

the

RESTEK

Innovators of High Resolution Chromatography Products

Advantage

Leak-Tight Seal for Agilent GCs

Vespel® Ring Inlet Seals

by Donna Lidgett, GC Accessories Product Marketing Manager

- ✓ Easy to use—Vespel® material seals the first time, every time, reducing variability among operators.
- ✓ Better sensitivity—lower leak rate reduces detector noise.
- ✓ Saves money—prevents oxygen from permeating the carrier gas, increasing column lifetime.
- ✓ Less maintenance—soft sealing area reduces wear on the injection port body.

In Agilent split/splitless injection ports, the inlet seal sits at the base of the injector. Dirt, non-volatile residue, septum fragments, and other undesirable particles contaminate the inlet seal and decrease analytical linearity. The only way to maintain optimum performance is by frequently changing the inlet seal and ensuring the seal is leak-tight.

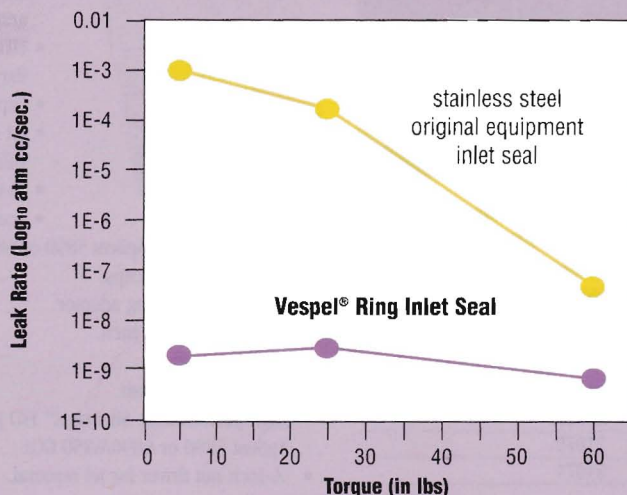
Restek designed the Vespel® Ring Inlet Seal to improve injection port performance on two levels. First, the Vespel® Ring Inlet Seal is made from high-quality stainless steel and features a Vespel® ring embedded into its face. This soft Vespel® ring will not harm the critical seal on the bottom of the injector body, and is outside the sample flow path, for worry-free chromatography.

Second, the Vespel® Ring Inlet Seal is designed to seal even after repeated temperature cycles and without retightening the reducing nut! With traditional stainless steel inlet seals, it is difficult to tighten to achieve a leak-tight seal. To determine the variances between a traditional seal and the new Vespel® Ring Inlet Seal, we compared the leak rate for each type of seal at increasing torque (Figure 1). Several inlet seals of each type were



Figure 1

The Vespel® Ring Inlet Seal achieves leak-tight seals even at low torque, reducing injection port wear and the chances of damaging the injection port.



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RESTEK

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tested using a high sensitivity helium leak detector that can detect a helium leak rate as small as 1×10^{-10} atm cc/s. Notice how well the Vespel® Ring Inlet Seal performs at all levels, but especially at the lower torque levels. This means changing seals is now easier than ever, and the seal is reliable every time.

These new seals are available in stainless steel, gold-plated, or with a Silcosteel® coating. Use the stainless steel seal for normal analyses. To reduce breakdown and adsorption of active compounds, use the gold-plated or Silcosteel®-treated seals. The gold surface offers better inertness than standard stainless steel, and the Silcosteel® treatment pro-

vides inertness similar to that of fused silica capillary columns. Why trust a metal-to-metal seal when you can make leak-tight seals quickly and easily—and more reliably—with the Restek Vespel® Ring Inlet Seal?

Vespel® Ring Inlet Seals for Agilent 5890/6890 and 6850 GCs

0.8mm ID Vespel Ring Inlet Seal (washers included)

	2-pk.	10-pk.
Gold-Plated	21562	21563
Silcosteel®	21564	21565
Stainless Steel	21560	21561

1.2mm ID Vespel Ring Inlet Seal (washers included)

	2-pk.	10-pk.
Gold-Plated	21568	21569
Silcosteel®	21570	21571
Stainless Steel	21566	21567

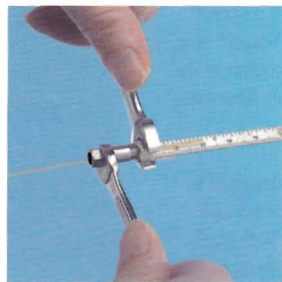


by Brad Rightnour and Michael Goss, Instrument Innovations Team

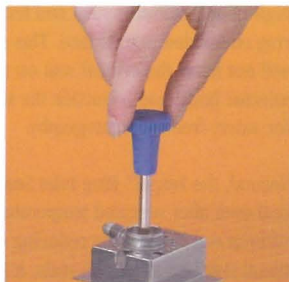
The Inlet Maintenance Kit includes these tools and many others.



Dislodge ferrules or remove silica deposits with the **Jet Reamer/Ferrule Remover**.



The **Capillary Installation Gauge** makes seating the ferrule and installing the column consistent and easy.



The **Inlet Liner Removal Tool** safely removes an inlet liner from a hot injection port without cracking the liner—and you won't burn your fingers!



Inlet kits include:

- Viton® o-rings.
- Capillary nuts.
- Inlet seals.
- Reducing nut.
- Scoring wafer.
- 11 mm Thermolite® septa.
- 4.0mm single gooseneck liner.
- 0.4, 0.5, and 0.8mm ID graphite ferrules.
- 4.0mm split liner with wool.
- Capillary column caps.
- 1/4- to 5/16-inch wrench.
- Septum puller.
- Installation gauge.
- Wire cleaning brush.
- Jet reamers/ferrule removers.
- Inlet liner removal tool.

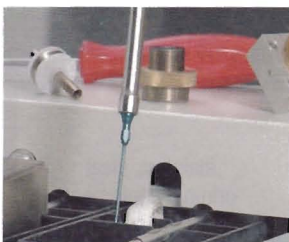
The FID Maintenance Kit includes these tools and many others.



FID maintenance made easy with tools and replacement components specifically matched to your instrument.



The **FID Ignitor** meets original equipment specifications.



The **High-Performance Silcosteel® FID Jet** will stay clean longer—even when exposed to highly active compounds.



FID kits include:

- 1/4-inch, 0.4, 0.5, and 0.8mm ID graphite ferrules.
- FID/NPD capillary adaptor.
- Capillary nuts.
- Jet reamers/ferrule removers.
- 1/4-inch nut.
- Scoring wafer.
- Ignitor for either Agilent 5890 or 6890/6850 GCs.
- Capillary column caps.
- FID flow measuring adaptor.
- 1/4- to 5/16-inch wrench.
- Installation gauge.
- Wire cleaning brush.
- High-performance Silcosteel® FID jet for either Agilent 5890 or 6890/6850 GCs.
- 1/4-Inch nut driver for jet removal.

Description	qty.	cat.#
Inlet Maintenance Kit for Agilent 5890/6890/6850 GCs	kit	21069
FID Maintenance Kit for Agilent 5890 GCs	kit	21070
FID Maintenance Kit for Agilent 6890/6850 GCs	kit	21071

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• 2 •

High-Speed Analysis of Petrochemicals

Using OPN Res-Sil™ C GC Packings

by Barry Burger, Petrochemical and Packed GC Innovations Chemist

- ✓ Unique selectivity for saturated and unsaturated hydrocarbons.
- ✓ Innovative bonding chemistry for batch-to-batch reproducibility, excellent thermal stability, and long life.
- ✓ Wide range of bonded phases available.
- ✓ Equivalent to Waters Durapak® packings.

For over 25 years the process GC and petrochemical industries have used bonded silica packings such as Waters Durapak® packings for analysis of C1 to C4 hydrocarbons. These phases provide unique selectivity by modifying silica with a covalent attachment of either n-octane or cyano-propyl (OPN) functional groups. These phases have many advantages over conventional gas liquid chromatography packings because they yield faster separations, higher thermal stability, shorter conditioning times, and longer lifetimes. In the past, these pack-

ings had inconsistent reproducibility and limited availability. Restek's research team has solved these age old problems by developing Res-Sil™ C packings for consistent batch-to-batch performance and immediate delivery.

Unique Selectivity for Process GC and High-Speed Analysis of Petrochemicals

Speed of analysis is crucial for process GC, and in laboratory gas analyzers using multiple columns and valve switching for separation of complex gas

mixtures. The Res-Sil™ C bonded packings are ideal for resolution of the saturated and unsaturated C4 hydrocarbons that are difficult to separate. The chromatogram in Figure 1 demonstrates the unique selectivity for separation of *cis*-2-butene before 1,3-butadiene using the OPN on Res-Sil™ C packing. This unique selectivity, when combined with other columns in series, provides petroleum and petrochemical method developers with a powerful tool for fast determination of C1 to C5 hydrocarbons.†

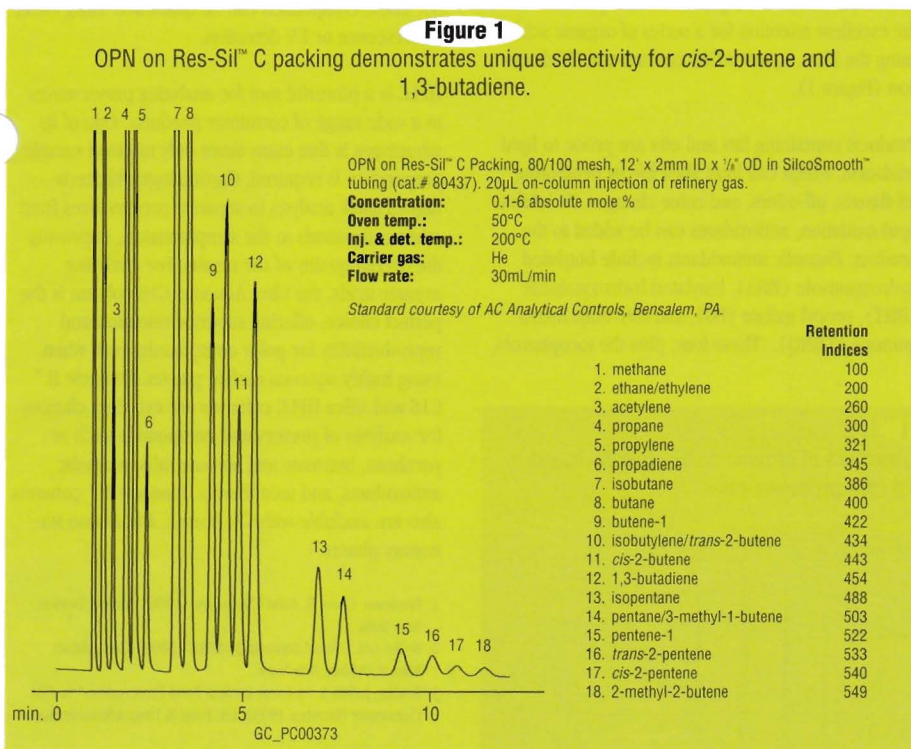
Innovative Research and Stringent QA Provide Batch-to-Batch Consistency

Historically, one of the problems with bonded phases such as Carbowax®, n-octane, and OPN on Porasil® packing has been batch-to-batch variations in the amount of liquid stationary phase added to solid silica support. Restek's product development team pulled together chemists with experience in GC packings and HPLC phase development to innovate a new synthesis procedure. Utilizing new synthesis pathways, the amount of bonded liquid phase is precisely controlled in every batch, resulting in reproducible retention times and separations. Each production batch of Res-Sil™ C packing is quality assurance tested with a complex hydrocarbon mixture to meet demanding retention time and retention index specifications. Column bleed also is evaluated at the recommended maximum temperature of 150°C, as part of the QA test to ensure that retention shifts and high baselines are not observed.

A Full Line of Bonded GC Phases

Restek offers a wide range of bonded packings for packed GC columns, including Rtx®-1 and Stabilwax® phases, Carbowax® and n-octane phases on Res-Sil™ C packing, and OPN on Res-Sil™ C packing. Each of these packings has low bleed, conditioning time of less than 30 minutes, long lifetime, and consistent batch-to-batch reproducibility. Every batch of Restek's bonded phases is tested for bleed, efficiency, retention index and retention time reproducibility. In addition, Restek offers a full range of packed and micro-packed GC columns, available with specially-deactivated Silcosteel® tubing for improved inertness and efficiency.

† N.C. Saha, S.K. Jain, and R.K. Dua, *J. of Chromat. Sci.* 1978: 16, pp.323-328. Reference not available from Restek.



Res-Sil™ C Packing Materials

Description	Temp. Limit (°C)	Mesh	Min. Qty.	cat.#	/g
Res-Sil™ C	300	60/80	10g	25400	
	300	80/100	10g	25028	
Res-Sil™ B	300	60/80	10g	25401	
	300	80/100	10g	25080	
-1% TCEP on Res-Sil™ B	175	80/100	10g	25081	
OPN on Res-Sil™ C	150	80/100	10g	25042	
n-Octane on Res-Sil™ C	150	80/100	10g	25030	
2% Carbowax® 1540 on Res-Sil™ C	150	80/100	10g	25044	

Restek's packed columns deliver the 1-2-3 punch!

1. Bonded stationary phases mean short conditioning times, low bleed levels, and unsurpassed column lifetimes.
2. SilcoSmooth™ tubing provides the inertness of glass and the durability of stainless steel.
3. Silcoport™ diatomaceous earth provides unsurpassed inertness for trace analyses.

HPLC Analysis of Preservatives

Using Ultra Aqueous and Pinnacle II™ Columns

by Rebecca Wittrig, Ph.D., Food, Flavors, and Fragrances Innovations Chemist

- ✓ Minimal sample preparation saves time.
- ✓ Ultra Aqueous C18 column provides superior retention and reproducibility for polar compounds.
- ✓ Pinnacle II™ Silica column resolves tocopherol isomers.

Preservatives are chemical compounds that are used in a wide range of applications to maintain overall product quality.¹ Some preservatives act as antimicrobial agents, some act as antioxidants, and some can perform both functions. Of the chemical compounds commonly used as preservatives, many can be effectively analyzed by high performance liquid chromatography (HPLC).² Because preservatives include a number of different compound types, there are a variety of HPLC stationary phases, mobile phases, and detectors that can be used.

Chemical preservatives kill or prevent the growth of microbes either by changing the microbes' environment or by reacting directly with them.³ Antimicrobial compounds include organic acids, benzoate and sorbate salts, sulfur dioxide and sulfites, nitrites, propionates, and parabens. Organic acids, such as acetic acid and citric acid, can be used to control the pH of a product. For example, in food products these acidulants can lower the pH out of the optimum pH range for bacteria, yeast, and/or molds. Organic acids such as malic acid and citric acid can be found naturally in fruits, oxalic acid can be found in spinach and rhubarb, and tartaric acid can be found in grapes.

Using HPLC, concentrations of these preservatives can be monitored. However, analyzing polar organic acids can be difficult on conventional reversed phase columns, even when using low pH, highly aqueous mobile phases to suppress ionization of the acid molecules and maximize retention. The Ultra Aqueous C18 column provides enhanced retention and selectivity for challenging applications such as this. The novel bonding chemistry used for this phase allows the alkyl groups to remain extended, even in highly aqueous mobile phase, preventing the chain folding that occurs with conventional C18 phases. Therefore, stable and reproducible retention is possible even with 100% aqueous mobile phases. Notice the excellent retention for a series of organic acids using the Ultra Aqueous C18 column and UV detection (Figure 1).

Products containing fats and oils are prone to lipid oxidation, which can limit shelf life by promoting off-flavors, off-odors, and color changes. To inhibit lipid oxidation, antioxidants can be added to the product. Phenolic antioxidants include butylated hydroxyanisole (BHA), butylated hydroxytoluene (BHT), propyl gallate (PG), and *tert*-butyl hydroquinone (TBHQ). These four, plus the tocopherols,

are the primary antioxidants found in foods and beverages produced in the U.S. Phenolic antioxidants, such as BHT, are regulated by the US Food and Drug Administration (FDA), and can be added to many products at levels up to 200ppm, based on the fat content.

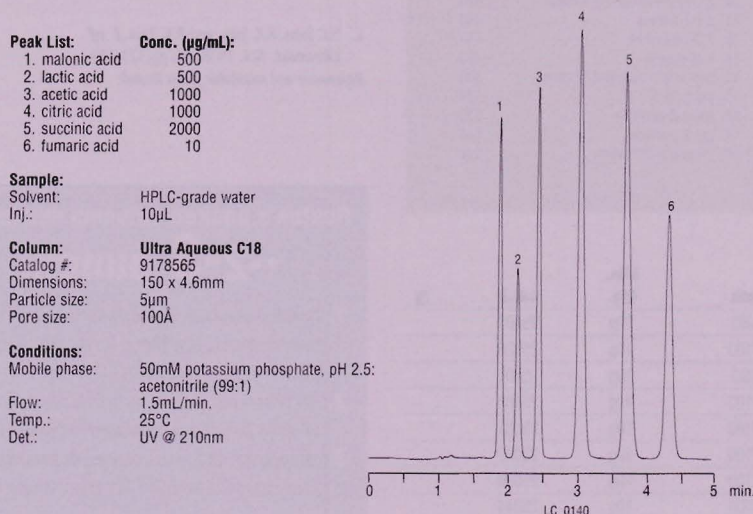
Phenolic antioxidants can be analyzed by reversed phase HPLC using a Pinnacle II™ C18 column and an acidified mobile phase. As with the analysis of organic acids, an acidic mobile phase is used to suppress ionization of the analytes. The HPLC separation of BHA, BHT, PG, and TBHQ using UV detection at 280nm shows how effectively these compounds can be separated using the Pinnacle II™ C18 column (Figure 2).

"Natural" antioxidants, such as tocopherols and tocotrienols, are used to inhibit lipid oxidation and to promote general health in the consumer. These compounds are found naturally in products such as fats and oils. When used as additives, however, they are regulated. Antioxidants such as tocopherols can be challenging to analyze, because they readily oxidize when exposed to light or oxygen. The analysis of four tocopherols by normal phase HPLC, using a Pinnacle II™ Silica column, shows how effectively these positional isomers can be separated (Figure 3). These compounds can be quantified using either fluorescence or UV detection.

HPLC is a powerful tool for analyzing preservatives in a wide range of consumer products. One of its advantages is that many times only minimal sample preparation is required. Chromatographic techniques allow analysts to separate preservatives from other compounds in the sample matrix, improving the overall quality of the results. For analyzing organic acids, the Ultra Aqueous C18 column is the perfect choice, offering superior retention and reproducibility for polar compounds, even when using highly aqueous mobile phases. Pinnacle II™ C18 and silica HPLC columns are excellent choices for analyses of preservative compounds such as parabens, benzoate and sorbate salts, phenolic antioxidants, and tocopherols. Pinnacle II™ columns also are available with C8, phenyl, and amino stationary phases.

Figure 1

An Ultra Aqueous C18 column shows excellent retention of organic acids typically found in foods, beverages, personal care products, etc.



1. Fennema, Owen R. *Food Chemistry* (1996), Marcel Dekker, New York.
2. Nollet (ed.), *Food Analysis by HPLC* (2000), 2nd edition, Marcel Dekker, New York.
3. Foulke, Judith E. "A Fresh Look at Food Preservatives" in *FDA Consumer* (October 1993), U.S. Food & Drug Administration.

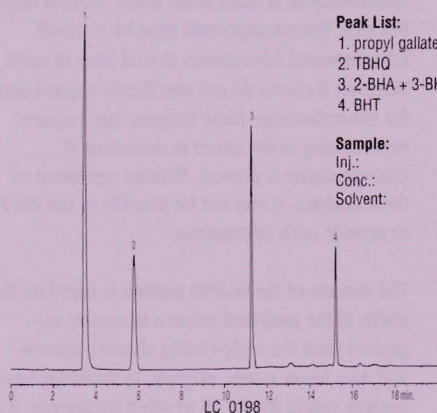
Questions?

Contact the industry's best Technical Service Team at 800-356-1688 or 814-353-1300, ext. 4, or contact your local Restek representative.



Figure 2

Phenolic antioxidants can be quantitated easily using a Pinnacle II™ C18 column and UV detection at 280nm.



Peak List:	conc.: (ppm)
1. propyl gallate	168
2. TBHQ	182
3. 2-BHA + 3-BHA	197
4. BHT	193

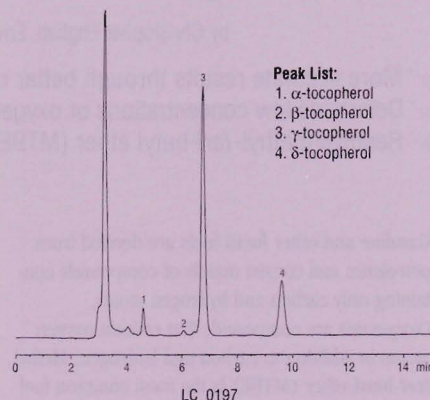
Sample:
Inj.: 10µL
Conc.: see peak list
Solvent: methanol

Column:
Catalog #: 9214565
Dimensions: 150 x 4.6mm
Particle Size: 5µm
Pore Size: 110Å

Conditions:
Mobile Phase: A = 1% acetic acid in water
B = methanol
Time (min.) A (%) B (%)
0 50 50
4 50 50
10 10 90
25 10 90
26 50 50
Flow: 1.0mL/min
Temp.: 30°C
Det.: UV @ 280nm

Figure 3

A Pinnacle II™ Silica column effectively separates the positional isomers of tocopherol by normal phase HPLC.



Peak List:
1. α-tocopherol
2. β-tocopherol
3. γ-tocopherol
4. δ-tocopherol

Sample:
Inj.: 10µL
Conc.: approx. 1.25% soy oil
Solvent: hexane

Column:
Catalog #: 9210565
Dimensions: 150 x 4.6mm
Particle Size: 5µm
Pore Size: 110Å

Conditions:
Mobile Phase: isopropyl alcohol:hexane (0.5:99.5)
Flow: 0.6 mL/min
Temp.: 30°C
Det.: UV @ 295nm

Ultra Aqueous C18 5µm Columns

	1.0mm ID	2.1mm ID	3.2mm ID	4.6mm ID
Length	cat.#	cat.#	cat.#	cat.#
30mm	9178531	9178532	9178533	9178535
50mm	9178551	9178552	9178553	9178555
100mm	9178511	9178512	9178513	9178515
150mm	9178561	9178562	9178563	9178565
200mm	9178521	9178522	9178523	9178525
250mm	9178571	9178572	9178573	9178575

Pinnacle II™ C18 5µm Columns

	1.0mm ID	2.1mm ID	3.2mm ID	4.6mm ID
Length	cat.#	cat.#	cat.#	cat.#
30mm	9214531	9214532	9214533	9214535
50mm	9214551	9214552	9214553	9214555
100mm	9214511	9214512	9214513	9214515
150mm	9214561	9214562	9214563	9214565
200mm	9214521	9214522	9214523	9214525
250mm	9214571	9214572	9214573	9214575

Pinnacle II™ Silica 5µm Columns

	1.0mm ID	2.1mm ID	3.2mm ID	4.6mm ID
Length	cat.#	cat.#	cat.#	cat.#
30mm	9210531	9210532	9210533	9210535
50mm	9210551	9210552	9210553	9210555
100mm	9210511	9210512	9210513	9210515
150mm	9210561	9210562	9210563	9210565
200mm	9210521	9210522	9210523	9210525
250mm	9210571	9210572	9210573	9210575

Trident™ Integral HPLC Guard Column System

Maximum protection against contaminants and particulate matter.



for **moreinfo**

For additional information about Trident™ guard columns, request the Trident™ Fast Facts (lit. cat.# 59314 and 59896).

Trident™ Direct HPLC Guard Column System

Three levels of protection!

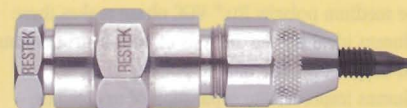


Trident™ Direct high-pressure filter
Protection against particulate matter.



Trident™ Direct 1cm guard cartridge holder with filter

Moderate protection against particulate matter and irreversibly adsorbed compounds.



Trident™ Direct 2cm guard cartridge holder with filter

Maximum protection against particulate matter and irreversibly adsorbed compounds.

MTBE & Oxygenate Analysis

Using an Rtx[®]-VGC GC Column

by Christopher English, Environmental Applications Chemist

- ✓ More accurate results through better resolution of target compounds.
- ✓ Determine low concentrations of oxygenates in the presence of aliphatic compounds.
- ✓ Resolve methyl-*tert*-butyl ether (MTBE) from target *tert*-butyl alcohol (TBA).

Gasoline and other fossil fuels are derived from petroleum and consist mainly of compounds containing only carbon and hydrogen atoms. Oxygenates are compounds that contain oxygen atoms in addition to carbon and hydrogen. Methyl *tert*-butyl ether (MTBE) is the most common fuel oxygenate. MTBE was first introduced into gasoline in 1979 to reduce overall emissions, replace lead and increase octane. In 1992, gasoline with up to 15% MTBE content by volume was used nationally to meet the first federally mandated wintertime reduction of carbon monoxide. With over one million underground fuel tanks in the United States alone, contamination of ground and surface water with oxygenates and gasoline components is a major environmental concern. Potentially, storage tanks worldwide will require cleanup. An equally challenging task is the identification and quantitation of these fuel-derived pollutants.

The US Environmental Protection Agency (EPA) has not sanctioned any method specifically for the analysis of oxygenates in gasoline. However, environmental laboratories have used a variety of methods to report these analytes, such as US EPA Methods 8015, 8020, and 8260. The three methods listed use a flame ionization detector (FID), photoionization detector (PID) and mass spectrometry (MS) respectively. Because gasoline range organic (GRO) samples can contain both petroleum and oxygenate components, chromatographic resolution is preferred regardless of the method used. One example involves the compounds MTBE and *tert*-butyl alcohol (TBA). Regulatory agencies recommend adding TBA to the target list for contaminated sites known to contain MTBE because it is both a breakdown product of MTBE and a gasoline additive. Both MTBE and TBA respond on the PID (Method 8020) and they share ions (MS by Method 8260), so MTBE and TBA must be resolved regardless of which detector is used.

The medium polarity Rtx[®]-VGC phase makes these columns ideal for the analysis of both hydrocarbons and oxygenates. The unique polarity of these columns improves the separation of oxygenates, which ensures more accurate detection when using PID. Restek does not recommend using FID alone for detecting these compounds.

A 30m, 0.45mm ID, 2.55µm Rtx[®]-VGC column helps determine low concentrations of oxygenates in the presence of aliphatic compounds, resolving MTBE from 2-methylpentane, 3-methylpentane, and TBA (Figure 1). Furthermore, these optimized column dimensions allow the correct desorb flow rates from the purge and trap, faster analyses times, and better resolution of closely eluting peaks, compared to traditional 0.53mm ID columns. The oxygenates can be identified by using MS detection (Figure 2).

One commonly overlooked compound in the analysis of GRO samples is chlorobenzene. Figure 1 does not include chlorobenzene, however another analy-

sis under identical conditions shows the retention time of chlorobenzene relative to ethylbenzene and *m/p*-xylene (Figure 3). Because the action limit for chlorobenzene is many times lower than for ethylbenzene, these compounds must be resolved. Environmental laboratories should keep in mind that even if clients do not specifically request data for chlorobenzene, these samples may require reprocessing in the future to determine if chlorobenzene is present. Without resolution of these analytes, it may not be possible to use the PID to provide such information.

The success of the GC/PID method is based on the ability of the analytical column to resolve oxygenates from the early-eluting alkanes, alkenes, and, to a lesser extent, alkynes. To minimize false positive results for MTBE or other oxygenates, it is important to separate 2-methylpentane and 3-methylpentane. Non-polar phases (e.g., Rtx[®]-1 and DB-MTBE columns) have been recommended for separating these compounds. However, these phases are incompatible with polar compounds, which can result in broader peaks and lower capacity for the alcohols. The Rtx[®]-VGC column will increase your level of confidence in your analytical data and prevent high bias. It is an ideal choice for analyzing gasoline additives in GRO samples.

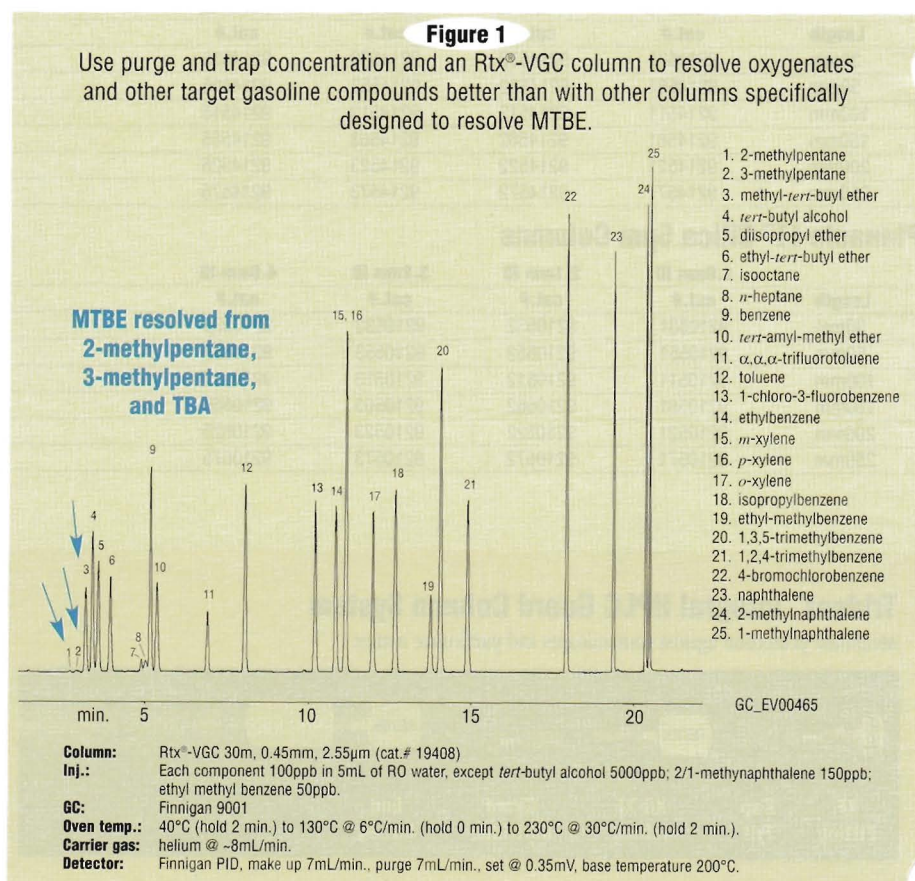
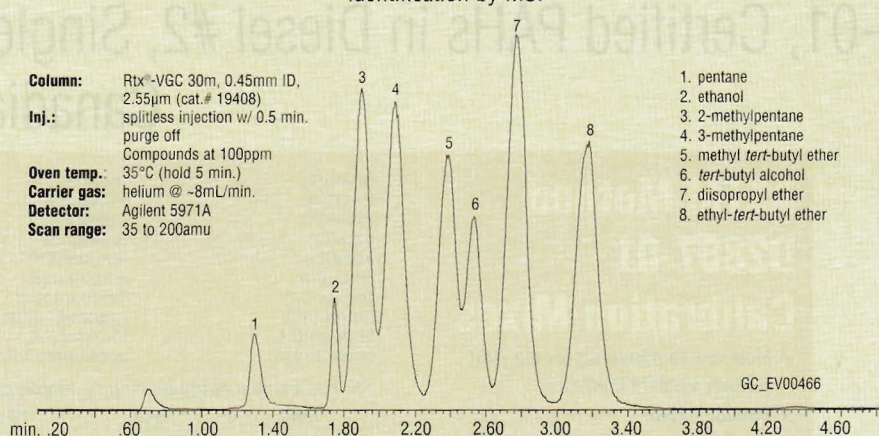
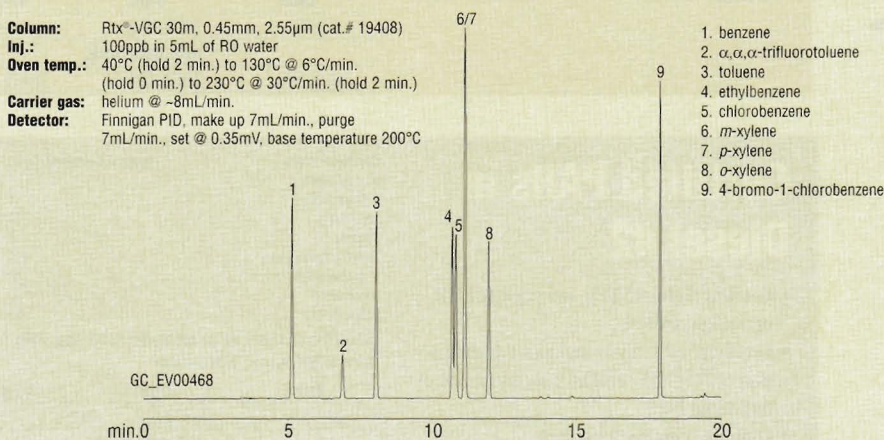


Figure 2

Methyl-*tert*-butyl-ether, *tert*-butyl alcohol, and closely eluting hydrocarbons separated for identification by MS.

**Figure 3**

The Rtx®-VGC column resolves chlorobenzene from ethylbenzene, for reliable quantitation.



Rtx®-VGC (Fused Silica) Stable to 260°C

ID	df (µm)	temp. limits	30-Meter	60-Meter	75-Meter	105-Meter
0.25mm	1.40	-40 to 240/260°C	19415	19416		
0.32mm	1.80	-40 to 240/260°C	19419	19420		
0.45mm	2.55	-40 to 240/260°C	19408		19409	
0.53mm	3.00	-40 to 240/260°C	19485	19488	19474	19489
ID	df (µm)	temp. limits	20-Meter	40-Meter		
0.18mm	1.00	-40 to 240/260°C	49414	49415		

Straight Silcosteel® Tubing

- Ideal for transfer lines, adsorbent traps, and thermal desorption tubes.
- Available in 1/8- and 1/4-inch OD.
- Easily cut to specific lengths.

18" (457mm) Length

ID	OD	qty.	cat.#
0.085" (2.16mm)	1/8" (3.18mm)	ea.	20575
0.085" (2.16mm)	1/8" (3.18mm)	5-pk.	20576
0.210" (5.33mm)	1/4" (6.35mm)	ea.	20577
0.210" (5.33mm)	1/4" (6.35mm)	5-pk.	20578

Restek is your #1 source for pesticide reference materials!

- ✓ Extensive selection of stock mixtures and single-component solutions.
- ✓ Custom mixtures made to your exact specifications.

Fax our reference materials department (814-353-1309) or contact your local Restek representative for more information.



Standards for Underground Storage Tank Monitoring (UST)

Monitoring underground storage tanks (UST) for leaks continues. Many states continue to modify existing analytical methods, with several states now using risk-based management of compounds involved. These new methods often pose challenges to the analyst, and require unique mixtures for calibration and matrix spike samples.

Restek continues to monitor the situation and respond with calibration mixtures to meet these needs. For our extensive selection of chemical standards for UST analyses, please refer to our 2002 *Chromatography Products Catalog* (lit. cat. #59662). For mixtures not listed there, please contact Technical Service at 800-356-1688 or 814-353-1300, ext. 4, or contact your local Restek representative.

California Oxygenates Mix

diisopropyl ether	2,000µg/mL
ethyl- <i>tert</i> -butyl ether	2,000
<i>tert</i> -amyl methyl ether	2,000
<i>tert</i> -butyl alcohol	10,000
methyl <i>tert</i> -butyl ether	2,000

In PET methanol, 1mL/ampul

Each	5-pk.	10-pk.
30465	30465-510	—
with data pack		
30465-500	30465-520	30565

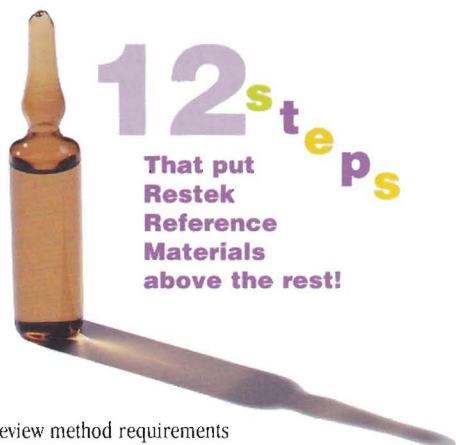
Universal "Y" Press-Tight® Connectors



- Split sample flow onto two different columns.
- Split a single column flow into two detectors.
- Perform confirmational analysis with a single injection.
- Fits 0.18, 0.25, 0.32, & 0.53mm ID columns.

Universal "Y" Press-Tight® Connector	
qty.	cat.#
ea.	20405
3-pk.	20406

ASTM D2887-01, Certified PAHs in Diesel #2, Single Com Canadian PH



12^{steps}

That put
Restek
Reference
Materials
above the rest!

1. Review method requirements
2. Verify compatibility and stability
3. Test raw materials
4. Certify balance and weights
5. Prepare glassware and ampuls
6. Prepare and package mixture
7. Test to assure quality
8. Validate expiration dates and shelf-life
9. Product packaging
10. Restek documentation
11. ISO 9001 registration
12. Custom reference materials program

For details on these 12 steps, refer to the annual *Chromatography Products Catalog* (lit. cat.# 59662) or contact Technical Service.

ASTM Method D2887-01 Calibration Mixes

- Meet new requirements for the 2001 revision of ASTM 2887-01.
- Pentane added.
- Equal weight/weight concentrations of all components—1% or 5%.
- Designed for both calibration and resolution tests—one sample for both test criteria.

pentane (C5)	hexadecane (C16)
hexane (C6)	heptadecane (C17)
heptane (C7)	octadecane (C18)
octane (C8)	eicosane (C20)
nonane (C9)	tetracosane (C24)
decane (C10)	octacosane (C28)
undecane (C11)	dotriacontane (C32)
dodecane (C12)	hexatriacontane (C36)
tetradecane (C14)	tetracontane (C40)
pentadecane (C15)	tetratetracontane (C44)

1% weight each in carbon disulfide, 1g solution/ampul

Each	5-pk.	10-pk.
31674	31674-510	—
with data pack		
31674-500	31674-520	31774

5% weight each, 1g/ampul

Each	5-pk.	10-pk.
31675	31675-510	—
with data pack		
31675-500	31675-520	31775

Certified PAHs in Diesel #2

- Confirm diesel #2 TPH and priority PAHs in a single analysis.
- Certificate of Analysis includes concentration of TPH and certified concentrations of individual PAHs.
- Complete data pack available.

Certified PAHs	Typical Certified Conc. (ppm)
acenaphthene	7
acenaphthylene	1
anthracene	13
fluorene	6
1-methylnaphthalene	110
2-methylnaphthalene	60
naphthalene	30
phenanthrene	13

50,000ppm diesel #2 in methylene chloride, PAH concentrations listed above, 1mL/ampul

Each	5-pk.	10-pk.
31673	31673-510	—
with data pack		
31673-500	31673-520	31773

Certified Aromatics in Gasoline

- Confirm unleaded gasoline TPH, BTEX, and aromatics in a single analysis.
- Certificate of Analysis includes concentration of TPH and certified concentrations of BTEX and individual aromatics.
- Complete data pack available.

Certified for:	n-propylbenzene
benzene	toluene
ethylbenzene	1,2,3-trimethylbenzene
m-ethyltoluene	1,2,4-trimethylbenzene
o-ethyltoluene	1,3,5-trimethylbenzene
p-ethyltoluene	m-xylene
isopropylbenzene	o-xylene
methyl tert-butyl ether	p-xylene
naphthalene	

5,500ppm gasoline in P&T methanol, certified components listed, 1mL/ampul

Each	5-pk.	10-pk.
30485	30485-510	—
with data pack		
30485-500	30485-520	30585

Certified for:	naphthalene
benzene	toluene
ethylbenzene	m-xylene
isopropylbenzene	o-xylene
methyl tert-butyl ether	p-xylene

5,500ppm gasoline in P&T methanol, certified components listed, 1mL/ampul

Each	5-pk.	10-pk.
30237	30237-510	—
with data pack		
30237-500	30237-520	30337

Canadian PHC

- Meets CCME 2001 Petroleum Hydrocarbons in Soil Method—Tier I.
- Primary reference calibration standards for quantification of four fractions.

CCME PHC Calibration Mix

decane (C10)
hexadecane (C16)
tetracontane (C40)
5,000µg/mL each in toluene, 1mL/ampul

Each	5-pk.	10-pk.
31684	31684-510	—
with data pack		
31684-500	31684-520	31784

C50 in Toluene

pentacontane (C50)
10µg/mL in toluene, 1mL/ampul

Each	5-pk.	10-pk.
31685	31685-510	—
with data pack		
31685-500	31685-520	31785

ference Materials

porant Explosives, US EPA 8270 Semivolatiles MegaMix™, C, and More!

Single-Component Explosives Solutions

- Support the US Department of Defense base closures and remediation.
- Mixtures and singles to support HPLC US EPA Method 8331.
- Mixtures and singles to support GC/ECD US EPA Method 8095.
- Internal standards and surrogates to support both methods.

Solvent A=acetonitrile

Compound	Solvent	µg/mL	Individual	Individual w/data pack	5-pk.	5-pk. w/data pack	10-pk.	10-pk. w/data pack
Packaged 1mL/ampul								
2-amino-4,6-dinitrotoluene mix	A	1,000	31670	31670-500	31670-510	31670-520	31770	
4-amino-2,6-dinitrotoluene mix	A	1,000	31671	31671-500	31671-510	31671-520	31771	
3,5-dinitroaniline mix	A	1,000	31661	31661-500	31661-510	31661-520	31761	
1,3-dinitrobenzene mix	A	1,000	31662	31662-500	31662-510	31662-520	31762	
2,4-dinitrotoluene mix	A	1,000	31663	31663-500	31663-510	31663-520	31763	
2,6-dinitrotoluene mix	A	1,000	31664	31664-500	31664-510	31664-520	31764	
HMX mix	A	1,000	31665	31665-500	31665-510	31665-520	31765	
nitrobenzene mix	A	1,000	31657	31657-500	31657-510	31657-520	31757	
2-nitrotoluene mix	A	1,000	31659	31659-500	31659-510	31659-520	31759	
3-nitrotoluene mix	A	1,000	31660	31660-500	31660-510	31660-520	31760	
4-nitrotoluene mix	A	1,000	31658	31658-500	31658-510	31658-520	31758	
RDX mix	A	1,000	31666	31666-500	31666-510	31666-520	31766	
tetryl mix	A	1,000	31667	31667-500	31667-510	31667-520	31767	
1,3,5-trinitrobenzene mix	A	1,000	31668	31668-500	31668-510	31668-520	31768	
2,4,6-trinitrotoluene mix	A	1,000	31669	31669-500	31669-510	31669-520	31769	

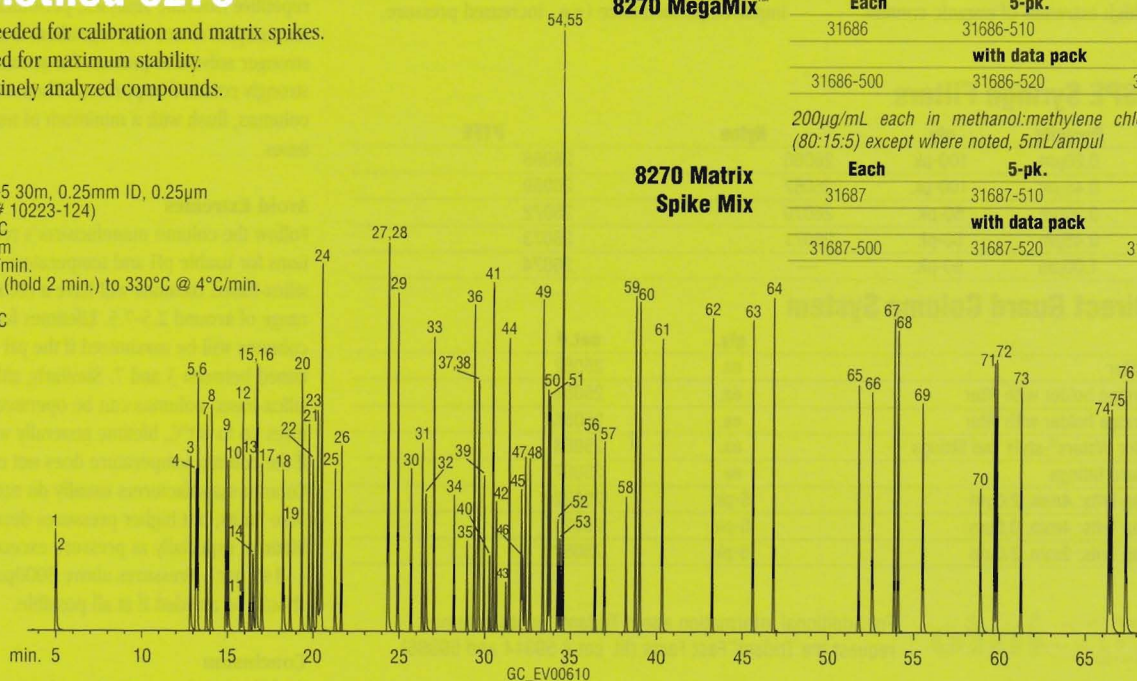
Semivolatiles MegaMix™ US EPA Method 8270

- Fewest mixtures needed for calibration and matrix spikes.
- Formulations formulated for maximum stability.
- Contains most routinely analyzed compounds.

Column: Rtx®-5 30m, 0.25mm ID, 0.25µm (cat.# 10223-124)
Inj. temp.: 250°C
Carrier gas: helium
Flow rate: 1mL/min.
Oven temp.: 35°C (hold 2 min.) to 330°C @ 4°C/min.
Det.: MS
Transfer line temp.: 300°C

8270 MegaMix™

8270 Matrix Spike Mix



1. pyridine	14. N-nitroso-di-n-propylamine	27. 2-methylnaphthalene	40. 1,2-dinitrobenzene	53. 4,6-dinitro-2-methylphenol	66. bis(2-ethylhexyl)adipate
2. N-nitrosodimethylamine	15. 4-methylphenol*	28. 4-chloro-3-methylphenol	41. acenaphthene	54. diphenylamine	67. benzo(a)anthracene
3. aniline	16. 3-methylphenol*	29. 1-methylnaphthalene	42. 3-nitroaniline	55. azobenzene	68. chrysene
4. phenol	17. nitrobenzene	30. hexachlorocyclopentadiene	43. 2,4-dinitrophenol	56. 4-bromophenyl phenyl ether	69. bis(2-ethylhexyl)phthalate
5. bis(2-chloroethyl)ether	18. isophorone	31. 2,4,6-trichlorophenol	44. dibenzofuran	57. hexachlorobenzene	70. di-n-octyl phthalate
6. 2-chlorophenol	19. 4-nitrophenol	32. 2,4,5-trichlorophenol	45. 2,4-dinitrotoluene	58. pentachlorophenol	71. benzo(b)fluoranthene
7. 1,3-dichlorobenzene	20. 2,4-dimethylphenol	33. 2-chloronaphthalene	46. 2-nitrophenol	59. phenanthrene	72. benzo(k)fluoranthene
8. 1,4-dichlorobenzene	21. bis(2-chloroethoxy)methane	34. 2-nitroaniline	47. 2,3,4,6-tetrachlorophenol	60. anthracene	73. benzo(a)pyrene
9. 1,2-dichlorobenzene	22. 2,4-dichlorophenol	35. 1,4-dinitrobenzene	48. 2,3,5,6-tetrachlorophenol	61. carbazole	74. indeno(1,2,3-cd)pyrene
10. benzyl alcohol	23. 1,2,4-trichlorobenzene	36. acenaphthylene	49. fluorene	62. di-n-butyl phthalate	75. dibenzo(a,h)anthracene
11. bis(2-chloroisopropyl)ether	24. naphthalene	37. 1,3-dinitrobenzene	50. 4-chlorophenyl phenyl ether	63. fluoranthene	76. benzo(ghi)perylene
12. 2-methylphenol	25. 4-chloroaniline	38. dimethyl phthalate	51. diethyl phthalate	64. pyrene	
13. hexachloroethane	26. hexachlorobutadiene	39. 2,6-dinitrotoluene	52. 4-nitroaniline	65. benzyl butyl phthalate	

*Concentration is 500µg/mL.

Tips for Maximizing HPLC Column Lifetime

by Greg France, HPLC Product Marketing Manager, and Terry Reid, HPLC Applications Chemist

- ✓ Extend the lifetime of your analytical HPLC column.
- ✓ Achieve more reproducible analyses.
- ✓ Protect your chromatographic system.

The analytical column is the heart of your HPLC system. Taking proper care of your column ensures that you get reproducible results for a maximum number of sample injections. By following the recommendations listed below, you can extend the lifetime of your column and improve the accuracy and reproducibility of your results.

Sample Preparation

The cleaner your samples, the longer your column will last. Obviously, there will be times when you must compromise column lifetime in order to reduce sample preparation efforts. At the very least, though, you should filter samples through a 0.45µm syringe tip filter to ensure they are free of particles. Restek offers a range of syringe filters, from 0.20µm to 1.00µm, in either nylon or PTFE. Also, make sure that all samples are completely soluble in the mobile phase. If you are running a mobile phase gradient, sample solubility should be verified at the low and high extremes of organic content.

Resprep™ SPE Syringe Filters

Filter Diameter	Porosity	qty.	Nylon
13mm	0.20µm	100-pk.	26066
13mm	0.45µm	100-pk.	26067
25mm	0.20µm	50-pk.	26070
25mm	0.45µm	50-pk.	26071
25mm	1.00µm	50-pk.	—

Trident™ Direct Guard Column System

Description	qty.	cat.#
High-pressure filter	ea.	25082
1cm guard cartridge holder with filter	ea.	25084
2cm guard cartridge holder with filter	ea.	25086
Connection tip for Waters®-style end fittings	ea.	25088
PEEK® tip standard fittings	ea.	25087
Replacement Cap Frits: 4mm, 2.0µm	5-pk.	25022
Replacement Cap Frits: 4mm, 0.5µm	5-pk.	25023
Replacement Cap Frits: 2mm, 2.0µm	5-pk.	25057

for more info

For additional information about Trident™ guard columns, request the Trident™ Fast Facts (lit. cat.# 59314 and 59896).

Inert PEEK® Tubing

Description	qty.	cat.#
PEEK® Tubing, 1/16" OD x 0.0025" ID Natural	3m	25320
PEEK® Tubing, 1/16" OD x 0.005" ID Red Stripe	3m	25065
PEEK® Tubing, 1/16" OD x 0.007" ID Yellow Stripe	3m	25066
PEEK® Tubing, 1/16" OD x 0.010" ID Blue Stripe	3m	25067
PEEK® Tubing, 1/16" OD x 0.020" ID Orange Stripe	3m	25068

Mobile Phases

Filter mobile phases (especially buffers) through a 0.45µm membrane. A 0.2µm filter removes bacteria as well as other particles. If you are running a gradient with a buffer, make sure the buffer salt remains in solution even at the highest percent organic.

Column Storage

Store columns in an appropriate solvent that contains at least 10% organic solvent and is free of salts or buffers. Seal a stored column with end plugs and label the column with the storage solvent, to avoid inadvertently combining incompatible solvents in the column when using it later. If a column is dedicated to a particular analysis, the analyte or method name should be recorded on the column.

Column Protection

Use a guard column and guard frits to protect your column from particles and buffer salts that can cause column damage and impaired performance.

loss of efficiency or peak symmetry). The Trident™ guard system allows you to choose a configuration that best suits the needs of your particular application: a Trident™ in-line guard cartridge, the Trident™ Direct system, or the Trident™ Integral guard system. (For illustrations of Trident™ systems, see page 5.) Each system can be built from a particulate filter frit, a filter frit with a 1cm guard column, or a filter frit with a 2cm guard column. Alternatively, a Trident™ in-line or direct system can be configured as a guard cartridge holder without the filter frit.

Column Cleanup

Ben Franklin said, "An ounce of prevention is worth a pound of cure." The same rings true for column maintenance: clean the column periodically. If you wait for column performance to significantly deteriorate before cleaning, you may have to repeat your analyses. The most effective cleanup technique is to backflush the column to remove the strongly adsorbed impurities that tend to accumulate at the head of the column. Do not flush into the detector because particles from the inlet frit could damage the detector. To clean the column, flush it with a strong solvent (e.g., high organic for reversed phase columns). If you are using a buffer, make sure it is completely flushed from the column and the system before switching to a mobile phase with a high percentage of organic solvent. This will prevent salts from precipitating. If you are doing repetitive isocratic analyses, periodically (i.e., every ten samples or so) use a gradient from weaker to stronger solvent to prevent the accumulation of strongly retained impurities. When cleaning columns, flush with a minimum of ten column volumes.

Avoid Extremes

Follow the column manufacturer's recommendations for usable pH and temperature ranges. Most silica-based columns will have a recommended pH range of around 2.5-7.5. Lifetimes for these columns will be maximized if the pH can be maintained between 3 and 7. Similarly, although most silica-based columns can be operated at temperatures up to 80°C, lifetime generally will be greatest if the column temperature does not exceed 40°C. Column manufacturers usually do not specify pressure limits, but higher pressures decrease column lifetime, especially as pressure exceeds 2000psi (~140 bar). Pressures above 3000psi (~200 bar) should be avoided if at all possible.

Conclusion

By following these recommendations, you will prolong the life of your analytical column and reduce the chances for unpleasant surprises during your routine analyses. If you have any questions, the Restek Technical Service Team will be happy to help you—call 814-353-1300 or 800-356-1688, ext. 4, or contact your local Restek representative.

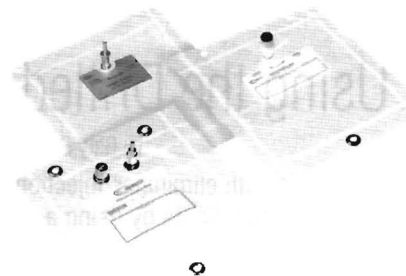
New Air Sampling Products

by Donna Lidgett, Air Monitoring Products Marketing Manager

Tedlar® Air Sampling Bags

- ✓ Find the bags you need—we offer sizes ranging from 0.5 liters to 100 liters.
- ✓ Unique all-in-one septum and valve fitting make these lightweight and easy to use.
- ✓ Polypropylene or stainless steel valves.

The unique design of these bags incorporates the sampling septum directly in the valve, providing easier use and lighter weight than other styles. We offer two types of bags: one with polypropylene valves and one with stainless steel valves.



			Polypropylene	Stainless Steel
Description		qty.	cat.#	cat.#
0.5L	6" x 6"	10-pk.	22049	22038
1L	7" x 7"	10-pk.	22050	22039
3L	9.5" x 10"	10-pk.	22051	22040
5L	12" x 12.5"	10-pk.	22052	22041
10L	11.75" x 18"	10-pk.	22053	22042
12L	13" x 20"	10-pk.	22054	22043
25L	17.5" x 24"	5-pk.	22055	22044
40L	24" x 24.25"	5-pk.	22056	22045
80L	28.25" x 30.5"	5-pk.	22057	22046
100L	28" x 36"	3-pk.	22058	22047
Replacement Septum		10-pk.	22059	22048

Thermal Desorption Tubes

- ✓ For PerkinElmer and Dynatherm Instruments.
- ✓ Available in a variety of packings: single bed to multi-bed.
- ✓ Air toxics tube ideal for EPA Method TO-14 compound list.
- ✓ PerkinElmer ATD-400 tubes offered in both stainless steel and glass.

Restek now offers a line of pre-packed thermal desorption tubes. The current offering includes the most popular packings for PerkinElmer ATD 50/400 instruments and the Dynatherm ACEM 900/901-FF thermal desorption unit.

PerkinElmer Thermal Desorption Tubes for ATD 50/400 Instruments

Description	OD	Length	qty.	Glass Tube	Stainless Steel Tube
				cat.#	cat.#
Air Toxics	1/4"	3.5"	10-pk.	24300	24301
Carbo Trap 300	1/4"	3.5"	10-pk.	24302	24303
Carbo Trap 349	1/4"	3.5"	10-pk.	24304	24305
Tenax TA	1/4"	3.5"	10-pk.	24306	24307
Tenax GR	1/4"	3.5"	6-pk.	24308	24309
Carbosieve S-III*	1/4"	3.5"	6-pk.	24310	24311
Chromosorb 106	1/4"	3.5"	10-pk.	24312	24313
Empty	1/4"	3.5"	10-pk.	24314	24315

Dynatherm Thermal Desorption Tubes for ACEM 900/901-FF Instruments

Description	ID	OD	Length	qty.	Glass Tube
					cat.#
Carbotrap™ 200	4mm	6mm	11.5cm	3-pk.	24316
Carbotrap™ 200	2mm	6mm	11.5cm	3-pk.	24317
Carbotrap™ 300	4mm	6mm	11.5cm	3-pk.	24318
Carbotrap™ 300	2mm	6mm	11.5cm	3-pk.	24319
Carbotrap™ 301	1mm	6mm	11.5cm	3-pk.	24320
Empty	4mm	6mm	11.5cm	5-pk.	24321
Empty	2mm	6mm	11.5cm	5-pk.	24322

Inert Inlet System Improves Responses for Chlorinated Pesticides

Using the Drilled Uniliner® Inlet Liner

by Gary Stidsen, Innovations Manager

- ✓ Inert sample path eliminates injection port discrimination.
- ✓ Reduce detection limits by using a splitless injection port without an on-column injector.

For years, chemists analyzing chlorinated pesticides have tried many different injection techniques in attempts to find the best balance between inertness and ability to contend with sample contamination. Cool on-column, split, splitless, and direct injection, and variations of these injection techniques, are used today.

Now, a specially modified injection port liner, developed by Restek chemists, reduces sample contact with active metal parts in split/splitless injection ports. This Drilled Uniliner® liner, shown in Figure 1, gives the benefits of both direct injection and splitless injection. The advantage of this liner is that the col-

umn is connected to the liner by a press-fit connection, thus preventing the sample from contacting the metal at the bottom of the injection port. Also, the hole on the side of the liner allows the purge flow to escape from the liner when the injection mode is switched from splitless to split.

Inertness

With the Drilled Uniliner® liner, the sample is transferred directly from the injection port to the column and contacts only this glass inlet liner. The configuration allows the sample to be "funneled" into the column entrance, thereby eliminating the need for vaporization aids such as fused silica

Figure 1
The drilled hole in a Uniliner® injection port liner makes direct injection possible with EPC systems by equalizing pressure in the injection port.



wool. The test probes endrin and 4,4'-DDT are good indicators of injection port inertness. Analyses of the performance evaluation mixture (PEM) show low breakdown of these compounds when using this liner.

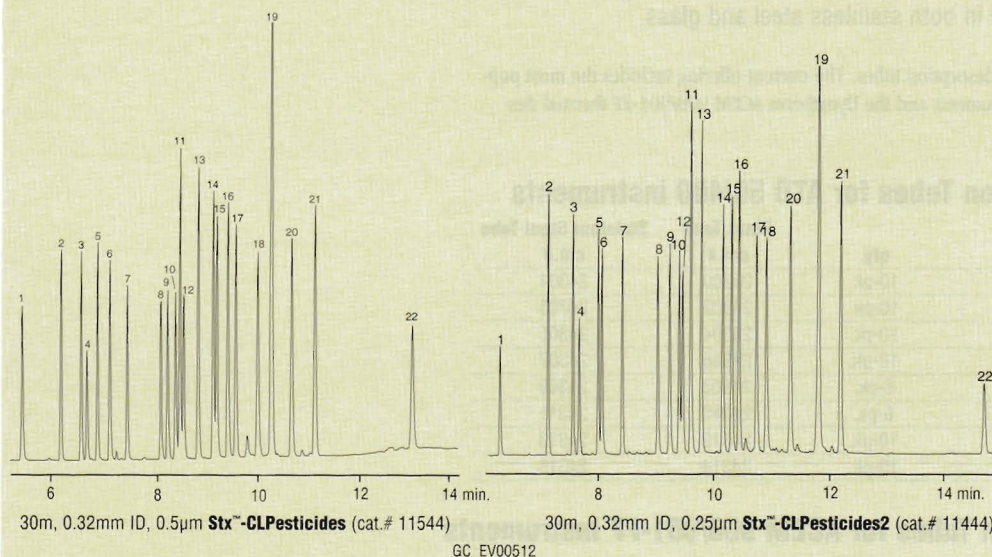
For maximum inertness, we recommend using the Drilled Uniliner® liner in combination with an Stx®-CLPesticides capillary column, as shown in Figure 2. Siltek™ surface deactivation in these columns further ensures maximum responses for the labile pesticides endrin, 4,4'-DDT, and methoxychlor. A special polymer formulation designed for organochlorine pesticides enables you to achieve excellent separation of the 22 chlorinated pesticides in Figure 2 in less than 15 minutes. Comparable analyses on Rtx®-CLPesticides columns take up to 24 minutes (Figure 2, inset).

Calibration

Linearity and continuing calibration checks for the chlorinated pesticides also are critical parameters that must be monitored. Table 1 indicates typical

Figure 2

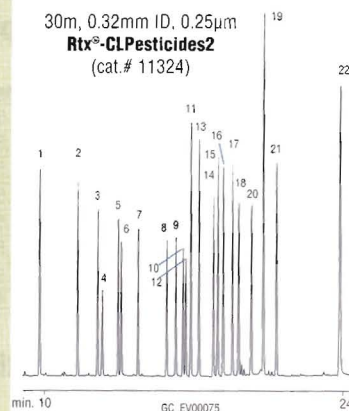
Stx™-CLPesticides and Stx™-CLPesticides2 columns provide rapid, excellent separation of chlorinated pesticides, and a Siltek™-deactivated Drilled Uniliner® inlet liner helps ensure high responses for sensitive analytes.



Oven temp.: 110°C (hold 1 min.) to 245°C @ 20°C/min. to 300°C @ 6°C/min.
Inj. & det. temp.: 210°C / 310°C
Carrier gas: helium
Dead time: 0.8min. @ 120°C
Inlet liner: Siltek™ Drilled Uniliner® liner (cat.# 21055-214.5)
Inj.: 1µL direct injection of 20/40/200ng/mL std. concentration in hexane
Make-up gas: nitrogen

- | | |
|--|-----------------------------|
| 1. 2,4,5,6 tetrachloro-
m-xylene (IS) | 12. endosulfan I |
| 2. α-BHC | 13. dieldrin |
| 3. γ-BHC | 14. endrin |
| 4. β-BHC | 15. 4,4'-DDD |
| 5. δ-BHC | 16. endosulfan II |
| 6. heptachlor | 17. 4,4'-DDT |
| 7. aldrin | 18. endrin aldehyde |
| 8. heptachlor epoxide | 19. methoxychlor |
| 9. γ-chlordane | 20. endosulfan sulfate |
| 10. α-chlordane | 21. endrin ketone |
| 11. 4,4'-DDE | 22. decachlorobiphenyl (IS) |

*Traditional analyses on
Rtx®-CLPesticides columns take
up to 24 minutes.*



On-column concentration: 16–160pg organochloride pesticide mix AB#2 (cat.# 32292)
Oven temp.: 120°C (hold 1 min.) to 300°C (hold 10 min.) @ 9°C/min.
Inj. port: Direct, Uniliner® liner (cat.# 20335), at 200°C
Detector: ECD, 300°C with Anode Purge
Dead time: 1.9 min.
Head pressure: 8.7psi (constant)
Flow rate: 1.3mL/min. @ 120°C, helium.

Table I

Small relative standard deviations for calibration factors show a Drilled Uniliner® inlet liner efficiently transfers the sample to the column.

	Relative Standard Deviation (%)	
	CLPesticides Column	CLPesticides2 Column
α-BHC	7.0	7.5
γ-BHC	3.3	3.8
β-BHC	10.2	9.6
δ-BHC	6.0	7.1
heptachlor	4.2	10.9
aldrin	2.3	1.2
heptachlor epoxide	10.7	8.6
γ-chlordane	6.8	6.7
α-chlordane	8.3	6.7
4,4' DDE	2.3	3.3
endosulfan I	9.2	8.3
dieldrin	7.6	6.6
endrin	4.9	5.3
4,4' DDD	2.7	4.1
endosulfan II	9.9	9.7
4,4' DDT	3.8	2.4
endrin aldehyde	12.3	13.3
methoxychlor	10.2	10.8
endosulfan sulfate	9.3	10.6
endrin ketone	7.9	5.3

Standard: cat#, 32292, 8/16/80µg/mL in hexane:toluene (1:1)

Calibration curve standards:
5/10/50ng/mL in hexane
20/40/200ng/mL in hexane
80/160/800ng/mL in hexane

Chlorinated pesticides listed in US EPA Method 8081.

linearity values (% RSD) obtained using a Drilled Uniliner® liner and Rtx®-CLPesticides columns. Equivalent results are obtained with Stx™-CLPesticides columns.

When using a Drilled Uniliner® liner, the efficient transfer of sample from the injection port to the column might allow more nonvolatile material to enter the column. For many samples this will not be an issue, especially if solid phase cleanup is performed. Using a guard column will help maintain the analytical column. When necessary, the guard column can be trimmed to remove the portion where the nonvolatile material collects (usually the first 6-12 inches).

Conclusion

The Drilled Uniliner® liner provides the advantages of both direct and splitless injection liners. The liner provides a more inert sample pathway to transfer the sample from the injector to the analytical column, and it helps eliminate injection port discrimination. A Drilled Uniliner® liner will reduce the detection limits for injections made on a splitless injection port, without the need for an on-column injector.




Stx™-CLPesticides (Fused Silica with Siltek™ deactivation)

ID	df (µm)	temp. limits	15-Meter	30-Meter
0.25mm	0.25	-60 to 310/330°C	11540	11543
0.32mm	0.50	-60 to 310/330°C	11541	11544
0.53mm	0.50	-60 to 310/330°C	11542	11545

Stx™-CLPesticides2 (Fused Silica with Siltek™ deactivation)

ID	df (µm)	temp. limits	15-Meter	30-Meter
0.25mm	0.20	-60 to 310/330°C	11440	11443
0.32mm	0.25	-60 to 310/330°C	11441	11444
0.53mm	0.42	-60 to 310/330°C	11442	11445

Uniliner® Inlet Liners for Agilent GCs

DI Liners for Agilent 5890/6890 GCs (For 0.25/0.32/0.53mm ID Columns)		ID*/OD & Length (mm)	cat.# ea.	cat.# 5-pk.
	Drilled Uniliner®	4.0 ID 6.3 OD x 78.5	21054	21055
	Siltek™ Drilled Uniliner®	4.0 ID 6.3 OD x 78.5	21054-214.1	21055-214.5
	Siltek™ 1mm Drilled Uniliner®	1.0 ID 6.3 OD x 78.5	21390-214.1	21391-214.5

*Nominal ID at syringe needle expulsion point.

Pesticide Surrogate Mix

decachlorobiphenyl
2,4,5,6-tetrachloro-*m*-xylene
200µg/mL each in acetone, 1mL/ampul

Each	5-pk.	10-pk.
32000	32000-510	
with data pack		
32000-500	32000-520	32100

Organochlorine Pesticide Mix AB #2

aldrin	8µg/mL	dieldrin	16
α-BHC	8	endosulfan I	8
β-BHC	8	endosulfan II	16
δ-BHC	8	endosulfan sulfate	16
γ-BHC (lindane)	8	endrin	16
α-chlordane	8	endrin aldehyde	16
γ-chlordane	8	endrin ketone	16
4,4'-DDD	16	heptachlor	8
4,4'-DDE	16	heptachlor epoxide (B)	8
4,4'-DDT	16	methoxychlor	80

In hexane:toluene (1:1), 1mL/ampul

Each	5-pk.	10-pk.
32292	32292-510	
with data pack		
32292-500	32292-520	32392



The Drilled Uniliner® inlet liner is the first inlet liner to allow direct injections in EPC systems!

Analyzing Organophosphorus Pesticides

Using an Rtx[®]-OPPesticides2 Column and GC/MS

by Gary Stidsen, Innovations Manager

- ✓ Low column bleed improves resolution of OPPs.
- ✓ Fast analysis times.
- ✓ Allows GC/MS analysis of many OPPs.

Typically, organophosphorus pesticides (OPPs) are analyzed using a dual-column gas chromatograph with flame photometric detectors (FPD) or nitrogen phosphorus detectors (NPD). These detectors provide the sensitivity needed for reporting limits, but only for a finite number of compounds. However, the list of compounds continues to increase, due to the introduction of new pesticides.

As the list of compounds grows, the use of gas chromatography/mass spectrometry (GC/MS) becomes more desirable. GC/MS analysis requires only one column and detector, thereby eliminating the complexity of the dual-column GC system. Column bleed and analyte resolution are important factors in GC/MS analysis. Minimizing column bleed is important to increase the signal-to-noise ratio for

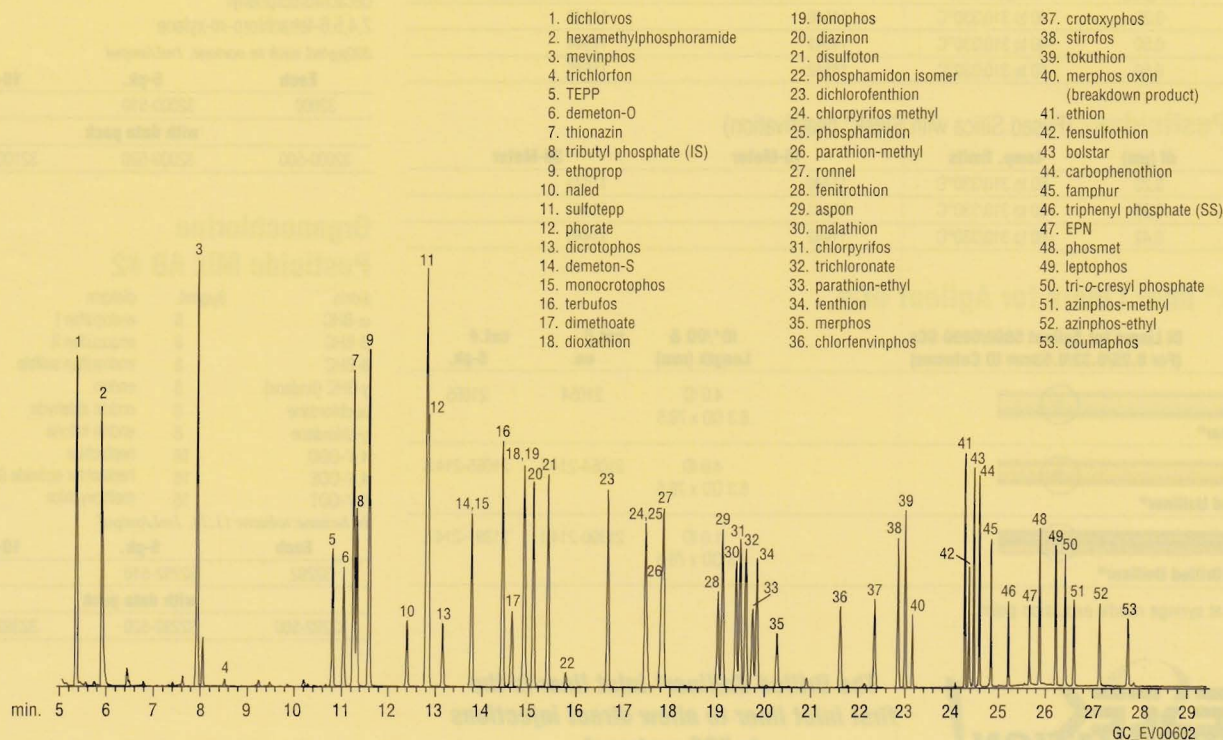
the late-eluting compounds at the detection limits. Although the MS can spectrally resolve the sample components, fewer coelutions in the chromatogram make data processing easier, including confirmation by spectral identification.

Using sophisticated computer-assisted stationary phase development (CASP.D) software, Restek chemists designed the Rtx[®]-OPPesticides2 column to provide low bleed and improve resolution for OPP analysis by MS (Figure 1). Not only are the separations dramatically improved compared to traditional columns for this analysis, but also the analysis time can be reduced by almost 50%.

The combination of an Rtx[®]-OPPesticides2 GC column with MS is an excellent system for analyzing long lists of OPPs. The column exhibits very low bleed and excellent resolution for these compounds.

Figure 1

The Rtx[®]-OPPesticides 2 column shows excellent resolution of 53 organophosphorus pesticides.



Column: Rtx[®]-OPPesticides2 30m, 0.25mm ID, 0.25µm (cat.# 11243)
Sample: Custom Mix, plus:
8140/8141 OP Pesticides Calibration Mix A (cat.# 32277)
8141 OP Pesticides Calibration Mix B (cat.# 32278)
Triphenylphosphate Standard (cat.# 32281)
Tributylphosphate Standard (cat.# 32280)
Inj.: 1µL, 100ppm each (100ng on column)
1.0µL splitless (hold 0.4 min.), 4mm double
goose-neck inlet liner (cat.# 20785)
Inj. temp.: 250°C

Carrier gas: helium, constant flow
Flow rate: 1.0mL/min.
Oven temp.: 80°C (hold 0.5 min.) to 140°C @ 20°C/min.
to 210°C @ 4°C/min. (hold 1 min.) to
280°C @ 30°C (hold 5 min).
Det: MS
Transfer line temp.: 280°C
Scan range: 35-400amu
Ionization: EI

Rtx®-OPPesticides2 Columns (Fused Silica) Stable to 310°C

ID	df (µm)	temp. limits	20-Meter	30-Meter
0.18mm	0.20	-20 to 310/330°C	11244	
0.25mm	0.25	-20 to 310/330°C		11243
0.32mm	0.32	-20 to 310/330°C		11241
0.53mm	0.50	-20 to 310/330°C		11242

Restek will create the right solution for you!

"The Company Chromatographers Trust"



Restek should be your first choice for custom-made reference materials. Our inventory of over 3,000 pure, characterized, neat compounds ensures you of maximum convenience,

maximum value, and minimum time spent blending mixtures in your lab.

- ✓ Quotations supplied quickly.
- ✓ Mixtures made to your EXACT specifications.
- ✓ Most reference materials shipped within 5-7 days after receipt of your order.*

For our online custom reference material request form, visit <http://www.restekcorp.com/stdreq.htm>

*Availability of raw materials and final product testing required may affect delivery of some mixtures. International orders require additional shipping time.

8140/8141 OP Pesticide Calibration Mix A

azinphos methyl	fenthion
bolstar (sulprofos)	merphos
chlorpyrifos	methyl parathion
coumaphos	mevinphos
demeton, O and S	naled
diazinon	phorate
dichlorvos	ronnel
disulfoton	stirofos
ethoprop	tokuthion (prothiofos)
fensulfthion	trichloronate

200µg/mL each in hexane:acetone (95:5), 1mL/ampul

Each	5-pk.	10-pk.
32277	32277-510	—
with data pack		
32277-500	32277-520	32377

8141 OP Pesticide Calibration Mix B

dimethoate	parathion
EPN	sulfotepp
malathion	TEPP
monocrotophos	

200µg/mL each in hexane:acetone (95:5), 1mL/ampul

Each	5-pk.	10-pk.
32278	32278-510	—
with data pack		
32278-500	32278-520	32378

8140/8141 Internal Standards & Surrogates

NPD Detector:

Internal Standard: 1-bromo-2-nitrobenzene
Surrogate: 4-chloro-3-nitrobenzotrifluoride

1-bromo-2-nitrobenzene

1,000µg/mL in acetone, 1mL/ampul

Each	5-pk.	10-pk.
32279	32279-510	—
with data pack		
32279-500	32279-520	32379

4-chloro-3-nitrobenzotrifluoride

1,000µg/mL in acetone, 1mL/ampul

Each	5-pk.	10-pk.
32282	32282-510	—
with data pack		
32282-500	32282-520	32382

FPD Detector:

Internal Standard: none recommended
Surrogate: tributylphosphate and triphenylphosphate

tributylphosphate

1,000µg/mL in acetone, 1mL/ampul

Each	5-pk.	10-pk.
32280	32280-510	—
with data pack		
32280-500	32280-520	32380

triphenylphosphate

1,000µg/mL in acetone, 1mL/ampul

Each	5-pk.	10-pk.
32281	32281-510	—
with data pack		
32281-500	32281-520	32381

Septum Alternative Provides Longer Life & Wear Resistance

Merlin Microseal™ Septa

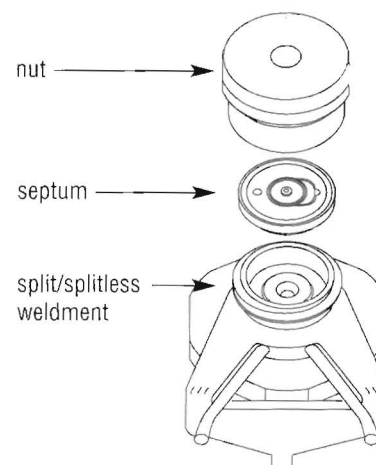
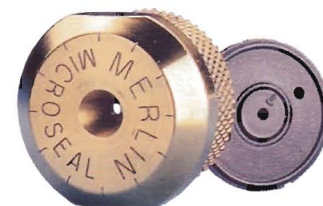
by Donna Lidgett, GC Accessories Product Marketing Manager

- ✓ For Agilent 5890/6890/6850 GCs compatible with EPC.
- ✓ High-pressure capability allows operation from 2 to 100psi.
- ✓ A top wiper rib improves resistance to particulate contamination and can be taken apart for cleaning.
- ✓ Reduces shedding of septum particles into the injection port liner, eliminating a major source of septum bleed and ghost peaks.
- ✓ Reduces the risk of septum leaks during extended automated runs.

Merlin Microseal™ Septa

Microseal™ High-Pressure Septa 400 Series	Merlin#	Similar to Agilent#	cat.#
Nut kit (1 nut, fits 300 & 400 series septa)	403	5182-3445	22809
Standard kit (nut, 2 high-pressure septa)	404	Not offered	22810
Starter kit (nut, 1 high-pressure septum)	405	5182-3442	22811
Replacement high-pressure septum (1 septum)	410	5182-3444	22812

Microseal™ Septa, 300 Series	Merlin#	Similar to Agilent#	cat.#
Standard kit (nut, 2 septa)	304	5181-8833	22813
Starter kit (nut, 1 septum)	305	5181-8816	22814
Microseal replacement septum (1 septum)	310	5181-8815	22815
Replacement PTFE washers (2-pk.)	311	5181-0853	22808



RESTEK. Behind the Scenes

What's New from the Analytical Reference Materials Team?

In addition to adding new product formulations to meet your changing requirements, we've been very busy behind the scenes working for you. Visit www.restekcorp.com/certfind.htm to view the information you need at your convenience.

- ✓ All Material Safety Data Sheets (MSDSs) have been converted to 16-part format.
- ✓ All 800+ stock product MSDSs are available on-line.
- ✓ 1000s of Certificates of Analysis are available on-line, too.

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Please direct your comments on this publication to Carrie Sprout, Graphic Designer, at carrie@restekcorp.com or call Restek, ext. 2151

Restek air canisters are being used at Ground Zero to monitor air quality. We are proud to have our products used in the 9/11 clean-up efforts at the Twin Towers site.

Thanks for a Great Pittcon® '02!

It was our best Pittcon® conference yet! We got to meet many of you, showcase our new products, and learn about advances in our industry. Thanks for stopping by our booth and talking with the Chromatography Wizards. Be sure to check out the technical presentations and posters at www.restekcorp.com. The winners of our daily drawing are listed below. Congratulations!

Monday, March 18: Pinnacle II™ HPLC Column of your choice (up to \$405 value)

Winner: Michael McCroan, The Minute Maid Company

Tuesday, March 19: SGT Triple Gas Filter & Single-Position Baseplate (up to \$320 value)

Winner: Gregory Ostrom, Naval Warfare Center

Wednesday, March 20: 30-Meter Fused Silica Capillary GC Column of your choice (up to \$525 value)

Winner: Wesley Wortham, BASF Agro

Thursday, March 21: \$500 in stock Analytical Reference Materials (up to \$500 value)

Winner: Neil Springarn, S & N Labs

New Literature

- ✓ Stx™-CLPesticides Columns Provide Improved System Inertness for Chlorinated Pesticides Analyses—*Applications Note* (lit. cat.# 59351B)
- ✓ HPLC Analyses of Preservatives—*Applications Note* (lit. cat.# 59398)
- ✓ EPA 8100 Analysis Using Rtx®-5SII MS, Rtx®-CLPesticides and Rtx®-CLPesticides2 Columns—*Applications Note* (lit. cat.# 59196A)
- ✓ Low ppb-Level Sulfur Analysis Using Sulfinert™ Sample Cylinders—*Applications Note* (lit. cat.# 59164A)
- ✓ GC Accessories Products—*Flyer* (lit. cat.# 59208B)
- ✓ Gas Purification Products for GCs—*Flyer* (lit. cat.# 59216B)
- ✓ Products for the Petrochemical Market—*Flyer* (lit. cat.# 59298)
- ✓ Ultra Aqueous C18 HPLC Column—*Fast Facts* (lit. cat.# 59371)
- ✓ US EPA Method 8260B Standards—*Fast Facts* (lit. cat.# 59332A)
- ✓ UST Products for the State of Texas—*Fast Facts* (lit. cat.# 59394)
- ✓ Sulfinert™ Products—*Fast Facts* (lit. cat.# 59318A)
- ✓ GC Racer - Fast GC Temperature Programmer—*New Product Flyer* (lit. cat.# 59297)
- ✓ Vespel® Ring Inlet Seals—*New Product Flyer* (lit. cat.# 59431)
- ✓ Rtx®-200 GC Column—*New Product Flyer* (lit. cat.# 59439)
- ✓ Integra-Guard® GC Columns—*New Product Flyer* (lit. cat.# 59441)
- ✓ 2002 Seminar Tours—*New Product Flyer* (lit. cat.# 59282A)
- ✓ Air Monitoring Products—*Catalog* (lit. cat.# 59661A)
- ✓ Genuine Restek Replacement Parts for Agilent GCs—*Catalog* (lit. cat.# 59627C)

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