonitrile*

PS-404 **Difenzoquat methylsulfate**
PS-404JS *100ug/ml in Toluene*
PS-404AJS *100ug/ml in H_2O*

PS-406 **Isopropalin**
F2366JS *1000ug/ml in Hexane*
F2366RPS *1000ug/ml in Hexane*
PS-406AJS *100ug/ml in Acetonitrile*

PS-407 **Tebuthiuron**
F2243JS *100ug/ml in MTBE*
F2243RPS *100ug/ml in MTBE*
PS-407AJS *100ug/ml in Acetonitrile*

PS-408 **Ethalfluralin**
F2365JS *1000ug/ml in Hexane*
F2365RPS *1000ug/ml in Hexane*
PS-408AJS *100ug/ml in Acetonitrile*

JS = 1ml RPS = 5x1ml

PS-409 **Piperalin**
PS-409JS *100ug/ml in Toluene*
PS-409AJS *100ug/ml in Acetonitrile*

PS-410 **Oryzalin**
F2386JS *1000ug/ml in Acetonitrile*
F2386RPS *1000ug/ml in Acetonitrile*
PS-408JS *100ug/ml in Toluene*

PS-411 **Dipropetryn**
PS-411JS *100ug/ml in MTBE*
PS-411AJS *100ug/ml in Acetonitrile*

PS-412 **Ethanedial dioxime**
PS-412JS *100ug/ml in Methanol*

PS-413 **Terbuthylazine**
F2291JS *1000ug/ml in MTBE*
F2291RPS *1000ug/ml in MTBE*
PS-413AJS *100ug/ml in Acetonitrile*

PS-414 **Fosamine Ammonium**
PS-414JS *100ug/ml in Toluene*
PS-414AJS *100ug/ml in H_2O*

PS-415 **Lenacil**
PS-415JS *100ug/ml in Methanol*

PS-416 **Velpar**
F2232JS *100ug/ml in MTBE*
F2232RPS *100ug/ml in MTBE*
PS-416AJS *100ug/ml in Acetonitrile*

PS-417 **Triclopyr**
PS-417JS *100ug/ml in MTBE*
PS-417AJS *100ug/ml in Acetonitrile*

PS-418 **Chlorpyrifos Methyl**
F2296JS *1000ug/ml in Hexane*
F2296RPS *1000ug/ml in Hexane*
PS-418AJS *100ug/ml in Acetonitrile*

PS-419 **Nitrapyrin**
PS-419JS *100ug/ml in Toluene*
PS-419AJS *100ug/ml in Acetonitrile*

PS-420 **o-Phenylphenol**
F2225JS *2000ug/ml in Methanol*
F2225RPS *2000ug/ml in Methanol*
PS-406AJS *100ug/ml in Acetonitrile*

PS-425 **Bensulide**
F2383JS *1000ug/ml in Methanol*
F2383RPS *1000ug/ml in Methanol*
PS-425AJS *100ug/ml in Acetonitrile*

PS-426 **Bromoxynil**
F2093JS *100ug/ml in Methanol*
F2093RPS *100ug/ml in Methanol*

PS-427 **Diphenylamine**
F992JS *100ug/ml in Methanol*
F992RPS *100ug/ml in Methanol*

PS-428 **Sodium arsenate**
PS-428JS *100ug/ml in Toluene*
PS-428AJS *100ug/ml in H_2O*

JS = 1ml RPS = 5x1ml

PS-429 **Monosodium acid methane arsonate sesquihydrate**
PS-429JS *100ug/ml in Toluene*
PS-429AJS *100ug/ml in H_2O*

PS-430 **Pyrazon**
PS-430JS *100ug/ml in Methanol*

PS-431 **Fluorodifen**
PS-431JS *100ug/ml in Methanol*

PS-432 **Ethoxyquin**
PS-432JS *100ug/ml in Toluene*
PS-432AJS *100ug/ml in Acetonitrile*

PS-433 **4.6-Dinitro-2-sec-butylphenol ethanolamine salt**
PS-433JS *100ug/ml in Toluene*
PS-433AJS *100ug/ml in H_2O*

PS-434 **Bromoxynil octanoic acid ester**
F2439JS *1000ug/ml in Isooctane*
F2439RPS *1000ug/ml in Isooctane*
PS-434AJS *100ug/ml in Acetonitrile*

PS-436 **2-sec-Butyl-4,6-dinitrophenol triethanolamine salt**
PS-436JS *100ug/ml in Toluene*
PS-436AJS *100ug/ml in H_2O*

PS-437 **2.4.5-Trichlorophenol ethanolamine salt**
PS-437JS *100ug/ml in Toluene*
PS-437AJS *100ug/ml in H_2O*

PS-450 **BDMC**
F2054JS *100ug/ml in Methanol*
F2054RPS *100ug/ml in Methanol*

PS-501 **Molinate**
F2242JS *100ug/ml in MTBE*
F2242RPS *100ug/ml in MTBE*
PS-501AJS *100ug/ml in Acetonitrile*

PS-502 **Cycloate**
F2227JS *100ug/ml in MTBE*
F2227RPS *100ug/ml in MTBE*
PS-502AJS *100ug/ml in Acetonitrile*

PS-503 **Butylate**
F2212JS *100ug/ml in MTBE*
F2212RPS *100ug/ml in MTBE*
PS-503AJS *100ug/ml in Acetonitrile*

PS-504 **Vernolate**
F2213JS *100ug/ml in MTBE*
F2213RPS *100ug/ml in MTBE*
PS-504AJS *100ug/ml in Acetonitrile*

PS-506 **Tri-allate**
PS-506JS *100ug/ml in Isooctane*
PS-506AJS *100ug/ml in Acetonitrile*

PS-507 **Di-allate**
F988JS *100ug/ml in Methanol*
F988RPS *100ug/ml in Methanol*

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Chem Service Pesticide Standards - Solution Listing

JS = 1ml RPS = 5x1ml

PS-540 **Barban**
F2091JS *100ug/ml in Methanol*
F2091RPS *100ug/ml in Methanol*

PS-541 **2.3.5-Trimethylphenyl methyl carbamate**
PS-541JS *100ug/ml in Toluene*
PS-541AJS *100ug/ml in Acetonitrile*

PS-542 **3,4,5-Trimethylphenyl methyl carbamate**

PS-543 **Methiocarb**
F2042JS *100ug/ml in Methanol*
F2042RPS *100ug/ml in Methanol*

PS-550 **Terbutol**
PS-550JS *100ug/ml in Toluene*
PS-550AJS *100ug/ml in Acetonitrile*

PS-551 **Baygon ®**
F2045JS *100ug/ml in Acetonitrile*
F2045RPS *100ug/ml in Acetonitrile*
PS-551JS *100ug/ml in Toluene*

PS-553 **Devrinol ®**
F2238JS *100ug/ml in MTBE*
F2238RPS *100ug/ml in MTBE*
PS-553AJS *100ug/ml in Acetonitrile*

PS-561 **2.3.5-Triiodobenzoic acid**
PS-561JS *100ug/ml in MTBE*
PS-561AJS *100ug/ml in Acetonitrile*

PS-562 **S.S.S-Tributylphosphoro trithioate**
F2214JS *100ug/ml in MTBE*
F2214RPS *100ug/ml in MTBE*
PS-562AJS *100ug/ml in Acetonitrile*

PS-601 **Tetraethylpyrophosphate**

PS-602 **Dicrotophos**
F2104JS *100ug/ml in Methanol*
F2104RPS *100ug/ml in Methanol*

PS-603 **Crotoxyphos**
F2101JS *100ug/ml in Methanol*
F2101RPS *100ug/ml in Methanol*

PS-605 **Naled**
F2067JS *100ug/ml in Toluene*
F2067RPS *100ug/ml in Toluene*
PS-605JS *100ug/ml in Acetonitrile*

PS-606 **Phosphamidon**
F2130JS *100ug/ml in Toluene*
F2130RPS *100ug/ml in Toluene*
PS-606JS *100ug/ml in Acetonitrile*

PS-607 **Ruelene ®**
PS-607JS *100ug/ml in Toluene*
PS-607AJS *100ug/ml in Acetonitrile*

PS-608 **Dylox ®**
F2215JS *100ug/ml in Acetonitrile*
F2215RPS *100ug/ml in Acetonitrile*
PS-608JS *100ug/ml in Toluene*

JS = 1ml RPS = 5x1ml

PS-609 **Monocrotophos**
F2122JS *100ug/ml in Toluene*
F2122RPS *100ug/ml in Toluene*
PS-609AJS *100ug/ml in Acetonitrile*

PS-610 **Paraoxon**
PS-610JS *100ug/ml in Toluene*
PS-610AJS *100ug/ml in Acetonitrile*

PS-611 **Tetrachlorvinphos**
F2069JS *100ug/ml in Methylene chloride*
F2069RPS *100ug/ml in Methylene chloride*
PS-611AJS *100ug/ml in Acetonitrile*

PS-612 **Phenamiphos**
F2246JS *100ug/ml in MTBE*
F2246RPS *100ug/ml in MTBE*
PS-612AJS *100ug/ml in Acetonitrile*

PS-613 **Dimethyl-p-nitrophenyl phosphate**
F2245JS *100ug/ml in MTBE*
F2245RPS *100ug/ml in MTBE*
PS-613AJS *100ug/ml in Acetonitrile*

PS-641 **Oxydemeton-methyl**
PS-641JS *100ug/ml in Toluene*
PS-641AJS *100ug/ml in Acetonitrile*

PS-642 **Dioxydemeton-S-methyl**
PS-642JS *100ug/ml in Toluene*
PS-642AJS *100ug/ml in Acetonitrile*

PS-643 **Pirimiphos-ethyl**
PS-643JS *100ug/ml in Toluene*
PS-643AJS *100ug/ml in Acetonitrile*

PS-644 **Pirimiphos-methyl**
PS-644JS *100ug/ml in Toluene*
PS-644AJS *100ug/ml in Acetonitrile*

PS-652 **Disulfoton**
F993JS *100ug/ml in Methanol*
F993RPS *100ug/ml in Methanol*

PS-653 **Imidan ®**
F2129JS *100ug/ml in Hexane*
F2129RPS *100ug/ml in Hexane*
PS-653JS *100ug/ml in Acetonitrile*

PS-654 **Phorate**
F1080JS *100ug/ml in Hexane*
F1080RPS *100ug/ml in Hexane*
PS-654JS *100ug/ml in Acetonitrile*

PS-655 **Fenthion**
F2064JS *100ug/ml in Propanol*
F2064RPS *100ug/ml in Propanol*

PS-656 **Coumaphos**
F2058JS *100ug/ml in Toluene*
F2058RPS *100ug/ml in Toluene*
PS-656AJS *100ug/ml in Acetonitrile*

PS-657 **Fenchlorphos**
F2068JS *100ug/ml in Toluene*
F2068RPS *100ug/ml in Toluene*
PS-657AJS *100ug/ml in Acetonitrile*

JS = 1ml RPS = 5x1ml

PS-658 **Dioxathion**
F2110JS *100ug/ml in Methanol*
F2110RPS *100ug/ml in Methanol*

PS-659 **Dimethoate**
F989JS *100ug/ml in Methanol*
F989RPS *100ug/ml in Methanol*

PS-661 **Demeton O**
PS-661JS *100ug/ml in Toluene*
PS-661AJS *100ug/ml in Acetonitrile*

PS-661/662 **Demeton O&S**
PS-661/662JS *100ug/ml in Toluene*
PS-661/662AJS *100ug/ml in Acetonitrile*

PS-662 **Demeton S**
F2059JS *100ug/ml in Toluene*
F2059RPS *100ug/ml in Toluene*
PS-662AJS *100ug/ml in Acetonitrile*

PS-663 **Aspon ®**
F2420JS *1000ug/ml in Hexane*
F2420RPS *1000ug/ml in Hexane*
PS-663JS *100ug/ml in Acetonitrile*

PS-664 **Dyfonate ®**
F2424JS *1000ug/ml in Hexane*
F2424RPS *1000ug/ml in Hexane*
PS-664JS *100ug/ml in Acetonitrile*

PS-665 **Abate ®**
PS-665JS *100ug/ml in Toluene*
PS-665AJS *100ug/ml in Acetonitrile*

PS-666 **Guthion ®**
F2055JS *100ug/ml in Toluene*
F2055RPS *100ug/ml in Toluene*
PS-666AJS *100ug/ml in Acetonitrile*

PS-667 **Fensulfothion**
F2063JS *100ug/ml in Methanol*
F2063RPS *100ug/ml in Methanol*

PS-668 **Zinophos ®**
F2152JS *100ug/ml in Hexane*
F2152RPS *100ug/ml in Hexane*
PS-668JS *100ug/ml in Acetonitrile*

PS-669 **Dicapthon**
PS-669JS *100ug/ml in Toluene*
PS-669AJS *100ug/ml in Acetonitrile*

PS-670 **O.O-Diethyl phosphoro chloridothioate**
PS-670JS *100ug/ml in Toluene*
PS-670AJS *100ug/ml in Acetonitrile*

PS-671 **Famphur**
F994JS *100ug/ml in Methanol*
F994RPS *100ug/ml in Methanol*

PS-672 **Prophos**
F2062JS *100ug/ml in Toluene*
F2062RPS *100ug/ml in Toluene*
PS-672AJS *100ug/ml in Acetonitrile*

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JS = 1ml RPS = 5x1ml

PS-673 **Guthion Ethyl**
F2421JS 1000ug/ml in Hexane
F2421RPS 1000ug/ml in Hexane
PS-673AJS 100ug/ml in Acetonitrile

PS-674 **Chlorpyrifos**
F2057JS 100ug/ml in Isooctane
F2057RPS 100ug/ml in Isooctane
PS-674AJS 100ug/ml in Acetonitrile

PS-675 **Akton ®**
PS-675JS 100ug/ml in Toluene
PS-675AJS 100ug/ml in Acetonitrile

PS-676 **Methamidophos**
PS-676JS 100ug/ml in Toluene
PS-676AJS 100ug/ml in Acetonitrile

PS-676-1 **N-Methyl-methamidophos**
PS-676-1JS 100ug/ml in Toluene
PS-676-1AJS 100ug/ml in Acetonitrile

PS-677 **Leptophos**
PS-677JS 100ug/ml in Toluene
PS-677AJS 100ug/ml in Acetonitrile

PS-678 **Fenitrothion**
F2423JS 1000ug/ml in Hexane
F2423RPS 1000ug/ml in Hexane
PS-678AJS 100ug/ml in Acetonitrile

PS-679 **Methidathion**
PS-679JS 100ug/ml in Toluene
PS-679AJS 100ug/ml in Acetonitrile

PS-680 **Terbufos**
F2137JS 100ug/ml in Methanol
F2137RPS 100ug/ml in Methanol

PS-681 **Isazophos**
PS-681JS 100ug/ml in Toluene
PS-681AJS 100ug/ml in Acetonitrile

PS-682 **Phosalone**
F2128JS 100ug/ml in Methanol
F2128RPS 100ug/ml in Methanol

PS-690 **Hexachlorobenzene**
F9JS 100ug/ml in Methanol
F9RPS 100ug/ml in Methanol
F9AJS 1000ug/ml in Isooctane
F9ARPS 1000ug/ml in Isooctane

PS-691 **BHC beta isomer**
F103JS 100ug/ml in Toluene
F103RPS 100ug/ml in Toluene

PS-692 **BHC alpha isomer**
F102JS 100ug/ml in Toluene
F102RPS 100ug/ml in Toluene

PS-693 **BHC delta isomer**
F105JS 100ug/ml in Toluene
F105RPS 100ug/ml in Toluene

PS-694 **o.p'-DDD**
F2305JS 100ug/ml in Methanol
F2305RPS 100ug/ml in Methanol

JS = 1ml RPS = 5x1ml

PS-695 **o.p'-DDE**
F2306JS 100ug/ml in Methanol
F2306RPS 100ug/ml in Methanol

PS-696 **p.p'-DDE**
F93JS 100ug/ml in Methanol
F93RPS 100ug/ml in Methanol

PS-698 **o.p'-DDT**
F2307JS 100ug/ml in Methanol
F2307RPS 100ug/ml in Methanol

PS-699 **p.p'-DDT**
F92JS 100ug/ml in Hexane
F92RPS 100ug/ml in Hexane
PS-699JS 100ug/ml in Methanol

PS-700 **Heptachlor epoxide (Isomer B)**
F101JS 100ug/ml in Methanol
F101RPS 100ug/ml in Methanol

PS-700-1 **trans-Heptachlor epoxide**
PS-700-1JS 100ug/ml in Methanol

PS-701 **Kepone ®**
F2441JS 1000ug/ml in MTBE
F2441RPS 1000ug/ml in MTBE
F2441AJS 100ug/ml in Hexane
F2441ARPS 100ug/ml in Hexane
PS-701AJS 100ug/ml in Acetonitrile

PS-702 **Mirex**
F2121JS 1000ug/ml in Methanol
F2121RPS 1000ug/ml in Methanol

PS-704 **Isobenzan**
PS-704JS 100ug/ml in Methanol

PS-730 **2-[2-Butoxyethoxy]ethyl thiocyanate**
F2390JS 1000ug/ml in Hexane
F2390RPS 1000ug/ml in Hexane
PS-730AJS 100ug/ml in Acetonitrile

PS-731 **Isobornyl thiocyanoacetate**
PS-731JS 100ug/ml in Toluene
PS-731AJS 100ug/ml in Acetonitrile

PS-733 **Phenothiazine**
PS-733JS 100ug/ml in Toluene
PS-733AJS 100ug/ml in Acetonitrile

PS-734 **Aldicarb**
F2002JS 100ug/ml in Methanol
F2002RPS 100ug/ml in Methanol

PS-737 **Oxamyl**
F2044JS 100ug/ml in Acetonitrile
F2044AJS 100ug/ml in Acetonitrile
PS-737JS 100ug/ml in Toluene

PS-738 **Acephate**
F2440JS 1000ug/ml in Acetone
F2440RPS 1000ug/ml in Acetone
PS-738AJS 100ug/ml in Acetonitrile

JS = 1ml RPS = 5x1ml

PS-739 **Bendiocarb**
F2387JS 1000ug/ml in Acetonitrile
F2387RPS 1000ug/ml in Acetonitrile
PS-739JS 100ug/ml in Toluene

PS-751 **Aminocarb**
F2370JS 1000ug/ml in Acetonitrile
F2370RPS 1000ug/ml in Acetonitrile
PS-751JS 100ug/ml in Toluene

PS-754 **Carbofuran**
F2006JS 100ug/ml in Methanol
F2006RPS 100ug/ml in Methanol

PS-756 **Zectran**
F2559JS 1000ug/ml in Acetonitrile
F2559RPS 1000ug/ml in Acetonitrile
PS-756JS 100ug/ml in Toluene

PS-757 **Pirimicarb**
PS-757JS 100ug/ml in Toluene
PS-757AJS 100ug/ml in Acetonitrile

PS-758 **Permethrin**
F2216JS 100ug/ml in MTBE
F22216RPS 100ug/ml in MTBE
PS-758AJS 100ug/ml in Acetonitrile

PS-758-1 **cis-Permethrin**
PS-758-1JS 100ug/ml in MTBE
PS-758-1AJS 100ug/ml in Acetonitrile

PS-758-2 **trans-Permethrin (Isomeric Mix)**
PS-758-2JS 100ug/ml in MTBE
PS-758-2AJS 100ug/ml in Acetonitrile

PS-775 **Methomyl**
F2043JS 100ug/ml in Acetonitrile
F2043RPS 100ug/ml in Acetonitrile
PS-775JS 100ug/ml in Toluene

PS-790 **S-Bioallethrin**
PS-790JS 100ug/ml in MTBE
PS-790AJS 100ug/ml in Acetonitrile

PS-791 **Bioallethrin**
PS-791JS 100ug/ml in MTBE
PS-791AJS 100ug/ml in Acetonitrile

PS-801 **Phenyl-2-thiourea**
PS-801JS 100ug/ml in Toluene
PS-801AJS 100ug/ml in Acetonitrile

PS-803 **Zinc phosphate**
PS-803JS 100ug/ml in Toluene
PS-803AJS 100ug/ml in H_2O

PS-804 **Thallium sulfate**
PS-803JS 100ug/ml in Toluene
PS-803AJS 100ug/ml in H_2O

PS-840 **Chlordimeform**
PS-840JS 100ug/ml in Toluene
PS-840AJS 100ug/ml in Acetonitrile

PS-842 **Phosfolan**
PS-842JS 100ug/ml in Toluene
PS-842AJS 100ug/ml in Acetonitrile

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JS = 1ml RPS = 5x1ml

PS-850 **Aramite (0.1mg/ml in Hexane)**

PS-851 **Azobenzene**
F2007JS *100ug/ml in Methanol*
F2007RPS *100ug/ml in Methanol*

PS-853 **Chlorbenside**
PS-853JS *100ug/ml in Toluene*
PS-853AJS *100ug/ml in Acetonitrile*

PS-854 **Chlorobenzilate**
F986JS *100ug/ml in Hexane*
F986RPS *100ug/ml in Hexane*
PS-854AJS *100ug/ml in Acetonitrile*

PS-855 **Ovex**
PS-855JS *100ug/ml in Hexane*
PS-855AJS *100ug/ml in Acetonitrile*

PS-856 **2.4-Dichlorophenyl benzenesulfonate**
PS-856JS *100ug/ml in Toluene*
PS-856AJS *100ug/ml in Acetonitrile*

PS-857 **Isopropyl-4.4'-dichlorobenzilate**
F2289JS *1000ug/ml in Isooctane*
F2289RPS *1000ug/ml in Isooctane*
PS-857AJS *100ug/ml in Acetonitrile*

PS-858 **Omite ®**
PS-858JS *100ug/ml in Toluene*
PS-858AJS *100ug/ml in Acetonitrile*

PS-860 **Quinomethionate**
PS-860JS *100ug/ml in Toluene*
PS-860AJS *100ug/ml in Acetonitrile*

PS-862 **Pentac ®**
PS-860JS *100ug/ml in Methanol*

PS-900 **Di-n-butylphthalate**
F68JS *100ug/ml in Hexane*
F68RPS *100ug/ml in Hexane*
PS-900AJS *100ug/ml in Acetonitrile*

PS-901 **Dimethylphthalate**
F71JS *100ug/ml in Methanol*
F71RPS *100ug/ml in Methanol*
F71AJS *100ug/ml in Ethyl acetate*
F71ARPS *100ug/ml in Ethyl acetate*

PS-902 **N.N-Diethyl-m-toluamide**
F2284JS *2000ug/ml in Acetone*
F2284RPS *2000ug/ml in Acetone*
PS-902AJS *100ug/ml in Acetonitrile*

PS-903 **Dibutyl succinate**
PS-903JS *100ug/ml in Toluene*
PS-903AJS *100ug/ml in Acetonitrile*

PS-904 **Benzyl benzoate**
F1093JS *2000ug/ml in Hexane*
F1093RPS *2000ug/ml in Hexane*
F1093AJS *5000ug/ml in Hexane*
F1093ARPS *5000ug/ml in Hexane*
PS-904AJS *100ug/ml in Acetonitrile*

JS = 1ml RPS = 5x1ml

PS-905 **2-Pivaloyl-1.3-indandione**
PS-905JS *100ug/ml in Toluene*
PS-905AJS *100ug/ml in Acetonitrile*

PS-906 **Di-n-propyl isocinchomeronate**
F2381JS *1000ug/ml in Methanol*
F2381RPS *1000ug/ml in Methanol*

PS-907 **Butylmesityl oxide oxalate**
PS-907JS *100ug/ml in Toluene*
PS-907AJS *100ug/ml in Acetonitrile*

PS-908 **Butoxypolypropylene glycol**
PS-908JS *100ug/ml in Methanol*

PS-910 **MGK R-11 ®**
PS-910JS *100ug/ml in Toluene*
PS-910AJS *100ug/ml in Acetonitrile*

PS-911 **2-Isovaleryl-1.3-indanedione**
PS-911JS *100ug/ml in Toluene*
PS-911AJS *100ug/ml in Acetonitrile*

PS-926 **9.10-Anthraquinone**
PS-926JS *100ug/ml in Methanol*

PS-940 **4-Allyl-2-methoxyphenol**
PS-940JS *100ug/ml in Methanol*

PS-951 **2-Undecanone**
PS-951JS *100ug/ml in 90% Methanol:10% H_2O*

PS-952 **2-Hydroxyethyl-n-octyl sulphide**
PS-952JS *100ug/ml in Methanol*

PS-960 **Piprotal**
PS-960JS *100ug/ml in Methanol*

PS-962 **MGK 264 ®**
F2239JS *100ug/ml in MTBE*
F2239RPS *100ug/ml in MTBE*
PS-962AJS *100ug/ml in Acetonitrile*

PS-976 **Sulfoxide**
F2132JS *100ug/ml in Methanol*
F2132RPS *100ug/ml in Methanol*

PS-1000 **Resmethrin**
F2293JS *100ug/ml in MTBE*
F2293RPS *100ug/ml in MTBE*
PS-1000AJS *100ug/ml in Acetonitrile*

PS-1001 **Amdro**
PS-1001JS *100ug/ml in Hexane*
PS-1001AJS *100ug/ml in Acetonitrile*

PS-1002 **Cycloheximide**
PS-1002JS *100ug/ml in Toluene*
PS-1002AJS *100ug/ml in Acetonitrile*

PS-1003 **Isofenphos**
PS-1003JS *100ug/ml in Toluene*
PS-1003AJS *100ug/ml in Acetonitrile*

PS-1004 **Butralin**
PS-1004JS *100ug/ml in Isooctane*
PS-1004AJS *100ug/ml in Acetonitrile*

JS = 1ml RPS = 5x1ml

PS-1005 **Amitraz**
PS-1005JS *100ug/ml in Toluene*
PS-1005AJS *100ug/ml in Acetonitrile*

PS-1006 **Diethatyl ethyl**
PS-1006JS *100ug/ml in Methanol*

PS-1008 **Ancymidol**
PS-1008JS *100ug/ml in Methanol*

PS-1009 **Asulam**
F2217JS *100ug/ml in Methanol*
F2217RPS *100ug/ml in Methanol*

PS-1010 **4-Ap**
PS-1010JS *100ug/ml in Methanol*

PS-1011 **Bentazon**
F2038JS *100ug/ml in Acetone*
F2038RPS *100ug/ml in Acetone*
F2038AJS *1000ug/ml in Acetonitrile*
F2038ARPS *1000ug/ml in Acetonitrile*

PS-1012 **Fluchloralin**
F2391JS *1000ug/ml in Hexane*
F2391RPS *1000ug/ml in Hexane*
PS-1012AJS *100ug/ml in Acetonitrile*

PS-1013 **Triadimefon**
F2218JS *100ug/ml in MTBE*
F2218RPS *100ug/ml in MTBE*
PS-1013AJS *100ug/ml in Acetonitrile*

PS-1014 **Phenmedipham**
PS-1014JS *100ug/ml in Toluene*
PS-1014AJS *100ug/ml in Acetonitrile*

PS-1015 **Desmedipham**
PS-1015JS *100ug/ml in Methanol*

PS-1016 **Acifluorfen**
F2037JS *100ug/ml in Acetone*
F2037RPS *100ug/ml in Acetone*
PS-1016AJS *100ug/ml in Acetonitrile*

PS-1017 **Benthiocarb**
PS-1017JS *100ug/ml in Methanol*

PS-1018 **Sulprofos**
F2056JS *100ug/ml in Hexane*
F2056RPS *100ug/ml in Hexane*
PS-1018AJS *100ug/ml in Acetonitrile*

PS-1020 **Chlorothalonil**
F2220JS *100ug/ml in MTBE*
F2220RPS *100ug/ml in MTBE*
PS-1020AJS *100ug/ml in Acetonitrile*

PS-1021 **Phentinoacetate**
PS-1021JS *100ug/ml in Toluene*
PS-1021AJS *100ug/ml in Acetonitrile*

PS-1022 **Chlorflurecol-methyl ester**
PS-1022JS *100ug/ml in Methanol*

PS-1024 **Profenofos**
PS-1024JS *100ug/ml in Hexane*
PS-1024AJS *100ug/ml in Acetonitrile*

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Chem Service Pesticide Standards - Solution Listing

JS = 1ml RPS = 5x1ml

PS-1025 **Cythioate**
PS-1025JS 100ug/ml in Toluene
PS-1025AJS 100ug/ml in Acetonitrile

PS-1026 **Mephosfolan**
PS-1026JS 100ug/ml in Toluene
PS-1026AJS 100ug/ml in Acetonitrile

PS-1028 **Diflubenzuron**
PS-1028JS 100ug/ml in Toluene
PS-1028AJS 100ug/ml in Acetonitrile

PS-1030 **d-(cis-trans)-Phenothrin**
F2458JS 1000ug/ml in Acetonitrile
F2458RPS 1000ug/ml in Acetonitrile
PS-1030JS 100ug/ml in Toluene

PS-1031 **Fentin hydroxide**
PS-1031JS 100ug/ml in Toluene
PS-1031AJS 100ug/ml in Acetonitrile

PS-1032 **Sanmarton**
F2459JS 1000ug/ml in Acetonitrile
F2459RPS 1000ug/ml in Acetonitrile
PS-1032JS 100ug/ml in Toluene

PS-1033 **Oxyfluorfen**
PS-1033JS 100ug/ml in Methanol

PS-1035 **Hexachlorophene**
F995JS 100ug/ml in Methanol
F995RPS 100ug/ml in Methanol

PS-1036 **Diclofop methyl**
PS-1036JS 100ug/ml in MTBE
PS-1036AJS 100ug/ml in Acetonitrile

PS-1038 **Super-Rozol**
PS-1038JS 100ug/ml in Toluene
PS-1038AJS 100ug/ml in Acetonitrile

PS-1040 **Methoprene ®**
F2292JS 1000ug/ml in MTBE
F2292RPS 1000ug/ml in MTBE
PS-1040AJS 100ug/ml in Acetonitrile

PS-1042 **Tetramethrin**
F2457JS 1000ug/ml in Acetonitrile
F2457RPS 1000ug/ml in Acetonitrile
PS-1042JS 100ug/ml in Toluene

PS-1044 **Norflurazon ®**
F2240JS 100ug/ml in MTBE
F2240RPS 100ug/ml in MTBE
PS-1044AJS 100ug/ml in Acetonitrile

PS-1045 **Ethofumesate**
PS-1045JS 100ug/ml in Toluene
PS-1045AJS 100ug/ml in Acetonitrile

PS-1046 **Baycarb ®**
PS-1046JS 100ug/ml in Methanol

PS-1047 **Mepiquat chloride**
PS-1047JS 100ug/ml in Toluene
PS-1047AJS 100ug/ml in H_2O

PS-1048 **1,8-Naphthalic anhydride**
PS-1048JS 100ug/ml in Toluene
PS-1048AJS 100ug/ml in Acetonitrile

JS = 1ml RPS = 5x1ml

PS-1049 **Vinclozolin**
PS-1049JS 100ug/ml in Isooctane
PS-1049AJS 100ug/ml in Acetonitrile

PS-1050 **Oxadiazon**
PS-1050JS 100ug/ml in Toluene
PS-1050AJS 100ug/ml in Acetonitrile

PS-1051 **Glyphosate**
PS-1051JS 100ug/ml in Toluene
PS-1051AJS 100ug/ml in H_2O

PS-1052 **Iprodione**
PS-1052JS 100ug/ml in Toluene
PS-1052AJS 100ug/ml in Acetonitrile

PS-1054 **Aldicarb sulfoxide**
F2004JS 100ug/ml in Acetonitrile
F2004RPS 100ug/ml in Acetonitrile
PS-1054JS 100ug/ml in Toluene

PS-1055 **Aldoxycarb**
F2003JS 100ug/ml in Methanol
F2003RPS 100ug/ml in Methanol

PS-1056 **Brodifacoum**
PS-1056JS 100ug/ml in Toluene
PS-1056AJS 100ug/ml in Acetonitrile

PS-1057 **Thiabendazole ®**
F2389JS 1000ug/ml in Methanol
F2389RPS 1000ug/ml in Methanol

PS-1059 **Vacor**
PS-1059JS 100ug/ml in Toluene
PS-1059AJS 100ug/ml in Acetonitrile

PS-1060 **Fenbutatin-oxide**
PS-1060JS 100ug/ml in Toluene
PS-1060AJS 100ug/ml in Acetonitrile

PS-1062 **Acarol ®**
PS-1062JS 100ug/ml in Toluene
PS-1062AJS 100ug/ml in Acetonitrile

PS-1063 **Carbosulfan**
PS-1063JS 100ug/ml in Toluene
PS-1063AJS 100ug/ml in Acetonitrile

PS-1064 **Baytan ®**
PS-1064JS 100ug/ml in Toluene
PS-1064AJS 100ug/ml in Acetonitrile

PS-1065 **Chlorsulfuron**
PS-1065JS 100ug/ml in Toluene
PS-1065AJS 100ug/ml in Acetonitrile

PS-1067 **Cymoxanil**
PS-1067JS 100ug/ml in Toluene
PS-1067AJS 100ug/ml in Acetonitrile

PS-1068 **Cypermethrin**
PS-1068JS 100ug/ml in Toluene
PS-1068AJS 100ug/ml in Acetonitrile

PS-1069 **Lontrel ®**
PS-1069JS 100ug/ml in MTBE
PS-1069AJS 100ug/ml in Acetonitrile

JS = 1ml RPS = 5x1ml

PS-1070 **Sonar ®**
F2231JS 100ug/ml in MTBE
F2231RPS 100ug/ml in MTBE
PS-1070AJS 100ug/ml in Acetonitrile

PS-1071 **tau-Fluvalinate**
PS-1071JS 100ug/ml in Isooctane
PS-1071AJS 100ug/ml in Acetonitrile

PS-1072 **Flucythrinate**
PS-1072JS 100ug/ml in Toluene
PS-1072AJS 100ug/ml in Acetonitrile

PS-1073 **Fenarimol**
F2230JS 100ug/ml in MTBE
F2230RPS 100ug/ml in MTBE
PS-1073AJS 100ug/ml in Acetonitrile

PS-1074 **Sulfometuron methyl**
PS-1074JS 100ug/ml in Toluene
PS-1074AJS 100ug/ml in Acetonitrile

PS-1075 **Tilt ®**
PS-1075JS 100ug/ml in Cyclohexane
PS-1075AJS 100ug/ml in Acetonitrile

PS-1076 **Safrotin ®**
PS-1076JS 100ug/ml in Toluene
PS-1076AJS 100ug/ml in Acetonitrile

PS-1077 **Carbendazim**
F2369JS 100ug/ml in Methanol
F2369RPS 100ug/ml in Methanol

PS-1078 **Metsulfuron methyl**
PS-1078JS 100ug/ml in Toluene
PS-1078AJS 100ug/ml in Acetonitrile

PS-1079 **Hexythiazox**
PS-1079JS 100ug/ml in Toluene
PS-1079AJS 100ug/ml in Acetonitrile

PS-1080 **Quizalofop ethyl**
PS-1080JS 100ug/ml in Toluene
PS-1080AJS 100ug/ml in Acetonitrile

PS-1081 **Chlorimuron ethyl**
PS-1081JS 100ug/ml in Toluene
PS-1081AJS 100ug/ml in Acetonitrile

PS-1082 **Bensulfuron-methyl**
PS-1082JS 100ug/ml in Toluene
PS-1082AJS 100ug/ml in Acetonitrile

PS-1083 **Beam ®**
F2221JS 100ug/ml in MTBE
F2221RPS 100ug/ml in MTBE
PS-1083AJS 100ug/ml in Acetonitrile

PS-1084 **MCPB methyl ester**
PS-1084JS 100ug/ml in MTBE
PS-1084AJS 100ug/ml in Acetonitrile

PS-1085 **Banol**
PS-1085JS 100ug/ml in Toluene
PS-1085AJS 100ug/ml in Acetonitrile

PS-1086 **Dodemorph**
PS-1086JS 100ug/ml in Methanol

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JS = 1ml RPS = 5x1ml

PS-1087 **Chlorfenvinphos**
F2097JS *100ug/ml in Methanol*
F2097RPS *100ug/ml in Methanol*

PS-1088 **Fenoxaprop ethyl**
PS-1088JS *100ug/ml in Methanol*

PS-1090 **Baythroid ®**
F2460JS *1000ug/ml in Acetonitrile*
F2460RPS *1000ug/ml in Acetonitrile*
PS-1090JS *100ug/ml in Toluene*

PS-1091 **Folicur ®**
PS-1091JS *100ug/ml in Isooctane*
PS-1091AJS *100ug/ml in Acetonitrile*

PS-1092 **Tycor ®**
PS-1092JS *100ug/ml in Methanol*

PS-1093 **Baycor ®**
PS-1093JS *100ug/ml in Toluene*
PS-1093AJS *100ug/ml in Acetonitrile*

PS-1094 **Tokuthion ®**
F2070JS *1000ug/ml in Toluene*
F2070RPS *1000ug/ml in Toluene*
PS-1094JS *100ug/ml in Acetonitrile*

PS-1095 **Monceren ®**
PS-1095JS *100ug/ml in Toluene*
PS-1095AJS *100ug/ml in Acetonitrile*

PS-1096 **Metasystox I ®**
PS-1096JS *100ug/ml in Toluene*
PS-1096AJS *100ug/ml in Acetonitrile*

PS-1097 **Fluazifop-p-butyl**
PS-1097JS *100ug/ml in Toluene*
PS-1097AJS *100ug/ml in Acetonitrile*

PS-1098 **Swep**
F2378JS *1000ug/ml in Acetonitrile*
F2378RPS *1000ug/ml in Acetonitrile*
PS-1098JS *100ug/ml in Toluene*

PS-1099 **Metalaxyl**
PS-1099JS *100ug/ml in Toluene*
PS-1099AJS *100ug/ml in Acetonitrile*

PS-1100 **Dalapon methyl ester**
F957JS *100ug/ml in Methanol*
F957RPS *100ug/ml in Methanol*

PS-1101 **2,4-DB methyl ester**
F959JS *100ug/ml in Methanol*
F959RPS *100ug/ml in Methanol*

PS-1102 **Dicamba methyl ester**
F961JS *100ug/ml in Methanol*
F961RPS *100ug/ml in Methanol*

PS-1103 **Dichlorprop methyl ester**
F963JS *100ug/ml in Methanol*
F963RPS *100ug/ml in Methanol*

PS-1104 **Dinoseb methyl ether**
F965JS *100ug/ml in Methanol*
F965RPS *100ug/ml in Methanol*

JS = 1ml RPS = 5x1ml

PS-1105 **4-Chloro-o-tolyloxyacetic acid**
F967JS *100ug/ml in Methanol*
F967RPS *100ug/ml in Methanol*

PS-1106 **Mecoprop methyl ester**
F969JS *100ug/ml in Methanol*
F969RPS *100ug/ml in Methanol*

PS-1107 **3,5-Dichlorobenzoic acid**
F2034JS *2000ug/ml in MTBE*
F2034RPS *2000ug/ml in MTBE*
PS-1107AJS *100ug/ml in Acetonitrile*

PS-1108 **Picloram methyl ester**
F2155JS *100ug/ml in Methanol*
F2155RPS *100ug/ml in Methanol*

PS-1109 **Pentachloroanisole**
F2156JS *100ug/ml in Methanol*
F2156RPS *100ug/ml in Methanol*

PS-1110 **Triclopyr methyl ester**
PS-1110JS *100ug/ml in MTBE*
PS-1110AJS *100ug/ml in Acetonitrile*

PS-1111 **Acifluorfen methyl ester**
F2224JS *100ug/ml in Isooctane: Acetone (90:10)*
F2224RPS *100ug/ml in Isooctane: Acetone (90:10)*

PS-1112 **Bentazon methyl derivative**
F2244JS *100ug/ml in Isooctane: Acetone (90:10)*
F2244RPS *100ug/ml in Isooctane: Acetone (90:10)*

PS-1113 **Chloramben methyl ester**
F2226JS *100ug/ml in Isooctane: Acetone (90:10)*
F2226RPS *100ug/ml in Isooctane: Acetone (90:10)*

PS-1114 **3.5-Dichlorobenzoic acid methyl ester**
F2223JS *2000ug/ml in MTBE*
F2223RPS *2000ug/ml in MTBE*
PS-1114AJS *100ug/ml in Acetonitrile*

PS-2000 **Isoproturon**
PS-2000JS *100ug/ml in Toluene*
PS-2000AJS *100ug/ml in Acetonitrile*

PS-2001 **Command**
PS-2001JS *100ug/ml in Methanol*

PS-2002 **Fenpropathrin**
PS-2002JS *100ug/ml in MTBE*
PS-2002AJS *100ug/ml in Acetonitrile*

PS-2003 **Bifenthrin**
PS-2003JS *100ug/ml in MTBE*
PS-2003AJS *100ug/ml in Acetonitrile*

PS-2004 **Asana ®**
PS-2004JS *100ug/ml in MTBE*
PS-2004AJS *100ug/ml in Acetonitrile*

JS = 1ml RPS = 5x1ml

PS-2005 **Accent ®**
PS-2005JS *100ug/ml in Toluene*
PS-2005AJS *100ug/ml in Acetonitrile*

PS-2006 **Systhane ®**
PS-2006JS *100ug/ml in Toluene*
PS-2006AJS *100ug/ml in Acetonitrile*

PS-2007 **Trichloronate**
F2222JS *100ug/ml in Isopropanol*
F2222RPS *100ug/ml in Isopropanol*
PS-2007AJS *100ug/ml in Acetonitrile*

PS-2008 **Bromophos ethyl**
PS-2008JS *100ug/ml in Hexane*
PS-2008AJS *100ug/ml in Acetonitrile*

PS-2009 **Bromophos methyl**
PS-2009JS *100ug/ml in Hexane*
PS-2009AJS *100ug/ml in Acetonitrile*

PS-2010 **Quinalphos**
PS-2010JS *100ug/ml in Toluene*
PS-2010AJS *100ug/ml in Acetonitrile*

PS-2011 **Pinnacle ®**
PS-2011JS *100ug/ml in Toluene*
PS-2011AJS *100ug/ml in Acetonitrile*

PS-2012 **Thiodicarb**
PS-2012JS *100ug/ml in Toluene*
PS-2012AJS *100ug/ml in Acetonitrile*

PS-2013 **Sethoxydim**
PS-2013JS *100ug/ml in Toluene*
PS-2013AJS *100ug/ml in Acetonitrile*

PS-2014 **Triforine**
PS-2014JS *100ug/ml in Toluene*
PS-2014AJS *100ug/ml in Acetonitrile*

PS-2015 **Clofentezine**
PS-2015JS *100ug/ml in Methanol*

PS-2016 **Imazapyr ®**
PS-2016JS *100ug/ml in MTBE*
PS-2016AJS *100ug/ml in Acetonitrile*

PS-2017 **Omethoate**
PS-2017JS *100ug/ml in Toluene*
PS-2017AJS *100ug/ml in Acetonitrile*

PS-2018 **lambda-Cyhalothrin**
PS-2018JS *100ug/ml in Hexane*
PS-2018AJS *100ug/ml in Acetonitrile*

PS-2019 **Busan 40**
PS-2019JS *100ug/ml in Toluene*
PS-2019AJS *100ug/ml in H_2O*

PS-2020 **Busan 85**
PS-2020JS *100ug/ml in Toluene*
PS-2020AJS *100ug/ml in H_2O*

PS-2021 **TCMTB**
F2385JS *1000ug/ml in Methylene chloride*
F2385RPS *1000ug/ml in Methylene chloride*
PS-2021AJS *100ug/ml in Acetonitrile*

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JS = 1ml RPS = 5x1ml

PS-2022 **Dioxacarb**
F2359JS 1000ug/ml in Methanol
F2359RPS 1000ug/ml in Methanol

PS-2023 **Strobane ®**
F2318JS 1000ug/ml in Isooctane
F2318RPS 1000ug/ml in Isooctane
PS-2023AJS 100ug/ml in Acetonitrile

PS-2024 **Sulfotep**
F940JS 100ug/ml in Hexane
F940RPS 100ug/ml in Hexane
PS-2024AJS 100ug/ml in Acetonitrile

PS-2025 **Phenthoate**
PS-2025JS 100ug/ml in Toluene
PS-2025AJS 100ug/ml in Acetonitrile

PS-2026 **Fosetyl-Aluminum**
PS-2026JS 1000ug/ml in Methanol

PS-2027 **Promecarb**
F2358JS 1000ug/ml in Methanol
F2358RPS 1000ug/ml in Methanol

PS-2028 **Copper Naphthenates**
PS-2028JS 100ug/ml in Toluene
PS-2028AJS 100ug/ml in Acetonitrile

PS-2029 **2-Fluoroacetamide**
PS-2029JS 100ug/ml in Methanol

PS-2030 **Metaldehyde**
PS-2030JS 100ug/ml in Toluene
PS-2030AJS 100ug/ml in Acetonitrile

PS-2031 **Formaldehyde (in water)**
Not Available in Solution

PS-2032 **Biphenyl**
F940JS 100ug/ml in Hexane
F940RPS 100ug/ml in Hexane
F2359JS 1000ug/ml in Methanol
F2359RPS 1000ug/ml in Methanol

PS-2033 **Dicyclopentadiene**
PS-2033JS 100ug/ml in Isooctane
PS-2033AJS 100ug/ml in Acetonitrile

PS-2034 **Cyanophos**
PS-2034JS 100ug/ml in Toluene
PS-2034AJS 100ug/ml in Acetonitrile

PS-2035 **Dithianon**
PS-2035JS 1000ug/ml in Methanol

PS-2036 **Formothion**
PS-2036JS 100ug/ml in Hexane
PS-2036AJS 100ug/ml in Acetonitrile

PS-2037 **Flamprop isopropyl**
PS-2037JS 100ug/ml in MTBE
PS-2037AJS 100ug/ml in Acetonitrile

PS-2038 **Flamprop-methyl**
PS-2038JS 100ug/ml in MTBE
PS-2038AJS 100ug/ml in Acetonitrile

PS-2039 **Imazethapyr**
PS-2039JS 1000ug/ml in Methanol

JS = 1ml RPS = 5x1ml

PS-2040 **Acetochlor**
PS-2040JS 1000ug/ml in Methanol

PS-2041 **Flusilazole**
PS-2041JS 100ug/ml in Toluene
PS-2041AJS 100ug/ml in Acetonitrile

PS-2042 **Triasulfuron**
PS-2042JS 100ug/ml in Toluene
PS-2042AJS 100ug/ml in Acetonitrile

PS-2043 **Imazalil**
PS-2043JS 100ug/ml in Hexane
PS-2043AJS 100ug/ml in Acetonitrile

PS-2043-1 **Imazalil sulfate**
PS-2043-1JS 100ug/ml in Toluene
PS-2043-1AJS 100ug/ml in H_2O

PS-2044 **Thidiazuron**
PS-2044JS 100ug/ml in Toluene
PS-2044AJS 100ug/ml in Acetonitrile

PS-2045 **Clethodim**
PS-2045JS 100ug/ml in Toluene
PS-2045AJS 100ug/ml in Acetonitrile

PS-2046 **Pyraclofos**
PS-2046JS 100ug/ml in Toluene
PS-2046AJS 100ug/ml in Acetonitrile

PS-2047 **Dichlofluanid**
PS-2047JS 100ug/ml in Toluene
PS-2047AJS 100ug/ml in Acetonitrile

PS-2048 **Methabenzthiazuron**
PS-2048JS 100ug/ml in Toluene
PS-2048AJS 100ug/ml in Acetonitrile

PS-2049 **Pyrazophos**
PS-2049JS 100ug/ml in Toluene
PS-2049AJS 100ug/ml in Acetonitrile

PS-2050 **Mefluidide**
PS-2050JS 100ug/ml in Methanol

PS-2051 **Kinoprene**
PS-2051JS 100ug/ml in Methanol

PS-2052 **Dimethipin**
PS-2052JS 100ug/ml in Methanol

PS-2053 **Imazaquin**
PS-2053JS 100ug/ml in MTBE
PS-2053AJS 100ug/ml in Acetonitrile

PS-2054 **Dichlormid**
PS-2054JS 100ug/ml in Toluene
PS-2054AJS 100ug/ml in Acetonitrile

PS-2055 **Methyl anthranilate**
PS-2055JS 100ug/ml in Methanol

PS-2056 **Sulfaquinoxaline**
F2258JS 100ug/ml in Methanol
F2258RPS 100ug/ml in Methanol

PS-2057 **Flutolanil**
PS-2057JS 100ug/ml in Methanol

JS = 1ml RPS = 5x1ml

PS-2058 **Ethiofencarb**
PS-2058JS 100ug/ml in Toluene
PS-2058AJS 100ug/ml in Acetonitrile

PS-2059 **Fuberidazole**
PS-2059JS 100ug/ml in Methanol

PS-2060 **Tolylfluanid**
PS-2060JS 100ug/ml in Toluene
PS-2060AJS 100ug/ml in Acetonitrile

PS-2061 **Ethidimuron**
PS-2061JS 100ug/ml in Toluene
PS-2061AJS 100ug/ml in Acetonitrile

PS-2062 **Propineb**
PS-2062JS 100ug/ml in Toluene
PS-2062AJS 100ug/ml in Acetonitrile

PS-2063 **Azocyclotin**
PS-2063JS 100ug/ml in Methylene chloride
PS-2063AJS 100ug/ml in Acetonitrile

PS-2064 **Pyrazoxyfen**
PS-2064JS 100ug/ml in Methanol

PS-2065 **Iprobenfos**
PS-2065JS 100ug/ml in Toluene
PS-2065AJS 100ug/ml in Acetonitrile

PS-2066 **Edifenphos**
PS-2066JS 100ug/ml in Toluene
PS-2066AJS 100ug/ml in Acetonitrile

PS-2067 **Buprofezin**
PS-2067JS 100ug/ml in Toluene
PS-2067AJS 100ug/ml in Acetonitrile

PS-2068 **Abamectin**
PS-2068JS 100ug/ml in Toluene
PS-2068AJS 100ug/ml in Acetonitrile

PS-2069 **Cartap hydrochloride**
PS-2069JS 100ug/ml in Toluene
PS-2069AJS 100ug/ml in H_2O

PS-2070 **Isoprocarb**
PS-2070JS 100ug/ml in Toluene
PS-2070AJS 100ug/ml in Acetonitrile

PS-2071 **Deltamethrin**
PS-2071JS 100ug/ml in MTBE
PS-2071AJS 100ug/ml in Acetonitrile

PS-2072 **Fenbuconazole**
PS-2072JS 100ug/ml in Methanol

PS-2073 **Cyromazine**
PS-2073JS 100ug/ml in Acetone
PS-2073AJS 100ug/ml in Acetonitrile

PS-2074 **Hexaflumuron**
PS-2070JS 100ug/ml in Toluene
PS-2070AJS 100ug/ml in Acetonitrile

PS-2075 **Azadirachtin**
Not Available in Solution

PS-2076 **Uniconizole-P**
PS-2076JS 100ug/ml in Methanol

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JS = 1ml RPS = 5x1ml

PS-2077 **Lactofen**
PS-2077JS 100ug/ml in Toluene
PS-2077AJS 100ug/ml in Acetonitrile

PS-2078 **Chlorotoluron**
PS-2078JS 100ug/ml in Toluene
PS-2078AJS 100ug/ml in Acetonitrile

PS-2079 **Benzoylprop ethyl**
F2493JS 1000ug/ml in Acetonitrile
F2493RPS 1000ug/ml in Acetonitrile
PS-2079JS 100ug/ml in Toluene

PS-2080 **Bioresmethrin**
PS-2080JS 100ug/ml in MTBE
PS-2080AJS 100ug/ml in Acetonitrile

PS-2081 **Pyridate**
PS-2081JS 100ug/ml in MTBE
PS-2081AJS 100ug/ml in Acetonitrile

PS-2082 **Probenazole**
PS-2082JS 100ug/ml in Methanol

PS-2083 **alpha-Cypermethrin**
PS-2083JS 100ug/ml in Hexane
PS-2083AJS 100ug/ml in Acetonitrile

PS-2084 **Bitrex** ®
PS-2084JS 100ug/ml in Toluene
PS-2084AJS 100ug/ml in H_2O

PS-2085 **Chlorophacinone**
PS-2085JS 100ug/ml in Toluene
PS-2085AJS 100ug/ml in Acetonitrile

PS-2086 **Imidacloprid**
PS-2086JS 100ug/ml in Methanol

PS-2087 **Binapacryl**
PS-2087JS 100ug/ml in MTBE
PS-2087AJS 100ug/ml in Acetonitrile

PS-2089 **Agribrom**
PS-2089JS 100ug/ml in Toluene
PS-2089AJS 100ug/ml in Acetonitrile

PS-2090 **Chloroxynil**
PS-2090JS 100ug/ml in Methanol

PS-2091 **Copper-8-Quinolinolate**
Not Available in Solution

PS-2092 **Cycloprate**
F2520JS 1000ug/ml in MTBE
F2520RPS 1000ug/ml in MTBE
PS-2092JS 100ug/ml in Acetonitrile

PS-2093 **Coumatetralyl**
PS-2093JS 100ug/ml in Methanol

PS-2094 **Validamycin**
PS-2094JS 100ug/ml in Methanol

PS-2095 **Mancozeb**
Not Available in Solution

PS-2096 **Metolcarb**
PS-2096JS 100ug/ml in Toluene
PS-2096AJS 100ug/ml in Acetonitrile

JS = 1ml RPS = 5x1ml

PS-2097 **Paclobutrazol**
PS-2097JS 100ug/ml in Toluene
PS-2097AJS 100ug/ml in Acetonitrile

PS-2098 **Quinclorac**
PS-2098JS 100ug/ml in MTBE
PS-2098AJS 100ug/ml in Acetonitrile

PS-2099 **Tribenuron methyl**
PS-2099JS 100ug/ml in Toluene
PS-2099AJS 100ug/ml in Acetonitrile

PS-2100 **Phoxim**
PS-2100JS 100ug/ml in Toluene
PS-2100AJS 100ug/ml in Acetonitrile

PS-2101 **Isoprothiolane**
PS-2101JS 100ug/ml in MTBE
PS-2101AJS 100ug/ml in Acetonitrile

PS-2102 **Fomesafen**
PS-2102JS 100ug/ml in Methanol

PS-2103 **Isodrin**
F921JS 100ug/ml in Methanol
F921RPS 100ug/ml in Methanol

PS-2104 **Cyprazine**
PS-2104JS 100ug/ml in Acetone
PS-2104AJS 100ug/ml in Acetonitrile

PS-2105 **Pyrazosulfuron-ethyl**
PS-2105JS 100ug/ml in Toluene
PS-2105AJS 100ug/ml in Acetonitrile

PS-2106 **Bensultap**
PS-2106JS 100ug/ml in Methanol

PS-2107 **Trietazine**
PS-2104JS 100ug/ml in Methylene chloride
PS-2104AJS 100ug/ml in Acetonitrile

PS-2108 **Halosulfuron-methyl**
PS-2108JS 100ug/ml in Toluene
PS-2108AJS 100ug/ml in Acetonitrile

PS-2109 **Prallethrin**
PS-2109JS 100ug/ml in Isooctane
PS-2109AJS 100ug/ml in Acetonitrile

PS-2110 **Pyriproxyfen**
PS-2110JS 100ug/ml in Methanol

PS-2111 **Flumetsulam**
PS-2111JS 100ug/ml in Toluene
PS-2111AJS 100ug/ml in Acetonitrile

PS-2112 **a-Chloralose**
PS-2112JS 100ug/ml in Toluene
PS-2112AJS 100ug/ml in Acetonitrile

PS-2113 **b-Chloralose**
PS-2113JS 100ug/ml in Toluene
PS-2113AJS 100ug/ml in Acetonitrile

PS-2114 **Phthalanillic acid**
PS-2114JS 100ug/ml in MTBE
PS-2114AJS 100ug/ml in Acetonitrile

JS = 1ml RPS = 5x1ml

PS-2115 **Tralomethrin**
PS-2115JS 100ug/ml in MTBE
PS-2115AJS 100ug/ml in Acetonitrile

PS-2116 **Mecoprop-P**
PS-2116JS 100ug/ml in MTBE
PS-2116AJS 100ug/ml in Acetonitrile

PS-2117 **Metamitron**
PS-2117JS 100ug/ml in Methanol

PS-2118 **Rimsulfuron**
PS-2116JS 100ug/ml in MTBE
PS-2116AJS 100ug/ml in Acetonitrile

PS-2119 **Flumiclorac-pentyl**
PS-2119JS 100ug/ml in MTBE
PS-2119AJS 100ug/ml in Acetonitrile

PS-2120 **Terbumeton**
PS-2120JS 100ug/ml in Methanol

PS-2121 **Triflumizole**
PS-2121JS 100ug/ml in Methanol

PS-2122 **Methoprotryne**
PS-2122JS 100ug/ml in MTBE
PS-2122AJS 100ug/ml in Acetonitrile

PS-2123 **Prosulfuron**
PS-2123JS 100ug/ml in Toluene
PS-2123AJS 100ug/ml in Acetonitrile

PS-2124 **Glufosinate-ammonium**
PS-2124JS 100ug/ml in Toluene
PS-2124AJS 100ug/ml in H_2O

PS-2125 **Pyridaben**
PS-2125JS 100ug/ml in Methanol

PS-2126 **Procymidone**
PS-2126JS 100ug/ml in Toluene
PS-2126AJS 100ug/ml in Acetonitrile

PS-2127 **Ditalimfos**
PS-2127JS 100ug/ml in Toluene
PS-2127AJS 100ug/ml in Acetonitrile

PS-2128 **Bronopol**
PS-2128JS 100ug/ml in Methanol

PS-2129 **Isoxaben**
PS-2129JS 100ug/ml in Methanol

PS-2130 **Cyproconazole**
PS-2130JS 100ug/ml in Cyclohexane
PS-2130AJS 100ug/ml in Acetonitrile

PS-2131 **Flurprimidol**
PS-2131JS 100ug/ml in Methanol

PS-2132 **Sulfentrazone**
PS-2132JS 100ug/ml in Methanol

PS-2133 **Prodiamine**
PS-2133JS 100ug/ml in Isooctane
PS-2133AJS 100ug/ml in Acetonitrile

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Chem Service Pesticide Standards - Solution Listing

JS = 1ml RPS = 5x1ml

PS-2134 **Hydroprene**
PS-2134JS 100ug/ml in Hexane
PS-2134AJS 100ug/ml in Acetonitrile

PS-2135 **Tralkoxydim**
PS-2135JS 100ug/ml in Toluene
PS-2135AJS 100ug/ml in Acetonitrile

PS-2136 **Fipronil**
PS-2136JS 100ug/ml in Hexane
PS-2136AJS 100ug/ml in Acetonitrile

PS-2137 **Oxadixyl**
PS-2137JS 100ug/ml in Toluene
PS-2137AJS 100ug/ml in Acetonitrile

PS-2138 **Dimethomorph**
PS-2138JS 100ug/ml in Toluene
PS-2138AJS 100ug/ml in Acetonitrile

PS-2138-1 **Z-Dimethomorph**
PS-2138-1JS 100ug/ml in Methanol

PS-2139 **Triazophos**
PS-2139JS 100ug/ml in Toluene
PS-2139AJS 100ug/ml in Acetonitrile

PS-2140 **Mefenacet**
PS-2140JS 100ug/ml in Methanol

PS-2141 **Azoxystrobin**
PS-2141JS 100ug/ml in Toluene
PS-2141AJS 100ug/ml in Acetonitrile

PS-2142 **Benalaxyl**
PS-2142JS 100ug/ml in Methanol

PS-2143 **Difenacoum**
PS-2143JS 100ug/ml in Methanol

PS-2144 **Cyprodinil**
PS-2144JS 100ug/ml in Toluene
PS-2144AJS 100ug/ml in Acetonitrile

PS-2145 **Pyrithiobac-Sodium**
PS-2145JS 100ug/ml in Toluene
PS-2145AJS 100ug/ml in H_2O

PS-2146 **Halofenozide**
PS-2146JS 100ug/ml in Methanol

PS-2147 **Triflusulfuron-methyl**
PS-2147JS 100ug/ml in Toluene
PS-2147AJS 100ug/ml in Acetonitrile

PS-2148 **Diflufenzopyr**
PS-2148JS 100ug/ml in Toluene
PS-2148AJS 100ug/ml in Acetonitrile

PS-2149 **Flocoumafen**
PS-2149JS 100ug/ml in Toluene
PS-2149AJS 100ug/ml in Acetonitrile

PS-2150 **Forchlorfenuron**
PS-2150JS 100ug/ml in Toluene
PS-2150AJS 100ug/ml in Acetonitrile

PS-2151 **Quizalofop-P-ethyl**
PS-2151JS 100ug/ml in Toluene
PS-2151AJS 100ug/ml in Acetonitrile

JS = 1ml RPS = 5x1ml

PS-2152 **Diniconazole**
PS-2152JS 100ug/ml in Methanol

PS-2153 **Diethofencarb**
PS-2153JS 100ug/ml in Methanol

PS-2154 **Dimethachlon**
PS-2154JS 100ug/ml in Methanol

PS-2155 **Pyridaphenthion**
PS-2155JS 100ug/ml in Toluene
PS-2155AJS 100ug/ml in Acetonitrile

PS-2156 **Tolclofos-Methyl**
PS-2156JS 100ug/ml in Toluene
PS-2156AJS 100ug/ml in Acetonitrile

PS-2157 **Hexaconazole**
PS-2157JS 100ug/ml in Toluene
PS-2157AJS 100ug/ml in Acetonitrile

PS-2158 **Trinexapac-ethyl**
PS-2158JS 100ug/ml in MTBE
PS-2158AJS 100ug/ml in Acetonitrile

PS-2159 **Difenoconazole**
PS-2159JS 100ug/ml in Methanol

PS-2160 **Mefenoxam**
PS-2160JS 100ug/ml in MTBE
PS-2160AJS 100ug/ml in Acetonitrile

PS-2161 **Dimethenamid**
PS-2161JS 100ug/ml in Toluene
PS-2161AJS 100ug/ml in Acetonitrile

PS-2162 **Imazamox**
PS-2162JS 100ug/ml in MTBE
PS-2162AJS 100ug/ml in Acetonitrile

PS-2163 **Thiazopyr**
PS-2163JS 100ug/ml in Toluene
PS-2163AJS 100ug/ml in Acetonitrile

PS-2164 **Glyphosine**
PS-2164JS 100ug/ml in Toluene
PS-2164AJS 100ug/ml in H_2O

PS-2165 **Cloransulam-methyl**
PS-2165JS 100ug/ml in Toluene
PS-2165AJS 100ug/ml in Acetonitrile

PS-2166 **Isoxaflutole**
PS-2166JS 100ug/ml in Toluene
PS-2166AJS 100ug/ml in Acetonitrile

PS-2167 **Propamocarb HCl**
PS-2167JS 100ug/ml in Toluene
PS-2167AJS 100ug/ml in H_2O

PS-2167-1 **Propamocarb**
PS-2167-1JS 100ug/ml in Toluene
PS-2167-1AJS 100ug/ml in H_2O

PS-2168 **Flumetralin**
PS-2168JS 100ug/ml in Isooctane
PS-2168AJS 100ug/ml in Acetonitrile

JS = 1ml RPS = 5x1ml

PS-2169 **Primisulfuron-methyl**
PS-2169JS 100ug/ml in Toluene
PS-2169AJS 100ug/ml in Acetonitrile

PS-2170 **Carfentrazone-ethyl**
PS-2170JS 100ug/ml in Toluene
PS-2170AJS 100ug/ml in Acetonitrile

PS-2171 **Chlorfenapyr**
PS-2171JS 100ug/ml in Toluene
PS-2171AJS 100ug/ml in Acetonitrile

PS-2172 **Fludioxonil**
PS-2172JS 100ug/ml in Toluene
PS-2172AJS 100ug/ml in Acetonitrile

PS-2173 **Dithiopyr**
PS-2173JS 100ug/ml in Toluene
PS-2173AJS 100ug/ml in Acetonitrile

PS-2174 **Fenoxycarb**
PS-2174JS 100ug/ml in Toluene
PS-2174AJS 100ug/ml in Acetonitrile

PS-2175 **Prochloraz**
PS-2175JS 100ug/ml in Toluene
PS-2175AJS 100ug/ml in Acetonitrile

PS-2176 **Triflumuron**
PS-2176JS 100ug/ml in Toluene
PS-2176AJS 100ug/ml in Acetonitrile

PS-2177 **Flutriafol**
PS-2177JS 100ug/ml in Toluene
PS-2177AJS 100ug/ml in Acetonitrile

PS-2178 **Metoxuron**
PS-2178JS 100ug/ml in Toluene
PS-2178AJS 100ug/ml in Acetonitrile

PS-2179 **Isopropylbenzene**
F825JS 100ug/ml in Methanol
F825RPS 100ug/ml in Methanol

PS-2180 **2-Imidazolidinethione**
F2430JS 5000ug/ml in Acetonitrile
F2430RPS 5000ug/ml in Acetonitrile
PS-2180JS 100ug/ml in Toluene

PS-2181 **Monothiono TEPP**
PS-2181JS 100ug/ml in Toluene
PS-2181AJS 100ug/ml in Acetonitrile

PS-2182 **Kresoxim-methyl**
PS-2182JS 100ug/ml in Toluene
PS-2182AJS 100ug/ml in Acetonitrile

PS-2183 **Ethametsulfuron-methyl**
PS-2183JS 100ug/ml in Toluene
PS-2183AJS 100ug/ml in Acetonitrile

PS-2184 **Dimehypo**
PS-2184JS 100ug/ml in Toluene
PS-2184AJS 100ug/ml in H_2O

PS-2185 **Glyphosate-isopropylammonium**
PS-2185JS 100ug/ml in Toluene
PS-2185AJS 100ug/ml in H_2O

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Chem Service Pesticide Standards - Solution Listing

JS = 1ml RPS = 5x1ml

PS-2186 **Hymexazole**
PS-2186JS 100ug/ml in Methanol

PS-2187 **Vamidothion**
PS-2187JS 100ug/ml in Toluene
PS-2187AJS 100ug/ml in Acetonitrile

PS-2188 **Tebufenozide**
PS-2188JS 100ug/ml in Toluene
PS-2188AJS 100ug/ml in Acetonitrile

PS-2189 **Pymetrozine**
PS-2189JS 100ug/ml in Toluene
PS-2189AJS 100ug/ml in Acetonitrile

PS-2190 **Dikegulac acid**
PS-2190JS 100ug/ml in MTBE
PS-2190AJS 100ug/ml in Acetonitrile

PS-2191 **Fluroxypyr-meptyl**
PS-2191JS 100ug/ml in Methanol

PS-2192 **Tebupirimfos**
PS-2192JS 100ug/ml in Toluene
PS-2192AJS 100ug/ml in Acetonitrile

PS-2193 **Benazolin-ethyl**
PS-2193JS 100ug/ml in MTBE
PS-2193AJS 100ug/ml in Acetonitrile

PS-2194 **Bifenazate**
PS-2194JS 100ug/ml in Toluene
PS-2194AJS 100ug/ml in Acetonitrile

PS-2195 **Imazamethabenz-methyl**
PS-2195JS 100ug/ml in Toluene
PS-2195AJS 100ug/ml in Acetonitrile

PS-2196 **Trifloxystrobin**
PS-2196JS 100ug/ml in Methylene chloride
PS-2196AJS 100ug/ml in Acetonitrile

PS-2197 **Imazapic**
PS-2197JS 100ug/ml in Toluene
PS-2197AJS 100ug/ml in Acetonitrile

PS-2198 **d-trans-Cyphenothrin**
PS-2198JS 100ug/ml in MTBE
PS-2198AJS 100ug/ml in Acetonitrile

PS-2199 **Cadusafos**
PS-2190JS 100ug/ml in Toluene
PS-2190AJS 100ug/ml in Acetonitrile

PS-2200 **Oxytetracycline hydrochloride**

PS-2201 **Neomycin sulfate salt**

PS-2202 **Fenhexamid**
PS-2202JS 100ug/ml in Toluene
PS-2202AJS 100ug/ml in Acetonitrile

PS-2203 **beta-Cypermethrin**
PS-2203JS 100ug/ml in MTBE
PS-2203AJS 100ug/ml in Acetonitrile

PS-2204 **beta-Cyfluthrin**
PS-2204JS 100ug/ml in MTBE
PS-2204AJS 100ug/ml in Acetonitrile

JS = 1ml RPS = 5x1ml

PS-2205 **Flufenacet**
PS-2205JS 100ug/ml in Methanol

PS-2206 **6-Benzylaminopurine**
PS-2206JS 100ug/ml in Toluene
PS-2206AJS 100ug/ml in Acetonitrile

PS-2207 **Penconazole**
PS-2207JS 100ug/ml in Toluene
PS-2207AJS 100ug/ml in Acetonitrile

PS-2208 **Diclosulam**
PS-2208JS 100ug/ml in Toluene
PS-2208AJS 100ug/ml in Acetonitrile

PS-2209 **Chlormephos**
PS-2209JS 100ug/ml in Toluene
PS-2209AJS 100ug/ml in Acetonitrile

PS-2210 **Monolinuron**
PS-2210JS 100ug/ml in Toluene
PS-2210AJS 100ug/ml in Acetonitrile

PS-2211 **Spinosad**
PS-2211JS 100ug/ml in Toluene
PS-2211AJS 100ug/ml in Acetonitrile

PS-2212 **Acibenzolar-S-methyl**
PS-2212JS 100ug/ml in Toluene
PS-2212AJS 100ug/ml in Acetonitrile

PS-2213 **Flufenoxuron**
PS-2213JS 100ug/ml in Toluene
PS-2213AJS 100ug/ml in Acetonitrile

PS-2214 **Cyclosulfamuron**
PS-2214JS 100ug/ml in Toluene
PS-2214AJS 100ug/ml in Acetonitrile

PS-2215 **Thiamethoxam**
PS-2215JS 100ug/ml in Methanol

PS-2216 **Fenpyroximate**
PS-2216JS 100ug/ml in Toluene
PS-2216AJS 100ug/ml in Acetonitrile

PS-2217 **Chlorethoxyfos**
PS-2217JS 100ug/ml in Toluene
PS-2217AJS 100ug/ml in Acetonitrile

PS-2218 **Methacrifos**
PS-2218JS 100ug/ml in Toluene
PS-2218AJS 100ug/ml in Acetonitrile

PS-2219 **Acetamiprid**
PS-2219JS 100ug/ml in Toluene
PS-2219AJS 100ug/ml in Acetonitrile

PS-2220 **Ivermectin**
PS-2220JS 100ug/ml in Toluene
PS-2220AJS 100ug/ml in Acetonitrile

PS-2221 **Diafenthiuron**
PS-2221JS 100ug/ml in Toluene
PS-2221AJS 100ug/ml in Acetonitrile

PS-2222 **BHC (epsilon isomer) (100ug/ml in Toluene)**

JS = 1ml RPS = 5x1ml

PS-2223 **Fenoxaprop-P-ethyl**
PS-2223JS 100ug/ml in Toluene
PS-2223AJS 100ug/ml in Acetonitrile

PS-2224 **Sulfosulfuron**
PS-2224JS 100ug/ml in Toluene
PS-2224AJS 100ug/ml in Acetonitrile

PS-2225 **Heptenophos**
PS-2225JS 100ug/ml in Toluene
PS-2225AJS 100ug/ml in Acetonitrile

PS-2226 **Prohexadione-Calcium**
PS-2226JS 100ug/ml in Toluene
PS-2226AJS 100ug/ml in Acetonitrile

PS-2227 **Mepronil**
PS-2227JS 100ug/ml in Methanol

PS-2228 **2,3,5,6-Tetrachloroaniline**
PS-2228JS 100ug/ml in Methanol

PS-2230 **Indoxacarb**
PS-2230JS 100ug/ml in Toluene
PS-2230AJS 100ug/ml in Acetonitrile

PS-2231 **Flucarbazone-sodium**
PS-2231AJS 100ug/ml in H_2O

PS-2232 **Foramsulfuron** .
PS-2230JS 100ug/ml in Toluene
PS-2230AJS 100ug/ml in Acetonitrile

PS-2233 **Thiometon**
PS-2230JS 100ug/ml in Toluene
PS-2230AJS 100ug/ml in Acetonitrile

PS-2234 **1-cis-3-Chloroallyl-3,5,7-triaza-1-azonia-adamantane chloride**
PS-2234JS 100ug/ml in Methanol

PS-2235 **Pyraclostrobin**
PS-2235JS 100ug/ml in Toluene
PS-2235AJS 100ug/ml in Acetonitrile

PS-2236 **Dalapon Sodium**
Not Available in Solution

PS-2237 **Etofenprox**
PS-2237JS 100ug/ml in Toluene
PS-2237AJS 100ug/ml in Acetonitrile

PS-2238 **Tefluthrin (100ug/ml in Acetonitrile)**

PS-2239 **Diclobutrazol 100ug/ml in Toluene**

PS-2240 **Fluazifop-butyl**
PS-2240JS 100ug/ml in Toluene
PS-2240AJS 100ug/ml in Acetonitrile

PS-2241 **Benfuracarb**
PS-2241JS 100ug/ml in Toluene
PS-2241AJS 100ug/ml in Acetonitrile

PS-2242 **Tridemorph**
PS-2242JS 100ug/ml in Toluene
PS-2242AJS 100ug/ml in Acetonitrile

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JS = 1ml RPS = 5x1ml

PS-2243 **Cyclanilide**
PS-2243JS 100ug/ml in Toluene
PS-2243AJS 100ug/ml in Acetonitrile

PS-2244 **zeta-Cypermethrin**
PS-2244JS 100ug/ml in Toluene
PS-2244AJS 100ug/ml in Acetonitrile

PS-2245 **Flumioxazin**
PS-2245JS 100ug/ml in Toluene
PS-2245AJS 100ug/ml in Acetonitrile

PS-2246 **Bispyribac Sodium**
PS-2246JS 100ug/ml in Toluene
PS-2246AJS 100ug/ml in Acetonitrile

PS-2247 **Teflubenzuron**
PS-2247JS 100ug/ml in Toluene
PS-2247AJS 100ug/ml in Acetonitrile

PS-2248 **Chlorfluazuron**
PS-2248JS 100ug/ml in Toluene
PS-2248AJS 100ug/ml in Acetonitrile

PS-2249 **Fluazinam**
PS-2249JS 100ug/ml in Toluene
PS-2249AJS 100ug/ml in Acetonitrile

PS-2250 **Ioxynil octanoate**
PS-2250JS 100ug/ml in Toluene
PS-2250AJS 100ug/ml in Acetonitrile

PS-2251 **Pyrimethanil**
PS-2251JS 100ug/ml in Toluene
PS-2251AJS 100ug/ml in Acetonitrile

PS-2252 **Lufenuron**
PS-2252JS 100ug/ml in Toluene
PS-2252AJS 100ug/ml in Acetonitrile

PS-2253 **Novaluron**
PS-2253JS 100ug/ml in Toluene
PS-2253AJS 100ug/ml in Acetonitrile

PS-2254 **Capsaicin, Natural**
PS-2254JS 100ug/ml in Toluene
PS-2254AJS 100ug/ml in Acetonitrile

PS-2255 **Tebutam**
PS-2255JS 100ug/ml in Toluene
PS-2255AJS 100ug/ml in Acetonitrile

PS-2257 **Etoxazole**
PS-2257JS 100ug/ml in Toluene
PS-2257AJS 100ug/ml in Acetonitrile

PS-2258 **Fenazaquin**
PS-2258JS 100ug/ml in Toluene
PS-2258AJS 100ug/ml in Acetonitrile

PS-2259 **Famoxadone**
PS-2259JS 100ug/ml in Toluene
PS-2259AJS 100ug/ml in Acetonitrile

PS-2260 **Boscalid**
PS-2260JS 100ug/ml in Toluene
PS-2260AJS 100ug/ml in Acetonitrile

JS = 1ml RPS = 5x1ml

PS-2261 **Clothianidin**
PS-2261JS 100ug/ml in Toluene
PS-2261AJS 100ug/ml in Acetonitrile

PS-2262 **Thiacloprid**
PS-2262JS 100ug/ml in Toluene
PS-2262AJS 100ug/ml in Acetonitrile

PS-2263 **Streptomycin sulfate**
PS-2263AJS 100ug/ml in Acetonitrile

PS-2264 **Methoxyfenozide**
PS-2264JS 100ug/ml in Toluene
PS-2264AJS 100ug/ml in Acetonitrile

PS-2265 **Emamectin**
PS-2265JS 100ug/ml in Toluene
PS-2265AJS 100ug/ml in Acetonitrile

PS-2266 **Cinnamaldehyde**
PS-2266JS 100ug/ml in Toluene
PS-2266AJS 100ug/ml in Acetonitrile

PS-2267 **2.3-Dichloronitrobenzene**
PS-2267JS 100ug/ml in Toluene
PS-2267AJS 100ug/ml in Acetonitrile

PS-2268 **2.4-Dichloronitrobenzene**
PS-2268JS 100ug/ml in Toluene
PS-2268AJS 100ug/ml in Acetonitrile

PS-2269 **2.5-Dichloronitrobenzene**
PS-2269JS 100ug/ml in Toluene
PS-2269AJS 100ug/ml in Acetonitrile

PS-2270 **3.4-Dichloronitrobenzene**
PS-2270JS 100ug/ml in Toluene
PS-2270AJS 100ug/ml in Acetonitrile

PS-2271 **3.5-Dichloronitrobenzene**
PS-2271JS 100ug/ml in Toluene
PS-2271AJS 100ug/ml in Acetonitrile

PS-2272 **2,6-Diisopropylnaphthalene**
PS-2272JS 100ug/ml in Toluene
PS-2272AJS 100ug/ml in Acetonitrile

PS-2273 **Fosthiazate**
PS-2273JS 100ug/ml in Toluene
PS-2273AJS 100ug/ml in Acetonitrile

PS-2274 **Mesotrione**
PS-2274JS 100ug/ml in Toluene
PS-2274AJS 100ug/ml in Acetonitrile

PS-2275 **Fenthion-ethyl**
PS-2275JS 100ug/ml in Toluene
PS-2275AJS 100ug/ml in Acetonitrile

PS-2276 **Clodinafop-propargyl**
PS-2276JS 100ug/ml in Toluene
PS-2276AJS 100ug/ml in Acetonitrile

PS-2277 **Ormetoprin**
PS-2277JS 100ug/ml in Toluene
PS-2277AJS 100ug/ml in Acetonitrile

PS-2278 **Sulfadimethoxine**
PS-2278JS 100ug/ml in Toluene
PS-2278AJS 100ug/ml in Acetonitrile

JS = 1ml RPS = 5x1ml

PS-2279 **Cybutryne**
PS-2279JS 100ug/ml in Toluene
PS-2279AJS 100ug/ml in Acetonitrile

PS-2280 **Cyhalofop-butyl**
PS-2280JS 100ug/ml in Toluene
PS-2280AJS 100ug/ml in Acetonitrile

PS-2281 **Pentanochlor**
PS-2281JS 100ug/ml in Toluene
PS-2281AJS 100ug/ml in Acetonitrile

PS-2282 **2,4-D isobutyl ester**
PS-2282JS 100ug/ml in Toluene
PS-2282AJS 100ug/ml in Acetonitrile

PS-2283 **Mecarbam**
PS-2283JS 100ug/ml in Toluene
PS-2283AJS 100ug/ml in Acetonitrile

PS-2284 **Quinoxyfen**
PS-2284JS 100ug/ml in Toluene
PS-2284AJS 100ug/ml in Acetonitrile

PS-2285 **Propoxycarbazone-sodium**
PS-2285AJS 100ug/ml in Acetonitrile

PS-2286 **Mesosulfuron-methyl**
PS-2286JS 100ug/ml in Toluene
PS-2286AJS 100ug/ml in Acetonitrile

PS-2287 **Mefenpyr-diethyl**
PS-2287JS 100ug/ml in Toluene
PS-2287AJS 100ug/ml in Acetonitrile

PS-2288 **Noruron**
PS-2288JS 100ug/ml in Toluene
PS-2288AJS 100ug/ml in Acetonitrile

PS-2289 **Cholecalciferol**
PS-2289JS 100ug/ml in Toluene
PS-2289AJS 100ug/ml in Acetonitrile

PS-2290 **Flonicamid**
PS-2290JS 100ug/ml in Toluene
PS-2290AJS 100ug/ml in Acetonitrile

PS-2291 **Dimethenamid-P**
PS-2291JS 100ug/ml in Toluene
PS-2291AJS 100ug/ml in Acetonitrile

PS-2292 **Fenamidone**
PS-2292JS 100ug/ml in Toluene
PS-2292AJS 100ug/ml in Acetonitrile

PS-2293 **Spiroxamine**
PS-2293JS 100ug/ml in Toluene
PS-2293AJS 100ug/ml in Acetonitrile

PS-2294 **Pretilachlor**
PS-2294JS 100ug/ml in Toluene
PS-2294AJS 100ug/ml in Acetonitrile

PS-2295 **Dinotefuran**
PS-2295JS 100ug/ml in Toluene
PS-2295AJS 100ug/ml in Acetonitrile

PS-2296 **Acequinocyl**
PS-2296JS 100ug/ml in Toluene
PS-2296AJS 100ug/ml in Acetonitrile

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Chem Service Pesticide Standards - Solution Listing

JS = 1ml RPS = 5x1ml

PS-2297 **Oxolinic acid**
PS-2297JS 100ug/ml in Toluene
PS-2297AJS 100ug/ml in Acetonitrile

PS-2299 **Tetraconazole**
PS-2299JS 100ug/ml in Toluene
PS-2299AJS 100ug/ml in Acetonitrile

PS-2300 **Dichlorprop-P**
PS-2300JS 100ug/ml in Toluene
PS-2300AJS 100ug/ml in Acetonitrile

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Numerical Listing
Metabolite Standards

Contains the metabolite listing, first by parent compound and then alphabetically. A metabolite is an intermediate substance produced by the decomposition of the parent (base) pesticide by air, moisture, soil conditions, etc. Please note that some metabolites are available in solution form only.

For example, Parathion (PS-95) is hydrolyzed to form 4-Nitrophenol. 4-Nitrophenol (catalog number O-896) is a metabolite of Parathion.

1 → **PS-95** **Parathion®** ← 2
O-896 4-Nitrophenol
F58S *100ug/ml in Methanol*
PS-610 Paraoxon ← 3
PS-613 Dimethyl-p-nitrophenyl phosphate
4 → *F2245S* *100ug/ml in t-Butylmethyl ether*

1 **Pesticide catalog number (parent compound)**

2 **Description of the parent pesticide**

3 Neat Metabolite standard (Catalog number and description)

4 *Solution Metabolite standard (Catalog number, concentration and solvent)*

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WARNING - READ YOUR MATERIAL SAFETY DATA SHEET BEFORE HANDLING OR USING ANY CHEMICALS

Chem Service Metabolite Standards by Parent Compound

PS-7 **Pentachlorophenol**
F1086 2,3,4,6-Tetrachlorophenol
F1098 2,3,4,6-Tetrachlorophenol

PS-17 **Dazomet**
MET-221A Methyl isothiocyanate

PS-20 **Ferbam**
F2430 2-Imidazolidinethione

PS-21 **Ziram**
F2430 2-Imidazolidinethione

PS-22 **Maneb**
F2430 2-Imidazolidinethione

PS-23 **Zineb®**
F2430 2-Imidazolidinethione

PS-24 **Thiram**
F2430 2-Imidazolidinethione

PS-25 **Captan**
MET-260A cis-1,2,3,6-Tetrahydrophthalimide

PS-26 **Folpet**
MET-26A Phthalamic acid
O-793 Phthalimide
O-89 Phthalic acid

PS-32 **Dalapon**
PS-1100 Dalapon methyl ester

PS-33 **Chlorthal**
MET-33A Monomethyl tetrachlorotere phthalate
MET-33B Tetrachloroterephthalic acid

PS-39 **p-Chlorophenoxy acetic acid**
F2190 4-Chlorophenol

PS-40 **MCPA**
MET-40A 4-Chloro-2-methylphenol

PS-41 **2,4-D**
F31 2,4-Dichlorophenol

PS-42 **2,4-D butyl ester**
F31 2,4-Dichlorophenol
PS-41 2,4-D

PS-43 **2,4-D isopropyl ester**
F31 2,4-Dichlorophenol
PS-41 2,4-D

PS-44 **Dichlorprop**
F31 2,4-Dichlorophenol

PS-45 **2,4,5-T®**
PS-9 2,4,5-Trichlorophenol

PS-47 **Silvex**
PS-342 Silvex-methyl ester
PS-9 2,4,5-Trichlorophenol

PS-52 **Chlorpropham**
F2501 3-Chloroaniline

PS-58 **Simazine**
MET-58A Atrazine desisopropyl
MET-58B Simazine hydroxy Solution
MET-58C 2-Chloro-4,6-diamino-1,3,5- triazine
MET-380E Atrazine desethyl desisopropyl-2-hydroxy

PS-59 **Monuron**
MET-59A Bis(p-chlorophenyl)urea
F706 4-Chloroaniline

PS-60 **Diuron**
F2506 3,4-Dichloroaniline
MET-59A Bis(p-chlorophenyl)urea
MET-60A N,N'-Bis(3,4-dichlorophenyl)urea
MET-60B 3-(4-Chlorophenyl)methyl urea

PS-61 **Fenuron**
O-987 Phenylurea

PS-68 **Tributhylphosphorotrithioite**
PS-562 S.S.S-Tributylphosphorotrithioate

PS-69 **Aldrin®**
PS-76 Dieldrin

PS-71 **Lindane**
F8 1,2,4-Trichlorobenzene
F2298 2,3,4-Trichlorophenol
F2299 2,3,5-Trichlorophenol
F2300 2,3,6-Trichlorophenol
PS-9 2,4,5-Trichlorophenol
PS-10 2,4,6-Trichlorophenol
O-2347 3,4,5-Trichlorophenol

PS-74 **DDT**
PS-695 o,p'-DDE
PS-696 p,p'-DDE
PS-694 o,p'-DDD
PS-72 p,p'-DDD
MET-698A p,p'-DDA

PS-75 **Chlordane**
MET-75A Oxychlordane Solution
MET-75B cis-Nonachlor
MET-75C trans-Nonachlor
MET-75D Chlordene

PS-77 **Endrin**
PS-77-1 Endrin aldehyde
PS-77-2 Endrin ketone

PS-78 **Heptachlor**
PS-700 Heptachlor epoxide

PS-81 **Endosulfan**
PS-81-3 Endosulfan sulfate
MET-81A Endosulfan alcohol
MET-81B Endosulfan ether
MET-81C Endosulfan lactone

PS-82 **Kelthane®**
MET-854B 4,4'-Dichlorobenzophenone
MET-82A o,p-Dicofol Solution

PS-83 **Methoxychlor**
MET-83A o,p'-Methoxychlor
MET-83B p,p-Methoxychlor-olefin

PS-84 **Carbaryl**
O-877 1-Naphthol

PS-86 **Malathion**
MET-86A Isomalathion Solution
MET-86B Malathion monocarboxylic acid Solution
MET-86C Malathion-O-analog (Malaoxon)
MET-86D Malathion monocarboxylic acid

PS-88 **Carbophenothion**
MET-88A Carbophenothion methyl Solution
MET-88B Carbophenothionmethyl-O-analog
MET-88C Carbophenothion methylsulfone Solution
MET-88D Carbophenothion methylsulfoxide Solution

PS-90 **Diazinon**
MET-90A Diazinon-O-analog
MET-90B 2-Isopropyl-6-methyl-4-pyrimidinol
MET-90C Diethyl phosphate

Chem Service Metabolite Standards by Parent Compound

PS-93 **EPN**
O-896 4-Nitrophenol

PS-94 **Methyl parathion**
O-896 4-Nitrophenol
PS-613 Dimethyl-p-nitrophenyl phosphate

PS-95 **Parathion®**
O-896 4-Nitrophenol
PS-610 Paraoxon
PS-613 Dimethyl-p-nitrophenyl phosphate

PS-103 **Dichlofenthion**
F31 2,4-Dichlorophenol

PS-104 **Warfarin**
MET-104A 7-Hydroxycoumarin
MET-104B 4-Hydroxycoumarin

PS-150 **Pentachloronitrobenzene**
MET-150A Pentachloroaniline
F938 Pentachlorobenzene
PS-7 Pentachlorophenol

PS-151 **Tetrachloronitrobenzene**
F1085 1,2,4,5-Tetrachlorobenzene
F1098 2,3,5,6-Tetrachlorophenol

PS-220 **Nabam**
F2430 2-Imidazolidinethione

PS-221 **Metham Sodium**
0-2179 Methylisocyanate
MET-221A Methylisothiocyanate

PS-222 **Benomyl**
MET-222A 2-Aminobenzimidazole
MET-222B STB
PS-1077 Carbendazim

PS-225 **Polyram**
F2430 2-Imidazolidinethione

PS-230 **Thiophanate methyl**
MET-222A 2-Aminobenzimidazole
PS-1077 Carbendazim

PS-250 **Dodine**
MET-250A Creatine

PS-260 **Captofol**
F2083 Dichloroacetic acid
O-89 Phthalic acid
MET-260A cis-1,2,3,6-Tetrahydrophthalimide

PS-306 **2,4-DB**
PS-41 2,4-D

PS-307 **MCPB**
PS-1084 MCPB-methyl ester
MET-40A 4-Chloro-2-methylphenol
PS-40 4-Chloro-o-tolyloxy acetic acid

PS-314 **3-Amino-2,5-dichlorobenzoic acid**
O-365 2,5-Dichloroaniline

PS-324 **Mecoprop**
MET-40A 4-Chloro-2-methylphenol

PS-343 **N-1-Naphthylphthalamic acid**
MET-343A N-(1-Naphthyl)phthalimide
O-89 Phthalic acid
F928 a-Naphthylamine

PS-345 **Endothal**
F2450 Dimethyl endothal

PS-346 **Dicamba**
MET-346A 5-Hydroxydicamba Solution

PS-348 **Butachlor**
MET-357C 2,6-Diethylaniline

PS-355 **Propachlor**
MET-355A Propachlor ESA
MET-355B Propachlor OA

PS-356 **3',4'-Dichloropropionanilide**
F2506 3,4-Dichloroaniline

PS-357 **Alachlor**
MET-357A 2-Chloro-2',6'-diethylacetanilide
MET-357C 2,6-Diethylaniline
MET-357D Alachlor ESA
MET-357E Alachlor OA

PS-366 **Paraquat dichloride tetrahydrate**
O-290 Methylamine hydrochloride

PS-368 **Chlorbromuron**
MET-59A Bis(p-chlorophenyl)urea

PS-372 **Linuron**
MET-372A 3,4-Dichloroaniline
F2506 3,4-Dichloroaniline
MET-60B 3-(4-Chlorophenyl)methyl urea

PS-374 **Metobromuron**
MET-374B p-Bromoaniline

PS-377 **Neburon**
MET-59A Bis(p-chlorophenyl)urea
F2506 3,4-Dichloroaniline

PS-379 **Terbutryne**
MET-380E Atrazine desethyl desisopropyl-2-hydroxy

PS-380 **Atrazine**
PS-395 Atraton
MET-380B Atrazine desethyl
MET-58C 2-Chloro-4,6-diamino-1,3,5-triazine
MET-380D Atrazine desethyl-2-hydroxy
MET-380E Atrazine desethyl desisopropyl-2-hydroxy
MET-58A Atrazine desisopropyl
MET-380F Atrazine-2-hydroxy

PS-381 **Simetryn**
MET-380E Atrazine desethyl desisopropyl-2-hydroxy

PS-383 **Ametryn**
MET-380D Atrazine desethyl-2-hydroxy
MET-380E Atrazine desethyl desisopropyl-2-hydroxy
MET-380F Atrazine-2-hydroxy

PS-384 **Prometryn**
MET-380D Atrazine desethyl-2-hydroxy
MET-380E Atrazine desethyl desisopropyl-2-hydroxy
MET-385A Propazine-2-hydroxy Solution

PS-385 **Propazine**
MET-380B Atrazine desethyl
MET-385A Propazine-2-hydroxy Solution
MET-380D Atrazine desethyl-2-hydroxy
MET-380E Atrazine desethyl desisopropyl-2-hydroxy

PS-386 **Prometon**
MET-380D Atrazine desethyl-2-hydroxy
MET-380E Atrazine desethyl desisopropyl-2-hydroxy
MET-385A Propazine-2-hydroxy Solution

PS-387 **Bladex**
MET-58C 2-Chloro-4,6-diamino-1,3,5-triazine
MET-380E Atrazine desethyl desisopropyl-2-hydroxy
MET-58A Atrazine desisopropyl

PS-392 **2,6-Dichlorobenzonitrile**
MET-392A 2,6-Dichlorobenzoic acid
MET-392B 2,6-Dichlorobenzamide
MET-392C 2,6-Dichlorobenzoic acid methyl ester

Chem Service Metabolite Standards by Parent Compound

PS-395 **Atraton**
MET-380D Atrazine desethyl-2-hydroxy
MET-380E Atrazine desethyl desisopropyl-2-hydroxy
MET-380F Atrazine-2-hydroxy

PS-397 **Ioxynil**
MET-397A Ioxynil-methyl

PS-401 **Ioxynil**
MET-401A N-Nitrosopendimethalin

PS-403 **Metolachlor**
MET-403A 2-[(2-Ethyl-6-methylphenyl)amino]-1-propanol
MET-403C Metolachlor ESA
MET-403D Metolachlor OA

PS-404 **Difenzoquat methyl sulfate**
MET-404C Difenzoquat-desmethyl methyl sulfate

PS-411 **Diproprtryn**
MET-380D Atrazine desethyl-2-hydroxy
MET-380E Atrazine desethyl desisopropyl-2-hydroxy
MET-385A Propazine-2-hydroxy Solution

PS-413 **Terbuthylazine**
MET-380E Atrazine desethyl desisopropyl-2-hydroxy
MET-58A Atrazine desisopropyl
MET-58C 2-Chloro-4,6-diamino-1,3,5-triazine
MET-413A Terbuthylazine-desethyl

PS-417 **Triclopyr**
MET-674A 3,5,6-Trichloro-2-pyridinol

PS-418 **Chlorpyrifos methyl**
MET-674A 3,5,6-Trichloro-2-pyridinol
MET-418B Chlorpyrifos methyl-O-analog

PS-419 **Nitrapyrin**
MET-419B 6-Chloro-2-picolinic acid methyl ester Solution

PS-426 **Bromoxynil**
MET-426A Bromoxynil-heptanoate
MET-426B Bromoxynil-methyl ether
PS-434 Bromoxynil-octanoate acid ester

PS-501 **Molinate**
O-2098 Ethanethiol

PS-502 **Cycloate**
MET-502A N-Ethyl cyclohexylamine

PS-503 **Butylate**
O-2043 Diisobutyl amine

PS-540 **Barban**
F2501 3-Chloroaniline
F2501S *1000ug/ml in Toluene*

PS-543 **Methiocarb**
MET-543A Methiocarb sulfone
MET-543B Methiocarb sulfoxide Solution

PS-553 **Devrinol®**
O-877 1-Naphthol
F997 1,4-Naphthoquinone

PS-605 **Dibrom**
PS-89 Dichlorovos

PS-607 **Ruelene®**
MET-607A 4-tert-Butyl-2-chlorophenol

PS-608 **Dylox®**
PS-89 Dichlorovos

PS-610 **Paraoxon**
PS-613 Dimethyl-p-nitrophenyl phosphate

PS-612 **Phenamiphos**
MET-612A Fenamiphos sulfoxide
MET-612B Fenamiphos sulfone

PS-644 **Pirimiphos methyl**
MET-644A 2-Diethylamino-6-methylpyrimidin-4-ol

PS-652 **Disulfoton**
MET-652A Disulfoton sulfone
MET-652B Disulfoton sulfoxide
PS-662 Demeton S

PS-653 **Imidan®**
MET-653A Phosmet-oxon Solution

PS-654 **Phorate**
MET-654A Phorate-oxon Solution
MET-654B Phorate sulfone Solution
MET-654C Phorate sulfoxide

PS-655 **Fenthion**
MET-655A Fenthion-sulfone
MET-655B Fenthion sulfoxide Solution
MET-655C Fenthion-O-analog Solution
MET-655D Fenthion sulfoxide

PS-656 **Coumaphos**
MET-656D Coumaphos-O-analog

PS-657 **Fenchlorphos**
MET-657A Fenchlorphos-oxon
PS-9 2,4,5-Trichlorophenol

PS-659 **Dimethoate**
PS-2017 Omethoate

PS-666 **Guthion®**
MET-666A Azinphos-methyl oxon Solution

PS-668 **Zinophos®**
MET-668A Thionazin-O-analog
MET-668B 2-Hydroxypyrazine Solution

PS-669 **Dicapthon**
MET-669A 2-Chloro-4-nitrophenol

PS-671 **Famphur**
MET-671A Famphur-O-analog
MET-671B p-Hydroxy-N,N-dimethylbenzene sulfonamide

PS-674 **Chlorpyrifos**
MET-674A 3,5,6-Trichloro-2-pyridinol
MET-674B Chlorpyrifos-oxon

PS-677 **Leptophos**
MET-677A Leptophos oxon
MET-677B 4-Bromo-2,5-dichlorophenol

PS-678 **Fenitrothion**
MET-678A Fenitrothion-O-analog Solution
MET-678B 3-Methyl-4-nitrophenol

PS-690 **Hexachlorobenzene**
PS-7 Pentachlorophenol
MET-690A Tetrachlorohydroquinone
MET-690B Pentachlorothiophenol
F1085 1,2,4,5-Tetrachlorobenzene
F938 Pentachlorobenzene
F1098 2,3,5,6-Tetrachlorophenol
PS-9 2,4,5-Trichlorophenol
PS-10 2,4,6-Trichlorophenol
F1086 2,3,4,6-Tetrachlorophenol

PS-694 **o,p'-DDD**
MET-694A o,p'-DDD olefin

PS-698 **o,p'-DDT**
PS-694 o,p'-DDD
PS-695 o,p'-DDE
MET-694A o,p'-DDD olefin

Chem Service Metabolite Standards by Parent Compound

PS-699 p,p'-DDT
PS-696 p,p'-DDE
PS-72 p,p'-DDD
MET-698A p,p'-DDA
MET-699B p,p'-DDMU

PS-734 Aldicarb
PS-1054 Aldicarb sulfoxide
PS-1055 Aldoxycarb

PS-738 Acephate
PS-676 Methamidophos

PS-739 Bendiocarb
MET-739A 2,2-Dimethyl-1,3-benzodioxole-4-ol

PS-754 Carbofuran
F2053 3-Hydroxycarbofuran
MET-754B 2,3-Dihydro-2,2-dimethylbenzofuran-7-ol
MET-754D 2,3-Dihydro-2,2-dimethylbenzofuran-3,7-diol Solution
MET-754E Carbofuran-3-keto
MET-754F Carbofuran phenol-3-keto

PS-758 Permethrin
MET-758B m-Phenoxybenzyl alcohol
MET-758C 3-Phenoxybenzoic acid

PS-775 Methomyl
F974 Acetonitrile

PS-840 Chlordimeform
MET-840A 4-Chloro-2-methylaniline

PS-854 Chlorobenzilate
MET-854A 4,4'-Dichlorobenzhydrol
MET-854B 4,4'-Dichlorobenzophenone
F2190 4-Chlorophenol
O-98 4-Chlorobenzoic acid

PS-858 Omite®
MET-858A 2-(4-tert-Butylphenoxy)cyclohexanol
O-869 4-tert-Butylphenol
MET-858B 1,2-Cyclohexanediol (cis & trans)

PS-1003 Isofenphos
MET-1003A Isofenphos-des-N-isopropyl Solution
MET-1003B Isofenphos-des-N-isopropyl-O-analogue Solution
MET-1003C Isofenphos-des-N-isopropyl

PS-1005 Amitraz
O-342 2,4-Dimethylaniline

PS-1011 Bentazon
MET-1011C 2-Amino-N-isopropylbenzamide

PS-1013 Triadimefon
PS-1064 Baytan®
F2190 4-Chlorophenol

PS-1015 Desmedipham
O-882 m-Aminophenol

PS-1016 Acifluorfen
MET-1016A Acifluorfen,amino

PS-1018 Sulprofos
MET-1018A Sulprofos sulfone Solution
MET-1018C Sulprofos-sulfoxide Solution

PS-1024 Profenofos
MET-1024A 4-Bromo-2-chlorophenol

PS-1028 Diflubenzuron
MET-1028A p-Chlorophenyl urea
F706 4-Chloroaniline

PS-1032 Sanmarton
MET-1032A 2-(p-Chlorophenyl)-3-methyl butyric acid

PS-1036 Diclofop methyl
MET-1036A Diclofop methyl, 5-hydroxy Solution
MET-1036B Diclofop acid

PS-1045 Ethofumesate
F705 Carbon disulfide
O-957 Methane sulfonic acid

PS-1047 Mepiquat chloride
MET-1047A N-Methyl piperdine

PS-1049 Vinclozolin
MET-1052B 3,5-Dichloroaniline

PS-1050 Oxadiazon
MET-1050A Oxadiazon-hydroxy Solution

PS-1051 Glyphosate
MET-1051A Aminomethyl phosphonic acid

PS-1052 Iprodione
MET-1052B 3,5-Dichloroaniline

PS-1063 Carbosulfan
PS-754 Carbofuran
F2053 3-Hydroxycarbofuran

PS-1064 Baytan®
F2190 4-Chlorophenol

PS-1065 Chlorsulfuron
MET-1065A Chlorsulfuron-5-hydroxy Solution

PS-1068 Cypermethrin
MET-758C 3-Phenoxybenzoic acid

PS-1071 Mavrik®
MET-758C 3-Phenoxybenzoic acid

PS-1075 Tilt®
MET-1075A 1,2,4-Triazole

PS-1077 Carbendazim
MET-222A 2-Aminobenzimidazole

PS-1080 Quizalofop ethyl
MET-1080A Quizalofop

PS-1094 Tokuthion®
F31 2,4-Dichlorophenol

PS-1096 Metasystox I®
PS-642 Dioxydemeton-S-methyl
PS-641 Oxydemeton-methyl

PS-1098 Swep
F2506 3,4-Dichloroaniline

PS-2000 Isoproturon
MET-2000A Monodesmethyl Isoproturon

PS-2009 Bromophos methyl
MET-2009A 4-Bromo-2,5-dichlorophenol

PS-2012 Thiodicarb
PS-775 Methomyl

PS-2015 Clofentezine
O-97 2-Chlorobenzoic acid
MET-2015A 2-Chlorobenzonitrile

PS-2020 Metaldehyde
F2322 Acetaldehyde

PS-2032 Biphenyl
O-880 p-Phenylphenol

PS-2040 Acetochlor
MET-2040A Metolachlor ESA
MET-2040B Metolachlor OA

Chem Service Metabolite Standards by Parent Compound

PS-2057 Flutolanil
MET-2057A Methyl o-trifluoromethyl benzoic acid
MET-2057B alpha, alpha, alpha,-Trifluoro-O-toluic acid
MET-2057C alpha, alpha, alpha,-Trifluoro-3'-hydroxy-O-toluanilide

PS-2063 Azocyclotin
MET-1075A 1,2,4-Triazole
PS-107 Tricyclohexyltin hydroxide

PS-2078 Chlorotoluron
MET-2078A 1-(3-Chloro-4-methylphenyl)-3-methylurea

PS-2120 Terbumeton
MET-380E Atrazine desethyl desisopropyl-2-hydroxy

PS-2136 Fipronil
MET-2136A Fipronil sulfone
MET-2136B Fipronil sulfide

PS-2161 Dimethenamid
MET-2161A Dimethenamid ESA
MET-2161B Dimethenamid OA

PS-2164 Glyphosine
MET-2164A Iminobis (methylphosphonic acid)

PS-2166 Isoxaflutole
MET-2166A 1-(Methylsulfonyl-4-trifluoromethyl phenyl)-2-cyano-3-cyclopropyl propyl-1,3 dione
MET-2166B 2-Methylsulfonyl-4-trifluoromethyl benzoic acid

PS-2205 Flufenacet
MET-2205A Flufenacet ESA
MET-2205B Flufenacet OA

PS-2243 Cyclanilide
MET-2243A 2,4-Dichloroaniline

Chem Service Metabolite Standards - Alphabetical Listing

MET#	DESCRIPTION	ASSOCIATED PS #
O-2000	Acetaldehyde	2020
MET-2040A	Acetochlor ESA	2040
MET-2040B	Acetochlor OA	2040
F974	Acetonitrile	775
MET-1016A	Acifluorfen,amino Solution	1016
MET-357D	Alachlor ESA	357
MET-357E	Alachlor OA	357
PS-1054	Aldicarb sulfoxide	734
PS-1055	Aldoxycarb	734
MET-222A	2-Aminobenzimidazole	222,230,1077
MET-1011C	2-Amino-N-isopropyl benzamide	1011
MET-1051A	Aminomethyl phosphonic acid	1051
O-882	m-Aminophenol	1015
PS-395	Atraton	380
MET-380B	Atrazine desethyl	380,385
MET-380E	Atrazine desethyl desisopropyl-2-hydroxy	58,379,380,381,383, 384,385,386,387,395, 411,413,2120
MET-380D	Atrazine desethyl-2-hydroxy	380,383,384,385,386, 395,411
MET-58A	Atrazine desisopropyl	58,380,387,413
MET-380F	Atrazine-2-hydroxy	380,383,395
MET-666A	Azinphos-methyl oxon Solution	666
PS-1064	Baytan	1013
MET-1011A	Bentazone-6-hydroxy Solution	1011
MET-1011B	Bentazone-8-hydroxy Solution	1011
MET-59A	Bis(p-chlorophenyl)urea	59,60,368,377
MET-60A	N,N'-Bis(3,4-dichlorophenyl)urea	60
MET-374B	p-Bromoaniline	374
MET-1024A	4-Bromo-2-chlorophenol	1024
MET-677B	4-Bromo-2,5-dichlorphenol	677
MET-2009A	4-Bromo-2,5-dichlorphenol	2009
PS-434	Bromoxynil octanoic acid ester	426
MET-426A	Bromoxynil-heptanoate	426
MET-426B	Bromoxynil-methyl ether	426
MET-607A	4-tert-Butyl-2-chlorophenol	607
O-869	4-tert-Butylphenol	858
MET-858A	2-(4-tert-Butylphenoxy)cyclo-hexanol	858
PS-1077	Carbendazim	222,230
PS-754	Carbofuran	1063
MET-754E	Carbofuran-3-keto	754
MET-754F	Carbofuranphenol-3-keto	754
F705	Carbon disulfide	1045
MET-88A	Carbophenothion methyl Solution	88
MET-88B	Carbophenothion methyl-O-analog	88
MET-88C	Carbophenothion methyl sulfone Solution	88
MET-88D	Carbophenothion methyl sulfoxide Solution	88
F2051	3-Chloroaniline	52,540
MET-75D	Chlordene	75
F706	4-Chloroaniline	59,1028
O-97	2-Chlorobenzoic acid	2015
O-98	4-Chlorobenzoic acid	854
MET-2015A	2-Chlorobenzonitrile	2015
MET-58C	2-Chloro-4.6-diamino-1.3.5-triazine	58,380,387,413
MET-357A	2-Chloro-2',6'-diethylacetanilide	357
MET-840A	4-Chloro-2-methylaniline	840
MET-40A	4-Chloro-2-methylphenol	40,307,324
MET-2078A	1-(3-Chloro-4-methylphenyl) -3-methylurea	2078
MET-669A	2-Chloro-4-nitrophenol	669
F2190	4-Chlorophenol	39,854,1013,1064
MET-1032A	2-(p-Chlorophenyl)-3-methyl butyric acid	1032
MET-60B	3-(4-Chlorophenyl)methyl urea	60,372
MET-1028A	p-Chlorophenylurea	1028

MET#	DESCRIPTION	ASSOCIATED PS #
MET-419B	6-Chloro-2-picolinic acid methyl ester Solution	419
PS-40	4-Chloro-o-tolyloxyacetic acid	307
MET-418B	Chlorpyrifos methyl-O-analog	418
MET-674B	Chlorpyrifos oxon	674
MET-1065A	Chlorsulfuron-5-hydroxy Solution	1065
MET-656D	Coumaphos-O-analog	656
MET-250A	Creatine	250
MET-858B	1.2-Cyclohexanediol (cis & trans mixture)	858
PS-41	2.4-D	42,43,306
PS-1100	Dalapon methyl ester	32
MET-698A	p,p'-DDA	74,699
PS-694	o.p'-DDD	74,698
PS-72	p.p'-DDD	74,699
MET-694A	o,p'-DDD olefin	694,698
PS-695	o.p'-DDE	74,698
PS-696	p.p'-DDE	74,699
MET-699B	p,p'-DDMU	699
PS-662	Demeton S	652
MET-90A	Diazinon-O-analog	90
F2083	Dichloroacetic acid	260
MET-372A	2,4-Dichloroaniline	372
MET-2243A	2,4-Dichloroaniline	2243
O-365	2.5-Dichloroaniline	314
F2506	3.4-Dichloroaniline	60,356,372,377,1098
MET-1052B	3.5-Dichloroaniline	1049,1052
MET-392B	2.6-Dichlorobenzamide	392
MET-854A	4.4'-Dichlorobenzhydrol	854
MET-392A	2.6-Dichlorobenzoic acid	392
MET-392C	2,6-Dichlorobenzoic acid methyl ester	392
MET-854B	4.4'-Dichlorobenzophenone	82,854
MET-346B	3,6-Dichloro-2-hydroxy benzoic acid	346
F31	2.4-Dichlorophenol	41,42,43,44,103,1094
PS-89	Dichlorvos	605,608
F2061S	100ug/ml in Toluene	605,608
MET-1036B	Diclofop acid	1036
MET-1036A	Diclofop methyl, 5-hydroxy Solution	1036
MET-82A	o,p-Dicofol Solution	82
PS-76	Dieldrin	69
MET-357C	2.6-Diethylaniline	348,357
MET-90C	Diethyl phosphate	90
MET-644A	2-Diethylamino-6-methyl pyrimidin-4-ol	644
MET-404C	Difenzoquat-desmethyl methyl sulfate	404
MET-754D	2,3-Dihydro-2,2-dimethyl benzo-furan-3,7-diol Solution	754
MET-754B	2,3-Dihydro-2,2-dimethylbenzo-furan-7-ol	754
O-2043	Diisobutylamine	503
MET-2161A	Dimethenamid ESA	2161
MET-2161B	Dimethenamid OA	2161
O-342	2.4-Dimethylaniline	1005
MET-739A	2,2-Dimethyl-1,3-benzodioxole-4-ol	739
F2450	Dimethyl endothal	345
PS-613	Dimethyl-p-nitrophenylphosphate	94,95,610
PS-642	Dioxydemeton-S-methyl	1096
MET-652A	Disulfoton sulfone	652
MET-652B	Disulfoton sulfoxide	652
PS-81-3	Endosulfan sulfate	81
MET-81A	Endosulfan alcohol	81
MET-81B	Endosulfan ether	81
MET-81C	Endosulfan lactone	81
PS-77-1	Endrin aldehyde	77
PS-77-2	Endrin ketone	77
O-2098	Ethanethiol	501

Chem Service Metabolite Standards - Alphabetical Listing

MET#	DESCRIPTION	ASSOCIATED PS #
MET-502A	N-Ethylcyclohexylamine	502
	Ethylene thiourea see 2-Imidazol-idinethione	
MET-403A	2-[(2-Ethyl-6-methylphenyl)amino]-1-propanol	403
MET-671A	Famphur-O-analog	671
MET-612B	Fenamiphos sulfone Solution	612
MET-612A	Fenamiphos sulfoxide	612
MET-657A	Fenchlorphos-oxon	657
MET-678A	Fenitrothion-O-analog Solution	678
MET-655C	Fenthion-O-analog Solution	655
MET-655A	Fenthion-sulfone	655
MET-655B	Fenthion sulfoxide Solution	655
MET-655D	Fenthion sulfoxide	655
MET-2136A	Fipronil sulfide	2136
MET-2136B	Fipronil sulfone	2136
MET-2205A	Flufenacet ESA	2205
MET-2205B	Flufenacet OA	2205
PS-700	Heptachlor epoxide	78
F2053	3-Hydroxycarbofuran	754,1063
MET-104A	7-Hydroxycoumarin	104
MET-104B	4-Hydroxycoumarin	104
MET-346A	5-Hydroxydicamba Solution	346
MET-671B	p-Hydroxy-N,N-dimethylbenzene sulfonamide	671
MET-668B	2-Hydroxypyrazine Solution	668
F2430	2-Imidazolidinethione	20,21,22,23,24,220,225
MET-2164A	Iminobis (methylphosphonic acid)	2164
MET-397A	Ioxynil-methyl	397
MET-1003C	Isofenphos-des-N-isopropyl	1003
MET-1003A	Isofenphos-des-N-isopropyl Solution	1003
MET-1003B	Isofenphos-des-N-isopropyl-O-analogue Solution	1003
MET-86A	Isomalathion Solution	86
MET-90B	2-Isopropyl-6-methyl-4-pyrim-idinol	90
MET-677A	Leptophos oxon	677
MET-86C	Malathion-O-analog	86
MET-86B	Malathion monocarboxylic acid Solution	86
MET-86D	Malathion monocarboxylic acid	86
PS-1084	MCPB methyl ester	307
PS-676	Methamidophos	738
O-957	Methane sulfonic acid	1045
MET-543A	Methiocarb sulfone	543
MET-543B	Methiocarb sulfoxide Solution	543
PS-775	Methomyl	2012
MET-83A	o,p'-Methoxychlor	83
MET-83B	p,p-Methoxychlor-olefin	83
O-290	Methylamine hydrochloride	366
O-2179	Methyl isocyanate	221
MET-221A	Methyl isothiocyanate	17,221
MET-678B	3-Methyl-4-nitrophenol	678
MET-1047A	N-Methylpiperidine	1047
MET-2166B	2-Methylsulfonyl-4-trifluoromethyl benzoic acid	2166
MET-2166A	1-(Methylsulfonyl-4-trifluoromethyl phenyl)-2-cyano-3-cyclopropyl propyl-1,3-dione	2166
MET-2057A	Methyl o-trifluoromethylbenzoate	2057
MET-403C	Metolachlor ESA	403
MET-403D	Metolachlor OA	403
MET-2000A	Monodesmethyl Isoproturon	2000
MET-33A	Monomethyl tetrachlorotere-phthalate	33
O-877	1-Naphthol	84,553
F997	1.4-Naphthoquinone	553
F928	a-Naphthylamine	343
MET-343A	N-(1-Naphthyl)phthalimide	343

MET#	DESCRIPTION	ASSOCIATED PS #
O-896	4-Nitrophenol	93,94,95
MET-401A	Nitrosopendimethalin	401
MET-75B	cis-Nonachlor *(ACS Standard Grade)*	75
MET-75C	trans-Nonachlor *(ACS Standard Grade)*	75
PS-2017	Omethoate	659
MET-1050A	Oxadiazon-hydroxy Solution	1050
MET-75A	Oxychlordane Solution	75
PS-641	Oxydemeton-methyl	1096
PS-610	Paraoxon	95
MET-150A	Pentachloroaniline	150
F938	Pentachlorobenzene	150,690
PS-7	Pentachlorophenol	150,690
MET-690B	Pentachlorothiophenol	690
MET-758C	3-Phenoxybenzoic acid	758,1068,1071
MET-758B	m-Phenoxybenzyl alcohol	758
O-880	p-Phenylphenol	2032
O-987	Phenylurea	61
MET-654A	Phorate-oxon Solution	654
MET-654B	Phorate sulfone Solution	654
MET-654C	Phorate sulfoxide	654
MET-653A	Phosmet-oxon Solution	653
MET-26A	Phthalamic acid	26
O-89	Phthalic acid	26,260,343
O-793	Phthalimide	26
MET-355A	Propachlor ESA	355
MET-355B	Propachlor OA	355
MET-385A	Propazine-2-hydroxy Solution	384,385,386,411
MET-1080A	Quizalofop	1080
PS-342	Silvex methyl ester	47
MET-58B	Simazine hydroxy Solution	58
MET-222B	STB	222
MET-1018A	Sulprofos sulfone Solution	1018
MET-1018C	Sulprofos-sulfoxide Solution	1018
MET-413A	Terbuthylazine desethyl	413
F1085	1.2.4.5-Tetrachlorobenzene	151,690
MET-690A	Tetrachlorohydroquinone	690
F1086	2.3.4.6-Tetrachlorophenol	7,690
F1098	2,3,5,6-Tetrachlorophenol	7,151,690
MET-33B	Tetrachloroterephthalic acid	33
MET-260A	cis-1,2,3,6-Tetrahydrophthalimide	25,260
MET-668A	Thionazin-O-analog	668
MET-1075A	1.2.4-Triazole	1075, 2063
PS-562	S.S.S-Tributylphosphorotrithioate	68
F8	1.2.4-Trichlorobenzene	71
F2298	2.3.4-Trichlorophenol	71
F2299	2.3.5-Trichlorophenol	71
F2300	2.3.6-Trichlorophenol	71
PS-9	2.4.5-Trichlorophenol	45,47,71,657,690
PS-10	2.4.6-Trichlorophenol	71,690
O-2347	3,4,5-Trichlorophenol	71
MET-674A	3,5,6-Trichloro-2-pyridinol	417,418,674
PS-107	Tricyclohexyltin hydroxide	2063
MET-2057B	alpha,alpha,alpha-Trifluoro-O-toluic acid	2057
MET-2057C	alpha,alpha,alpha-Trifluoro-3'-hydroxy-O-toluanilide	2057

Chem Service EPA Pesticide Methods

The Chem Service General Catalog offers Reference Standards for numerous EPA Methods, including those pertaining to pesticide analysis. Pesticide standards are listed by EPA Method Number and cross referenced to all other associated EPA methodology. The Chem Service General Catalog contains neat chemicals, single component solutions, mixtures, and kits for the following methods which analyze for pesticides:

EPA Method #	Classification
504/504.1	EDB & DBCP
505	Organohalide Pesticides & Commercial PCBs
507	Nitrogen & Phosphorous Containing Pesticides
508/508.1/508A	Chlorinated Pesticides & PCBs
509	Ethylene Thiourea Determination
515.1/515.2	Chlorinated Acids
525.1/525.2	Organic Compounds/Organochlorine Pesticides
531.1	Carbamate Pesticides
535	Acetamide Herbicide Degradates
547	Glyphosate
548/548.1	Endothal
549/549.1/549.2	Diquat/Paraquat
551.1	Halogenated Pesticides & Herbicides
553	Benzidines & Nitrogen Containing Pesticides
555	Chlorinated Herbicides
604.1	Phenolic Pesticides
608/608.1/608.2	Organochlorine Pesticides & PCBs
614/614.1	Organophosphorous Pesticides
615	Chlorinated Herbicides
616	Carbon, Hydrogen & Oxygen Pesticide Compounds
617	Organohalide Pesticides
618	Volatile Pesticides
619	Triazine Pesticides
622/622.1	Organophosphorous Pesticides
625	Organochlorine Pesticides
627	Dinitroaniline Pesticides
629	Bladex
630/630.1	Dithiocarbamate Pesticides
631	Benomyl & Carbendazim
632	Carbamate & Urea Pesticides
632.1	Carbamate & Amide Pesticides

EPA Method #	Classification
633	Organonitrogen Pesticides
633.1	Neutral Nitrogen Containing Pesticides
634	Thiocarbamate Pesticides
635	Rotenone
636	Bensulide
637	TCMTB & 2,2'-Dithiobis(benzothiazole)
638	Oryzalin
639	Bendiocarb
640	Mercaptobenzothiazole
641	Thiabendazole
642	Biphenyl & o-Phenylphenol
643	Bentazon
644	Picloram
645	Amine Pesticides & Lethane
646	Dinitroaromatic Pesticides
680	Organochlorine Pesticides
1618	Organohalide & Organophosphorous Pesticides
1656	Organohalide Pesticides
1657	Organophosphorous Pesticides
1658	Phenoxyacid Herbicides
1660	Pyrethrins & Pyrethroids
8080A	Organochlorine Pesticides & PCBs
8081/8081A/8081B	Organochlorine Pesticides & PCBs
8140/8141A	Organophosphorous Pesticides
8150/8150A/8150B	Chlorinated Herbicides
8151/8151A/8151B	Chlorinated Herbicides
8250A	Organochlorine Pesticides & PCBs
8318	Carbamate Pesticides
8270/8270A/8270B	Organochlorine Pesticides & PCBs
8321	Organophosphorous Compounds
CLP	Pesticide & PCB Compounds
CLP QTM	Organochlorine Pesticides & PCBs
TCLP-1311	Organic Pesticides & Herbicides
TO-10	Organochlorine Pesticides

To request a copy of the Chem Service General Catalog, please call +1-610-692-3026 or 1-800-452-9994, fax +1-610-692-8729 or send email to: info@chemservice.com.

Chem Service EPA Pesticide Methods

EPA Method 504/504.1

EDB/DBCP

EPA METHOD 504,*8010B,8011*

F819	1,2-Dibromo-3-chloropropane *(DBCP)*
F820	1,2-Dibromoethane *(EDB)*

2000ug/ml in Methanol - (2 components)

CSHC-16JM **1ml Ampules**
CSHC-16RPM **5x1ml Ampules**

EDB/DBCP/123TCA STANDARDS MIXTURE

EPA METHOD 504.1

F819	1.2-Dibromo-3-chloropropane
F820	1.2-Dibromoethane
F814	1.2.3-Trichloropropane

2000ug/ml in Methanol - (3 components)

CSHC-16AJM **1ml Ampules**
CSHC-16ARPM **5x1ml Ampules**

EPA Method 505

ORGANOHALIDE PESTICIDES & COMMERCIAL PCB'S

EPA METHOD 505

F2072	Alachlor
F89	Aldrin®
F107	Arochlor 1016
F108	Arochlor 1221
F113	Arochlor 1232
F109	Arochlor 1242
F110	Arochlor 1248
F111	Arochlor 1254
F112	Arochlor 1260
F2208	Atrazine
F907	cis-Chlordane
F908	trans-Chlordane
F90	Dieldrin
F98	Endrin
F100	Heptachlor
F101	Heptachlor epoxide
F9	Hexachlorobenzene
F53	Hexachlorocyclopentadiene
F104	Lindane (BHC gamma isomer)
F910	Methoxychlor
F2179	cis-Nonachlor
F2180	trans-Nonachlor
F2073	Simazine
F106	Toxaphene®

Neat compounds of each of the above - (24 component kit)

OHP505-1N **KIT**

1ml Solutions of each, in the appropriate solvent - (24 component kit)

OHP505-1JS **KIT**

ORGANOHALIDE PESTICIDES MIXTURE #1

EPA METHOD 505

F2072	Alachlor
F89	Aldrin®
F90	Dieldrin
F98	Endrin
F100	Heptachlor
F101	Heptachlor epoxide
F9	Hexachlorobenzene
F104	Lindane (BHC gamma isomer)
F910	Methoxychlor

100ug/ml in Toluene - (9 components)

OHP505-1JM **1ml Ampule**
OHP505-1RPM **5x1ml Ampules**

ORGANOHALIDE PESTICIDES MIXTURE #2

EPA METHOD 505

F2208	Atrazine
F907	cis-Chlordane
F908	trans-Chlordane
F100	Heptachlor
F53	Hexachlorocyclopentadiene
F2179	cis-Nonachlor
F2180	trans-Nonachlor
F2073	Simazine

100ug/ml in Methanol - (8 components)

OHP505-2JM **1ml Ampule**
OHP505-2RPM **5x1ml Ampules**

ORGANOHALIDE PESTICIDE MIXTURES KIT

EPA METHOD 505

OHP505-1M	Organohalide Pesticides Mixture #1 - 505
OHP505-2M	Organohalide Pesticides Mixture #2 - 505

1ml of each of the above in the appropriate solvent - (2 component kit)

MMOHP505-2 **KIT**

ORGANOHALIDE PESTICIDES MIXTURE #3

EPA METHOD 505

50ug/ml	F2072	Alachlor
5ug/ml	F89	Aldrin®
1250ug/ml	F2208	Atrazine
5ug/ml	F907	cis-Chlordane
5ug/ml	F908	trans-Chlordane
5ug/ml	F90	Dieldrin
5ug/ml	F98	Endrin
5ug/ml	F100	Heptachlor
5ug/ml	F101	Heptachlor epoxide
5ug/ml	F9	Hexachlorobenzene
5ug/ml	F53	Hexachlorocyclopentadiene
5ug/ml	F104	Lindane (BHC gamma isomer)
25ug/ml	F910	Methoxychlor
5ug/ml	F2179	cis-Nonachlor
5ug/ml	F2180	trans-Nonachlor
1250ug/ml	F2073	Simazine

Mixture in Acetone - (16 components)

OHP505-3JM **1ml Ampule**
OHP505-3RPM **5x1ml Ampules**

AROCHLORS, TOXAPHENE® & CHLORDANE SOLUTIONS KIT

EPA METHOD 505,*508,525.2,608,617,625,1656,8080A/8081,8250A,8270B,CLP*

F107AS	Arochlor 1016 Solution
F108AS	Arochlor 1221 Solution
F113AS	Arochlor 1232 Solution
F109AS	Arochlor 1242 Solution
F110AS	Arochlor 1248 Solution
F111AS	Arochlor 1254 Solution
F112BS	Arochlor 1260 Solution
F91AS	Chlordane Solution
F106BS	Toxaphene® Solution

1ml Solutions of each, 1000ug/ml in Hexane - (9 component kit)

CTA608-1JS **KIT**

Whether it is bottled or ampuled, neat or solution, rest assured that Chem Service products not only follow an over 40 year tradition in providing highly purified materials for reference standards, but also that we will strive to continually increase the quality of our materials and services for our customers.

POLYCHLORINATED BIPHENYLS

EPA METHOD 505,*608,617,625,8080A/8081,8250A/8270B,CLP*

F107	Arochlor 1016
F108	Arochlor 1221
F113	Arochlor 1232
F109	Arochlor 1242
F110	Arochlor 1248
F111	Arochlor 1254
F112	Arochlor 1260

Neat compounds of each of the above - (7 component kit)
PP-8N **KIT**

1ml Solutions of each, 100ug/ml in Methanol - (7 component kit)
PP-8JS **KIT**

INSTRUMENT PERFORMANCE CHECK STANDARDS

EPA METHOD 505

F98	1g	Endrin	
F98S	5ml	100ug/ml	Methanol
F99	10mg	Endrin aldehyde	
F99S	5ml	100ug/ml	Methanol
F2022	10mg	Endrin ketone	
F2022S	5ml	100ug/ml	Methanol

ON-GOING STABILITY STUDIES

Chem Service is committed to providing our customers with high quality analytical materials. As part of our quality program, our Standards Grade materials have on-going, lot-specific testing. The testing program for all Standards Grade materials will certify the standard for purity, identity, concentration, and stability. Subsequently, through on-going testing, our Standards Grade material is tested to ensure that it has maintained the certified quality. If we detect a purity or stability problem during the on-going testing, which will affect the expiration date of a Standard's Grade material, rest assured, we will alert our customers and offer a replacement.

EPA Method 507

NITROGEN & PHOSPHOROUS CONTAINING PESTICIDES

EPA METHOD 507

F2072	Alachlor
F2209	Ametryne
F2211	Atraton
F2208	Atrazine
F2221	Beam®
F2200	Bromacil
F2204	Butachlor
F2212	Butylate
F2203	Carboxin
F2199	Chlorpropham
F2227	Cycloate
F2238	Devrinol®
F2060	Diazinon
F2061	Dichlorvos
F2245	Dimethyl-p-nitrophenyl phosphate
F2228	Diphenamid
F993	Disulfoton
MET-652A	Disulfoton sulfone
MET-652B	Disulfoton sulfoxide
F2229	S-Ethyl dipropylthiocarbamate
F2230	Fenarimol
F2241	Metolachlor
F2237	Metribuzin
F2239	MGK 264®
F2242	Molinate
F2240	Norflurazon®
F2246	Phenamiphos
F2062	Prophos
F2066	Phosdrin®
F2210	Prometon
F2235	Prometryne
F2233	S-Propylbutylethylthiocarbamate
F1083	Propyzamide
F2236	Propazine
F2073	Simazine
F2234	Simetryn
F2231	Sonar®
F2243	Tebuthiuron
F2206	Terbacil
F2137	Terbufos
F2207	Terbutryne
F2069	Tetrachlorvinphos
F2218	Triadimefon
F2065	Tributylphosphorotrithioite
F2232	Velpar
F2213	Vernolate

NOTES: *MET-652A, Disulfoton sulfone and MET-652B, Disulfoton sulfoxide are sold in 100mg only, but are supplied in the solution kit.*

Neat compounds of each of the above - (46 component kit)
NPP-507N **KIT**

1ml Solutions of each, in the appropriate solvent - (46 component kit)
NPP-507JS **KIT**

PESTICIDES MIXTURE #1

EPA METHOD 507,*525.2*

F2209	Ametryne
F2227	Cycloate
F993	Disulfoton
F2246	Phenamiphos
F2210	Prometon
F2065	Tributylphosphorotrithioite

1000ug/ml in tert-Butylmethyl ether - (6 components)
PM507-1JM **1ml Ampule**
PM507-1RPM **5x1ml Ampules**

WE ACCEPT... VISA MasterCard

Chem Service EPA Pesticide Methods

PESTICIDES MIXTURE #2

EPA METHOD 507,*525.2*

F2208	Atrazine
F2228	Diphenamid
F2229	S-Ethyl dipropylthiocarbamate
F2066	Phosdrin®
F2235	Prometryne
F2236	Propazine
F2062	Prophos
F2207	Terbutryne
F2218	Triadimefon

1000ug/ml in tert-Butylmethyl ether - (9 components)

PM507-2JM **1ml Ampule**
PM507-2RPM **5x1ml Ampules**

PESTICIDES MIXTURE #3

EPA METHOD 507,*525.2*

F2204	Butachlor
F2203	Carboxin
F2060	Diazinon
F2241	Metolachlor
F2237	Metribuzin
F2239	MGK 264®
F2240	Norflurazon®
F2137	Terbufos
F2213	Vernolate

1000ug/ml in tert-Butylmethyl ether - (9 components)

PM507-3JM **1ml Ampule**
PM507-3RPM **5x1ml Ampules**

PESTICIDES MIXTURE #4

EPA METHOD 507,*525.2*

F2072	Alachlor
F2211	Atraton
F2221	Beam®
F2200	Bromacil
F2212	Butylate
F2199	Chlorpropham
F2242	Molinate
F1083	Propyzamide
F2069	Tetrachlorvinphos
F2232	Velpar

1000ug/ml in tert-Butylmethyl ether - (10 components)

PM507-4JM **1ml Ampule**
PM507-4RPM **5x1ml Ampules**

PESTICIDES MIXTURE #5

EPA METHOD 507,*525.2*

F2238	Devrinol®
F2061	Dichlorvos
F2230	Fenarimol
F2233	S-Propyl butylethylthiocarbamate
F2234	Simetryn
F2231	Sonar®
F2243	Tebuthiuron
F2206	Terbacil

1000ug/ml in tert-Butylmethyl ether - (8 components)

PM507-5JM **1ml Ampule**
PM507-5RPM **5x1ml Ampules**

NITROGEN & PHOSPHOROUS CONTAINING PESTICIDES MIXTURES KIT

EPA METHOD 507

PM507-1JM	Pesticides Mixture #1 - 507
PM507-2JM	Pesticides Mixture #2 - 507
PM507-3JM	Pesticides Mixture #3 - 507
PM507-4JM	Pesticides Mixture #4 - 507
PM507-5JM	Pesticides Mixture #5 - 507

1ml of each, in tert-Butylmethyl ether - (5 component kit)

MMPM507-5 **KIT**

LABORATORY PERFORMANCE CHECK MIXTURE

EPA METHOD 507

15ug/ml	F2208	Atrazine
500ug/ml	F2200	Bromacil
250ug/ml	F2051	1,3-Dimethyl-2-nitrobenzene
30ug/ml	F2210	Prometon
250ug/ml	F2052	Triphenyl phosphate
5ug/ml	F2213	Vernolate

Mixture in tert-Butylmethyl ether - (6 components)

LPC-507JM **1ml Ampule**
LPC-507RPM **5x1ml Ampules**

SUPPLEMENTAL PESTICIDES KIT

EPA METHOD 507

F2245	Dimethyl-p-nitrophenylphosphate
MET-652A	Disulfoton sulfone
MET-652B	Disulfoton sulfoxide
F2073	Simazine

Neat compounds of each of the above - (4 component kit)

PM507-6N **KIT**

SIMAZINE STANDARDS

EPA METHOD 507,*8141A*

F2073	100mg	Simazine
F2073JS	1ml	100ug/mlMethanol
F2073RPS	5x1ml	100ug/mlMethanol
F2073AJS	1ml	1000ug/mlAcetone (Ampule)
F2073ARPS	5x1ml	1000ug/mlAcetone (Ampule)

MERPHOS CALIBRATION STANDARDS

EPA METHOD 507,*622,1657,8140/8141A,8321*

F2214	1g	S.S.S-Tributylphosphorotrithioate
F2214JS	1ml	100ug/mltert-Butylmethyl ether (Ampule)
F2214RPS	5x1ml	100ug/mltert-Butylmethyl ether (Ampule)

INTERNAL STANDARDS

EPA METHOD 507

F2052	5g	Triphenyl phosphate
F2052JS	1ml	500ug/mltert-Butylmethyl ether (Ampule)
F2052RPS	5x1ml	500ug/mltert-Butylmethyl ether (Ampule)
F2287	5g	o-Nitrotoluene
F2287JS	1ml	2500ug/mltert-Butylmethyl ether (Ampule)
F2287RPS	5x1ml	2500ug/mltert-Butylmethyl ether (Ampule)
F2287AJS	1ml	1000ug/mlAcetonitrile
F2287ARPS	5x1ml	1000ug/mlAcetonitrile

SURROGATE STANDARDS

EPA METHOD 507

F2051	5g	1,3-Dimethyl-2-nitrobenzene
F2051JS	1ml	2000ug/mltert-Butylmethyl ether (Ampule)
F2051RPS	5x1ml	2000ug/mltert-Butylmethyl ether (Ampule)
F2051AJS	1ml	2500ug/mltert-Butylmethyl ether (Ampule)
F2051ARPS	5x1ml	2500ug/mltert-Butylmethyl ether (Ampule)

Chem Service's pesticide and metabolite standards are internationally recognized for their superior quality. These standards, whether sold as neat products, or as solutions, are certified for purity, identity, stability and are traceable by lot.

EPA Methods

EPA Method 508/508.1/508A

CHLORINATED PESTICIDES & PCB'S

EPA METHOD 508

F89	Aldrin®
F107	Arochlor 1016
F108	Arochlor 1221
F113	Arochlor 1232
F109	Arochlor 1242
F110	Arochlor 1248
F111	Arochlor 1254
F112	Arochlor 1260
F102	BHC (alpha isomer)
F103	BHC (beta isomer)
F105	BHC (delta isomer)
F907	cis-Chlordane
F908	trans-Chlordane
F2201	Chloroneb
F986	Chlorobenzilate
F2220	Chlorothalonil
F2040	Chlorthal
F94	4.4'-DDD
F93	4.4'-DDE
F92	4.4'-DDT
F90	Dieldrin
F202	a-Endosulfan
F203	b-Endosulfan
F97	Endosulfan sulfate
F98	Endrin
F99	Endrin aldehyde
F2022	Endrin ketone
F100	Heptachlor
F101	Heptachlor epoxide
F9	Hexachlorobenzene
F104	Lindane (BHC gamma isomer)
F910	Methoxychlor
F2216	Permethrin
F2205	Propachlor
F2202	Terrazole®
F106	Toxaphene®
F2140	Trifluralin

Neat compounds of each of the above (37 component kit)
CPW-508N **KIT**

1ml Solutions of each, in the appropriate solvent - (37 component kit)
CPW-508JS **KIT**

ORGANOCHLORINE PESTICIDES MIXTURE #1

EPA METHOD 508/508.1,*525.2,608,617,625,8080A/8081, 8250A/8270B,CLP*

F89	Aldrin®
F102	BHC (alpha isomer)
F103	BHC (beta isomer)
F105	BHC (delta isomer)
F907	cis-Chlordane
F908	trans-Chlordane
F94	4.4'-DDD
F93	4.4'-DDE
F92	4.4'-DDT
F90	Dieldrin
F202	a-Endosulfan
F203	b-Endosulfan
F97	Endosulfan sulfate
F98	Endrin
F99	Endrin aldehyde
F2022	Endrin ketone
F100	Heptachlor
F101	Heptachlor epoxide
F104	Lindane (BHC gamma isomer)
F910	Methoxychlor

1000ug/ml in tert-Butylmethyl ether - (20 components)
OCP508-1JM **1ml Ampule**
OCP508-1RPM **5x1ml Ampules**

AROCHLORS, TOXAPHENE® & CHLORDANE SOLUTIONS KIT

EPA METHOD 508,*505,525.2,608,617,625,1656,8080A/8081, 8250A/8270B,CLP*

F107AJS	Arochlor 1016 Solution
F108AJS	Arochlor 1221 Solution
F113AJS	Arochlor 1232 Solution
F109AJS	Arochlor 1242 Solution
F110AJS	Arochlor 1248 Solution
F111AJS	Arochlor 1254 Solution
F112BJS	Arochlor 1260 Solution
F91AJS	Chlordane Solution
F106BJS	Toxaphene® Solution

1ml Solutions of each, 1000ug/ml in Hexane - (9 component kit)
CTA608-1JS **KIT**

ORGANOCHLORINE PESTICIDES MIXTURE #2

EPA METHOD 508/508.1,*525.2*

F2201	Chloroneb
F986	Chlorobenzilate
F2220	Chlorothalonil
F2040	Chlorthal
F9	Hexachlorobenzene
F2216	Permethrin
F2205	Propachlor
F2202	Terrazole®
F2140	Trifluralin

1000ug/ml in tert-Butylmethyl ether - (9 components)
OCP508-2JM **1ml Ampule**
OCP508-2RPM **5x1ml Ampules**

ORGANOCHLORINE PESTICIDES MIXTURE #3

EPA METHOD 508.1

F2072	Alachlor
F2208	Atrazine
F2487	Bladex
F53	Hexachlorocyclopentadiene
F2241	Metolachlor
F2237	Metribuzin
F2073	Simazine

500ug/ml in Ethyl acetate - (7 components)
OCP508-3JM **1ml Ampule**
OCP508-3RPM **5x1ml Ampules**

DEGRADATION CALIBRATION MIXTURE

EPA METHOD 508/508.1,*525.2,608,617,625,1618,1656,8080A/8081, 8250A/8270B,CLP*

200ug/ml	F92	4,4'-DDT
100ug/ml	F98	Endrin

Mixture in tert-Butylmethyl ether - (2 components)
DC-508JM **1ml Ampule**
DC-508RPM **5x1ml Ampules**

DEGRADATION PRODUCTS MIXTURE

EPA METHOD 508/508.1,*525.2,608,617,625,1618,1656,8080A/8081, 8250A/8270B,CLP*

200ug/ml	F93	4.4'-DDE
200ug/ml	F94	4.4'-DDD
100ug/ml	F99	Endrin aldehyde
100ug/ml	F2022	Endrin ketone

Mixture in tert-Butylmethyl ether - (4 components)
DP508-1JM **1ml Ampule**
DP508-1RPM **5x1ml Ampules**

Chem Service EPA Pesticide Methods

ORGANOCHLORINE PESTICIDES MIXTURES

EPA METHOD 508/508.1,*608,617,625,8080A/8081,8250A/8270B,CLP*

F89	Aldrin®
F102	BHC (alpha isomer)
F103	BHC (beta isomer)
F105	BHC (delta isomer)
F104	Lindane
F94	4,4'-DDD
F93	4,4'-DDE
F92	4,4'-DDT
F90	Dieldrin
F202	Endosulfan I
F203	Endosulfan II
F97	Endosulfan sulfate
F98	Endrin
F99	Endrin aldehyde
F100	Heptachlor
F101	Heptachlor epoxide
F910	Methoxychlor

100ug/ml in Toluene:Hexane (50:50) - (17 components)

OCP-8080JM **1ml Ampule**
OCP-8080RPM **5x1ml Ampules**

100ug/ml in Toluene:Hexane (50:50), less Methoxychlor - (16 components)

PPO-8JM **1ml Ampule**
PPO-8RPM **5x1ml Ampules**

2000ug/ml in Toluene:Hexane (50:50), less Methoxychlor - (16 components)

PP-HC5JM **1ml Ampule**
PP-HC5RPM **5x1ml Ampules**

LABORATORY PERFORMANCE CHECK MIXTURE

EPA METHOD 508/508.1

40ug/ml	F105	BHC (delta isomer)
50ug/ml	F2220	Chlorothalonil
2ug/ml	F2057	Chlorpyrifos
50ug/ml	F2040	Chlorthal

Mixture in tert-Butylmethyl ether - (4 components)

LPC-508JM **1ml Ampule**
LPC-508RPM **5x1ml Ampules**

DECACHLOROBIPHENYL STANDARDS

EPA METHOD 508A

F2170	10mg	Decachlorobiphenyl
F2170JS	1ml	1000ug/mlHexane (Ampule)
F2170RPS	5x1ml	1000ug/mlHexane (Ampule)
F2170AJS	1ml	100ug/mlHexane (Ampule)
F2170ARPS	5x1ml	100ug/mlHexane (Ampule)
F2170BJS	1ml	500ug/mlAcetone (Ampule)
F2170BRPS	5x1ml	500ug/mlAcetone (Ampule)
F2170CJS	1ml	1000ug/mlToluene (Ampule)
F2170CRPS	5x1ml	1000ug/mlToluene (Ampule)

AROCHLOR 1260 STANDARDS

EPA METHOD 508A

F112	50mg	Arochlor 1260
F112JS	1ml	100ug/mlMethanol
F112RPS	5x1ml	100ug/mlMethanol
F112AJS	1ml	2000ug/mlMethanol
F112ARPS	5x1ml	2000ug/mlMethanol
F112BJS	1ml	1000ug/mlHexane (Ampule)
F112BRPS	5x1ml	1000ug/mlHexane (Ampule)

2-CHLOROBIPHENYL STANDARDS

EPA METHOD 508A

2800G	50mg	2-Chlorobiphenyl
2800GS	2ml	100ug/ml Hexane

INTERNAL STANDARDS

EPA METHOD 508/508.1

F999	1g	Pentachloronitrobenzene
F999JS	1ml	100ug/mlMethanol
F999RPS	5x1ml	100ug/mlMethanol
F999AJS	1ml	1000ug/mlIsooctane (Ampule)
F999ARPS	5x1ml	1000ug/mlIsooctane (Ampule)
F999BJS	1ml	2000ug/mlEthyl acetate (Ampule)
F999BRPS	5x1ml	2000ug/mlEthyl acetate (Ampule)

SURROGATE STANDARDS

EPA METHOD 508/508.1

F2174	10mg	4.4'-Dichlorobiphenyl
F2174JS	1ml	2000ug/mltert-Butylmethyl ether (Ampule)
F2174RPS	5x1ml	2000ug/mltert-Butylmethyl ether (Ampule)
F2174AJS	1ml	100ug/mlHexane (Ampule)
F2174ARPS	5x1ml	100ug/mlHexane (Ampule)

SURROGATE STANDARDS

EPA METHOD 508.1

F2172	500mg	4,4'-Dibromobiphenyl
F2172JS	1ml	1000ug/mlMethylene chloride (Ampule)
F2172RPS	5x1ml	1000ug/mlMethylene chloride (Ampule)
F2172AJS	1ml	100ug/mlHexane (Ampule)
F2172ARPS	5x1ml	100ug/mlHexane (Ampule)
F2172BJS	1ml	2000ug/mlEthyl acetate (Ampule)
F2172BRPS	5x1ml	2000ug/mlEthyl acetate (Ampule)

EPA Method 509

ETHYLENE THIOUREA STANDARDS

EPA METHOD 509

F2430	5g	2-Imidazolidinethione
F2430AJS	1ml	100ug/mlEthyl acetate containing 0.1% DTT (Ampule)
F2430ARPS	5x1ml	100ug/mlEthyl acetate containing 0.1% DTT (Ampule)

FREE RADICAL SCAVENGER STANDARDS

EPA METHOD 509

F2447	100mg	Dithiothreitol (DTT)
F2447JS	1ml	1000ug/mlEthyl acetate (Ampule)
F2447RPS	5x1ml	1000ug/mlEthyl acetate (Ampule)

INTERNAL STANDARDS

EPA METHOD 509

F2448	1g	3,4,5,6-Tetrahydro-2-pyrimidinethiol
F2448JS	1ml	100ug/mlEthyl acetate containing 0.1% DTT (Ampule)
F2448RPS	5x1ml	100ug/mlEthyl acetate containing 0.1% DTT (Ampule)

SURROGATE STANDARDS

EPA METHOD 509

F2449	250mg	Propylene thiourea
F2449JS	1ml	100ug/mlEthyl acetate containing 0.1% DTT (Ampule)
F2449RPS	5x1ml	100ug/mlEthyl acetate containing 0.1% DTT (Ampule)

LABORATORY PERFORMANCE CHECK MIXTURE

EPA METHOD 509

1ug/ml	F2430	2-Imidazolidinethione
10ug/ml	F2449	Propylene thiourea
100ug/ml	F2448	3.4.5.6-Tetrahydro-2-pyrimidinethiol

Mixture in Ethyl acetate containin0.1% of DTT - (3 components)

LPC509-1JM **1ml Ampule**
LPC509-1RPM **5x1ml Ampules**

EPA Method 515.1/515.2

CHLORINATED ACIDS

EPA METHOD 515.1/515.2/515.3

F2037	Acifluorfen
F2038	Bentazon
F2039	Chloramben
F954	2.4-D
F956	Dalapon
F958	2.4-DB
F960	Dicamba
F2034	3,5-Dichlorobenzoic acid
F962	Dichlorprop
F964	Dinoseb
MET-346A	5-Hydroxydicamba
F58	4-Nitrophenol
F64	Pentachlorophenol
F2041	Picloram
F970	Silvex
F972	2.4.5-T®
F2178	Tetrachloroterephthalic acid

NOTE: *5-Hydroxydicamba (MET-346A), is supplied as 100ug/ml in Acetone:Water (90:10) in both the neat and solution kit.*

Neat compounds of each of the above - (17 component kit)
CA-515N **KIT**

1ml Solutions of each, in the appropriate solvent - (17 component kit)
CA-515JS **KIT**

METHYLATED CHLORINATED ACIDS

EPA METHOD 515.1/515.2/515.3

F2224	Acifluorfen methyl ester
F2244	Bentazon methyl derivative
F2226	Chloramben methyl ester
F2040	Chlorthal
F955	2.4-D methyl ester
F957	Dalapon methyl ester
F959	2,4-DB methyl ester
F961	Dicamba methyl ester
F2223	3.5-Dichlorobenzoic acid methyl ester
F963	Dichlorprop methyl ester
F965	Dinoseb methyl ether
MET-346A	5-Hydroxydicamba
F2175	p-Nitroanisole
F2156	Pentachloroanisole
F2155	Picloram methyl ester
F971	Silvex methyl ester
F973	(2.4.5-Trichlorophenoxy)acetic acid methyl ester

NOTES: *5-Hydroxydicamba (MET-346A), is supplied as 100ug/ml in Acetone:Water (90:10) for both the neat and solution kit. It is not a methyl ester.*

Neat compounds of each of the above - (17 component kit)
MCA-515N **KIT**

1ml Solutions of each, in the appropriate solvent - (17 component kit)
MCA-515JS **KIT**

CHLORINATED ACIDS MIXTURE

EPA METHOD 515.1

100ug/ml	F2037	Acifluorfen
200ug/ml	F2038	Bentazon
100ug/ml	F2039	Chloramben
200ug/ml	F954	2.4-D
1300ug/ml	F956	Dalapon
800ug/ml	F958	2.4-DB
100ug/ml	F960	Dicamba
100ug/ml	F2034	3,5-Dichlorobenzoic acid
300ug/ml	F962	Dichlorprop
200ug/ml	F964	Dinoseb
100ug/ml	F58	4-Nitrophenol
100ug/ml	F64	Pentachlorophenol
100ug/ml	F2041	Picloram
100ug/ml	F970	Silvex
100ug/ml	F972	2.4.5-T®
20ug/ml	F2178	Tetrachloroterephthalic acid

Mixture in tert-Butylmethyl ether - (16 components)

CA-515JM **1ml Ampule**
CA-515RPM **5x1ml Ampules**

METHYLATED CHLORINATED ACIDS MIXTURE #2

EPA METHOD 515.1

100ug/ml	F2224	Acifluorfen methyl ester
200ug/ml	F2244	Bentazon methyl derivative
100ug/ml	F2226	Chloramben methyl ester
20ug/ml	F2040	Chlorthal
200ug/ml	F955	2.4-D methyl ester
1300ug/ml	F957	Dalapon methyl ester
800ug/ml	F959	2,4-DB methyl ester
100ug/ml	F961	Dicamba methyl ester
100ug/ml	F2223	3.5-Dichlorobenzoic acid methyl ester
300ug/ml	F963	Dichlorprop methyl ester
200ug/ml	F965	Dinoseb methyl ether
100ug/ml	F2175	p-Nitroanisole
100ug/ml	F2156	Pentachloroanisole
100ug/ml	F2155	Picloram methyl ester
100ug/ml	F971	Silvex methyl ester
100ug/ml	F973	(2.4.5-Trichlorophenoxy)acetic acid methyl ester

Mixture in tert-Butylmethyl ether - (16 components)

MCA-515AJM **1ml Ampule**
MCA-515ARPM **5x1ml Ampules**

CHLORINATED ACIDS MIXTURE #2

EPA METHOD 515.1

F2037	Acifluorfen
F2038	Bentazon
F2039	Chloramben
F954	2.4-D
F956	Dalapon
F958	2.4-DB
F960	Dicamba
F2034	3,5-Dichlorobenzoic acid
F962	Dichlorprop
F964	Dinoseb
F58	4-Nitrophenol
F64	Pentachlorophenol
F2041	Picloram
F970	Silvex
F972	2.4.5-T ®
F2178	Tetrachloroterephthalic acid

1000ug/ml in tert-Butylmethyl ether - (16 components)

CA-515AJM **1ml Ampule**
CA-515ARPM **5x1ml Ampules**

METHYLATED CHLORINATED ACIDS MIXTURE

EPA METHOD 515.1

F2224	Acifluorfen methyl ester
F2244	Bentazon methyl derivative
F2226	Chloramben methyl ester
F2040	Chlorthal
F955	2.4-D methyl ester
F957	Dalapon methyl ester
F959	2,4-DB methyl ester
F961	Dicamba methyl ester
F2223	3.5-Dichlorobenzoic acid methyl ester
F963	Dichlorprop methyl ester
F965	Dinoseb methyl ether
F2175	p-Nitroanisole
F2156	Pentachloroanisole
F2155	Picloram methyl ester
F971	Silvex methyl ester
F973	(2.4.5-Trichlorophenoxy)acetic acid methyl ester

1000ug/ml in tert-Butylmethyl ether - (16 components)

MCA-515JM **1ml Ampule**
MCA-515RPM **5x1ml Ampules**

CHLORINATED HERBICIDES MIXTURE #A

EPA METHOD 515.1,*8150B*

F954	2,4-D
F970	Silvex
F972	2,4,5-T

2000ug/ml in Acetone - (3 components)

CSHC-14AJM **1ml Ampule**
CSHC-14ARPM **5x1ml Ampules**

CHLORINATED HERBICIDE ESTERS MIXTURE

EPA METHOD 515.1,*8150B*

F955	2,4-D methyl ester
F971	Silvex methyl ester
F973	2,4,5-T methyl ester

2000ug/ml in Hexane - (3 components)

CSHC-14JM **1ml Ampule**
CSHC-14RPM **5x1ml Ampules**

CHLORINATED ACIDS MIXTURE #1

EPA METHOD 515.2

500ug/ml	F2034	3,5-Dichlorobenzoic acid
100ug/ml	F962	Dichlorprop
200ug/ml	F964	Dinoseb
100ug/ml	F64	Pentachlorophenol
100ug/ml	F972	2.4.5-T®
100ug/ml	F2178	Tetrachloroterephthalic acid

Mixture in tert-Butylmethyl ether - (6 components)

CA515-1JM **1ml Ampule**
CA515-1RPM **5x1ml Ampules**

METHYLATED CHLORINATED ACIDS MIXTURE #1

EPA METHOD 515.2

100ug/ml	F2040	Chlorthal
500ug/ml	F2223	3.5-Dichlorobenzoic acid methyl ester
100ug/ml	F963	Dichlorprop methyl ester
200ug/ml	F965	Dinoseb methyl ether
100ug/ml	F2156	Pentachloroanisole
100ug/ml	F973	(2.4.5-Trichlorophenoxy)acetic acid methyl ester

Mixture in Methanol - (6 components)

MCA515-1JM **1ml Ampule**
MCA515-1RPM **5x1ml Ampules**

CHLORINATED ACIDS MIXTURE #2

EPA METHOD 515.2

200ug/ml	F2037	Acifluorfen
1000ug/ml	F2038	Bentazon
100ug/ml	F954	2.4-D
1000ug/ml	F958	2.4-DB
300ug/ml	F960	Dicamba
300ug/ml	F2041	Picloram
100ug/ml	F970	Silvex

Mixture in tert-Butylmethyl ether - (7 components)

CA515-2JM **1ml Ampule**
CA515-2RPM **5x1ml Ampules**

METHYLATED CHLORINATED ACIDS MIXTURE #2

EPA METHOD 515.2

200ug/ml	F2224	Acifluorfen methyl ester
1000ug/ml	F2244	Bentazon methyl derivative
100ug/ml	F955	2.4-D methyl ester
1000ug/ml	F959	2,4-DB methyl ester
300ug/ml	F961	Dicamba methyl ester
300ug/ml	F2155	Picloram methyl ester
100ug/ml	F971	Silvex methyl ester

Mixture in Methanol - (7 components)

MCA515-2JM **1ml Ampule**
MCA515-2RPM **5x1ml Ampules**

CHLORINATED ACIDS MIXTURE #3

EPA METHOD 515.3

500ug/ml	F2037	Acifluorfen
1000ug/ml	F2038	Bentazon
500ug/ml	F2039	Chloramben
1000ug/ml	F954	2.4-D
1000ug/ml	F956	Dalapon
1000ug/ml	F958	2.4-DB
500ug/ml	F960	Dicamba
500ug/ml	F2034	3,5-Dichlorobenzoic acid
1000ug/ml	F962	Dichlorprop
1000ug/ml	F964	Dinoseb
1000ug/ml	F58	4-Nitrophenol
100ug/ml	F64	Pentachlorophenol
1000ug/ml	F2041	Picloram
250ug/ml	F970	Silvex
250ug/ml	F972	2.4.5-T®
500ug/ml	F2178	Tetrachloroterephthalic acid

Mixture in tert-Butylmethyl ether - (16 components)

CA515-3JM **1ml Ampule**
CA515-3RPM **5X1ml Ampules**

METHYLATED CHLORINATED ACIDS MIXTURE #3

EPA METHOD 515.3

500ug/ml	F2224	Acifluorfen methyl ester
1000ug/ml	F2244	Bentazon methyl derivative
500ug/ml	F2226	Chloramben methyl ester
500ug/ml	F2040	Chlorthal
1000ug/ml	F955	2.4-D methyl ester
1000ug/ml	F957	Dalapon methyl ester
1000ug/ml	F959	2,4-DB methyl ester
500ug/ml	F961	Dicamba methyl ester
500ug/ml	F2223	3.5-Dichlorobenzoic acid methyl ester
1000ug/ml	F963	Dichlorprop methyl ester
1000ug/ml	F965	Dinoseb methyl ether
1000ug/ml	F2175	p-Nitroanisole
100ug/ml	F2156	Pentachloroanisole
1000ug/ml	F2155	Picloram methyl ester
250ug/ml	F971	Silvex methyl ester
250ug/ml	F973	(2.4.5-Trichlorophenoxy)acetic acid methyl ester

Mixture in tert-Butylmethyl ether - (16 components)

MCA515-3JM **1ml Ampule**
MCA515-3RPM **5x1ml Ampules**

Chem Service EPA Pesticide Methods

LABORATORY PERFORMANCE CHECK MIXTURE

EPA METHOD 515.1/515.2

250ug/ml	F905	4,4'-Dibromooctafluorobiphenyl
600ug/ml	F2034	3,5-Dichlorobenzoic acid
500ug/ml	F2035	2,4-Dichlorophenylacetic acid
4ug/ml	F964	Dinoseb
1600ug/ml	F58	4-Nitrophenol

Mixture in tert-Butylmethyl ether - (5 components)

LPC-515JM **1ml Ampule**
LPC-515RPM **5x1ml Ampules**

METHYLATED LABORATORY PERFORMANCE CHECK MIXTURE

EPA METHOD 515.1/515.2

250ug/ml	F905	4,4'-Dibromooctafluorobiphenyl
600ug/ml	F2223	3.5-Dichlorobenzoic acid methyl ester
500ug/ml	F2036	2,4-Dichlorophenylacetic acid methyl ester
4ug/ml	F965	Dinoseb methyl ether
1600ug/ml	F2175	p-Nitroanisole

Mixture in tert-Butylmethyl ether - (5 components)

MLPC-515JM **1ml Ampule**
MLPC-515RPM **5x1ml Ampules**

SURROGATE STANDARDS

EPA METHOD 515.1/515.2/515.3

F2035	100mg	2,4-Dichlorophenylacetic acid	
F2035JS	1ml	2000ug/ml	Acetone (Ampule)
F2035RPS	5x1ml	2000ug/ml	Acetone (Ampule)
F2035AJS	1ml	100ug/ml	tert-Butylmethyl ether (Ampule)
F2035ARPS	5x1ml	100ug/ml	tert-Butylmethyl ether (Ampule)
F2035BJS	1ml	5000ug/ml	tert-Butylmethyl ether (Ampule)
F2035BRPS	5x1ml	5000ug/ml	tert-Butylmethyl ether (Ampule)
F2036	100mg	2,4-Dichlorophenylacetic acid methyl ester	
F2036JS	1ml	100ug/mlAcetone	(Ampule)
F2036RPS	5x1ml	100ug/mlAcetone	(Ampule)
F2036AJS	1ml	2000ug/mlAcetone	(Ampule)
F2036ARPS	5x1ml	2000ug/mlAcetone	(Ampule)
F2036BJS	1ml	5000ug/mlMethanol	
F2036BRPS	5x1ml	5000ug/mlMethanol	

INTERNAL STANDARDS

EPA METHOD 515.1/515.2/515.3

F905	100mg	4.4'-Dibromooctafluorobiphenyl
F905JS	1ml	2000ug/mlMethylene chloride (Ampule)
F905RPS	5x1ml	2000ug/mlMethylene chloride (Ampule)
F905AJS	1ml	100ug/mltert-Butylmethyl ether (Ampule)
F905ARPS	5x1ml	100ug/mltert-Butylmethyl ether (Ampule)
F905BJS	1ml	5000ug/mlMethanol
F905BRPS	5x1ml	5000ug/mlMethanol
F905CJS	1ml	2000ug/mltert-Butylmethyl ether (Ampule)
F905CRPS	5x1ml	2000ug/mltert-Butylmethyl ether (Ampule)

EPA Method 525.1/525.2

ORGANOCHLORINE PESTICIDES MIXTURE

EPA METHOD 525.1/525.2

F2072	Alachlor
F89	Aldrin®
F2208	Atrazine
F907	cis-Chlordane
F908	trans-Chlordane
F98	Endrin
F100	Heptachlor
F101	Heptachlor epoxide
F104	Lindane
F910	Methoxychlor
F2180	trans-Nonachlor
F2073	Simazine

100ug/ml in Acetone - (12 components)

OCP-525JM **1ml Ampule**
OCP-525RPM **5x1ml Ampules**

ORGANOCHLORINE PESTICIDES MIXTURE #2

EPA METHOD 525.2

F2072	Alachlor
F89	Aldrin ®
F2208	Atrazine
F907	cis-Chlordane
F908	trans-Chlordane
F98	Endrin
F100	Heptachlor
F101	Heptachlor epoxide
F104	Lindane (BHC gamma isomer)
F910	Methoxychlor
F2180	trans-Nonachlor
F2073	Simazine

500ug/ml in Acetone - (12 components)

OCPH-525JM **1ml Ampule**
OCPH-525RPM **5x1ml Ampules**

PESTICIDES MIXTURE #1

EPA METHOD 525.2,*507*

F2209	Ametryne
F2227	Cycloate
F993	Disulfoton
F2246	Phenamiphos
F2210	Prometon
F2065	Tributylphosphorotrithioite

1000ug/ml in tert-Butylmethyl ether - (6 components)

PM507-1JM **1ml Ampule**
PM507-1RPM **5x1ml Ampules**

PESTICIDES MIXTURE #2

EPA METHOD 525.2,*507*

F2208	Atrazine
F2228	Diphenamid
F2229	S-Ethyl dipropylthiocarbamate
F2066	Phosdrin®
F2235	Prometryne
F2236	Propazine
F2062	Prophos
F2207	Terbutryne
F2218	Triadimefon

1000ug/ml in tert-Butylmethyl ether - (9 components)

PM507-2JM **5ml Ampule**
PM507-2RPM **5x1ml Ampules**

Chem Service EPA Pesticide Methods

PESTICIDES MIXTURE #3

EPA METHOD 525.2,*507*

F2204	Butachlor
F2203	Carboxin
F2060	Diazinon
F2241	Metolachlor
F2237	Metribuzin
F2239	MGK 264®
F2240	Norflurazon®
F2137	Terbufos
F2213	Vernolate

1000ug/ml in tert-Butylmethyl ether - (9 components)

PM507-3JM **1ml Ampule**
PM507-3RPM **5x1ml Ampules**

PESTICIDES MIXTURE #4

EPA METHOD 525.2,*507*

F2072	Alachlor
F2211	Atraton
F2221	Beam®
F2200	Bromacil
F2212	Butylate
F2199	Chlorpropham
F2242	Molinate
F1083	Propyzamide
F2069	Tetrachlorvinphos
F2232	Velpar

1000ug/ml in tert-Butylmethyl ether - (10 components)

PM507-4JM **1ml Ampule**
PM507-4RPM **5x1ml Ampules**

PESTICIDES MIXTURE #5

EPA METHOD 525.2,*507*

F2238	Devrinol®
F2061	Dichlorvos
F2230	Fenarimol
F2233	S-Propyl butylethylthiocarbamate
F2234	Simetryn
F2231	Sonar®
F2243	Tebuthiuron
F2206	Terbacil

1000ug/ml in tert-Butylmethyl ether - (8 components)

PM507-5JM **1ml Ampule**
PM507-5RPM **5x1ml Ampules**

ORGANOCHLORINE PESTICIDES MIXTURE #1

EPA METHOD 525.2,*508/508.1,608,617,625,8080A/8081,8250A, 8270B,CLP*

F89	Aldrin®
F102	BHC (alpha isomer)
F103	BHC (beta isomer)
F105	BHC (delta isomer)
F907	cis-Chlordane
F908	trans-Chlordane
F94	4.4-DDD
F93	4.4-DDE
F92	4.4-DDT
F90	Dieldrin
F202	a-Endosulfan
F203	b-Endosulfan
F97	Endosulfan sulfate
F98	Endrin
F99	Endrin aldehyde
F2022	Endrin ketone
F100	Heptachlor
F101	Heptachlor epoxide
F104	Lindane (BHC gamma isomer)
F910	Methoxychlor

1000ug/ml in tert-Butylmethyl ether - (20 components)

OCP508-1JM **1ml Ampule**
OCP508-1RPM **5x1ml Ampules**

DEGRADATION CALIBRATION MIXTURE

EPA METHOD 525.2,*508/508.1,608,617,625,1618,1656,8080A/8081, 8250A/8270B,CLP*

200ug/ml	F92	4,4'-DDT
100ug/ml	F98	Endrin

Mixture in tert-Butylmethyl ether - (2 components)

DC-508JM **1ml Ampule**
DC-508RPM **5x1ml Ampules**

DEGRADATION PRODUCTS MIXTURE

EPA METHOD 525.2,*508/508.1,608,617,625,1618,1656,8080A/8081, 8250A/8270B,CLP*

200ug/ml	F93	4.4'-DDE
200ug/ml	F94	4.4'-DDD
100ug/ml	F99	Endrin aldehyde
100ug/ml	F2022	Endrin ketone

Mixture in tert-Butylmethyl ether - (4 components)

DP508-1JM **1ml Ampule**
DP508-1RPM **5x1ml Ampules**

ORGANOCHLORINE PESTICIDES MIXTURE #2

EPA METHOD 525.2,*508/508.1*

F2201	Chloroneb
F986	Chlorobenzilate
F2220	Chlorothalonil
F2040	Chlorthal
F9	Hexachlorobenzene
F2216	Permethrin
F2205	Propachlor
F2202	Terrazole®
F2140	Trifluralin

1000ug/ml in tert-Butylmethyl ether - (9 components)

OCP508-2JM **1ml Ampule**
OCP508-2RPM **5x1ml Ampules**

DISULFOTON SULFONE & DISULFOTON SULFOXIDE STANDARDS

EPA METHOD 525.2

MET-652A	100mg	Disulfoton sulfone
MET-652B	100mg	Disulfoton sulfoxide

SIMAZINE STANDARDS

EPA METHOD 525.2

F2073	100mg	Simazine
F2073JS	1ml	100ug/mlMethanol
F2073RPS	5x1ml	100ug/mlMethanol
F2073AJS	1ml	1000ug/mlAcetone (Ampule)
F2073ARPS	5x1ml	1000ug/mlAcetone (Ampule)

Chem Service provides Certificate of Analyses with the purchase of "Standards Grade" pesticide, metabolite, and environmental materials as well as organic chemicals, solutions or mixtures, free of charge (where applicable). This will certify the material for purity or concentration, identity, stability and lot traceability.

Chem Service EPA Pesticide Methods

EPA Method 531.1

CARBAMATE PESTICIDES

EPA METHOD 531.1,*8318*

F2002	Aldicarb
F2003	Aldicarb sulfone
F2004	Aldicarb sulfoxide
F2045	Baygon®
F2005	Carbaryl
F2006	Carbofuran
F2359	Dioxacarb
F2053	3-Hydroxycarbofuran
F2042	Methiocarb
F2043	Methomyl
F2044	Oxamyl
F2358	Promecarb

NOTE: *Dioxacarb (F2359) and Promecarb (F2358) are not included in CP-8318M and CP-8318JM. Aldicarb sulfoxide (F2004) and Oxamyl (F2044) are not included in CP8318-2M.*

Neat compounds of each of the above - (12 component kit)
CP-8318N **KIT**

1ml Solutions of each, in the appropriate solvent - (12 component kit)
CP-8318JS **KIT**

100ug/ml in Acetonitrile - (10 components)
CP-8318JM **1ml**
CP-8318RPM **5x1ml Ampule**

1000ug/ml in Acetonitrile - (10 components)
CP8318-2JM **1ml**
CP8318-2RPM **5x1ml Ampule**

LABORATORY PERFORMANCE CHECK MIXTURE

EPA METHOD 531.1,*8318*

1000ug/ml	F2004	Aldicarb sulfoxide
100ug/ml	F2054	BDMC
20ug/ml	F2053	3-Hydroxycarbofuran
200ug/ml	F2042	Methiocarb

Mixture in Acetonitrile - (4 components)
LPC-531JM **1ml Ampule**
LPC-531RPM **5x1ml Ampule**

INTERNAL STANDARDS

EPA METHOD 531.1

F2054	100mg	BDMC
F2054JS	1ml	100ug/mlMethanol
F2054RPS	5x1ml	100ug/mlMethanol

EPA Method 535
Measurement of Chloroacetanilide and other Acetamide Herbicide Degradates in Drinking Water

Chem Service has produced the standards called for in EPA Method 535. Please contact us for current size and price information (610)692-3026 or email us at info@chemservice.com

EPA Method 547

GLYPHOSATE STOCK STANDARD

EPA METHOD 547

F1104JS	1ml	Glyphosate 100ug/mlDeionized water
F1104RPS	5x1ml	Glyphosate 100ug/mlDeionized water

EPA Method 548/548.1

ENDOTHAL STANDARD SOLUTIONS KIT

EPA METHOD 548

F1100JS	Endothal 50ug/ml in Deionized water
F1101RPS	Endothal 10ug/ml in Deionized water

1ml Solutions of each of the above - (2 component kit)
ES-548JS **KIT**

ENDOTHAL-PFPH DERIVATIVE STANDARDS

EPA METHOD 548

F2075	100mg	Endothal-PFPH
F2075JS	1ml	100ug/mltert-Butylmethyl ether (Ampule)
F2075RPS	5x1ml	100ug/mltert-Butylmethyl ether (Ampule)

ENDOTHAL STANDARDS

EPA METHOD 548.1

F2443	1g	Endothal
F2443JS	1ml	100ug/mlMethanol
F2443RPS	5x1ml	100ug/mlMethanol

ENDOTHAL METHYL DERIVATIVE STANDARDS

EPA METHOD 548.1

F2450	10mg	Dimethyl endothal
F2450JS	1ml	100ug/mlToluene (Ampule)
F2450RPS	5x1ml	100ug/mlToluene (Ampule)

INTERNAL STANDARDS

EPA METHOD 548

F202	100mg	a-Endosulfan
F202JS	1ml	100ug/mlHexane (Ampule)
F202RPS	5x1ml	100ug/mlHexane (Ampule)
F202AJS	1ml	100ug/mltert-Butylmethyl ether (Ampule)
F202ARPS	5x1ml	100ug/mltert-Butylmethyl ether (Ampule)

INTERNAL STANDARDS

EPA METHOD 548.1

F720	50mg	Acenaphthene-d_{10}
F720JS	1ml	2000ug/mlMethanol
F720RPS	5x1ml	2000ug/mlMethanol

EPA Method 549/549.1

DIQUAT/PARAQUAT

EPA METHOD 549.1

F1102AJS	Diquat Dibromide monohydrate Solution (1970ug/ml)
F1103AJS	Paraquat dichloride tetrahydrate Solution (1770ug/ml)

Note: Ion concentration of Diquat and Paraquat is 1000ug/ml

1ml Solutions of each, in deionized water - (2 component kit)
SS-549AJS **KIT**

DIQUAT/PARAQUAT

EPA METHOD 549.1

F1102JS	Diquat dibromide monohydrate 100ug/ml in Deionized water
F1103JS	Paraquat chloride tetrahydrate 100ug/ml in Deionized water

1ml Solutions of each of the above - (2 component kit)
SS-549JS **KIT**

Chem Service EPA Pesticide Methods

EPA Method 551.1

HALOGENATED PESTICIDES & HERBICIDES MIXTURE

EPA METHOD 551.1

F2072	Alachlor
F2208	Atrazine
F2200	Bromacil
F2487	Bladex
F98	Endrin
F99	Endrin aldehyde
F2022	Endrin ketone
F100	Heptachlor
F101	Heptachlor epoxide
F9	Hexachlorobenzene
F53	Hexachlorocyclopentadiene
F104	Lindane (BHC gamma isomer)
F2241	Metolachlor
F2237	Metribuzin
F910	Methoxychlor
F2073	Simazine
F2140	Trifluralin

1000ug/ml in Acetone - (17 components)

HPH551-1JM **1ml Ampule**

HPH551-1RPM **5x1ml Ampules**

SURROGATE STANDARDS

EPA METHOD 551.1

F904	1g	Decafluorobiphenyl
F904JS	1ml	2000ug/mlMethylene chloride (Ampule)
F904RPS	5x1ml	2000ug/mlMethylene chloride (Ampule)
F904AJS	1ml	2000ug/mlAcetonitrile
F904ARPS	5x1ml	2000ug/mlAcetonitrile
F904BJS	1ml	1000ug/mlAcetone (Ampule)
F904BRPS	5x1ml	1000ug/mlAcetone (Ampule)

INTERNAL STANDARDS

EPA METHOD 551.1

F833	5g	4-Bromofluorobenzene
F833JS	1ml	2000ug/mlMethanol
F833RPS	5x1ml	2000ug/mlMethanol
F833AJS	1ml	10,000ug/mlAcetone (Ampule)
F833ARPS	5x1ml	10,000ug/mlAcetone (Ampule)

EPA Method 553

BENZIDINES & NITROGEN CONTAINING PESTICIDES

EPA METHOD 553

250ug/ml	F5	Benzidine
370ug/ml	F2493	Benzoylprop ethyl
310ug/ml	F2428	Caffeine
310ug/ml	F2005	Carbaryl
740ug/ml	F2429	1-(2-Chlorophenyl)-2-thiourea
240ug/ml	F28	3.3'-Dichlorobenzidine
770ug/ml	F2154	3.3'-Dimethoxybenzidine
440ug/ml	F2371	Diuron
1310ug/ml	F2280	Linuron
400ug/ml	F2374	Monuron
3160ug/ml	F2382	Rotenone
470ug/ml	F2377	Siduron
330ug/ml	F991	o-Tolidine

Mixture in Acetonitrile - (13 components)

BNCP-553JM **1ml Ampule**

BNCP-553RPM **5x1ml Ampules**

PERFORMANCE CHECK STANDARDS

EPA METHOD 553

F2456	10mg	Decafluorotriphenylphosphine oxide
F2456JS	1ml	100ug/mlAcetonitrile
F2456RPS	5x1ml	100ug/mlAcetonitrile

2-IMIDAZOLIDINETHIONE (Ethylene Thiourea) STANDARDS

EPA METHOD 553

F2430	5g	2-Imidazolidinethione
F2430JS	5ml	5000ug/mlAcetonitrile
F2430RPS	5x1ml	5000ug/mlAcetonitrile

SURROGATE STANDARDS MIXTURE

EPA METHOD 553

F2455	Benzidine-d_8
F2456	Decafluorotriphenylphosphine oxide

500ug/ml in Methanol - (2 components)

SS-553JM **1ml Ampule**

SS-553RPM **5x1ml Ampules**

SURROGATE STANDARDS

EPA METHOD 553

		Benzidine-d_8
F2455JS	1ml	100ug/mlMethanol
F2455RPS	5x1ml	100ug/mlMethanol
F2456	10mg	Decafluorotriphenylphosphine oxide
F2456JS	1ml	100ug/mlAcetonitrile
F2456RPS	5x1ml	100ug/mlAcetonitrile

EPA Method 555

CHLORINATED HERBICIDES MIXTURE #1

EPA METHOD 555

F2037	Acifluorfen
F2038	Bentazon
F2039	Chloramben
F954	2.4-D
F960	Dicamba
F962	Dichlorprop
F2041	Picloram
F970	Silvex

1000ug/ml in Acetonitrile - (8 components)

CH555-1JM **1ml Ampules**

CH555-1RPM **5x1ml Ampules**

CHLORINATED HERBICIDES MIXTURE #2

EPA METHOD 555

F966	4-Chloro-o-tolyloxyacetic acid
F958	2.4-DB
F2034	3,5-Dichlorobenzoic acid
F964	Dinoseb
F968	Mecoprop
F58	4-Nitrophenol
F64	Pentachlorophenol
F972	2.4.5-T®

1000ug/ml in Acetonitrile - (8 components)

CH555-2JM **1ml Ampule**

CH555-2RPM **5x1ml Ampules**

EPA Method 604.1

PHENOLIC PESTICIDES

EPA METHOD 604.1

F2288	Dichlorophen
F995	Hexachlorophene

Neat compounds of each of the above - (2 component kit)

PP604-1N **KIT** **$70.00**

1ml Solutions of each, 100ug/ml in Methanol - (2 component kit)

PP604-1JS **KIT** **$62.00**

EPA Method 608/608.1/608.2

ORGANOCHLORINE PESTICIDES

EPA METHOD 608,*508,625,8080A/8081,8250A/8270B,CLP*

F89	Aldrin®
F109	Arochlor 1242
F111	Arochlor 1254
F108	Arochlor 1221
F113	Arochlor 1232
F110	Arochlor 1248
F112	Arochlor 1260
F107	Arochlor 1016
F102	a-BHC
F103	b-BHC
F105	d-BHC
F91	Chlordane
F94	4,4'-DDD
F93	4,4'-DDE
F92	4,4'-DDT
F90	Dieldrin
F202	a-Endosulfan
F203	b-Endosulfan
F97	Endosulfan sulfate
F98	Endrin
F99	Endrin aldehyde
F100	Heptachlor
F101	Heptachlor epoxide
F104	Lindane (g-BHC)
F910	Methoxychlor
F106	Toxaphene®

NOTE: *PPO-8JM, PPO-8RPM, PP-HC5JM, PP-HC5RPM, OCP-8080JM, OCP-8080RPM, OCP508-1JM and OCP508-1RPM do not contain the Arochlors, Chlordane or Toxaphene.*

NOTE: *PPO-8JM, PPO-8RPM, PP-HC5JM and PP-HC5RPM do not contain Methoxychlor.*

NOTE: *OCP508-1JM, OCP508-1RPM contain F2022 Endrin Ketone, F907 cis-Chlordane and F908 trans-Chlordane.*

Neat compounds of each of the above - (26 component kit)
PPO-8N **KIT**

1ml Solutions of each, in the appropriate solvent - (26 component kit)
PPO-8JS **KIT**

100ug/ml in Toluene:Hexane (50:50), less Methoxychlor - (16 components)
PPO-8JM **1ml Ampule**
PPO-8RPM **5x1ml Ampules**

2000ug/ml in Toluene:Hexane (50:50), less Methoxychlor - (16 components)
PP-HC5JM **1ml Ampule**
PP-HC5RPM **5x1ml Ampules**

100ug/ml in Toluene:Hexane (50:50) - (17 components)
OCP-8080JM **1ml Ampule**
OCP-8080RPM **5x1ml Ampules**

1000ug/ml in tert-Butylmethyl ether - (20 components)
OCP508-1JM **1ml Ampule**
OCP508-1RPM **5x1ml Ampules**

TOXAPHENE® & CHLORDANE KIT

EPA METHOD 608,*617,625,8080A/8081,8250A/8270B,CLP*

F91	Chlordane
F106	Toxaphene®

Neat compounds of each of the above - (2 component kit)
PP-7N **KIT**

1ml Solutions of each, in the appropriate solvent - (2 component kit)
PP-7JS **KIT**

POLYCHLORINATED BIPHENYLS

EPA METHOD 608,*617,625,8080A/8081,8250A/8270B,CLP*

F107	Arochlor 1016
F108	Arochlor 1221
F113	Arochlor 1232
F109	Arochlor 1242
F110	Arochlor 1248
F111	Arochlor 1254
F112	Arochlor 1260

Neat compounds of each of the above - (7 component kit)
PP-8N **KIT**

1ml Solutions of each, 100ug/ml in Methanol - (7 component kit)
PP-8JS **KIT**

PESTICIDES - CONTROL SAMPLE MIXTURE

EPA METHOD 608,*8080A/8081*

20ug/ml	F89	Aldrin
20ug/ml	F102	BHC (alpha isomer)
20ug/ml	F103	BHC (beta isomer)
100ug/ml	F94	4.4'-DDD
20ug/ml	F93	4.4'-DDE
100ug/ml	F92	4.4'-DDT
20ug/ml	F90	Dieldrin
20ug/ml	F202	a-Endosulfan
100ug/ml	F203	b-Endosulfan
100ug/ml	F97	Endosulfan sulfate
100ug/ml	F98	Endrin
20ug/ml	F100	Heptachlor
20ug/ml	F101	Heptachlor epoxide

Mixture in Toluene - (13 components)
CSM-8080JM **1ml Ampule**
CSM-8080RPM **5x1ml Ampules**

AROCHLORS, TOXAPHENE® & CHLORDANE SOLUTIONS KIT

EPA METHOD 608,*505,508,525.2,617,625,1656,8080A/8081, 8250A/8270B,CLP*

F107AS	Arochlor 1016 Solution
F108AS	Arochlor 1221 Solution
F113AS	Arochlor 1232 Solution
F109AS	Arochlor 1242 Solution
F110AS	Arochlor 1248 Solution
F111AS	Arochlor 1254 Solution
F112BS	Arochlor 1260 Solution
F91AS	Chlordane Solution
F106BS	Toxaphene® Solution

1ml Solutions of each, 1000ug/ml in Hexane - (9 component kit)
CTA608-1JS **KIT**

DEGRADATION CALIBRATION MIXTURE

EPA METHOD 608,*508/508.1,525.2,617,625,1618,1656,8080A/8081, 8250A/8270B,CLP*

200ug/ml	F92	4.4'-DDT
100ug/ml	F98	Endrin

Mixture in tert-Butylmethyl ether - (2 components)
DC-508JM **1ml Ampule**
DC-508RPM **5x1ml Ampules**

DEGRADATION PRODUCTS MIXTURE

EPA METHOD 608,*508/508.1,525.2,617,625,1618,1656,8080A/8081, 8250A/8270B,CLP*

200ug/ml	F93	4.4'-DDE
200ug/ml	F94	4.4'-DDD
100ug/ml	F99	Endrin aldehyde
100ug/ml	F2022	Endrin ketone

Mixture in tert-Butylmethyl ether - (4 components)
DP508-1JM **1ml Ampule**
DP508-1RPM **5x1ml Ampules**

Chem Service EPA Pesticide Methods

ORGANOCHLORINE PESTICIDES KIT #1

EPA METHOD 608.1

F986	Chlorobenzilate
F2201	Chloroneb
F2289	Chloropropylate
F819	1.2-Dibromo-3-chloropropane
F999	Pentachloronitrobenzene
F2205	Propachlor
F2202	Terrazole ®

Neat compounds of each of the above - (7 component kit)
OCP608-1N **KIT**

1ml Solutions of each, in the appropirate solvent - (7 component kit)
OCP608-1JS **KIT**

ORGANOCHLORINE PESTICIDES MIXTURE #1

EPA METHOD 608.1

200ug/ml	F986	Chlorobenzilate
40ug/ml	F2201	Chloroneb
200ug/ml	F2289	Chloropropylate
40ug/ml	F819	1.2-Dibromo-3-chloropropane
60ug/ml	F999	Pentachloronitrobenzene
1000ug/ml	F2205	Propachlor
40ug/ml	F2202	Terrazole®

Mixture in Isooctane - (7 components)
OCP608-1JM **1ml Ampule**
OCP608-1RPM **5x1ml Ampules**

ORGANOCHLORINE PESTICIDES#2

EPA METHOD 608.2

F2220	Chlorothalonil
F2040	Chlorthal
F2290	Dicloran
F910	Methoxychlor
F2216	Permethrin

Neat compounds of each of the above - (5 component kit)
OCP608-2N **KIT**

1ml Solutions of each, in the appropirate solvent - (5 component kit)
OCP608-2JS **KIT**

1000ug/ml in Toluene - (5 components)
OCP608-2JM **1ml Ampule**
OCP608-2RPM **5x1ml Ampules**

EPA Method 614/614.1

ORGANOPHOSPHOROUS PESTICIDES MIXTURE #1

EPA METHOD 614

F2059	Demeton S
F2060	Diazinon
F993	Disulfoton
F2113	Ethion
F2055	Guthion®
F2118	Malathion
F996	Methyl parathion
F998	Parathion®

1000ug/ml in Hexane - (8 components)
OPP614-1JM **1ml Ampule**
OPP614-1RPM **5x1ml Ampules**

With our expertise in analyte compatibility, solubility, solution stability and analysis, Chem Service is uniquely qualified to provide your customized solutions and mixture standards. For a custom quotation, please use the use the request form on page 144.

ORGANOPHOSPHOROUS PESTICIDES MIXTURE #2

EPA METHOD 614.1

F2110	Dioxathion
F2112	EPN
F2113	Ethion
F2137	Terbufos

1000ug/ml in Hexane - (4 components)
OPP614-2JM **1ml Ampule**
OPP614-2RPM **5x1ml Ampules**

EPA Method 615

CHLORINATED HERBICIDES

EPA METHOD 615,*8151*

F2037	Acifluorfen
F2038	Bentazon
F2039	Chloramben
F966	4-Chloro-o-tolyloxyacetic acid
F954	2,4-D
F956	Dalapon
F958	2,4-DB
F960	Dicamba
F2034	3,5-Dichlorobenzoic acid
F962	Dichlorprop
F964	Dinoseb
MET-346A	5-Hydroxydicamba
F968	Mecoprop
F58	4-Nitrophenol
F64	Pentachlorophenol
F2041	Picloram
F970	Silvex
F972	2,4,5-T®
F2178	Tetrachloroterephthalic acid

NOTE: *5-Hydroxydicamba, MET-346A, is available 100ug/ml in Acetone:Water (90:10) only and is not included in CH-8151JM or CH-8151RPM.*

Neat compounds of each of the above - (19 component kit)
CH-8151N **KIT**

Solutions of each of the above in an appropriate solvent - (19 component kit)
CH-8151JS **KIT**

1000ug/ml in Acetone - (18 components)
CH-8151JM **1ml Ampule**
CH-8151RPM **5x1ml Ampules**

CHLORINATED HERBICIDES - CONTROL SAMPLE MIXTURE

EPA METHOD 615,*8150B*

10,000ug/ml	F966	4-Chloro-o-tolyloxyacetic acid
100ug/ml	F954	2.4-D
250ug/ml	F956	Dalapon
100ug/ml	F958	2.4-DB
10ug/ml	F960	Dicamba
100ug/ml	F962	Dichlorprop
50ug/ml	F964	Dinoseb
10,000ug/ml	F968	Mecoprop
10ug/ml	F970	Silvex
10ug/ml	F972	2.4.5-T®

Mixture in Toluene - (10 components)
CSM8150-1JM **1ml Ampule**
CSM8150-1RPM **5x1ml Ampules**

Chem Service EPA Pesticide Methods

METHYLATED CHLORINATED HERBICIDES

EPA METHOD 615,*8151*

F2224	Acifluorfen methyl ester
F2244	Bentazon methyl derivative
F2226	Chloramben methyl ester
F967	4-Chloro-o-tolyloxyacetic acid methyl ester
F2040	Chlorthal
F955	2.4-D methyl ester
F957	Dalapon methyl ester
F959	2,4-DB methyl ester
F961	Dicamba methyl ester
F2223	3.5-Dichlorobenzoic acid methyl ester
F963	Dichlorprop methyl ester
F965	Dinoseb methyl ether
MET-346A	5-Hydroxydicamba
F969	Mecoprop methyl ester
F2175	p-Nitroanisole
F2156	Pentachloroanisole
F2155	Picloram methyl ester
F971	Silvex methyl ester
F973	(2.4.5-Trichlorophenoxy)acetic acid methyl ester

NOTE: *5-Hydroxydicamba, MET-346A, is not included in MCH-8151JM or MCH-8151RPM.*

NOTE: *In MCH-8151N and MCH-8151JS, MET-364A is included as a non-methyl ester, at 100ug/ml in Acetone:Water (90:10).*

Neat compounds of each of the above - (19 component kit)
MCH-8151N **KIT**

5ml Solutions of each, in the appropriate solvent - (19 component kit)
MCH-8151JS **KIT**

1000ug/ml in Acetone:Isooctane (10:90) - (18 components)
MCH-8151JM **1ml Ampule**
MCH-8151RPM **5x1ml Ampule**

METHYLATED CHLORINATED HERBICIDES - CONTROL SAMPLE MIXTURE

EPA METHOD 615,*8150B*

10000ug/ml	F967	4-Chloro-o-tolyloxyacetic acid methyl ester
100ug/ml	F955	2.4-D methyl ester
250ug/ml	F957	Dalapon methyl ester
100ug/ml	F959	2,4-DB methyl ester
10ug/ml	F961	Dicamba methyl ester
100ug/ml	F963	Dichlorprop methyl ester
50ug/ml	F965	Dinoseb methyl ether
10000ug/ml	F969	Mecoprop methyl ester
10ug/ml	F971	Silvex methyl ester
10ug/ml	F973	(2.4.5-Trichlorophenoxy)acetic acid methyl ester

Mixture in Hexane - (10 components)
MCSM8150-1JM **1ml Ampule**
MCSM8150-1RPM **5x1ml Ampules**

EPA Method 616

CARBON, HYDROGEN & OXYGEN PESTICIDE COMPOUNDS MIXTURE

EPA METHOD 616

F2520	Cycloprate
F2521	Kinoprene
F2292	Methoprene ®
F2293	Resmethrin

1000ug/ml in tert-Butylmethyl ether - (4 components)
CHOP616-1JM **1ml Ampule**
CHOP616-1RPM **5x1ml Ampule**

EPA Method 617

ORGANOHALIDE PESTICIDES MIXTURE

EPA METHOD 617

F2095	Captan
F2096	Carbophenothion
F2290	Dicloran
F921	Isodrin
F2281	Kelthane®
F2121	Mirex
F999	Pentachloronitrobenzene
F2295	Perthane®
F2318	Strobane®
F2140	Trifluralin

1000ug/ml in Methylene chloride - (10 components)
OHP617-1JM **1ml Ampule**
OHP617-1RPM **5x1ml Ampules**

TOXAPHENE® & CHLORDANE KIT

EPA METHOD 617,*608,625,8080A/8081,8250A/8270B,CLP*

F91	Chlordane
F106	Toxaphene®

Neat compounds of each of the above - (2 component kit)
PP-7N **KIT**

1ml Solutions of each, in the appropriate solvent - (2 component kit)
PP-7JS **KIT**

AROCHLORS, TOXAPHENE® & CHLORDANE SOLUTIONS KIT

EPA METHOD 617,*505,508,525.2,608,625,1656,8080A/8081,8250A,8270B,CLP*

F107AS	Arochlor 1016 Solution
F108AS	Arochlor 1221 Solution
F113AS	Arochlor 1232 Solution
F109AS	Arochlor 1242 Solution
F110AS	Arochlor 1248 Solution
F111AS	Arochlor 1254 Solution
F112BS	Arochlor 1260 Solution
F91AS	Chlordane Solution
F106BS	Toxaphene® Solution

1ml Solutions of each, 1000ug/ml in Hexane - (9 component kit)
CTA608-1JS **KIT**

ORGANOCHLORINE PESTICIDES MIXTURE

EPA METHOD 617,*508,608,625,8080/8081,8250A/8270B,CLP*

F89	Aldrin
F102	BHC (alpha isomer)
F103	BHC (beta isomer)
F105	BHC (delta isomer)
F94	4.4'-DDD
F93	4.4'-DDE
F92	4.4'-DDT
F90	Dieldrin
F202	a-Endosulfan
F203	b-Endosulfan
F97	Endosulfan sulfate
F98	Endrin
F99	Endrin aldehyde
F100	Heptachlor
F101	Heptachlor epoxide
F104	Lindane (BHC gamma isomer)
F910	Methoxychlor

100ug/ml in Toluene:Hexane (50:50) - (17 components)
OCP-8080JM **1ml Ampule**
OCP-8080RPM **5x1ml Ampule**

Chem Service EPA Pesticide Methods

POLYCHLORINATED BIPHENYLS

EPA METHOD 617,*505,608,625,8080A/8081,8250A/8270B,CLP*

F107	Arochlor 1016
F108	Arochlor 1221
F113	Arochlor 1232
F109	Arochlor 1242
F110	Arochlor 1248
F111	Arochlor 1254
F112	Arochlor 1260

Neat compounds of each of the above - (7 component kit)
PP-8N **KIT**

1ml Solutions of each, 100ug/ml in Methanol - (7 component kit)
PP-8JS **KIT**

DEGRADATION CALIBRATION MIXTURE

EPA METHOD 617,*508/508.1,525.2,608,625,1618,1656,8080A/8081, 8250A/8270B,CLP*

200ug/ml	F92	4.4'-DDT
100ug/ml	F98	Endrin

Mixture in tert-Butylmethyl ether - (2 components)
DC-508JM **1ml Ampule**
DC-508RPM **5x1ml Ampules**

DEGRADATION PRODUCTS MIXTURE

EPA METHOD 617,*508/508.1,525.2,608,625,1618,1656,8080A/8081, 8250A/8270B,CLP*

200ug/ml	F93	4.4'-DDE
200ug/ml	F94	4.4'-DDD
100ug/ml	F99	Endrin aldehyde
100ug/ml	F2022	Endrin ketone

Mixture in tert-Butylmethyl ether - (4 components)
DP508-1JM **1ml Ampule**
DP508-1RPM **5x1ml Ampules**

EPA Method 618

VOLATILE PESTICIDES MIXTURE

EPA METHOD 618

F2023	Chloropicrin
F820	1.2-Dibromoethane

20,000ug/ml in Cyclohexane - (2 components)
VP618-1JM **1ml Ampule**
VP618-1RPM **5x1ml Ampules**

INTERNAL STANDARDS

EPA METHOD 618

F47	5g	Bromoform
F47JS	1ml	100ug/mlMethanol
F47RPS	5x1ml	100ug/mlMethanol

EPA Method 619

TRIAZINE PESTICIDES MIXTURE

EPA METHOD 619

F2209	Ametryne
F2211	Atraton
F2208	Atrazine
F2210	Prometon
F2235	Prometryne
F2236	Propazine
F2234	Simetryn
F2073	Simazine
F2291	Terbuthylazine
F2207	Terbutryne

500ug/ml in Acetone - (10 components)
TP619-1JM **5ml Ampule**

EPA Method 622/622.1

ORGANOPHOSPHOROUS PESTICIDES MIXTURE #1

EPA METHOD 622

F2058	Coumaphos
F2059	Demeton S
F993	Disulfoton
F2063	Fensulfothion
F2064	Fenthion
F2055	Guthion®
F1080	Phorate
F2056	Sulprofos
F2070	Tokuthion®
F2222	Trichloronate

1000ug/ml in Methylene chloride - (10 components)
OPP622-1AJM **1ml Ampule**
OPP622-1ARPM **5x1ml Ampules**

ORGANOPHOSPHOROUS PESTICIDES MIXTURE #2

EPA METHOD 622

F2061	Dichlorvos
F2066	Phosdrin®
F2069	Tetrachlorvinphos

1000ug/ml in Hexane - (3 components)
OPP622-1BJM **1ml Ampule**
OPP622-1BRPM **5x1ml Ampules**

ORGANOPHOSPHOROUS PESTICIDES MIXTURE #3

EPA METHOD 622

F2057	Chlorpyrifos
F2296	Chlorpyrifos Methyl
F2060	Diazinon
F2068	Fenchlorphos
F996	Methyl parathion
F2062	Prophos
F2065	Tributylphosphorotrithioite

1000ug/ml in Hexane - (7 components)
OPP622-2JM **1ml Ampule**
OPP622-2RPM **5x1ml Ampules**

ORGANOPHOSPHOROUS PESTICIDES MIXTURE #4

EPA METHOD 622

F2067	Dibrom
F2061	Dichlorvos
F2069	Tetrachlorvinphos

1000ug/ml in Hexane - (3 components)
OPP622-3JM **1ml Ampule**
OPP622-3RPM **5x1ml Ampules**

MERPHOS CALIBRATION STANDARDS

EPA METHOD 622,*507,1657,8140/8141A,8321*

F2214	1g	S.S.S-Tributylphosphorotrithioate
F2214JS	1ml	100ug/mltert-Butylmethyl ether (Ampule)
F2214RPS	5x1ml	100ug/mltert-Butylmethyl ether (Ampule)

Chem Service EPA Pesticide Methods

EPA Method 625

PESTICIDE MIXTURE #1

EPA METHOD 625

F102	BHC (alpha isomer)
F94	4.4'-DDD
F90	Dieldrin
F98	Endrin
F100	Heptachlor
F101	Heptachlor epoxide
F104	Lindane (BHC gamma isomer)

100ug/ml in Acetone - (7 components)

PM625-1JM **1ml Ampule**
PM625-1RPM **5x1ml Ampules**

PESTICIDE MIXTURE #2

EPA METHOD 625

F89	Aldrin®
F103	BHC (beta isomer)
F93	4.4'-DDE
F92	4.4'-DDT
F202	a-Endosulfan
F203	b-Endosulfan

100ug/ml in Acetone - (6 components)

PM625-2JM **1ml Ampule**
PM625-2RPM **5x1ml Ampules**

DEGRADATION PRODUCTS MIXTURE

EPA METHOD 625,*508/508.1,525.2,608,617,1656,8080A/8081, 8250A/8270B,CLP*

200ug/ml	F93	4.4'-DDE
200ug/ml	F94	4.4'-DDD
100ug/ml	F99	Endrin aldehyde
100ug/ml	F2022	Endrin ketone

Mixture in tert-Butylmethyl ether - (4 components)

DP508-1JM **1ml Ampule**
DP508-1RPM **5x1ml Ampules**

DEGRADATION CALIBRATION MIXTURE

EPA METHOD 625,*508/508.1,525.2,608,617,1656,8080A/8081, 8250A/8270B,CLP*

100ug/ml	F98	Endrin
200ug/ml	F92	4.4'-DDT

Mixture in tert-Butylmethyl ether - (2 components)

DC-508JM **1ml Ampule**
DC-508RPM **5x1ml Ampules**

Synthesis Capability

Chem Service is continually increasing the number of "Standards Grade" pesticide materials in response to the increasing worldwide need for these analytical grade standards. Our chemists are experts in the synthesis and purification of pesticides and their related metabolites. Since we last printed this catalog, Chem Service has added more than 100 new neat "Standards Grade" pesticides and metabolites and several hundred single component pesticide standard solutions.

ORGANOCHLORINE PESTICIDES

EPA METHOD 608,*508,625,8080A/8081,8250A/8270B,CLP*

F89	Aldrin®
F109	Arochlor 1242
F111	Arochlor 1254
F108	Arochlor 1221
F113	Arochlor 1232
F110	Arochlor 1248
F112	Arochlor 1260
F107	Arochlor 1016
F102	a-BHC
F103	b-BHC
F105	d-BHC
F91	Chlordane
F94	4,4'-DDD
F93	4,4'-DDE
F92	4,4'-DDT
F90	Dieldrin
F202	a-Endosulfan
F203	b-Endosulfan
F97	Endosulfan sulfate
F98	Endrin
F99	Endrin aldehyde
F100	Heptachlor
F101	Heptachlor epoxide
F104	Lindane (g-BHC)
F910	Methoxychlor
F106	Toxaphene®

NOTE: *PPO-8JM, PPO-8RPM, PP-HC5JM, PP-HC5RPM, OCP-8080JM, OCP-8080RPM, OCP508-1JM and OCP508-1RPM do not contain the Arochlors, Chlordane or Toxaphene.*

NOTE: *PPO-8JM, PPO-8RPM, PP-HC5JM and PP-HC5RPM do not contain Methoxychlor.*

NOTE: *OCP508-1JM, OCP508-1RPM contain F2022 Endrin Ketone, F907 cis-Chlordane and F908 trans-Chlordane.*

Neat compounds of each of the above - (26 component kit)

PPO-8N **KIT**

1ml Solutions of each, in the appropriate solvent - (26 component kit)

PPO-8JS **KIT**

100ug/ml in Toluene:Hexane (50:50), less Methoxychlor - (16 components)

PPO-8JM **1ml Ampule**
PPO-8RPM **5x1ml Ampules**

2000ug/ml in Toluene:Hexane (50:50), less Methoxychlor - (16 components)

PP-HC5JM **1ml Ampule**
PP-HC5RPM **5x1ml Ampules**

100ug/ml in Toluene:Hexane (50:50) - (17 components)

OCP-8080JM **1ml Ampule**
OCP-8080RPM **5x1ml Ampules**

1000ug/ml in tert-Butylmethyl ether - (20 components)

OCP508-1JM **1ml Ampule**
OCP508-1RPM **5x1ml Ampules**

EPA Method 627

DINITROANILINE PESTICIDES MIXTURE

EPA METHOD 627

F2364	Benfluralin
F2365	Ethalfluralin
F2366	Isopropalin
F2367	Profluoralin®
F2140	Trifluralin

1000ug/ml in Hexane - (5 components)

DNAP627-1JM **1ml Ampule**
DNAP627-1RPM **5x1ml Ampules**

Chem Service EPA Pesticide Methods

CALIBRATION STANDARDS

EPA METHOD 627

F2140	1g	Trifluralin
F2140JS	1ml	100ug/mlToluene (Ampule)
F2140RPS	5x1ml	100ug/mlToluene (Ampule)

EPA Method 629

BLADEX (CYANAZINE) STANDARDS

EPA METHOD 629

F2487	1g	Bladex
F2487S	1ml	1000ug/mltert-Butylmethyl ether (Ampule)
F2487S	5x1ml	1000ug/mltert-Butylmethyl ether (Ampule)

EPA Method 630/630.1

DITHIOCARBAMATE PESTICIDES CALIBRATION STANDARDS

EPA METHOD 630/630.1

F2368	1g	Ziram
F2368JS	1ml	100ug/mlAcetonitrile
F2368RPS	5x1ml	100ug/mlAcetonitrile

INTERFERENT CHECK STANDARDS

EPA METHOD 630.1

F705	5g	Carbon disulfide (Ampule)
F705JS	1ml	100ug/mlMethanol (Ampule)
F705RPS	5x1ml	100ug/mlMethanol (Ampule)
F705AJS	1ml	100ug/mlHexane (Ampule)
F705ARPS	5x1ml	100ug/mlHexane (Ampule)

EPA Method 631

BENOMYL AND CARBENDAZIM STANDARDS

EPA METHOD 631

PS-222	100mg	Benomyl
F2369	100mg	Carbendazim
F2369JS	1ml	100ug/mlMethanol
F2369RPS	5x1ml	100ug/mlMethanol

EPA Method 632

CARBAMATE & UREA PESTICIDES MIXTURE

EPA METHOD 632

F2370	Aminocarb
F2091	Barban
F2045	Baygon®
F2005	Carbaryl
F2006	Carbofuran
F2199	Chlorpropham
F2371	Diuron
F2372	Fenuron
F2373	Fluometuron
F2280	Linuron
F2042	Methiocarb
F2043	Methomyl
F2374	Monuron
F2375	Neburon
F2044	Oxamyl
F2376	Propham
F2377	Siduron
F2378	Swep

1000ug/ml in Acetonitrile - (18 components)

CUP632-1JM **1ml Ampule**
CUP632-1RPM **5x1ml Ampules**

CARBAMATE & UREA PESTICIDES MIXTURE #2

EPA METHOD 632

F2370	Aminocarb
F2091	Barban
F2045	Baygon®
F2005	Carbaryl
F2006	Carbofuran
F2199	Chlorpropham
F2371	Diuron
F2372	Fenuron
F2373	Fluometuron
F2280	Linuron
F2042	Methiocarb
F2043	Methomyl
F2374	Monuron
F2375	Neburon
F2044	Oxamyl
F2376	Propham
F2377	Siduron
F2378	Swep
F2559	Zectran *(Mexacarbate)*

1000ug/ml in Acetonitrile - (19 components)

CUP632-2JM **1ml Ampule**
CUP632-2RPM **5x1ml Ampules**

ADDITIONAL ANALYTES

EPA METHOD 632

F2558	1g	Fenuron TCA
F2558JS	1ml	1000ug/mlAcetonitrile (Ampule)
F2558RPS	5x1ml	1000ug/mlAcetonitrile (Ampule)
F2560	1g	Monuron TCA
F2560JS	1ml	1000ug/mlAcetonitrile (Ampule)
F2560RPS	5x1ml	1000ug/mlAcetonitrile (Ampule)

EPA Method 632.1

CARBAMATE & AMIDE PESTICIDES MIXTURE

EPA METHOD 632.1

F2238	Devrinol®
F2379	Propanil

1000ug/ml in Acetonitrile:Acetone (90:10) - (2 components)

CAP632-1JM **1ml Ampule**
CAP632-1RPM **5x1ml Ampules**

EPA Method 633

ORGANONITROGEN PESTICIDES MIXTURE

EPA METHOD 633

F2221	Beam®
F2200	Bromacil
F2284	N.N-Diethyl-m-toluamide
F2237	Metribuzin
F2206	Terbacil
F2218	Triadimefon
F2232	Velpar

1000ug/ml in Acetone - (7 components)

ONP633-1JM **1ml Ampule**
ONP633-1RPM **5x1ml Ampules**

Chem Service EPA Pesticide Methods

EPA Method 633.1

NEUTRAL NITROGEN CONTAINING PESTICIDES MIXTURE

EPA METHOD 633.1

F2230	Fenarimol
F2239	MGK 264®
F2381	MGK 326®
F1083	Propyzamide

1000ug/ml in Methanol - (4 components)

NNP633-1JM **1ml Ampule**
NNP633-1RPM **5x1ml Ampules**

EPA Method 634

THIOCARBAMATE PESTICIDES MIXTURE

EPA METHOD 634

F2212	Butylate
F2227	Cycloate
F2229	S-Ethyl dipropylthiocarbamate
F2242	Molinate
F2233	S-Propyl butylethylthiocarbamate
F2213	Vernolate

1000ug/ml in tert-Butylmethyl ether - (6 components)

TCP-507JM **1ml Ampule**
TCP-507RPM **5x1ml Ampules**

INTERNAL STANDARDS

EPA METHOD 634

F2052	5g	Triphenyl phosphate
F2052JS	1ml	500ug/mltert-Butylmethyl ether (Ampule)
F2052RPS	5x1ml	500ug/mltert-Butylmethyl ether (Ampule)

SURROGATE STANDARDS

EPA METHOD 634

F2051	5g	1,3-Dimethyl-2-nitrobenzene
F2051JS	1ml	2000ug/mltert-Butylmethyl ether (Ampule)
F2051RPS	5x1ml	2000ug/mltert-Butylmethyl ether (Ampule)

EPA Method 635

ROTENONE STANDARDS

EPA METHOD 635

F2382	1g	Rotenone
F2382JS	1ml	1000ug/mlMethylene chloride
F2382RPS	5x1ml	1000ug/mlMethylene chloride

EPA Method 636

BENSULIDE STANDARDS

EPA METHOD 636

F2383	100mg	Bensulide
F2383JS	1ml	1000ug/ml Methanol
F2383RPS	5x1ml	1000ug/ml Methanol

EPA Method 637

TCMTB AND MBTS (2,2'-DITHIOBIS(BENZO-THIAZOLE) STANDARDS

EPA METHOD 637

F2385	100mg	TCMTB
F2385JS	1ml	1000ug/mlMethylene chloride (Ampule)
F2385RPS	5x1ml	1000ug/mlMethylene chloride (Ampule)
F2384	5g	2,2'-Dithiobis(benzothiazole) (MBTS)
F2384JS	1ml	1000ug/mlMethylene chloride (Ampule)
F2384RPS	5x1ml	1000ug/mlMethylene chloride (Ampule)

EPA Method 638

ORYZALIN STANDARDS

EPA METHOD 638

F2386	1g	Oryzalin
F2386JS	1ml	1000ug/mlAcetonitrile
F2386RPS	5x1ml	1000ug/mlAcetonitrile

EPA Method 639

BENDIOCARB STANDARDS

EPA METHOD 639

F2387	1g	Bendiocarb
F2387JS	1ml	1000ug/mlAcetonitrile
F2387RPS	5x1ml	1000ug/mlAcetonitrile

INTERNAL STANDARDS

EPA METHOD 639

F2271	5g	Methyl benzoate
F2271JS	1ml	500ug/mlMethanol
F2271RPS	5x1ml	500ug/mlMethanol

EPA Method 640

2-MERCAPTO-BENZOTHIAZOLE STANDARDS

EPA METHOD 640

F2388	2g	2-Mercaptobenzothiazole
F2388JS	1ml	1000ug/mlMethanol
F2388RPS	5x1ml	1000ug/mlMethanol

EPA Method 641

THIABENDAZOLE® STANDARDS

EPA METHOD 641

F2389	1g	Thiabendazole®
F2389JS	1ml	1000ug/mlMethanol
F2389RPS	5x1ml	1000ug/mlMethanol

EPA Method 642

BIPHENYL AND o-PHENYLPHENOL(2-Biphenylol) STANDARDS

EPA METHOD 642

F1062	5g	Biphenyl
F1062JS	1ml	100ug/mlHexane (Ampule)
F1062RPS	5x1ml	100ug/mlHexane (Ampule)
F1062AJS	1ml	1000ug/mlMethanol
F1062ARPS	5x1ml	1000ug/mlMethanol
F2225	1g	2-Biphenylol
F2225JS	1ml	2000ug/mlMethanol
F2225RPS	5x1ml	2000ug/mlMethanol

EPA Method 643

BENTAZON STANDARDS

EPA METHOD 643

F2038	1g	Bentazon
F2038JS	1ml	100ug/mlAcetone (Ampule)
F2038RPS	5x1ml	100ug/mlAcetone (Ampule)
F2038AJS	1ml	1000ug/mlAcetonitrile
F2038ARPS	5x1ml	1000ug/mlAcetonitrile

Chem Service EPA Pesticide Methods

EPA Method 644

PICLORAM STANDARDS

EPA METHOD 644

F2041	100mg	Picloram
F2041JS	1ml	100ug/mlAcetone (Ampule)
F2041RPS	5x1ml	100ug/mlAcetone (Ampule)
F2041AJS	1ml	1000ug/mlAcetonitrile
F2041ARPS	5x1ml	1000ug/mlAcetonitrile

INTERNAL STANDARDS

EPA METHOD 644

F2266	5g	Salicylic acid
F2266JS	1ml	2000ug/mlIsopropanol
F2266RPS	5x1ml	2000ug/mlIsopropanol

EPA Method 645

AMINE PESTICIDES & LETHANE MIXTURE

EPA METHOD 645

F2072	Alachlor
F2204	Butachlor
F2228	Diphenamid
F2390	Lethane
F2240	Norflurazon®
F2231	Sonar®

1000ug/ml in Hexane:Acetone (50:50) - (6 components)

APL645-1JM **1ml Ampule**
APL645-1RPM **5x1ml Ampule**

INTERNAL STANDARDS

EPA METHOD 645

F2052	5g	Triphenyl phosphate
F2052JS	1ml	500ug/mltert-Butylmethyl ether (Ampule)
F2052RPS	5x1ml	500ug/mltert-Butylmethyl ether (Ampule)

SURROGATE STANDARDS

EPA METHOD 645

F2051	5g	1,3-Dimethyl-2-nitrobenzene
F2051JS	1ml	2000ug/ml tert-Butylmethyl ether (Ampule)
F2051RPS	5x1ml	2000ug/ml tert-Butylmethyl ether

EPA Method 646

DINITROAROMATIC PESTICIDES MIXTURE

EPA METHOD 646

F2169	1-Chloro-2.4-dinitrobenzene
F2109	Dinocap
F2391	Fluchloralin

1000ug/ml in Hexane - (3 components)

DNAP646-1JM **1ml Ampule**
DNAP646-1RPM **5x1ml Ampules**

EPA Method 680

ORGANOCHLORINE PESTICIDES MIXTURE

EPA METHOD 680,*508/508.1,608,617,625,8080A/8081,8250A/8270B,CLP*

F89	Aldrin®
F102	BHC (alpha isomer)
F103	BHC (beta isomer)
F105	BHC (delta isomer)
F907	cis-Chlordane
F908	trans-Chlordane
F94	4.4'-DDD
F93	4.4'-DDE
F92	4.4'-DDT
F90	Dieldrin
F202	a-Endosulfan
F203	b-Endosulfan
F97	Endosulfan sulfate
F98	Endrin
F99	Endrin aldehyde
F2022	Endrin ketone
F100	Heptachlor
F101	Heptachlor epoxide
F104	Lindane (BHC gamma isomer)
F910	Methoxychlor

1000ug/ml in tert-Butylmethyl ether - (20 components)

OCP508-1JM **1ml Ampule**
OCP508-1RPM **5x1ml Ampules**

TUNING STANDARDS

EPA METHOD 680

F834	10mg	Decafluorotriphenylphosphine
F834JS	1ml	2000ug/mlMethylene Chloride (Ampule)
F834RPS	5x1ml	2000ug/mlMethylene Chloride (Ampule)
F834AJS	1ml	25,000ug/mlMethylene Chloride (Ampule)
F834ARPS	5x1ml	25,000ug/mlMethylene Chloride (Ampule)

INTERNAL STANDARDS

EPA METHOD 680

F730	10mg	Chrysene-d_{12}
F730JS	1ml	2000ug/mlMethylene chloride (Ampule)
F730RPS	5x1ml	2000ug/mlMethylene chloride (Ampule)
F208	100mg	Phenanthrene-d_{10}
F208JS	1ml	100ug/mlMethanol
F208RPS	5x1ml	100ug/mlMethanol
F208AJS	1ml	2000ug/mlMethylene chloride (Ampule)
F208ARPS	5x1ml	2000ug/mlMethylene chloride (Ampule)

EPA 600 Series Methods for Wasterwater Pollutants

Under the authority of the Clean Water Act these analytical standards were developed by the U.S. EPA. The 600 Series Methods are designed to monitor organic chemcials from the Priority Pollutants List applicable to municipal and industrial discharge of wastewater. The Priority Pollutants, which are identified and quantified using the 600 Method Series, include pesticides, volatile organic compounds, as well as synthetic organic compounds.

EPA Method 1618

ORGANOPHOSPHOROUS PESTICIDES MIXTURE #1

EPA METHOD 1618

50ug/ml	F2058	Coumaphos
100ug/ml	F2060	Diazinon
50ug/ml	F2061	Dichlorvos
100ug/ml	F989	Dimethoate
100ug/ml	F2215	Dylox ®
100ug/ml	F2112	EPN
100ug/ml	F2068	Fenchlorphos
200ug/ml	F2063	Fensulfothion
100ug/ml	F2055	Guthion ®
100ug/ml	F2421	Guthion Ethyl
100ug/ml	F2118	Malathion
100ug/ml	F996	Methyl parathion
100ug/ml	F998	Parathion ®
100ug/ml	F1080	Phorate
100ug/ml	F2062	Prophos
50ug/ml	F2056	Sulprofos
100ug/ml	F2137	Terbufos
100ug/ml	F2069	Tetrachlorvinphos
200ug/ml	F2214	S.S.S-Tributylphosphorotrithioate

Mixture in Isooctane - (19 components)

OPP1618-1JM **1ml Ampule**
OPP1618-1RPM **5x1ml Ampules**

ORGANOPHOSPHOROUS PESTICIDES MIXTURE #2

EPA METHOD 1618

50ug/ml	F2097	Chlorfenvinphos
50ug/ml	F2057	Chlorpyrifos
100ug/ml	F2296	Chlorpyrifos Methyl
200ug/ml	F2101	Crotoxyphos
200ug/ml	F2059	Demeton S
100ug/ml	F2067	Dibrom
100ug/ml	F2422	Dichlofenthion
600ug/ml	F2110	Dioxathion
100ug/ml	F993	Disulfoton
100ug/ml	F2113	Ethion
200ug/ml	F994	Famphur
100ug/ml	F2064	Fenthion
100ug/ml	F2066	Phosdrin ®
200ug/ml	F2129	Imidan ®
100ug/ml	F2117	Leptophos
50ug/ml	F940	Tetraethyldithiopyrophosphate
100ug/ml	F2070	Tokuthion ®
100ug/ml	F2222	Trichloronate

Mixture in Isooctane - (18 components)

OPP1618-2JM **1ml Ampule**
OPP1618-2RPM **5x1ml Ampules**

CHLORINATED HERBICIDES MIXTURE

EPA METHOD 1618,*8150B,8321*

F954	2,4-D
F958	2,4-DB
F956	Dalapon
F960	Dicamba
F962	Dichlorprop
F964	Dinoseb
F966	4-Chloro-o-tolyloxyacetic acid
F968	Mecoprop
F970	Silvex
F972	2,4,5-T®

Mixture at 100ug/ml in Acetone - (10 components)

CH-8150JM **1ml Ampule**
CH-8150RPM **5x1ml Ampules**

DEGRADATION CALIBRATION MIXTURE

EPA METHOD 1618,*508/508.1,525.2,608,617,1656,8080A/8081, 8250A/8270B,CLP*

100ug/ml	F98	Endrin
200ug/ml	F92	4.4'-DDT

Mixture in tert-Butylmethyl ether - (2 components)

DC-508JM **1ml Ampule**
DC-508RPM **5x1ml Ampules**

METHYLATED CHLORINATED HERBICIDES MIXTURE

EPA METHOD 1618,*8150B*

F955	2,4-D, methyl ester
F959	2,4-DB, methyl ester
F957	Dalapon, methyl ester
F961	Dicamba, methyl ester
F963	Dichlorprop, methyl ester
F965	Dinoseb, methyl ether
F967	4-Chloro-o-tolyloxy acetic acid methyl ester
F969	Mecoprop methyl ester
F971	Silvex, methyl ester
F973	2,4,5-(Trichlorophenoxy) acetic acid methyl ester

Mixture at 100ug/ml in Methanol - (10 components)

MCH-8150JM **1ml Ampule**
MCH-8150RPM **5x1ml Ampules**

DEGRADATION PRODUCTS MIXTURE

EPA METHOD 1618,*508/508.1,525.2,608,617,1656,8080A/8081, 8250A/8270B,CLP*

200ug/ml	F93	4.4'-DDE
200ug/ml	F94	4.4'-DDD
100ug/ml	F99	Endrin aldehyde
100ug/ml	F2022	Endrin ketone

Mixture in tert-Butylmethyl ether - (4 components)

DP508-1JM **1ml Ampule**
DP508-1RPM **5x1ml Ampules**

NON-ITD ORGANOPHOSPHATE COMPOUND

EPA METHOD 1618

Carbophenothion methyl

MET-88A 5ml 100ug/ml Methanol

GPC CALIBRATION MIXTURE

EPA METHOD 1618,*1656,1657*

15,000ug/ml	F66	Bis(2-ethylhexyl)phthalate
300,000ug/ml	O-2305	Corn oil
1,400ug/ml	F64	Pentachlorophenol
100ug/ml	F1047	Perylene
500ug/ml	I-159	Sulfur

Mixture in Isooctane - (5 components)

GPC1657-1JM **1ml Ampule**
GPC1657-1RPM **5x1ml Ampules**

DIBUTYL CHLORENDATE STANDARDS

EPA METHOD 1618

F850	1g	Dibutyl chlorendate
F850JS	1ml	1000ug/mlMethylene chloride (Ampule)
F850RPS	5x1ml	1000ug/mlMethylene chloride (Ampule)
F850AJS	1ml	2000ug/mlAcetone (Ampule)
F850ARPS	5x1ml	2000ug/mlAcetone (Ampule)

SURROGATE STANDARDS FOR PHENOXY ACID HERBICIDES

EPA METHOD 1618

F2035	100mg	2,4-Dichlorophenylacetic acid
F2035JS	1ml	2000ug/mlAcetone (Ampule)
F2035RPS	5x1ml	2000ug/mlAcetone (Ampule)

Chem Service EPA Pesticide Methods

SPE CARTRIDGE CALIBRATION STANDARDS

EPA METHOD 1618

F21	5g	2,4,6-Trichlorophenol
F21JS	1ml	100ug/mlMethanol
F21RPS	5x1ml	100ug/mlMethanol

EPA Method 1656

ORGANOHALIDE PESTICIDES MIXTURE #1

EPA METHOD 1656

4000ug/ml	F2440	Acephate
40ug/ml	F2072	Alachlor
2000ug/ml	F2208	Atrazine
20ug/ml	F103	BHC (beta isomer)
100ug/ml	F2439	Bromoxynil octanoic acid ester
400ug/ml	F2094	Captafol
400ug/ml	F988	Di-allate
20ug/ml	F97	Endosulfan sulfate
40ug/ml	F98	Endrin
20ug/ml	F921	Isodrin
100ug/ml	F2438	Prowl®
400ug/ml	F2216	Permethrin

Mixture in Acetone - (12 components)

OHP1656-1JM **1ml Ampule**
OHP1656-1RPM **5x1ml Ampules**

ORGANOHALIDE PESTICIDES MIXTURE #2

EPA METHOD 1656

10ug/ml	F102	BHC (alpha isomer)
10ug/ml	F2040	Chlorthal
20ug/ml	F93	4.4'-DDE
20ug/ml	F92	4.4'-DDT
40ug/ml	F2103	Dichlone
20ug/ml	F2365	Ethalfluralin
40ug/ml	F2230	Fenarimol
40ug/ml	F910	Methoxychlor
20ug/ml	F2237	Metribuzin

Mixture in Isooctane - (9 components)

OHP1656-2JM **1ml Ampule**
OHP1656-2RPM **5x1ml Ampules**

ORGANOHALIDE PESTICIDES MIXTURE #3

EPA METHOD 1656

10ug/ml	F908	trans-Chlordane
20ug/ml	F2022	Endrin ketone
10ug/ml	F101	Heptachlor epoxide
40ug/ml	F2366	Isopropalin
10ug/ml	F104	Lindane (BHC gamma isomer)
40ug/ml	F2126	Nitrofen
10ug/ml	F999	Pentachloronitrobenzene
20ug/ml	F2140	Trifluralin

Mixture in Isooctane - (8 components)

OHP1656-3JM **1ml Ampule**
OHP1656-3RPM **5x1ml Ampules**

ORGANOHALIDE PESTICIDES MIXTURE #4

EPA METHOD 1656

40ug/ml	F2364	Benfluralin
500ug/ml	F986	Chlorobenzilate
10ug/ml	F90	Dieldrin
20ug/ml	F202	a-Endosulfan
40ug/ml	F2121	Mirex
400ug/ml	F2206	Terbacil
1000ug/ml	F2291	Terbuthylazine
200ug/ml	F2218	Triadimefon

Mixture in Isooctane - (8 components)

OHP1656-4JM **1ml Ampule**
OHP1656-4RPM **5x1ml Ampules**

ORGANOHALIDE PESTICIDES MIXTURE #5

EPA METHOD 1656

100ug/ml	F2095	Captan
10ug/ml	F907	cis-Chlordane
20ug/ml	F2220	Chlorothalonil
20ug/ml	F94	4.4'-DDD
100ug/ml	F2240	Norflurazon®
1000ug/ml	F2073	Simazine

Mixture in Acetone - (6 components)

OHP1656-5JM **1ml Ampule**
OHP1656-5RPM **5x1ml Ampules**

ORGANOHALIDE PESTICIDES MIXTURE #6

EPA METHOD 1656

40ug/ml	F89	Aldrin®
10ug/ml	F105	BHC (delta isomer)
200ug/ml	F2200	Bromacil
100ug/ml	F2204	Butachlor
20ug/ml	F203	b-Endosulfan
20ug/ml	F100	Heptachlor
200ug/ml	F2441	Kepone®

Mixture in Isooctane - (7 components)

OHP1656-6JM **1ml Ampule**
OHP1656-6RPM **5x1ml Ampules**

ORGANOHALIDE PESTICIDES MIXTURES KIT

EPA METHOD 1656

OHP1656-1JM	Organohalide Pesticides Mixture #1
OHP1656-2JM	Organohalide Pesticides Mixture #2
OHP1656-3JM	Organohalide Pesticides Mixture #3
OHP1656-4JM	Organohalide Pesticides Mixture #4
OHP1656-5JM	Organohalide Pesticides Mixture #5
OHP1656-6JM	Organohalide Pesticides Mixture #6

1ml of each, in the appropriate solvent - (6 component kit)

MMOHP1656-6 **KIT**

AROCHLORS, TOXAPHENE® & CHLORDANE SOLUTIONS KIT

EPA METHOD 1656,*505,508,525.2,608,617,625,8080A/8081, 8250A/8270B,CLP*

F107AJS	Arochlor 1016 Solution
F108AJS	Arochlor 1221 Solution
F113AJS	Arochlor 1232 Solution
F109AJS	Arochlor 1242 Solution
F110AJS	Arochlor 1248 Solution
F111AJS	Arochlor 1254 Solution
F112BJS	Arochlor 1260 Solution
F91AJS	Chlordane Solution
F106BJS	Toxaphene® Solution

1ml Solutions of each, 1000ug/ml in Hexane - (9 component kit)

CTA608-1JS **KIT**

DEGRADATION CALIBRATION MIXTURE

EPA METHOD 1656,*508/508.1,525.2,608,617,1618,8080A/8081, 8250A/8270B,CLP*

100ug/ml	F98	Endrin
200ug/ml	F92	4.4'-DDT

Mixture in tert-Butylmethyl ether - (2 components)

DC-50J8M **1ml Ampule**
DC-508RPM **5x1ml Ampules**

Whether it is bottled or ampuled, neat or solution, rest assured that Chem Service products not only follow an over 40 year tradition in providing highly purified materials for reference standards, but also that we will strive to continually increase the quality of our materials and services for our customers.

Chem Service EPA Pesticide Methods

DEGRADATION PRODUCTS MIXTURE

EPA METHOD 1656,*508/508.1,525.2,608,617,1618,8080A/8081, 8250A/8270B,CLP*

200ug/ml	F93	4.4'-DDE
200ug/ml	F94	4.4'-DDD
100ug/ml	F99	Endrin aldehyde
100ug/ml	F2022	Endrin ketone

Mixture in tert-Butylmethyl ether - (4 components)

DP508-1JM **1ml Ampule**
DP508-1RPM **5x1ml Ampules**

GPC CALIBRATION MIXTURE

EPA METHOD 1656,*1618,1657*

15,000ug/ml	F66	Bis(2-ethylhexyl)phthalate
300,000ug/ml	O-2305	Corn oil
1,400ug/ml	F64	Pentachlorophenol
100ug/ml	F1047	Perylene
500ug/ml	I-159	Sulfur

Mixture in Isooctane - (5 components)

GPC1657-1JM **1ml Ampule**
GPC1657-1RPM **5x1ml Ampule**

ADDITIONAL METHOD ANALYTES

EPA METHOD 1656

F2096	1gm	Carbophenothion
F2096JS	1ml	100ug/ml Methanol
F2096RPS	5x1ml	100ug/ml Methanol
F99	10mg	Endrin aldehyde
F99JS	1ml	100ug/ml Methanol
F99RPS	5x1ml	100ug/ml Methanol
F2379	1g	Propanil
F2379JS	1ml	1000ug/mlAcetonitrile:Acetone (90:10)
F2379RPS	5x1ml	1000ug/mlAcetonitrile:Acetone (90:10)
F106	1g	Toxaphene®
F106JS	1ml	100ug/mlMethanol
F106RPS	1ml	100ug/mlMethanol
F106AJS	1ml	2500ug/mlAcetone (Ampule)
F106ARPS	1ml	2500ug/mlAcetone (Ampule)
F106BJS	1ml	1000ug/mlHexane (Ampule)
F106BRPS	5x1ml	1000ug/mlHexane (Ampule)

SURROGATE STANDARDS

EPA METHOD 1656

F850	1g	Dibutyl chlorendate
F850JS	1ml	1000ug/mlMethylene chloride (Ampule)
F850RPS	5x1ml	1000ug/mlMethylene chloride (Ampule)
F850AJS	1ml	2000ug/mlAcetone (Ampule)
F850ARPS	5x1ml	2000ug/mlAcetone (Ampule)

EPA Method 1657

ORGANOPHOSPHOROUS PESTICIDES MIXTURE #1

EPA METHOD 1657

250ug/ml	F2061	Dichlorvos
100ug/ml	F993	Disulfoton
100ug/ml	F2068	Fenchlorphos
100ug/ml	F2064	Fenthion
50ug/ml	F2055	Guthion®
100ug/ml	F2056	Sulprofos
100ug/ml	F2065	Tributylphosphorotrithioite

Mixture in Isooctane - (7 components)

OPP1657-1JM **1ml Ampule**
OPP1657-1RPM **5x1ml Ampules**

ORGANOPHOSPHOROUS PESTICIDES MIXTURE #2

EPA METHOD 1657

100ug/ml	F2097	Chlorfenvinphos
100ug/ml	F2057	Chlorpyrifos
100ug/ml	F2059	Demeton S
100ug/ml	F2422	Dichlofenthion
50ug/ml	F989	Dimethoate
250ug/ml	F2215	Dylox®
250ug/ml	F994	Famphur
100ug/ml	F2117	Leptophos
100ug/ml	F996	Methyl parathion
500ug/ml	F2425	Tri-o-cresyl phosphate

Mixture in Isooctane - (10 components)

OPP1657-2JM **1ml Ampule**
OPP1657-2RPM **5x1ml Ampules**

ADDITIONAL ANALYTE

EPA METHOD 1657

		Carbophenothion methyl	
MET-88A	5ml	100ug/ml	Methanol

ORGANOPHOSPHOROUS PESTICIDES MIXTURE #3

EPA METHOD 1657

100ug/ml	F2296	Chlorpyrifos Methyl
250ug/ml	F2101	Crotoxyphos
250ug/ml	F2067	Dibrom
250ug/ml	F2063	Fensulfothion
100ug/ml	F2421	Guthion Ethyl
250ug/ml	F2129	Imidan®
100ug/ml	F998	Parathion®
250ug/ml	F2066	Phosdrin®
250ug/ml	F2130	Phosphamidon
100ug/ml	F940	Tetraethyldithiopyrophosphate *(Sulfotepp)*
100ug/ml	F2137	Terbufos
100ug/ml	F2214	S.S.S-Tributylphosphorotrithioate

NOTE: *For exact ratios of the E and Z isomer of F2130 - Call Customer Service at (800) 452-9994.*

Mixture in Isooctane - (12 components)

OPP1657-3JM **1ml Ampule**
OPP1657-3RPM **5x1ml Ampules**

ORGANOPHOSPHOROUS PESTICIDES MIXTURE #4

EPA METHOD 1657

250ug/ml	F2058	Coumaphos
100ug/ml	F2060	Diazinon
100ug/ml	F2112	EPN
100ug/ml	F2113	Ethion
100ug/ml	F2118	Malathion
100ug/ml	F1080	Phorate
100ug/ml	F2062	Prophos
100ug/ml	F2069	Tetrachlorvinphos
100ug/ml	F2222	Trichloronate

Mixture in Isooctane - (9 components)

OPP1657-4JM **1ml Ampule**
OPP1657-4RPM **5x1ml Ampules**

ORGANOPHOSPHOROUS PESTICIDES MIXTURES KIT

EPA METHOD 1657

OPP1657-1JM	Organophosphorous Pesticides Mixture #1
OPP1657-2JM	Organophosphorous Pesticides Mixture #2
OPP1657-3JM	Organophosphorous Pesticides Mixture #3
OPP1657-4JM	Organophosphorous Pesticides Mixture #4

1ml of each, in the appropriate solvent - (4 component kit)

MMOPP1657-4 **KIT**

Chem Service EPA Pesticide Methods

GPC CALIBRATION MIXTURE

EPA METHOD 1657,*1618,1656*

15,000ug/ml	F66	Bis(2-ethylhexyl)phthalate
300,000ug/ml	O-2305	Corn oil
1,400ug/ml	F64	Pentachlorophenol
100ug/ml	F1047	Perylene
500ug/ml	I-159	Sulfur

Mixture in Isooctane - (5 components)

GPC1657-1JM **1ml Ampule**
GPC1657-1RPM **5X1ml Ampules**

MERPHOS CALIBRATION STANDARDS

EPA METHOD 1657,*507,622,8140/8141A,8321*

F2214	1g	S,S,S-Tributylphosphorotrithioate
F2214JS	1ml	100ug/mltert-Butylmethyl ether (Ampule)
F2214RPS	5x1ml	100ug/mltert-Butylmethyl ether (Ampule)

SURROGATE SPIKING MIXTURE

EPA METHOD 1657

F2191	Tributyl phosphate
F2052	Triphenyl phosphate

2000ug/ml in Acetone - (2 components)

SS-1657JM **1ml Ampule**
SS-1657RPM **5x1ml Ampules**

SURROGATE STANDARDS

EPA METHOD 1657

F2191	5g	Tributyl phosphate
F2191JS	1ml	2000ug/mlAcetone (Ampule)
F2191RPS	5x1ml	2000ug/mlAcetone (Ampule)
F2052	5g	Triphenyl phosphate
F2052JS	1ml	500ug/mltert-Butylmethyl ether (Ampule)
F2052RPS	5x1ml	500ug/mltert-Butylmethyl ether (Ampule)

EPA Method 1658

METHYLATED PHENOXYACID HERBICIDES MIXTURE #1

EPA METHOD 1658

5000ug/ml	F967	4-Chloro-o-tolyloxyacetic acid methyl ester
100ug/ml	F955	2.4-D methyl ester
50ug/ml	F957	Dalapon methyl ester
200ug/ml	F959	2,4-DB methyl ester
20ug/ml	F961	Dicamba methyl ester
100ug/ml	F963	Dichlorprop methyl ester
50ug/ml	F965	Dinoseb methyl ether
5000ug/ml	F969	Mecoprop methyl ester
50ug/ml	F2155	Picloram methyl ester
20ug/ml	F971	Silvex methyl ester
20ug/ml	F973	(2.4.5-Trichlorophenoxy)acetic acid methyl ester

Mixture in Isooctane - (11 components)

MPH1658-1JM **1ml Ampule**
MPH1658-1RPM **5x1ml Ampules**

SURROGATE STANDARDS

EPA METHOD 1658

F2035	100mg	2,4-Dichlorophenylacetic acid
F2035JS	1ml	2000ug/mlAcetone (Ampule)
F2035RPS	5x1ml	2000ug/mlAcetone (Ampule)
F2036	100mg	2,4-Dichlorophenylacetic acid methyl ester
F2036JS	1ml	100ug/mlAcetone (Ampule)
F2036RPS	5x1ml	100ug/mlAcetone (Ampule)
F2036AJS	1ml	2000ug/mlAcetone (Ampule)
F2036ARPS	5x1ml	2000ug/mlAcetone (Ampule)

METHYLATED PHENOXYACID HERBICIDES MIXTURE #2

EPA METHOD 1658

500ug/ml	F967	4-Chloro-o-tolyloxyacetic acid methyl ester
500ug/ml	F955	2.4-D methyl ester
500ug/ml	F957	Dalapon methyl ester
1000ug/ml	F959	2,4-DB methyl ester
500ug/ml	F961	Dicamba methyl ester
500ug/ml	F963	Dichlorprop methyl ester
500ug/ml	F969	Mecoprop methyl ester
250ug/ml	F971	Silvex methyl ester
500ug/ml	F973	(2.4.5-Trichlorophenoxy)acetic acid methyl ester

Mixture in Isooctane - (9 components)

MPH1658-2JM **1ml Ampule**
MPH1658-2RPM **5x1ml Ampules**

EPA Method 1660

PYRETHRINS & PYRETHROIDS MIXTURE #1

EPA METHOD 1660

400ug/ml	F2460	Baythroid®
400ug/ml	F2458	d-(cis-trans)-Phenothrin
200ug/ml	F2459	Sanmarton
400ug/ml	F2457	Tetramethrin

Mixture in Acetonitrile - (4 components)

PP1660-1JM **1ml Ampule**
PP1660-1RPM **5x1ml Ampules**

PYRETHRINS & PYRETHROIDS MIXTURE #2

EPA METHOD 1660

PS-96	Allethrin
F2293	Resmethrin
F2216	Permethrin

400ug/ml in Acetonitrile - (3 components)

PP1660-2JM **1ml Ampule**
PP1660-2RPM **5X1ml Ampules**

PYRETHRUM STANDARD

EPA METHOD 1660

PS-97	100mg	Pyrethrum

TECHNICAL TIP

Opening an ampule - The ampules are scored at the neck (color band) to facilitate opening. 1) Chill ampule before opening - this is especially important for gas solutions & mixtures. 2) Hold the ampule vertically at arms length, with the bottle section in one hand, head section in the other - thumbs touching at the neck. 3) Press out and away with thumbs to open. 4) Transfer sample to a suitable vial and cap. 5) Caution - Edges where the ampule has been broken may be sharp: handle with care.

EPA Method 8080A/8081

ORGANOCHLORINE PESTICIDES

EPA METHOD 8080A/8081,*508,608,625,8250A/8270B,CLP*

F89	Aldrin®
F109	Arochlor 1242
F111	Arochlor 1254
F108	Arochlor 1221
F113	Arochlor 1232
F110	Arochlor 1248
F112	Arochlor 1260
F107	Arochlor 1016
F102	a-BHC
F103	b-BHC
F105	d-BHC
F91	Chlordane
F94	4,4'-DDD
F93	4,4'-DDE
F92	4,4'-DDT
F90	Dieldrin
F202	a-Endosulfan
F203	b-Endosulfan
F97	Endosulfan sulfate
F98	Endrin
F99	Endrin aldehyde
F100	Heptachlor
F101	Heptachlor epoxide
F104	Lindane (g-BHC)
F910	Methoxychlor
F106	Toxaphene®

NOTE: *PPO-8JM, PPO-8RPM, PP-HC5JM, PP-HC5RPM, OCP-8080JM, OCP-8080RPM, OCP508-1JM and OCP508-1RPM do not contain the Arochlors,Chlordane or Toxaphene.*

NOTE: *PPO-8JM, PPO-8RPM, PP-HC5JM and PP-HC5RPM do not contain Methoxychlor.*

NOTE: *OCP508-1JM, OCP508-1RPM contain F2022 Endrin Ketone, F907cis-Chlordane and F908 trans-Chlordane.*

Neat compounds of each of the above - (26 component kit)
PPO-8N **KIT**

1ml Solutions of each, in the appropriate solvent - (26 component kit)
PPO-8JS **KIT**

100ug/ml in Toluene:Hexane (50:50), less Methoxychlor - (16 components)
PPO-8JM **1ml Ampule**
PPO-8RPM **5x1ml Ampules**

2000ug/ml in Toluene:Hexane (50:50), less Methoxychlor - (16 components)
PP-HC5JM **1ml Ampule**
PP-HC5RPM **5x1ml Ampules**

100ug/ml in Toluene:Hexane (50:50) - (17 components)
OCP-8080JM **1ml Ampule**
OCP-8080RPM **5x1ml Ampules**

1000ug/ml in tert-Butylmethyl ether - (20 components)
OCP508-1JM **1ml Ampule**
OCP508-1RPM **5x1ml Ampules**

CUSTOM SOLUTIONS

Our in-house certified neat chemicals are the building blocks of quality custom solutions. Chem Service can tailor a product to meet your certification, budget, and delivery requirements. Use our custom solution request form on page 144 or call customer service directly at 1-(800) 452-9994 or (+) 1-610-692-3026.

ORGANOCHLORINE PESTICIDES KITS

EPA METHOD 8081

F2072	Alachlor
F2094	Captafol
F2095	Captan
F907	cis-Chlordane
F908	trans-Chlordane
F986	Chlorobenzilate
F2201	Chloroneb
F2289	Chloropropylate
F2220	Chlorothalonil
F2040	Chlorthal
F988	Di-allate
F819	1.2-Dibromo-3-chloropropane
F2103	Dichlone
F2022	Endrin ketone
F9	Hexachlorobenzene
F53	Hexachlorocyclopentadiene
F921	Isodrin
F2281	Kelthane®
F2441	Kepone®
F2121	Mirex
F2126	Nitrofen
F2180	trans-Nonachlor
F999	Pentachloronitrobenzene
F2216	Permethrin
F2295	Perthane®
F2205	Propachlor
F2318	Strobane®
F2202	Terrazole®
F2140	Trifluralin

NOTE: *Dichlone (F2103), Kepone ® (PS-701), Nitrofen (F2126) and Strobane® (F2318) are not included in OCP8081-1JM* and OCP8081-1RPM.

Neat compounds of each of the above - (29 component kit)
OCP8081-1N **KIT**

1ml Solutions of each, in the appropriate solvent - (29 component kit)
OCP8081-1JS **KIT**

1000ug/ml in Isooctane:Acetone (90:10), 1ml Ampule - (25 components)
OCP8081-1JM **1ml Ampule**
OCP8081-1RPM **5x1ml Ampules**

PESTICIDES - CONTROL SAMPLE MIXTURE

EPA METHOD 8080A/8081,*608*

20ug/ml	F89	Aldrin®
20ug/ml	F102	BHC (alpha isomer)
20ug/ml	F103	BHC (beta isomer)
100ug/ml	F94	4.4'-DDD
20ug/ml	F93	4.4'-DDE
100ug/ml	F92	4.4'-DDT
20ug/ml	F90	Dieldrin
20ug/ml	F202	a-Endosulfan
100ug/ml	F203	b-Endosulfan
100ug/ml	F97	Endosulfan sulfate
100ug/ml	F98	Endrin
20ug/ml	F100	Heptachlor
20ug/ml	F101	Heptachlor epoxide

Mixture in Toluene - (13 components)
CSM-8080JM **1ml Ampule**
CSM-8080RPM **5x1ml Ampules**

DEGRADATION CALIBRATION MIXTURE

EPA METHOD 8080A/8081,*508/508.1,525.2,608,617,625,1618,1656, 8250A/8270B,CLP*

100ug/ml	F98	Endrin
200ug/ml	F92	4.4'-DDT

Mixture in tert-Butylmethyl ether - (2 components)
DC-508JM **1ml Ampule**
DC-508RPM **5x1ml Ampules**

Chem Service EPA Pesticide Methods

DEGRADATION PRODUCTS MIXTURE

EPA METHOD 8080A/8081,*508/508.1 ,525.2,608,617,625,1618,1656, 8250A/8270B,CLP*

200ug/ml	F93	4.4'-DDE
200ug/ml	F94	4.4'-DDD
100ug/ml	F99	Endrin aldehyde
100ug/ml	F2022	Endrin ketone

Mixture in tert-Butylmethyl ether - (4 components)

DP508-1JM **1ml Ampule**
DP508-1RPM **5x1ml Ampules**

FLORISIL CARTRIDGE CHECK MIXTURE

EPA METHOD 8080/8081A,8270B

5ug/ml	F102	BHC (alpha isomer)
10ug/ml	F94	4.4'-DDD
10ug/ml	F92	4.4'-DDT
20ug/ml	F2170	Decachlorobiphenyl
10ug/ml	F90	Dieldrin
10ug/ml	F98	Endrin
5ug/ml	F202	a-Endosulfan
5ug/ml	F100	Heptachlor
5ug/ml	F104	Lindane (BHC gamma isomer)
50ug/ml	F910	Methoxychlor
20ug/ml	F903	2,4,5,6-Tetrachloro-m-xylene

Mixture in Hexane - (11 components)

FCC8081-1JM **1ml Ampule**
FCC8081-1RPM **5x1ml Ampules**

SURROGATE STANDARDS MIXTURE #1

EPA METHOD 8080A/8081,*CLP*

F2170	Decachlorobiphenyl
F903	2,4,5,6-Tetrachloro-m-xylene

2000ug/ml in Toluene - (2 components)

SM-8080JM **1ml Ampule**
SM-8080RPM **5x1ml Ampules**

SURROGATE STANDARDS MIXTURE #2

EPA METHOD 8080A/8081,*CLP*

F850	Dibutyl chlorendate
F903	2,4,5,6-Tetrachloro-m-xylene

2000ug/ml in Acetone - (2 components)

SM-8080AJM **1ml Ampule**
SM-8080ARPM **5x1ml Ampules**

SURROGATE STANDARDS

EPA METHOD 8080A/8081

F2320	5g	4-Chloro-3-nitrobenzotrifluoride
F2320JS	5ml	1000ug/mlIsooctane (Ampule)
F2320RPS	5ml	1000ug/mlIsooctane (Ampule)
F2170	10mg	Decachlorobiphenyl
F2170JS	1ml	1000ug/mlHexane (Ampule)
F2170RPS	5x1ml	1000ug/mlHexane (Ampule)
F2170AJS	1ml	100ug/mlHexane (Ampule)
F2170ARPS	5x1ml	100ug/mlHexane (Ampule)
F2170BJS	1ml	500ug/ml Acetone (Ampule)
F2170BRPS	5x1ml	500ug/ml Acetone (Ampule)
F850	1g	Dibutyl chlorendate
F850JS	1ml	1000ug/mlMethylene chloride (Ampule)
F850RPS	5x1ml	1000ug/mlMethylene chloride (Ampule)
F850AJS	1ml	2000ug/mlAcetone (Ampule)
F850ARPS	5x1ml	2000ug/mlAcetone (Ampule)
F903	1g	2,4,5,6-Tetrachloro-m-xylene
F903JS	1ml	200ug/mlMethanol
F903RPS	5x1ml	200ug/mlMethanol

INTERNAL STANDARDS

EPA METHOD 8080A/8081

F2319	1g	1-Bromo-2-nitrobenzene
F2319JS	1ml	1000ug/mlIsooctane (Ampule)
F2319RPS	5x1ml	1000ug/mlIsooctane (Ampule)
F2319AJS	1ml	5000ug/mlIsooctane (Ampule)
F2319ARPS	5x1ml	5000ug/mlIsooctane (Ampule)
F999	1g	Pentachloronitrobenzene
F999JS	1ml	100ug/mlMethanol
F999RPS	5x1ml	100ug/mlMethanol
F999AJS	1ml	1000ug/mlIsooctane (Ampule)
F999ARPS	5x1ml	1000ug/mlIsooctane (Ampule)
F999BJS	1ml	2000ug/mlEthyl acetate
F999BRPS	5x1ml	2000ug/mlEthyl acetate
F999CJS	1ml	5000ug/mlIsooctane (Ampule)
F999CRPS	5x1ml	5000ug/mlIsooctane (Ampule)

EPA Method 8140/8141A

ORGANOPHOSPHOROUS PESTICIDES

METHOD 8140/8141A

F2057	Chlorpyrifos
F2058	Coumaphos
F2059	Demeton-S
F2060	Diazinon
F2067	Dibrom
F2061	Dichlorvos
F993	Disulfoton
F2068	Fenchlorophos
F2063	Fensulfothion
F2064	Fenthion
F2055	Guthion
F996	Methyl parathion
F1080	Phorate
F2066	Phosdrin
F2062	Prophos
F2056	Sulprofos
F2069	Tetrachlorvinphos
F2070	Tokuthion
F2065	Tributylphosphorotrithioite
F2222	Trichloronate

Neat compounds of each of the above - (20 component kit)

OPP-8140N **KIT**

1ml Solutions of each, in the appropriate solvent - (20 component kit)

OPP-8140JS **KIT**

100ug/ml in Methylene chloride - (20 components)

OPP-8140JM **1ml Ampule**
OPP-8140RPM **5x1ml Ampules**

TRIAZINE HERBICIDES MIXTURE

EPA METHOD 8141A

F2208	Atrazine
F2073	Simazine

200ug/ml in Acetone - (2 components)

TH8141-1JM **1ml Ampule**
TH8141-1RPM **5x1ml Ampules**

Our Chem Service standards materials are available convenience sized – for your specific laboratory use. If you require a 5x1ml (RPM), or 1ml (JM), request it when ordering any of our quality materials. Your order will be processed promptly and each item requested will arrive with a Material Safety Data Sheet and a Certificate of Analysis, where applicable.

Chem Service EPA Pesticide Methods

ORGANOPHOSPHOROUS COMPOUNDS

EPA METHOD 8141A

(Supplement to EPA Method 8140)

F989	Dimethoate
F2112	EPN
F2118	Malathion
F2122	Monocrotophos
F998	Parathion®
F940	Tetraethyldithiopyrophosphate
F2138	Tetraethylpyrophosphate

NOTE: *Tetraethylpyrophosphate (F2138), is not included in the mixture due to its instability. It is recommended that it be purchased individually.*

Neat compounds of each of the above - (7 component kit)
OPP-8141N **KIT**

1ml Solutions of each, in the appropriate solvent - (7 component kit)
OPP-8141JS **KIT**

Mixture at 100ug/ml in Hexane - (6 components)
OPP-8141JM **1ml Ampule**
OPP-8141RPM **5x1ml Ampules**

ORGANOPHOSPHOROUS COMPOUNDS MIXTURE

EPA METHOD 8141A

F2420	Aspon®
F2096	Carbophenothion
F2097	Chlorfenvinphos
F2296	Chlorpyrifos methyl
F2101	Crotoxyphos
F2422	Dichlofenthion
F2104	Dicrotophos
F2110	Dioxathion
F2424	Dyfonate®
F2215	Dylox®
F2113	Ethion
F994	Famphur
F2423	Fenitrothion
F2421	Guthion Ethyl
F2117	Leptophos
F2129	Imidan®
F2130	Phosphamidon
F2137	Terbufos
F2152	Zinophos®

100ug/ml in Hexane - (19 components)
OPC8141A-1JM **1ml Ampule**
OPC8141A-1RPM **5x1ml Ampules**

ORGANOPHOSPHOROUS PESTICIDES MIXTURES KIT

EPA METHOD 8141A

OPP-8140JM	Organophosphorous Pesticides Mixture
OPP-8141JM	Organophosphorous Compounds Mixture
OPC8141A-1JM	Organophosphorous Compounds Mixture

1ml of each, in the appropriate solvent - (3 component kit)
MMOPP8141-3 **KIT**

SPECIAL ORGANOPHOSPHOROUS MIXTURE

EPA METHOD 8141A

F2060	Diazinon
F2113	Ethion
F2118	Malathion
F996	Methyl parathion
F998	Parathion®

100ug/ml in Cyclohexane - (5 components)
CR8141-1JM **1ml Ampule**
CR8141-1RPM **5x1ml Ampules**

HALOGENATED PESTICIDES MIXTURE

EPA METHOD 8140/8141A

F2057	Chlorpyrifos
F2058	Coumaphos
F2061	Dichlorvos
F2067	Dibrom
F2068	Fenchlorphos
F2069	Tetrachlorvinphos
F2070	Tokuthion®
F2222	Trichloronate

500ug/ml in Hexane - (8 components)
HP8140-1JM **1ml Ampule**
HP8140-1RPM **5x1ml Ampules**

TEPP STANDARDS

EPA METHOD 8141A

F2138	1g	Tetraethylpyrophosphate

INDUSTRIAL CHEMICALS MIXTURE

EPA METHOD 8141A

F2425	Tri-o-cresyl phosphate
F2115	Hexamethylphosphoric triamide

1000ug/ml in Hexane - (2 components)
IC8141-1JM **1ml Ampule**
IC8141-1RPM **5x1ml Ampules**

EPN STANDARDS

EPA METHOD 8141A

F2112	1g	EPN
F2112JS	1ml	100ug/mlHexane (Ampule)
F2112RPS	5x1ml	100ug/mlHexane (Ampule)
F2112AJS	1ml	1000ug/mlHexane (Ampule)
F2112ARPS	5x1ml	1000ug/mlHexane (Ampule)

SIMAZINE STANDARDS

EPA METHOD 8141A,*507*

F2073	100mg	Simazine
F2073JS	1ml	100ug/mlMethanol
F2073RPS	5x1ml	100ug/mlMethanol
F2073AJS	1ml	1000ug/mlAcetone (Ampule)
F2073ARPS	5x1ml	1000ug/mlAcetone (Ampule)

ATRAZINE STANDARDS

EPA METHOD 8141A

F2208	1g	Atrazine
F2208JS	1ml	100ug/mltert-Butylmethyl ether (Ampule)
F2208RPS	5x1ml	100ug/mltert-Butylmethyl ether (Ampule)

TEPP DEGRADATION STANDARDS (TEP)

EPA METHOD 8141A

F2192	5g	Triethyl phosphate
F2192JS	1ml	100ug/mlHexane (Ampule).
F2192RPS	5x1ml	100ug/mlHexane (Ampule)

DIBROM DEGRADATION STANDARDS

EPA METHOD 8140/8141A

F2061	1g	Dichlorvos
F2061JS	1ml	100ug/mlToluene (Ampule)
F2061RPS	5x1ml	100ug/mlToluene (Ampule)
F2061AJS	1ml	1000ug/mlHexane (Ampule)
F2061ARPS	5x1ml	1000ug/mlHexane (Ampule)

Chem Service EPA Pesticide Methods

MERPHOS CALIBRATION STANDARDS

EPA METHOD 8140/8141A,*507,622,1657,8321*

F2214	1g	S.S.S-Tributylphosphorotrithioate
F2214JS	1ml	100ug/mltert-Butylmethyl ether (Ampule)
F2214RPS	5x1ml	100ug/mltert-Butylmethyl ether (Ampule)

INTERNAL STANDARDS

EPA METHOD 8140/8141A

F2319	1g	1-Bromo-2-nitrobenzene
F2319JS	1ml	1000ug/mlIsooctane (Ampule)
F2319RPS	5x1ml	1000ug/mlIsooctane (Ampule)

SURROGATE STANDARDS

EPA METHOD 8140/8141A

F2320	5g	4-Chloro-3-nitrobenzotrifluoride
F2320JS	1ml	1000ug/mlIsooctane (Ampule)
F2320RPS	5x1ml	1000ug/mlIsooctane (Ampule)
F2191	5g	Tributyl phosphate
F2191JS	1ml	2000ug/mlAcetone (Ampule)
F2191RPS	5x1ml	2000ug/mlAcetone (Ampule)
F2052	5g	Triphenyl phosphate
F2052JS	1ml	500ug/mltert-Butylmethyl ether (Ampule)
F2052RPS	5x1ml	500ug/mltert-Butylmethyl ether (Ampule)

EPA Method 8150/8150A/8150B

CHLORINATED HERBICIDES

EPA METHOD 8150B,*1618,8321*

F954	2,4-D
F958	2,4-DB
F956	Dalapon
F960	Dicamba
F962	Dichlorprop
F964	Dinoseb
F966	4-Chloro-o-tolyloxyacetic acid
F968	Mecoprop
F970	Silvex
F972	2,4,5-T®

Neat compounds of each of the above - (10 component kit)
CH-8150N **KIT**

1ml Solutions of each, in the appropriate solvent - (10 component kit)
CH-8150JS **KIT**

100ug/ml in Acetone - (10 components)
CH-8150JM **1ml Ampule**
CH-8150RPM **5x1ml Ampules**

METHYLATED CHLORINATED HERBICIDES

EPA METHOD 8150B,*1618*

F955	2,4-D, methyl ester
F959	2,4-DB, methyl ester
F957	Dalapon, methyl ester
F961	Dicamba, methyl ester
F963	Dichlorprop, methyl ester
F965	Dinoseb, methyl ether
F967	4-Chloro-o-tolyloxy acetic acid, methyl ester
F969	Mecoprop methyl ester
F971	Silvex, methyl ester
F973	2,4,5-(Trichlorophenoxy) acetic acid, methyl ester

Neat compounds of each of the above - (10 component kit)
MCH-8150N **KIT**

1ml Solutions of each, in the appropriate solvent - (10 component kit)
MCH-8150JS **KIT**

Mixture at 100ug/ml in Methanol - (10 components)
MCH-8150JM **1ml Ampule**
MCH-8150RPM **5x1ml Ampules**

CHLORINATED HERBICIDES MIXTURE

EPA METHOD 8150B,*515.1*

F954	2,4-D
F970	Silvex
F972	2,4,5-T®

2000ug/ml in Acetone - (3 components)
CSHC-14AJM **1ml Ampule**
CSHC-14ARPM **5x1ml Ampules**

CHLORINATED HERBICIDE ESTERS MIXTURE

EPA METHOD 8150B,*515.1*

F955	2,4-D methyl ester
F971	Silvex methyl ester
F973	2,4,5-T methyl ester

2000ug/ml in Hexane - (3 components)
CSHC-14JM **1ml Ampule**
CSHC-14RPM **5x1ml Ampules**

CHLORINATED HERBICIDES - CONTROL SAMPLE MIXTURE

EPA METHOD 8150B,*615*

10,000ug/ml	F966	4-Chloro-o-tolyloxyacetic acid
100ug/ml	F954	2.4-D
250ug/ml	F956	Dalapon
100ug/ml	F958	2.4-DB
10ug/ml	F960	Dicamba
100ug/ml	F962	Dichlorprop
50ug/ml	F964	Dinoseb
10,000ug/ml	F968	Mecoprop
10ug/ml	F970	Silvex
10ug/ml	F972	2,4,5-T®

Mixture in Toluene - (10 components)
CSM8150-1JM **1ml Ampule**
CSM8150-1RPM **5x1ml Ampules**

METHYLATED CHLORINATED HERBICIDES - CONTROL SAMPLE MIXTURE

EPA METHOD 8150B,*615*

10,000ug/ml	F967	4-Chloro-o-tolyloxyacetic acid methyl ester
100ug/ml	F955	2.4-D methyl ester
250ug/ml	F957	Dalapon methyl ester
100ug/ml	F959	2,4-DB methyl ester
10ug/ml	F961	Dicamba methyl ester
100ug/ml	F963	Dichlorprop methyl ester
50ug/ml	F965	Dinoseb methyl ether
10,000ug/ml	F969	Mecoprop methyl ester
10ug/ml	F971	Silvex methyl ester
10ug/ml	F973	(2.4.5-Trichlorophenoxy)acetic acid methyl ester

Mixture in Hexane - (10 components)
MCSM8150-1JM **1ml Ampule**
MCSM8150-1RPM **5x1ml Ampules**

SURROGATE STANDARDS

EPA METHOD 8150B

F2035 100mg		2,4-Dichlorophenylacetic acid
F2035JS 5ml	2000ug/ml	Acetone (Ampule)
F2035RPS 5ml	2000ug/ml	Acetone (Ampule)
F2036 100mg		2,4-Dichlorophenylacetic acid methyl ester
F2036JS 5ml	100ug/ml	Acetone (Ampule)
F2036RPS 5ml	100ug/ml	Acetone (Ampule)
F2036AJS 5ml	2000ug/ml	Acetone (Ampule)
F2036ARPS5ml	2000ug/ml	Acetone (Ampule)

EPA Method 8151/8151A/8151B

CHLORINATED HERBICIDES

EPA METHOD 8115,*615*

F2037	Acifluorfen
F2038	Bentazon
F2039	Chloramben
F966	4-Chloro-o-tolyloxyacetic acid
F954	2,4-D
F956	Dalapon
F958	2,4-DB
F960	Dicamba
F2034	3,5-Dichlorobenzoic acid
F962	Dichlorprop
F964	Dinoseb
MET-346A	5-Hydroxydicamba
F968	Mecoprop
F58	4-Nitrophenol
F64	Pentachlorophenol
F2041	Picloram
F970	Silvex
F972	2,4,5-T®
F2178	Tetrachloroterephthalic acid

NOTE: *5-Hydroxydicamba, MET-346A, is available 100ug/ml in Acetone:Water (90:10) only and is not included in CH-8151JM or CH-8151RPM.*

Neat compounds of each of the above - (19 component kit)
CH-8151N **KIT**

Solutions of each of the above in an appropriate solvent - (19 component kit)
CH-8151JS **KIT**

1000ug/ml in Acetone - (18 components)
CH-8151JM **1ml Ampule**
CH-8151RPM **5x1ml Ampules**

METHYLATED CHLORINATED HERBICIDES

EPA METHOD 8151,*615*

F2224	Acifluorfen methyl ester
F2244	Bentazon methyl derivative
F2226	Chloramben methyl ester
F967	4-Chloro-o-tolyloxyacetic acid methyl ester
F2040	Chlorthal
F955	2.4-D methyl ester
F957	Dalapon methyl ester
F959	2,4-DB methyl ester
F961	Dicamba methyl ester
F2223	3.5-Dichlorobenzoic acid methyl ester
F963	Dichlorprop methyl ester
F965	Dinoseb methyl ether
MET-346A	5-Hydroxydicamba
F969	Mecoprop methyl ester
F2175	p-Nitroanisole
F2156	Pentachloroanisole
F2155	Picloram methyl ester
F971	Silvex methyl ester
F973	(2.4.5-Trichlorophenoxy)acetic acid methyl ester

NOTE: *5-Hydroxydicamba, MET-346A, is not included in MCH-8151JM or MCH-8151RPM.*

NOTE: *In MCH-8151N and MCH-8151JS, MET-364A is included as a non-methyl ester, at 100ug/ml in Acetone:Water (90:10).*

Neat compounds of each of the above - (19 component kit)
MCH-8151N **KIT**

1ml Solutions of each, in the appropriate solvent - (19 component kit)
MCH-8151JS **KIT**

1000ug/ml in Acetone:Isooctane (10:90) - (18 components)
MCH-8151JM **1ml Ampule**
MCH-8151RPM **5x1ml Ampules**

FLORISIL CARTRIDGE CHECK MIXTURE

EPA METHOD 8151/8151A

100ug/ml	F973	(2.4.5-Trichlorophenoxy)acetic acid methyl ester
50ug/ml	F2156	Pentachloroanisole
200ug/ml	F2155	Picloram methyl ester

Mixture in Hexane - (3 components)
FCC8151-1JM **1ml Ampule**
FCC8151-1RPM **5x1ml Ampules**

SPIKING STANDARDS

EPA METHOD 8151

F2093	1g	Bromoxynil
F2093JS	1ml	100ug/mlMethanol
F2093RPS	5x1ml	100ug/mlMethanol

INTERNAL STANDARDS

EPA METHOD 8151

F905	100mg	4,4-Dibromooctafluorobiphenyl
F905JS	1ml	2000ug/mlMethylene chloride (Ampule)
F905RPS	5x1ml	2000ug/mlMethylene chloride (Ampule)
F27	5g	1.4-Dichlorobenzene
F27JS	1ml	100ug/mlMethanol
F27RPS	5x1ml	100ug/mlMethanol

SURROGATE STANDARDS

EPA METHOD 8151

F2035	100mg	2,4-Dichlorophenylacetic acid
F2035JS	1ml	2000ug/mlAcetone (Ampule)
F2035RPS	5x1ml	2000ug/mlAcetone (Ampule)
F2036	100mg	2,4-Dichlorophenylacetic acid methyl ester
F2036JS	1ml	100ug/mlAcetone (Ampule)
F2036RPS	5x1ml	100ug/mlAcetone (Ampule)
F2036AJS	1ml	2000ug/mlAcetone (Ampule)
F2036ARPS	5x1ml	2000ug/mlAcetone (Ampule)

SOLUTION STABILITY

Chem Service has an internal requirement that neat standard grade materials have a purity of 98% or greater. These same high purity neat standards are used to make our standard solutions and mixtures. Corrections are made to analytes with purities of less than 99%. Balances used to prepare stock and custom standards are calibrated to NIST traceable weights.

The expiration date is based on our years of experience with the product, not an arbitrarily assigned one year expiration date when the product is ordered.

EPA Method 8250A/8270B

ORGANOCHLORINE PESTICIDES

EPA METHOD 8250A/8270B,*508,608,625,8080A/8081,CLP*

F89	Aldrin®
F109	Arochlor 1242
F111	Arochlor 1254
F108	Arochlor 1221
F113	Arochlor 1232
F110	Arochlor 1248
F112	Arochlor 1260
F107	Arochlor 1016
F102	a-BHC
F103	b-BHC
F105	d-BHC
F91	Chlordane
F94	4,4'-DDD
F93	4,4'-DDE
F92	4,4'-DDT
F90	Dieldrin
F202	a-Endosulfan
F203	b-Endosulfan
F97	Endosulfan sulfate
F98	Endrin
F99	Endrin aldehyde
F100	Heptachlor
F101	Heptachlor epoxide
F104	Lindane (g-BHC)
F910	Methoxychlor
F106	Toxaphene®

NOTE: *PPO-8JM, PPO-8RPM, PP-HC5JM, PP-HC5RPM, OCP-8080JM, OCP-8080RPM, OCP508-1JM and OCP508-1RPM do not contain the Arochlors, Chlordane or Toxaphene.*

NOTE: *PPO-8JM, PPO-8RPM, PP-HC5JM and PP-HC5RPM do not contain Methoxychlor.*

NOTE: *OCP508-1JM, OCP508-1RPM contain F2022 Endrin Ketone, F907 cis-Chlordane and F908 trans-Chlordane.*

Neat compounds of each of the above - (26 component kit)
PPO-8N **KIT**

1ml Solutions of each, in the appropriate solvent - (26 component kit)
PPO-8JS **KIT**

100ug/ml in Toluene:Hexane (50:50), less Methoxychlor - (16 components)
PPO-8JM **1ml Ampule**
PPO-8RPM **5x1ml Ampules**

2000ug/ml in Toluene:Hexane (50:50), less Methoxychlor - (16 components)
PP-HC5JM **1ml Ampule**
PP-HC5RPM **5x1ml Ampules**

100ug/ml in Toluene:Hexane (50:50) - (17 components)
OCP-8080JM **1ml Ampule**
OCP-8080RPJM **5x1ml Ampules**

1000ug/ml in tert-Butylmethyl ether - (20 components)
OCP508-1J **1ml Ampule**
OCP508-1RPM **5x1ml Ampules**

PS-2261 Clothianidin CAS#210880-92-5
Clothianidin, trade name Poncho 600, is a member of the chloronicotinyl insecticide family. It has been registered with the EPA for seed treatment use on corn and canola. Go to page 71 for chemical name, alternate names, chemical formula, and chemical structure information.

AROCHLORS, TOXAPHENE® & CHLORDANE SOLUTIONS KIT

EPA METHOD 8250A/8270B,*505,508,525.2,608,617,625,1656, 8080A/8081,CLP*

F107AJS	Arochlor 1016 Solution
F108AJS	Arochlor 1221 Solution
F113AJS	Arochlor 1232 Solution
F109AJS	Arochlor 1242 Solution
F110AJS	Arochlor 1248 Solution
F111AJS	Arochlor 1254 Solution
F112BJS	Arochlor 1260 Solution
F91AJS	Chlordane Solution
F106BJS	Toxaphene® Solution

1ml Solutions of each, 1000ug/ml in Hexane - (9 component kit)
CTA608-1JS **KIT**

ORGANOCHLORINE PESTICIDE MATRIX SPIKING MIXTURE

EPA METHOD 8250A/8270B

200ug/ml	F89	Aldrin®
500ug/ml	F92	4,4'-DDT
500ug/ml	F90	Dieldrin
500ug/ml	F98	Endrin
200ug/ml	F100	Heptachlor
200ug/ml	F104	Lindane

Mixture in Acetone - (6 components)
OCP-MSJM **1ml Ampule**
OCP-MSRPM **5x1ml Ampules**

DEGRADATION CALIBRATION MIXTURE

EPA METHOD 608,*508/508.1,525.2,617,625,1618,1656,8080A/8081, 8250A/8270B,CLP*

200ug/ml	F92	4.4'-DDT
100ug/ml	F98	Endrin

Mixture in tert-Butylmethyl ether - (2 components)
DC-508JM **1ml Ampule**
DC-508RPM **5x1ml Ampules**

DEGRADATION PRODUCTS MIXTURE

EPA METHOD 608,*508/508.1,525.2,617,625,1618,1656,8080A/8081, 8250A/8270B,CLP*

200ug/ml	F93	4.4'-DDE
200ug/ml	F94	4.4'-DDD
100ug/ml	F99	Endrin aldehyde
100ug/ml	F2022	Endrin ketone

Mixture in tert-Butylmethyl ether - (4 components)
DP508-1JM **1ml Ampule**
DP508-1RPM **5x1ml Ampules**

ORGANOPHOSPHOROUS PESTICIDES - HIGH CONCENTRATION MIXTURE

EPA METHOD 8270B

F989	Dimethoate
F993	Disulfoton
F994	Famphur
F996	Methyl parathion
F1080	Phorate
F998	Parathion®
F940	Tetraethyldithiopyrophosphate
F941	O,O,O-Triethylphosphorothioate
F2152	Zinophos® (Thionazin)

2000ug/ml in Hexane:Acetone (80:20) - (9 components)
CSHC-13JM **1ml Ampule**
CSHC-13RPM **5x1ml Ampules**

Chem Service EPA Pesticide Methods

EPA Method 8318

CARBAMATE PESTICIDES

EPA METHOD 8318,*531.1*

F2002	Aldicarb
F2003	Aldicarb sulfone
F2004	Aldicarb sulfoxide
F2045	Baygon®
F2005	Carbaryl
F2006	Carbofuran
F2359	Dioxacarb
F2053	3-Hydroxycarbofuran
F2042	Methiocarb
F2043	Methomyl
F2044	Oxamyl
F2358	Promecarb

NOTE: *Dioxacarb (F2359) and Promecarb (F2358) are not included in CP-8318JM and CP-8318RPM. Aldicarb sulfoxide (F2004) and Oxamyl (F2044) are not included in CP8318-2JM and CP8318-2RPM.*

Neat compounds of each of the above - (12 component kit)
CP-8318N **KIT**

1ml Solutions of each, in the appropriate solvent - (12 component kit)
CP-8318JS **KIT**

100ug/ml in Acetonitrile- (10 components)
CP-8318JM **1ml**
CP-8318RPM **5x1ml Ampules**

1000ug/ml in Acetonitrile - (10 components)
CP8318-2JM **1ml Ampule**
CP8318-2RPM **5x1ml Ampules**

LABORATORY PERFORMANCE CHECK MIXTURE

EPA METHOD 8318,*531.1*

1000ug/ml	F2004	Aldicarb sulfoxide
100ug/ml	F2054	BDMC
20ug/ml	F2053	3-Hydroxycarbofuran
200ug/ml	F2042	Methiocarb

Mixture in Acetonitrile - (4 components)
LPC-531JM **1ml Ampule**
LPC-531RPM **5x1ml Ampules**

INTERNAL STANDARDS

EPA METHOD 8318

F2054	100mg	BDMC
F2054JS	1ml	100ug/mlMethanol
F2054RPS	5x1ml	100ug/mlMethanol

EPA Method 8321

ORGANOPHSOPHOROUS COMPOUNDS

EPA METHOD 8321

F2217	Asulam
F994	Famphur
F2067	Dibrom
F2061	Dichlorvos
F989	Dimethoate
F993	Disulfoton
F2215	Dylox®
F2063	Fensulfothion
F2043	Methomyl
F996	Methyl parathion
F2122	Monocrotophos
F1080	Phorate
F2065	Tributylphosphorotrithioite
F2142	Tris(2.3-dibromopropyl) phosphate

Neat compounds of each of the above - (14 component kit)
OPC-8321N **KIT**

1ml Solutions of each, in the appropriate solvent - (14 component kit)
OPC-8321JS **KIT**

1000ug/ml in Acetonitrile - (14 components)
OPC-8321JM **1ml Ampule**
OPC-8321RPM **5x1ml Ampules**

CHLORINATED HERBICIDES

EPA METHOD 8321,*1618,8150B*

F954	2,4-D
F958	2,4-DB
F956	Dalapon
F960	Dicamba
F962	Dichlorprop
F964	Dinoseb
F966	4-Chloro-o-tolyloxyacetic acid
F968	Mecoprop
F970	Silvex
F972	2,4,5-T®

Neat compounds of each of the above - (10 component kit)
CH-8150N **KIT**

1ml Solutions of each, in the appropriate solvent - (10 component kit)
CH-8150JS **KIT**

Mixture at 100ug/ml in Acetone - (10 components)
CH-8150JM **1ml Ampule**
CH-8150RPM **5x1ml Ampules**

MERPHOS CALIBRATION STANDARDS

EPA METHOD 8321,*507,622,1657,8140/8141A*

F2214	1g	S.S.S-Tributylphosphorotrithioate
F2214JS	1ml	100ug/mltert-Butylmethyl ether (Ampule)
F2214RPS	5x1ml	100ug/mltert-Butylmethyl ether (Ampule)

EPA Methods



Environmental & Analytical Standards Catalog

Also available from Chem Service is our Environmental & Analytical Standards Catalog. The catalog contains over 300 pages of environmental standards, analytical standards in neat and solution form. It also contains the complete listing of standards for EPA methods, ASTM methods, UST Standards, International Standards, Food Analysis Standards, and much more. Contact us for your free copy.

CLP Pesticides

PESTICIDE & PCB COMPOUNDS

CLP PESTICIDES

F89	Aldrin®
F107	Arochlor 1016
F108	Arochlor 1221
F113	Arochlor 1232
F109	Arochlor 1242
F110	Arochlor 1248
F111	Arochlor 1254
F112	Arochlor 1260
F102	BHC (alpha isomer)
F103	BHC (beta isomer)
F105	BHC (delta isomer)
F907	cis-Chlordane
F908	trans-Chlordane
F93	4.4'-DDE
F94	4.4'-DDD
F92	4.4'-DDT
F90	Dieldrin
F202	a-Endosulfan
F203	b-Endosulfan
F97	Endosulfan sulfate
F98	Endrin
F99	Endrin aldehyde
F2022	Endrin ketone
F100	Heptachlor
F101	Heptachlor epoxide
F104	Lindane (BHC gamma isomer)
F910	Methoxychlor
F106	Toxaphene®

Neat compounds of each of the above - (28 component kit)
CLPPES-1N **KIT**

1ml Solutions of each, in the appropriate solvent - (28 component kit)
CLPPES-1JS **KIT**

TOXAPHENE® & CHLORDANE KIT

CLP PESTICIDES

F91	Chlordane
F106	Toxaphene®

Neat compounds of each of the above - (2 component kit)
PP-7N **KIT**

1ml Solutions of each, in the appropriate solvent - (2 component kit)
PP-7JS **KIT**

AROCHLOR 1016 & AROCHLOR 1260 MIXTURE

CLP PESTICIDES

F107	Arochlor 1016
F112	Arochlor 1260

200ug/ml in Hexane - (2 components)
CSM-CLPPJM **1ml Ampule**
CSM-CLPPRPM **5x1ml Ampules**

POLYCHLORINATED BIPHENYLS

CLP PESTICIDES

F107	Arochlor 1016
F108	Arochlor 1221
F113	Arochlor 1232
F109	Arochlor 1242
F110	Arochlor 1248
F111	Arochlor 1254
F112	Arochlor 1260

Neat compounds of each of the above - (7 component kit)
PP-8N **KIT**

1ml Solutions of each, 100ug/ml in Methanol - (7 component kit)
PP-8JS **KIT**

ORGANOCHLORINE PESTICIDES

CLP PESTICIDES

F89	Aldrin®
F109	Arochlor 1242
F111	Arochlor 1254
F108	Arochlor 1221
F113	Arochlor 1232
F110	Arochlor 1248
F112	Arochlor 1260
F107	Arochlor 1016
F102	a-BHC
F103	b-BHC
F105	d-BHC
F91	Chlordane
F94	4,4'-DDD
F93	4,4'-DDE
F92	4,4'-DDT
F90	Dieldrin
F202	a-Endosulfan
F203	b-Endosulfan
F97	Endosulfan sulfate
F98	Endrin
F99	Endrin aldehyde
F100	Heptachlor
F101	Heptachlor epoxide
F104	Lindane (g-BHC)
F910	Methoxychlor
F106	Toxaphene®

NOTE: *PPO-8M, PPO-8JM, PP-HC5, PP-HC5JM, OCP-8080M, OCP-8080JM, OCP508-1M and OCP508-1JM do not contain the Arochlors, Chlordaneor Toxaphene.*

NOTE: *PPO-8M, PPO-8JM, PP-HC5 and PP-HC5JM do not contain Methoxychlor.*

NOTE: *OCP508-1M, OCP508-1JM contain F2022 Endrin Ketone, F907 cis-Chlordane and F908 trans-Chlordane.*

Neat compounds of each of the above - (26 component kit)
PPO-8N **KIT**

1ml Solutions of each, in the appropriate solvent - (26 component kit)
PPO-8JS **KIT**

100ug/ml in Toluene:Hexane (50:50), less Methoxychlor - (16 components)
PPO-8JM **1ml Ampule**
PPO-8RPM **5x1ml Ampules**

2000ug/ml in Toluene:Hexane (50:50), less Methoxychlor - (16 components)
PP-HC5JM **1ml Ampule**
PP-HC5RPM **5x1ml Ampules**

100ug/ml in Toluene:Hexane (50:50) - (17 components)
OCP-8080JM **1ml Ampule**
OCP-8080RPM **5x1ml Ampules**

1000ug/ml in tert-Butylmethyl ether - (20 components)
OCP508-1JM **1ml Ampule**
OCP508-1RPM **5x1ml Ampules**

AROCHLORS, TOXAPHENE® & CHLORDANE SOLUTIONS KIT

CLP PESTICIDES

F107AS	Arochlor 1016 Solution
F108AS	Arochlor 1221 Solution
F113AS	Arochlor 1232 Solution
F109AS	Arochlor 1242 Solution
F110AS	Arochlor 1248 Solution
F111AS	Arochlor 1254 Solution
F112BS	Arochlor 1260 Solution
F91AS	Chlordane Solution
F106BS	Toxaphene® Solution

1ml Solutions of each, 1000ug/ml in Hexane - (9 component kit)
CTA608-1JS **KIT**

Chem Service EPA Pesticide Methods

PESTICIDES STANDARD MIXTURE A

CLP PESTICIDES

100ug/ml	F102	BHC (alpha isomer)
200ug/ml	F94	4.4'-DDD
200ug/ml	F92	4.4'-DDT
200ug/ml	F2107	Decachlorobiphenyl
200ug/ml	F90	Dieldrin
100ug/ml	F202	a-Endosulfan
200ug/ml	F98	Endrin
100ug/ml	F100	Heptachlor
100ug/ml	F104	Lindane (BHC gamma isomer)
1000ug/ml	F910	Methoxychlor
100ug/ml	F903	2,4,5,6-Tetrachloro-m-xylene

Mixture in Hexane - (11 components)

CLP-18JM **1ml Ampule**
CLP-18RPM **5x1ml Ampules**

PESTICIDES STANDARD MIXTURE B

CLP PESTICIDES

100ug/ml	F89	Aldrin®
100ug/ml	F103	BHC (beta isomer)
100ug/ml	F105	BHC (delta isomer)
100ug/ml	F907	cis-Chlordane
100ug/ml	F908	trans-Chlordane
200ug/ml	F93	4.4'-DDE
200ug/ml	F2170	Decachlorobiphenyl
200ug/ml	F203	b-Endosulfan
200ug/ml	F97	Endosulfan sulfate
200ug/ml	F99	Endrin aldehyde
200ug/ml	F2022	Endrin ketone
100ug/ml	F101	Heptachlor epoxide
100ug/ml	F903	2,4,5,6-Tetrachloro-m-xylene

Mixture in Toluene:Hexane (50:50) - (13 components)

CLP-19JM **1ml Ampule**
CLP-19RPM **5x1ml Ampules**

DEGRADATION CALIBRATION MIXTURE

CLP PESTICIDES

200ug/ml	F92	4.4'-DDT
100ug/ml	F98	Endrin

Mixture in tert-Butylmethyl ether - (2 components)

DC-508JM **1ml Ampule**
DC-508RPM **5x1ml Ampules**

DEGRADATION PRODUCTS MIXTURE

CLP PESTICIDES

200ug/ml	F93	4.4'-DDE
200ug/ml	F94	4.4'-DDD
100ug/ml	F99	Endrin aldehyde
100ug/ml	F2022	Endrin ketone

Mixture in tert-Butylmethyl ether - (4 components)

DP508-1JM **1ml Ampule**
DP508-1RPM **5x1ml Ampules**

CLP MATRIX SPIKING MIXTURE

CLP PESTICIDES

100ug/ml	F89	Aldrin
200ug/ml	F92	4.4'-DDT
200ug/ml	F90	Dieldrin
200ug/ml	F98	Endrin
100ug/ml	F100	Heptachlor
100ug/ml	F104	Lindane (BHC gamma isomer)

Mixture in Acetone - (6 components)

CLP-MSJM **1ml Ampule**
CLP-MSRPM **5x1ml Ampules**

PESTICIDE PERFORMANCE EVALUATION MIXTURE

CLP PESTICIDES

10ug/ml	F102	BHC (alpha isomer)
10ug/ml	F103	BHC (beta isomer)
100ug/ml	F92	4.4'-DDT
20ug/ml	F2170	Decachlorobiphenyl
50ug/ml	F98	Endrin
10ug/ml	F104	Lindane (BHC gamma isomer)
250ug/ml	F910	Methoxychlor
20ug/ml	F903	2,4,5,6-Tetrachloro-m-xylene

Mixture in Toluene:Hexane (50:50) - (8 components)

CLP-16JM **1ml Ampule**
CLP-16RPM **5x1ml Ampules**

PESTICIDE RESOLUTION CHECK MIXTURE

CLP PESTICIDES

10ug/ml	F908	trans-Chlordane
20ug/ml	F93	4.4'-DDE
20ug/ml	F2170	Decachlorobiphenyl
20ug/ml	F90	Dieldrin
10ug/ml	F202	a-Endosulfan
20ug/ml	F97	Endosulfan sulfate
20ug/ml	F2022	Endrin ketone
100ug/ml	F910	Methoxychlor
20ug/ml	F903	2,4,5,6-Tetrachloro-m-xylene

Mixture in Hexane - (9 components)

CLP-15JM **1ml Ampule**
CLP-15RPM **5x1ml Ampules**

SURROGATE STANDARDS MIXTURE #1

CLP PESTICIDES

F2170	Decachlorobiphenyl
F903	2,4,5,6-Tetrachloro-m-xylene

2000ug/ml in Toluene - (2 components)

SM-8080JM **1ml Ampule**
SM-8080RPM **5x1ml Ampules**

SURROGATE STANDARDS MIXTURE #2

CLP PESTICIDES

F850	Dibutyl chlorendate
F903	2,4,5,6-Tetrachloro-m-xylene

2000ug/ml in Acetone - (2 components)

SM-8080AJM **1ml Ampule**
SM-8080ARPM **5x1ml Ampules**

SURROGATE STANDARDS

CLP PESTICIDES

F2170	10mg	Decachlorobiphenyl
F2170JS	1ml	1000ug/mlHexane (Ampule)
F2170RPS	5x1ml	1000ug/mlHexane (Ampule)
F2170AJS	1ml	100ug/mlHexane (Ampule)
F2170ARPS	5x1ml	100ug/mlHexane (Ampule)
F2170BJS	1ml	500ug/mlAcetone (Ampule)
F2170BRPS	5x1ml	500ug/mlAcetone (Ampule)
F850	1g	Dibutyl chlorendate
F850JS	1ml	1000ug/mlMethylene chloride (Ampule)
F850RPS	5x1ml	1000ug/mlMethylene chloride (Ampule)
F850AJS	1ml	2000ug/mlAcetone (Ampule)
F850ARPS	5x1ml	2000ug/mlAcetone (Ampule)
F903	1g	2,4,5,6-Tetrachloro-m-xylene
F903JS	1ml	200ug/mlMethanol
F903RPS	5x1ml	200ug/mlMethanol

Chem Service EPA Pesticide Methods

CLP QTM Pesticides

ORGANOCHLORINE PESTICIDES MIXTURE

CLP QUICK TURNAROUND METHOD - PESTICIDES

F89	Aldrin®
F102	BHC (alpha isomer)
F103	BHC (beta isomer)
F105	BHC (delta isomer)
F907	cis-Chlordane
F908	trans-Chlordane
F94	4.4'-DDD
F93	4.4'-DDE
F92	4.4'-DDT
F90	Dieldrin
F202	a-Endosulfan
F203	b-Endosulfan
F97	Endosulfan sulfate
F98	Endrin
F99	Endrin aldehyde
F2022	Endrin ketone
F100	Heptachlor
F101	Heptachlor epoxide
F104	Lindane (BHC gamma isomer)
F910	Methoxychlor

1000ug/ml in tert-Butylmethyl ether - (20 components)

OCP508-1JM **1ml Ampule**

OCP508-1RPM **5x1ml Ampules**

CONTROL SAMPLE MIXTURE

CLP QUICK TURNAROUND METHOD - PESTICIDES

1ug/ml	F89	Aldrin®
10ug/ml	F105	BHC (delta isomer)
20ug/ml	F92	4.4'-DDT
15ug/ml	F90	Dieldrin
20ug/ml	F202	a-Endosulfan
5ug/ml	F203	b-Endosulfan
25ug/ml	F98	Endrin
4ug/ml	F100	Heptachlor
1ug/ml	F101	Heptachlor epoxide
2ug/ml	F910	Methoxychlor

Mixture in Hexane - (10 components)

CSMQPST-1JM **1ml Ampule**

CSMQPST-1RPM **5x1ml Ampules**

SYSTEM MONITORING COMPOUNDS

CLP QUICK TURNAROUND METHOD - PESTICIDES

F2170	10mg	Decachlorobiphenyl
F2170JS	1ml	1000ug/mlHexane (Ampule)
F2170RPS	5x1ml	1000ug/mlHexane (Ampule)
F2170AJS	1ml	100ug/mlHexane (Ampule)
F2170ARPS	5x1ml	100ug/mlHexane (Ampule)
F2170BJS	1ml	500ug/mlAcetone (Ampule)
F2170BRPS	5x1ml	500ug/mlAcetone (Ampule)

PS-2276 Clodinafop-propargyl

Clodinafop-propargyl, also known as a herbicide in the Oxyphenoxy acid ester family. It is registered for use on spring wheat. Go to page 72 for chemical name, alternate names, chemical formula, and chemical structure information.

TCLP - EPA Method 1311

TCLP PESTICIDES SPIKING MIXTURES

TCLP

F98	Endrin
F100	Heptachlor
F101	Heptachlor epoxide
F104	Lindane (BHC gamma isomer)
F910	Methoxychlor

100ug/ml in Methanol - (5 components)

TCLP-1PJM **1ml Ampule**

TCLP-1PRPM **5x1ml Ampules**

2000ug/ml in Methanol - (5 components)

TCLP-1PSJM **1ml Ampule**

TCLP-1PSRPM **5x1ml Ampules**

TOXAPHENE® & CHLORDANE KIT

TCLP

F91	Chlordane
F106	Toxaphene®

Neat compounds of each of the above - (2 component kit)

PP-7N **KIT**

1ml Solutions of each, in the appropriate solvent - (2 component kit)

PP-7JS **KIT**

CHLORINATED HERBICIDES MIXTURE

TCLP

F954	2,4-D
F970	Silvex
F972	2,4,5-T®

2000ug/ml in Acetone - (3 components)

CSHC-14JAM **1ml Ampule**

CSHC-14ARPM **5x1ml Ampules**

CHLORINATED HERBICIDE ESTERS MIXTURE

TCLP

F955	2,4-D methyl ester
F971	Silvex methyl ester
F973	2,4,5-T methyl ester

2000ug/ml in Hexane - (3 components)

CSHC-14JM **1ml Ampule**

CSHC-14RPM **5x1ml Ampules**

Synthesis Capability

Chem Service is continually increasing the number of "Standards Grade" pesticide materials in response to the increasing worldwide need for these analytical grade standards. Our chemists are experts in the synthesis and purification of pesticides and their related metabolites. Since we last printed this catalog, Chem Service has added more than 100 new neat "Standards Grade" pesticides and metabolites and several hundred single component pesticide standard solutions.

Chem Service EPA Pesticide Methods

EPA Method TO10

ORGANOCHLORINE PESTICIDES

EPA METHOD TO10

F89	Aldrin®	F102	BHC (alpha isomer)	F103	BHC (beta isomer)
F2095	Captan	F91	Chlordane	F2220	Chlorothalonil
F2057	Chlorpyrifos	F955	2.4-D methyl ester	PS-315	2.4-D butoxyethyl ester
PS-298	2.4-D butoxypolypropylene ester	PS-42	2.4-D butyl ester	PS-301	2.4-D sec-butyl ester
PS-337	2.4-D dimethylamine salt	PS-338	2.4-D ethanolamine salt	PS-304	2.4-D ethyl ester
PS-319	2.4-D isooctyl ester	PS-332	2.4-D isopropanol amine salt	PS-43	2.4-D isopropyl ester
PS-302	2.4-D propylene glycol ester	F92	4.4'-DDT	F93	4.4'-DDE
F90	Dieldrin	F2061	Dichlorvos	F98	Endrin
F99	Endrin aldehyde	F2068	Fenchlorphos	PS-26	Folpet
F100	Heptachlor	F101	Heptachlor epoxide	F9	Hexachlorobenzene
PS-82	Kelthane®	F104	Lindane (BHC gamma isomer)	F910	Methoxychlor
F2121	Mirex	F2180	trans-Nonachlor	MET-75A	Oxychlordane
F938	Pentachlorobenzene	F64	Pentachlorophenol	F717	2.4.5-Trichlorophenol

Neat compounds of each of the above - (39 component kit)
NOTE: *MET-75A Oxychlordane 10ng/ul in Methanol*

ATO-10N **KIT**

Chem Service Pesticide Kits

Fungicide Kit
PSK-42

DESCRIPTION - This kit contains a selection of 42 standards of the most common fungicides in use today. Sizes range from 10mg to 1g.

Halogenated Phenols

PS-6	Dichlorophen
PS-7	Pentachlorophenol
PS-8	2.3.4.6-Tetrachlorophenol
PS-9	2.4.5-Trichlorophenol
PS-10	2.4.6-Trichlorophenol

Halogenated Quinones

PS-11	Chloranil
PS-12	Dichlone

Mercurials

PS-13	1.4.5.6.7.7-Hexachloro-N-(ethylmercuri)-5-norbornene-2.3-dicarboximide
PS-14	Phenyl mercuric acetate
PS-15	Phenyl mercuric benzoate
PS-214	Phenyl mercuric chloride
PS-215	Phenyl mercuric hydroxide
PS-216	Phenyl mercuric lactate
PS-217	Phenyl mercuric phthalate

Diazines

PS-17	Dazomet

Quinolinols

PS-18	8-Hydroxyquinoline

Thiocarbamates

PS-19	2-Chloroallyl diethyldithiocarbamate
PS-20	Ferbam
PS-21	Ziram
PS-22	Maneb
PS-23	Zineb®
PS-24	Tetramethylthiuram disulfide
PS-220	Nabam
PS-221	Metham sodium
PS-222	Benomyl

Thioimides

PS-25	Captan
PS-26	Folpet

Miscellaneous

PS-27	Dinocap
PS-250	Dodine
PS-255	Chloroneb
PS-260	Captafol
PS-261	Glyodin
PS-262	Dexon®
PS-264	Terrazole®
PS-272	Hexachloroacetone
PS-273	Bromoacetyl bromide
PS-274	Picloram
PS-280	Cadmium succinate
PS-281	Disodium methyl arsenate
PS-290	Lead arsenate
PS-291	Ammonium fluosilicate
PS-292	Copper oxychloride
PS-293	Dicloran
PS-294	Carboxin
PS-295	Oxycarboxin
PS-1013	Triadimefon
PS-1020	Chlorothalonil
PS-1021	Phentinoacetate
PS-1031	Fentin hydroxide
PS-1035	Hexachlorophene
PS-1052	Iprodione
PS-1057	Thiabendazole®
PS-1064	Baytan®
PS-1067	Cymoxanil
PS-1075	Tilt®
PS-1077	Carbendazim
PS-1083	Beam®

Catalog #: PSK-42
Neat compounds of each of the above - (42 component kit, randomly selected)

Chem Service Pesticide Kits

Common Pesticides Kit
PSK-101

DESCRIPTION - This kit contains a selection of 101 standards of the most common pesticides in use today. Sizes range from 10mg to 1g.

PS-1	1.2-Dibromo-3-chloropropane
PS-7	Pentachlorophenol
PS-11	Chloranil
PS-12	Dichlone
PS-20	Ferbam
PS-21	Ziram
PS-22	Maneb
PS-23	Zineb ®
PS-25	Captan
PS-30	Methyl-1-naphthalene acetate
PS-41	2.4-D
PS-42	2.4-D butyl ester
PS-43	2.4-D isopropyl ester
PS-45	2.4.5-T ®
PS-46	2.4.5-T isopropyl ester
PS-47	Silvex
PS-49	Gibberellic acid
PS-54	S-Ethyl dipropylthiocarbamate
PS-58	Simazine
PS-59	Monuron
PS-60	Diuron
PS-61	1.1-Dimethyl-3-phenylurea
PS-65	Maleic hydrazide
PS-69	Aldrin ®
PS-70	BHC (mixed isomers)
PS-71	Lindane
PS-74	DDT
PS-75	Chlordane
PS-76	Dieldrin
PS-77	Endrin
PS-78	Heptachlor
PS-79	Toxaphene ®
PS-81	Endosulfan
PS-83	Methoxychlor
PS-85	Nicotine
PS-86	Malathion
PS-89	Dichlorvos
PS-90	Diazinon
PS-94	Methyl parathion
PS-95	Parathion ®
PS-96	Allethrin (0.1mg/ml in Methylene chloride)
PS-97	Pyrethrum
PS-99	Rotenone
PS-100	Piperonyl butoxide
PS-104	Warfarin
PS-105	Sodium fluoroacetate
PS-152	1.3-Dichloropropene
PS-154	1.2-Dibromoethane
PS-155	Bromomethane
PS-221	Metham sodium
PS-222	Benomyl
PS-261	Glyodin
PS-274	Picloram
PS-301	2.4-D sec-butyl ester
PS-313	Sesone ®
PS-326	Ethyl-3-amino-2.5-dichloro benzoate
PS-339	(2.4.5-Trichlorophenoxy)acetic acid methyl ester
PS-342	Silvex methyl ester
PS-349	Propyzamide
PS-350	Diphenamid
PS-355	Propachlor
PS-356	3'.4'-Dichloropropionanilide
PS-357	Alachlor
PS-366	Paraquat CL tetrahydrate
PS-372	Linuron
PS-375	Terbacil
PS-377	Neburon
PS-380	Atrazine
PS-382	Aminotriazole
PS-384	Prometryne
PS-399	Profluoralin ®
PS-402	Procyazine
PS-419	Nitrapyrin
PS-426	Bromoxynil
PS-503	Butylate
PS-506	Tri-allate
PS-543	Methiocarb
PS-551	Baygon ®
PS-603	Crotoxyphos
PS-605	Dibrom
PS-607	Ruelene ®
PS-608	Dylox ®
PS-611	Tetrachlorvinphos
PS-641	Oxydemeton-methyl
PS-643	Pirimiphos-ethyl
PS-644	Pirimiphos-methyl
PS-652	Disulfoton
PS-654	Phorate
PS-655	Fenthion
PS-659	Dimethoate
PS-662	Demeton S
PS-664	Dyfonate ®
PS-665	Abate ®
PS-666	Guthion ®
PS-674	Chlorpyrifos
PS-680	Terbufos
PS-734	Aldicarb
PS-738	Acephate
PS-739	Bendiocarb
PS-754	Carbofuran
PS-757	Pirimicarb
PS-902	N.N-Diethyl-m-toluamide
PS-1000	Resmethrin
PS-1016	Acifluorfen
PS-1020	Chlorothalonil
PS-1035	Hexachlorophene
PS-1078	Metsulfuron methyl

Catalog #: PSK-101
Neat compounds of each of the above - (101 component kit, randomly selected)

Complete Pesticide Kit
PSK-350

DESCRIPTION - This kit contains a selection of 350 standards of the pesticides in use today as well as many of those that have been banned or discontinued. When placing an order for this kit, if you have special requirements for what is to be included in your selection, please specify at the time of order. Sizes range from 10mg to 1g.

Catalog #: PSK-350
Neat compounds of each of the above - (350 component kit, randomly selected)

Herbicides and Plant Growth Regulators Kit
PSK-105

DESCRIPTION - This kit contains a selection of 105 standards of the most common and some unusual herbicides and plant growth regulators in use today. Sizes range from 10mg to 1g.

Aromatic Acids and Derivatives
PS-29 1-Naphthaleneacetic acid
PS-30 Methyl-1-naphthalene acetate
PS-50 N-m-Tolylphthalamic acid
PS-335 Ethyl-1-naphthalene acetate
PS-343 N-1-Naphthylphthalamic acid

Halogenated Acids and Derivatives
PS-31 Chloroacetic acid
PS-32 Dalapon
PS-33 Chlorthal
PS-34 Trichloroacetic acid
PS-308 Fenac
PS-310 p-Chloromandelic acid
PS-314 3-Amino-2.5-dichlorobenzoic acid
PS-1016 Acifluorfen
PS-346 Dicamba

Phenoxy Acids and Derivatives
PS-35 2-Naphthoxyacetic acid
PS-36 Phenoxyacetic acid
PS-37 2-Phenoxypropionic acid
PS-38 o-Chlorophenoxy acetic acid
PS-39 p-Chlorophenoxy acetic acid
PS-40 4-Chloro-o-tolyloxyacetic acid
PS-41 2.4-D
PS-42 2.4-D butyl ester
PS-43 2.4-D isopropyl ester
PS-44 Dichlorprop
PS-45 2.4.5-T ®
PS-46 2.4.5-T isopropyl ester
PS-47 Silvex
PS-306 2.4-DB
PS-1036 Diclofop methyl
PS-309 2.4.5-T butoxyethyl ester
PS-312 p-Bromophenoxy acetic acid
PS-313 Sesone ®
PS-315 2.4-D butoxyethyl ester
PS-316 2.4-DB dimethylamine salt
PS-319 2.4-D isooctyl ester

Indole Acids
PS-48 3-Indolebutyric acid
PS-320 3-Indoleacetic acid
PS-321 3-Indolepropionic acid

Miscellaneous Acids
PS-49 Gibberellic acid
PS-340 N.N-Dimethylsuccinamic acid
PS-341 2-Furanacrylic acid
PS-344 Ammonium sulfamate
PS-345 Endothal

Arsenicals
PS-51 Dimethylarsinic acid
PS-428 Sodium arsenate
PS-429 Monosodium acid methane arsonate

Acetamides and Anilides
PS-28 1-Naphthaleneacetamide
PS-348 Butachlor
PS-349 Propyzamide
PS-350 Diphenamid
PS-351 N.N-Diallyl-2-chloroacetamide
PS-352 N-Methyl-N-1-naphthyl acetamide
PS-354 N-1-Naphthylacetamide
PS-355 Propachlor
PS-356 3'.4'-Dichloropropionanilide
PS-357 Alachlor
PS-358 Nitralin
PS-1009 Asulam

Quaternary Ammonium and Related Compounds
PS-360 Allyl trimethylammonium bromide
PS-361 (2-Bromoethyl)trimethyl ammonium-bromide
PS-363 Chlormequat chloride
PS-365 Diquat Dibromide monohydrate
PS-366 Paraquat CL tetrahydrate

Urea Derivatives and Uracils
PS-59 Monuron
PS-60 Diuron
PS-61 1.1-Dimethyl-3-phenylurea
PS-62 Bromacil
PS-368 Chlorbromuron
PS-369 Fluometuron
PS-371 Monuron TCA
PS-372 Linuron
PS-373 Siduron
PS-374 Metobromuron
PS-375 Terbacil
PS-376 Chloroxuron
PS-377 Neburon

Triazines and Related Compounds
PS-58 Simazine
PS-380 Atrazine
PS-382 Aminotriazole
PS-383 Ametryne
PS-384 Prometryne
PS-385 Propazine
PS-386 Prometon
PS-387 Bladex
PS-388 Anilazine

Miscellaneous Nitrogen Compounds
PS-63 Chloranocryl
PS-64 Diphenylacetonitrile
PS-65 Maleic hydrazide
PS-389 Benfluralin
PS-390 N-[(2.4-Dichlorophenoxy)acetyl]-DL-methionine
PS-391 Daminozide
PS-392 2.6-Dichlorobenzonitrile
PS-393 Trifluralin
PS-394 Nitrofen
PS-426 Bromoxynil
PS-427 Diphenylamine
PS-430 Pyrazon
PS-431 Fluorodifen
PS-432 Ethoxyquin
PS-434 Bromoxynil octanoic acid ester
PS-1006 Diethatyl ethyl
PS-1011 Bentazon
PS-1017 Benthiocarb
PS-1033 Oxyfluorfen
PS-1044 Norflurazon ®
PS-1050 Oxadiazon
PS-1065 Chlorsulfuron
PS-1070 Sonar ®
PS-1074 Sulfometuron methyl
PS-1078 Metsulfuron methyl
PS-1081 Chlorimuron ethyl
PS-1082 Benzsulfuron methyl

Carbamates and Thiocarbamates
PS-52 Chlorpropham
PS-53 Propham
PS-54 S-Ethyl dipropylthiocarbamate
PS-55 S-Propyl butylethylthiocarbamate
PS-501 Molinate
PS-502 Cycloate
PS-503 Butylate
PS-504 Vernolate
PS-506 Tri-allate
PS-507 Di-allate
PS-550 Terbutol
PS-551 Baygon ®
PS-1015 Desmedipham

Nitrophenols
PS-56 Dinoseb
PS-57 4.6-Dinitro-o-cresol
PS-433 4.6-Dinitro-2-sec-butylphenol ethanolamine salt

Sulfur Compounds
PS-66 Diethyl dithiobis(thionoformate)

Phosphorus Compounds
PS-67 Phosphan
PS-68 Tributylphosphoro-trithioite
PS-325 (2-Chloroethyl)phosphonic acid
PS-1051 Glyphosate

Catalog #: PSK-105
Neat compounds of each of the above - (105 component kit, randomly selected)

Reference Literature/MSDS Software/Purchasing Information

Reference Literature

The ***Farm Chemicals Handbook*** published annually by the Farm Chemicals Magazine. Contains a pesticide directory and comprehensive list of farm chemical manufactures and suppliers.

The Pesticide Manual *- A World Compendium*, published by the British Crop Protection Council; edited by Charles R. Worthing. Over 750 compounds, each described on a separate page, listing: nomenclature and development; manufacturing and properties; uses, toxicology, formulation and methods of analyses.

The Merck Index*: The Most Recent Edition*, the basic reference tool for all analytical libraries.

Please call (800) 452-9994, for current pricing and availability.

MSDS Software

Our MSDS CDs are acceptable by OSHA. The program gives you the option of printing one or all of the MSDS on the CD, and will print to either the screen or a printer (both dot matrix and laser). Demo disks are available upon request. Updates to the CD will be made available periodically for a nominal fee.

Pesticides, Metabolites and Environmental Chemicals
Cat # DSK-201

Purchasing Information

Extended Business Hours - Chem Service's business hours are 8:00 a.m. to 6:00 p.m. Monday - Friday for ordering and support of all Chem Service products.

Rush Hours - Place any rush order by 4:00 p.m. EST and have guaranteed same day shipment of any in-stock Chem Service product. With our extensive 13,000 plus inventory of reference materials, Chem Service has the products you need when you need them.

Purity Minimums - Chem Service's policy is to provide all neat Standards Grade materials that meet the 98% purity minimum. There will be a few exceptions for a small number of compounds where the chemical stability or the nature of the compound makes this purity unobtainable or impractical, due to chemical stability, isomer separation, purification, synthesis, cost or other factors, but nearly all Standards Grade materials will ship as 98% or higher purity.

Certified Neat Products and Certified Custom Solutions - Our certified in-house neat chemicals are the basis of our quality custom solutions. We can customize a product to meet your specification, certification, budget and delivery requirements. Use our Custom Solution & Mixture Request form on page 144 or call for a quotation at (+) 1-610-692-3026.

Prices - Are Subject to Change Without Notice.

Product Documentation

MATERIAL SAFETY DATA SHEETS (MSDS) - Federal Regulation (OSHA) 29 CFR 1910.1200 and other applicable state laws require us to furnish a Material Safety Data Sheet with the initial delivery of each hazardous chemical. Where hazards are known, appropriate warnings are noted on the label. (Always READ your Material Safety Data Sheet before handling chemicals.)

Warning - Read your Material Safety Data Sheet before handling or using any chemicals.

MSDS are shipped in the box with the chemicals, in accordance with OSHA's requirements.

For additional copies, replacement copies, updated versions or MSDS in advance of an order, Chem Service will supply up to ten (10) total MSDS at no charge. Further requests or quantities greater then ten will incur a labor and processing charge based on the size of the request and the time required to process the MSDS.

A quotation can be supplied - Please address your requests to the "MSDS Department".

All our MSDS are available on CD-ROM. See Page 137 for our Pesticide CD-ROM, or our General Catalog.

CERTIFICATE OF ANALYSIS (COA) - With the purchase of any Chem Service "Standards Grade" environmental, pesticide, organic chemicals, solutions or mixtures, a COA will be provided free of charge, where available. COAs are available for kits, but need to be requested at the time of order. Please note that "Standards Grade" products assigned a purity of tech, will not receive a COA. Also, metabolites supplied at 10ng/ul may not have a COA supplied.

Replacement Policy

"If it's on the label, we guarantee it."

Prior to the expiration date shown on the label and exclusive of any customer contamination, we will replace any products showing purity degradation. You must advise our Customer Service Department immediately to receive approval and instruction on either disposal or return of the product.

Contact us at:

Chem Service, Inc.
660 Tower Lane
PO Box 599
West Chester, PA 19381-0599

INTERNET and E-MAIL
Web Site: http://www.chemservice.com

General: info@chemservice.com
Marketing: marketing@chemservice.com
Orders, Pricing and Availability: quote@chemservice.com
Technical Inquiries: tech@chemservice.com

ORDERS
Phone: 1-610-692-3026 or 1-800-452-9994
Fax: 1-610-692-8729

TECHNICAL INQUIRIES & CUSTOMER SERVICE
Phone: 1-610-692-3026 or 1-800-452-9994
Fax: 1-610-692-8729

Return Policy

Goods may not be returned for credit except with Seller's written permission and then only in strict compliance with Seller's return shipment instructions, since most of Seller's products are classified as Hazardous Materials (HazMats) by the U.S. D.O.T. or Dangerous Goods under the applicable international conventions (ICAO/IATA or IMDG). It is imperative that the Buyer not return anything without specific instructions from Seller to prevent Buyer's violation of applicable laws and regulations. Buyer will at times handle and dispose of goods in accordance with Seller's instructions, the current Material Safety Data Sheet, and all applicable law and government regulations.

Buyer has 15 days to notify Seller of any damage or shortage, and 30 days to notify Seller of item ordered incorrectly. If a return is necessary, a return authorization number (RO#) must be given by the Customer Service Manager, and the item(s) must be returned within 10 days after issuance of the RO#.

Unauthorized returns may result in an assessment of a charge to the Buyer equal to Chem Service's actual expense in handling the unauthorized return. In addition, Buyer may incur regulatory or legal sanctions for illegal shipments and will be held liable by Chem Service for any expenses, including legal fees, fines, or other penalties incurred by Chem Service as a result of Buyer's unauthorized shipment.

The restocking fee is 15% or a $10.00 minimum and is decided upon by the Seller.

Grade Information

"STANDARDS GRADE" (S.G.) - Material has been analyzed and assigned a certified purity and valid expiration date. The analysis is traceable by lot number. Minimum purity requirement is 98% for neat materials, except in a few cases where it is not physically or economically possible (a few of these items may be assigned a purity of "Tech" or "Mix of Isomers" due to the nature of the compound - not to be confused with "Technical Grade"). This item is acceptable as a standard by various government agencies.

Products furnished by Chem Service, Inc. are **FOR LABORATORY USE ONLY!** Our products may **NOT BE USED** as drugs, cosmetics, agricultural or pesticidal products, food additives or as household chemicals.

Warning - Read your Material Safety Data Sheet before handling or using any chemicals.

Safety Precautions

Every chemical, especially every chemical used in a pesticide, must be considered highly poisonous unless known to be inert. Observe the following precautions:

1. Always read and understand the Material Safety Data Sheet (MSDS) for each chemical.

2. Avoid skin contact with pesticides, whether in solvent or undiluted.

3. Avoid breathing vapors. These chemicals should be used in a properly functioning fume hood. Keep containers closed except when in actual use.

4. The LD50 values (mg/kg of the pesticide that results in a fatality of 50% of rats by oral administration) are given in the numerical section of the catalog and in the MSDS. Chemicals with a value less than 50mg/kg are considered especially poisonous and special precautions should be observed. These values are the result of literature searches and are not independently verified by Chem Service. All chemicals should be regarded as poisonous.

If evidence of leakage or spillage of any pesticide is present when the pesticide is unpacked, transfer the package to a restricted area where it may be stored safely. Except for arranging safe storage, DO NOT FURTHER HANDLE the package or packaging materials. Thoroughly wash hands or skin that may have been in contact with the materials. Use rubber or plastic gloves in handling. Also, advise the shipper immediately and request further instructions from Chem Service. **DO NOT**, however, ship or RETURN any material without written authorization from Chem Service.

Terms and Conditions of Sale

NOTICE: THIS LANGUAGE FORMS YOUR CONTRACT WITH CHEM SERVICE, INC.

1. **ACCEPTANCE GOVERNING PROVISIONS** - Buyer places any order subject to the terms and conditions herein contained, whether additional to or different from those contained in Buyer's purchase order or any other form or document heretofore or hereafter supplied by Buyer to Seller. Seller's failure to object to provisions contained in any purchase order or any other form or document from Buyer shall not be construed as a waiver of these terms and conditions and not an acceptance of any such provision. If Buyer places an order from Seller's catalogue or catalogue supplement, Buyer is deemed to have assented to these terms. If Buyer places an order without reference to the catalogue, Buyer is deemed to have assented to these terms within ten (10) days of receipt of Seller's invoice or delivery of all or any part of the order, whichever is first, unless Seller receives written notice of any objection within 10 days after Buyer's receipt of this form. This contract and the terms and conditions shall be governed by and construed in accordance with the laws of the Commonwealth of Pennsylvania.

2. **CHANGES, CANCELLATION** - No change by Buyer of any term or condition of this contract or any of Seller's rights or remedies hereunder shall be binding on Seller, nor shall the order thereby acknowledged be cancelled or changed by Buyer, unless Seller shall expressly consent thereto in writing by Seller's authorized officer. There are no representations, agreements, promises or understandings between Buyer and Seller that are not expressed herein.

3. **DELIVERY, CLAIMS, DELAYS, RETURNS** - Unless specified differently in writing, all sales are F.O.B. Seller's shipping point. Delivery of goods to the carrier at Seller's plant or other loading point shall constitute delivery to Buyer and, regardless of shipping terms, all risk of loss or damage in transit shall be borne by Buyer. Seller reserves the right to make delivery in installments, all such installments to be separately invoiced and paid for when due per invoice, without regard to subsequent deliveries. Delay in delivery of any installment shall not relieve Buyer of its obligation to accept remaining deliveries.

   Immediately upon Buyer's receipt of any goods shipped hereunder, Buyer shall inspect the same and shall notify Seller, in writing, of any claims for shortages, defects or damages and shall hold the goods for Seller's written instructions concerning disposition. If Buyer shall fail to so notify Seller, within five days after the goods have been received by Buyer, such goods shall conclusively be deemed to conform to the terms and conditions thereof.

   Seller shall not be liable for any loss, damage or penalty as a result of any delay in or failure to manufacture, deliver or otherwise perform hereunder due to any cause beyond Seller's reasonable control, including, without limitation, unsuccessful reactions, act of Buyer, embargo or other governmental act, regulation or request, including but not limited to reinterpretation of any regulation, or change in enforcement or policy, affecting the conduct of Seller's business, fire, explosion, accident, theft, vandalism, riot, acts of war, strikes or other labor difficulties, lightning, flood, windstorm or other act of God, delay in transportation or inability to obtain necessary labor, fuel, materials, supplies or power at current prices.

4. **ALLOCATION OF GOODS** - If Seller is unable for any reason to supply the total demands for goods specified in Buyer's order, Seller may allocate its available supply among any or all buyers on such basis as Seller may deem fair and practical, without liability for any failure of performance which may result therefrom.

5. **PAYMENT** - Terms of sale are net 30 days of date of invoice, unless otherwise stated. Materials will be billed at the price in effect at the time shipment is made. If the financial condition of Buyer does not justify the terms of payment specified, Seller may demand full or partial payment in advance before proceeding with the contract. If Buyer defaults in any payment when due, under this or any other order, Seller at its option without prejudice to its other lawful remedies, may defer delivery or cancel this contract.

6. **TAXES AND OTHER CHARGES** - Any use tax, sales tax, excise tax, duty, custom, inspection or testing fee, or any other tax, fee or charge of any nature whatsoever imposed by any governmental authority, on or measured by the transaction between Seller and Buyer shall be paid by Buyer in addition to price quoted or invoiced. In the event Seller is required to pay any such tax, fee or charge, Buyer shall reimburse Seller therefor or, in lieu of such payment, Buyer shall provide Seller at the time the order is submitted an exemption certificate or other document acceptable to the authority imposing the tax, fee or charge.

7. **WARRANTIES** - Unless specified differently in writing, Seller warrants that its products shall conform to the description of such products as provided in the Seller's catalog. THIS WARRANTY IS EXCLUSIVE, AND SELLER MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURCHASE. Seller's warranties made in connection with this sale shall not be effective if Seller has determined in its sole discretion, that Buyer has misused the products in any manner or has failed to use the products in accordance with instructions, if any, furnished by the Seller and/or in accordance with any material safety data sheet.

   Seller's sole and exclusive liability and Buyer's exclusive remedy with respect to products proved to Seller's satisfaction to be defective or nonconforming shall be the replacement of such product without charge or refund of the purchase price, at Seller's sole discretion, upon the disposition of such products in accordance with Seller's instructions. SELLER SHALL NOT BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR CONTINGENT DAMAGES.

8. **COMPLIANCE WITH LAWS, REGULATIONS** - Seller certifies that to the best of its knowledge its products are produced in compliance with applicable requirements of the Fair Labor Standards Act, as amended, and the Occupational Safety and Health Standards Act of 1970 and regulations, rules and orders issued pursuant thereto. Seller also certifies to the best of its knowledge, it is in compliance with Executive Order 11246 and its regulations, rules and orders issued pursuant thereto, that it does not discriminate against any employee or prospective employee because of race, creed, color, national origin, sex, age or handicap, nor permit discrimination in any form nor maintain segregated facilities for its employees; that it actively pursues employment of minorities, females, handicapped, disabled veterans and veterans of the Vietnam era; and that it uses its best efforts to award contracts to and place purchase orders with minority business enterprises and with labor surplus area concerns and small business concerns.

Terms and Conditions of Sale

9. **BUYER'S USE OF PRODUCTS** - Seller's products are intended only for laboratory use and, unless otherwise indicated on Seller's invoice, other writings, or on product labels, are not to be used for other purposes, including but not limited to as, or a component in a food, drug, medical device (including in vitro diagnostic reagents) or cosmetics as defined in the Federal Food, Drug and Cosmetic Act, as amended, nor as a pesticide unless otherwise stated by Seller in writing furnished to Buyer. Buyer expressly represents and warrants to Seller that Buyer will properly test, use, manufacture and market any products purchased from Seller and any final articles made from them in accordance with the practices of a reasonable person who is an expert in the field and in strict compliance with all applicable federal and state food, drug, device and cosmetic and other relevant laws and regulations, now and hereinafter enacted. Buyer further warrants to Seller that any final articles manufactured from Seller's products shall not be adulterated or misbranded within the meaning of the Federal Food, Drug, and Cosmetic Act and shall not be articles which may not be introduced into interstate commerce. Buyer agrees to comply with instructions, if any, furnished by Seller relating to the use of the products and not misuse the products in any manner.

Buyer acknowledges (1) that Seller's products are small quantities solely for purposes of scientific experimentation, or analysis, or chemical research and intended only for laboratory use by technically qualified individuals, (2) that the products will be used only for such purposes, and by such qualified individuals and, (3) that some of Seller's products may not be on the Inventory of Existing Chemical Substances defined pursuant to the Toxic Substances Control Act (TSCA). Seller assumes no responsibility to assure that products purchased hereunder may be used in a commercial application under the provisions of TSCA and regulations promulgated under TSCA. Seller will provide a Material Safety Data Sheet (MSDS) to Buyer which will inform persons using the product of the health risks which Seller has reason to believe may be associated with the product. Buyer agrees that it will inform its employees (1) that some of Seller's products may not be on the Inventory of Existing Chemical Substances defined pursuant to the Toxic Substances Control Act (TSCA)and that (2) a current MSDS is available to any and all employees or other personnel working, handling and/or in contact with or proximity to Seller's products for which an MSDS is required. Buyer agrees that it will comply with all provisions of 29 C.F.R. Part 1910. If the products purchased from Seller are to be repackaged, relabeled, or used as starting material or components of other products, Buyer will verify Seller's assay of the product and accept its obligations to conform to the requirements of TSCA.

Buyer agrees that it has the responsibility to verify the hazards and to conduct any further research necessary to learn the hazards involved in using products purchased from Seller. Buyer also has the duty to warn Buyer's employees, customers and any auxiliary personnel (such as freight handlers, etc.) of any risks involved in using or handling the products.

10. **INDEMNIFICATION** - Buyer agrees to indemnify and hold Seller harmless from and against any and all losses, damages and expenses, (including attorney's fees and other costs of defending any action) that Seller may sustain or incur as a result of any claim for damages for personal injury, death, damage to property or other injury by reason of any claim of negligence, breach of express or implied warranty, strict liability in tort or other theory of law made by Buyer, its officers, agents or employees, it's successors and assigns, and its customers, whether direct or indirect, in connection with the use of Seller's products, or by reason of Buyer's failure to perform the obligations herein contained. This obligation of indemnification shall exist notwithstanding any ordinary negligence or fault by the Seller.

In the event of any claim against Seller by an employee of Buyer or an employee of a subcontractor of Buyer or other person who might or would benefit from an immunity from making indemnity, contained in any state or federal workers' compensation law or similar law, the Buyer specifically waives the immunity and agrees to indemnify Seller and hold Seller harmless from any claim for any type of injury or damages.

Buyer shall notify Seller within 15 days of Buyer's receipt of knowledge of any claim involving Seller's products resulting in personal injury, death, or damage to property and Buyer shall fully cooperate with Seller in the investigation and determination of the cause of such accident and shall make available to Seller all statements, reports and tests made by Buyer or made available to Buyer by others. The furnishing of such information to Seller and any investigation by Seller shall not constitute an assumption of any liability by Seller.

11. **PATENT DISCLAIMER** - Seller does not warrant that the use or sale of the products delivered hereunder will not infringe the claims of any United States or other patents covering the product itself or the use thereof in combination with other products or in the operation of any process.

12. **RETURNS AND DISPOSAL** - Goods may not be returned for credit except with Seller's written permission and then only in strict compliance with Seller's return shipment instructions. Buyer agrees that it will, at all times, handle and dispose of goods in accordance with Seller's instructions, the current Material Safety Data Sheet, and all applicable law and government regulations.

13. **TECHNICAL ASSISTANCE** - At Buyer's request, Seller may furnish technical assistance and information with respect to Seller's products. Unless otherwise agreed, all such technical assistance and information will be provided gratis, and Buyer assumes sole responsibility for results obtained in reliance thereon. SELLER MAKES NO WARRANTIES OF ANY KIND OR NATURE WITH RESPECT TO TECHNICAL ASSISTANCE OR INFORMATION PROVIDED BY IT. ANY SUGGESTIONS BY SELLER REGARDING USE, APPLICATION OR SUITABILITY OF THE PRODUCTS SHALL NOT BE CONSTRUED A WARRANTY UNLESS EXPRESSLY DESIGNATED AS SUCH, IN WRITING, SIGNED BY SELLER.

14. **RUSH ORDERS** (SAME DAY SHIPMENT) - Seller will accept rush orders for any in-stock items until 4pm EST, for next day delivery by Federal Express or UPS. This service is provided without additional charge to all customers, but Buyer will be responsible for any additional charge for shipping made by the carrier. Seller will use reasonable efforts to ship by next day service but Seller assumes no liability for failure to deliver a rush order the next day.

Solvent Miscibility Table

