

the **RESTEK** Advantage

Innovators of High Resolution Chromatography Products

new!

Dual Vespel® Ring Inlet Seal

Washerless, Leak-Tight Seal for Agilent GCs

by Donna Lidgett, GC Accessories Product Marketing Manager

- ✓ Vespel® ring in bottom surface simplifies installation—eliminates the washer.
- ✓ Vespel® ring in top surface reduces operator variability by requiring minimal torque to seal.
- ✓ Prevents oxygen from permeating the carrier gas, increasing column lifetime.

In Agilent split/splitless injection ports, it can be difficult to make and maintain a good seal with a conventional metal inlet disk. The metal-to-metal seal dictates that you apply considerable torque to the reducing nut, and, based on our testing, this does not ensure a leak-tight seal. Over the course of oven temperature cycling, metal seals are prone to leaks, which ultimately can degrade the capillary column and cause other analytical difficulties.



Eliminate the washer!

Our Dual Vespel® Ring Inlet Seal* greatly improves injection port performance—it stays

sealed, even after repeated temperature cycles, without retightening the reducing nut! This seal, a new version of our popular Vespel® Ring Inlet Seal, features two soft Vespel® rings, one embedded in its

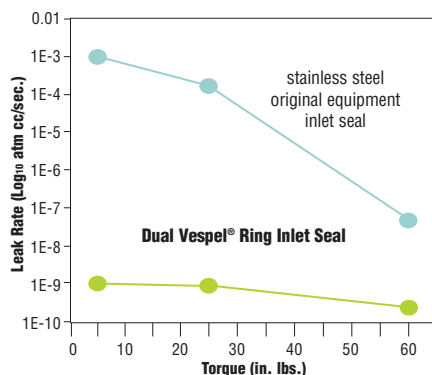


Dual Vespel® Ring Inlet Seals are available in Siltek™-treated, gold-plated, or untreated stainless steel.

top surface and the other embedded in its bottom surface. The Vespel® rings eliminate the need for a washer, and ensure very little torque is needed to make a leak-tight seal. The rings will not harm the critical seal in the injector body, or any other surface, and are outside the sample flow path. Tests using a high sensitivity helium leak detector show Dual Vespel® Ring Inlet Seals will seal equally effectively at torques from 5 to 60 in. lb. (Figure 1).

Why trust a metal-to-metal seal when you can make leak-tight seals quickly, easily, and more reliably—without a washer, with a Restek Dual Vespel® Ring Inlet Seal. Use an untreated stainless steel Dual Vespel® Ring Inlet Seal for analyses of unreactive compounds. To reduce breakdown and adsorption of active compounds, use a Siltek™-treated or gold-plated seal. Siltek™ treatment provides the highest level of inertness.

Figure 1 The Dual Vespel® Ring Inlet Seal achieves leak-tight seals even at low torque, reducing the chance of leak-related problems.



0.8mm ID Dual Vespel® Ring Inlet Seal	2-pk./price	10-pk./price
Siltek™	21242	21243
Gold-Plated	21240	21241
Stainless Steel	21238	21239
1.2mm ID Dual Vespel® Ring Inlet Seal	2-pk./price	10-pk./price
Siltek™	21248	21249
Gold-Plated	21246	21247
Stainless Steel	21244	21245

*Patent pending.

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Restek
Innovation!

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RESTEK

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Fast Analysis of Semivolatile Organic Analytes

Using a 0.18mm ID Rtx®-5Sil MS Capillary GC Column

By Katia May, Ph.D., Senior R&D Chemist, and Christopher English, Environmental Innovations Chemist

- ✓ Improve efficiency by reducing analysis time for 90 compounds to less than 15 minutes.
- ✓ Low-bleed, high-resolution column is ideal for trace analyses.
- ✓ 8270 MegaMix™ reference mix includes 76 target compounds, has 18-month shelf life.

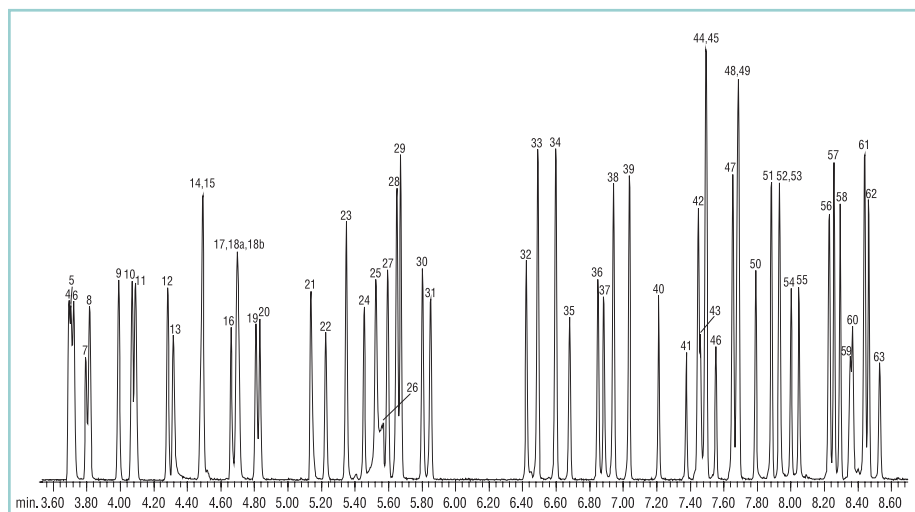
US EPA Method 8270D is one of the GC/MS methods followed to determine concentrations of semivolatile organic compounds in solid waste, soil, water, and air matrices. In a single analysis, environmental laboratories following Method 8270D typically evaluate 100 or more semivolatile organic compounds representing several classes of compounds of differing

chemical properties and reactivity. This complexity puts stringent demands on the column used to perform the analysis. Some polycyclic aromatic hydrocarbons (PAHs) elute at high temperatures, for example, so the method requires a column with low bleed at high temperature. The column also must exhibit excellent efficiency, to ensure resolution of

closely eluting compounds with similar mass spectra, including structural isomers. Additionally, calibration mixes of semivolatile compounds must be combined carefully, to prevent interactions that could compromise stability.

Rtx®-5Sil MS column performance allows improved detection limits and increased productivity, and the column performs exceptionally well in analyses of semivolatile compounds. Figure 1 shows an analysis of our 8270 MegaMix™ reference mix of 76 target

Figure 1 78 semivolatile pollutants, plus surrogates and internal standards, separated in less than 15 min. on a 0.18mm ID Rtx®-5Sil MS column.

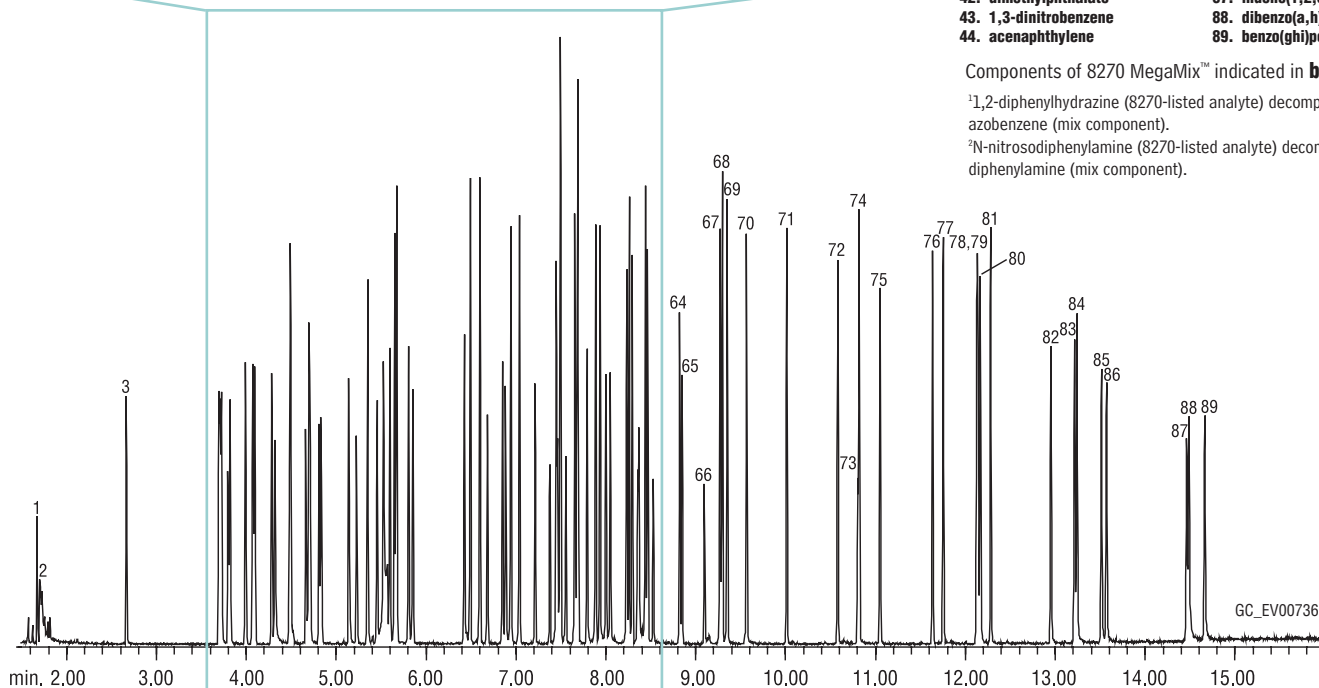


- | | |
|--|--|
| 1. N-nitrosodimethylamine | 45. 2,6-dinitrotoluene |
| 2. pyridine | 46. 1,2-dinitrobenzene |
| 3. 2-fluorophenol (ss) | 47. acenaphthene-d10 (is) |
| 4. aniline | 48. 3-nitroaniline |
| 5. phenol-d6 (ss) | 49. acenaphthene |
| 6. phenol | 50. 2,4-dinitrophenol |
| 7. bis(2-chloroethyl)ether | 51. dibenzofuran |
| 8. 2-chlorophenol | 52. 4-nitrophenol |
| 9. 1,3-dichlorobenzene | 53. 2,4-dinitrotoluene |
| 10. 1,4-dichlorobenzene-d4 (is) | 54. 2,3,4,6-tetrachlorophenol |
| 11. 1,4-dichlorobenzene | 55. 2,3,5,6-tetrachlorophenol |
| 12. 1,2-dichlorobenzene | 56. diethyl phthalate |
| 13. benzyl alcohol | 57. fluorene |
| 14. bis(2-chloroisopropyl)ether | 58. 4-chlorophenyl phenyl ether |
| 15. 2-methylphenol | 59. 4-nitroaniline |
| 16. N-nitroso-di-n-propylamine | 60. 4,6-dinitro-2-methylphenol |
| 17. hexachloroethane | 61. diphenylamine² |
| 18a. 4-methylphenol | 62. azobenzene¹ |
| 18b. 3-methylphenol | 63. 2,4,6-tribromophenol (ss) |
| 19. nitrobenzene-d5 (ss) | 64. 4-bromophenyl phenyl ether |
| 20. nitrobenzene | 65. hexachlorobenzene |
| 21. isophorone | 66. pentachlorophenol |
| 22. 2-nitrophenol | 67. phenanthrene-d10 (is) |
| 23. 2,4-dimethylphenol | 68. phenanthrene |
| 24. bis(2-chloroethoxy)methane | 69. anthracene |
| 25. 2,4-dichlorophenol | 70. carbazole |
| 26. benzoic acid | 71. di-n-butylphthalate |
| 27. 1,2,4-trichlorobenzene | 72. fluoranthene |
| 28. naphthalene-d8 (is) | 73. benzidine |
| 29. naphthalene | 74. pyrene |
| 30. 4-chloroaniline | 75. p-terphenyl-d14 (ss) |
| 31. hexachlorobutadiene | 76. butyl benzyl phthalate |
| 32. 4-chloro-3-methylphenol | 77. bis(2-ethylhexyl)adipate |
| 33. 2-methylnaphthalene | 78. benzo(a)anthracene |
| 34. 1-methylnaphthalene | 79. chrysene-d12 (is) |
| 35. hexachlorocyclopentadiene | 80. chrysene |
| 36. 2,4,6-trichlorophenol | 81. bis(2-ethylhexyl)phthalate |
| 37. 2,4,5-trichlorophenol | 82. di-n-octyl phthalate |
| 38. 2-fluorobiphenyl (ss) | 83. benzo(b)fluoranthene |
| 39. 2-chloronaphthalene | 84. benzo(k)fluoranthene |
| 40. 2-nitroaniline | 85. benzo(a)pyrene |
| 41. 1,4-dinitrobenzene | 86. perylene-d12 (is) |
| 42. dimethylphthalate | 87. indeno(1,2,3-cd)pyrene |
| 43. 1,3-dinitrobenzene | 88. dibenzo(a,h)anthracene |
| 44. acenaphthylene | 89. benzo(ghi)perylene |

Components of 8270 MegaMix™ indicated in **bold**.

¹1,2-diphenylhydrazine (8270-listed analyte) decomposes to azobenzene (mix component).

²N-nitrosodiphenylamine (8270-listed analyte) decomposes to diphenylamine (mix component).



compounds, plus benzoic acid, benzidine, and surrogate and internal standards, on our new 20m, 0.18mm ID, 0.18µm Rtx®-5Sil MS column (cat.# 42702). The Rtx®-5Sil MS stationary phase is based on a silarylene polymer specifically designed for the demanding GC/MS analysis of semivolatiles compounds, and the column exhibits lower bleed than columns prepared from phenyl/methyl polymers. All target compounds can be quantified with greater sensitivity. The thin phase film in this column allows superior resolution of structural isomers benzo(b)fluoranthene and benzo(k)fluoranthene (peaks 83 and 84), while achieving a very short analysis time of less than 15 minutes. Peak shape and response are excellent, even for active compounds such as 2,4-dinitrophenol and pentachlorophenol (peaks 50 and 66). Optimizing the temperature program, as well as the physical dimensions of the column, contributes to better resolution of closely eluting peaks and shortens the analysis time.

In order to achieve the separation shown in Figure 1, care must be taken to optimize injection conditions. To reduce solvent effects that could interfere with N-nitrosodimethylamine and pyridine (peaks 1 and 2), we chose a splitless inlet liner, rather than a direct injection liner (e.g., a Uniliner®). A cyclo double gooseneck design enables the sample to be completely volatilized in the injection port prior to condensing at the column inlet, and ensures more reproducible results, relative to a standard (straight) liner. The 2mm internal diameter provides the best results with 0.5µL injections. The splitless hold time also is very important: a change of only several seconds can reduce sensitivity by 50%. We discovered that a pulsed splitless analysis, using a 0.20 min. pulse 5psi higher than the column flow backpressure, dramatically improves sample transfer onto the column. Making the pulse 3 seconds (0.05 min.) longer than the splitless hold time (0.15 min.) allows excess solvent to be swept away quickly. The 270°C injection port temperature vaporizes the

sample with minimal analyte breakdown. GC conditions were adjusted to resolve analytes that coelute and share ions. Aniline and phenol (peaks 4 and 6), for example, were resolved by using an initial temperature ramp rate of 14°C/min., and the key to resolving isomers benzo(b)fluoranthene and benzo(k)fluoranthene (peaks 83 and 84) is to be sure that they elute during the temperature ramp portion of the program. If the isomers elute during the final hold time they will not be well resolved. By using a 0.18mm ID Rtx®-5Sil MS column under these conditions, you will ensure a rapid and successful analysis of the 8270 compounds.

To meet the substantial demand for reference materials for Method 8270, we offer 8270 MegaMix™ reference mix (cat.# 31686)—a formulation of 76 target compounds in methylene chloride/benzene (75:25).

continued on page 5

Rtx®-5Sil MS 20m, 0.18mm ID, 0.18µm (cat.# 42702)

Sample: US EPA Method 8270D mix: 8270 MegaMix™ (cat.# 31686), benzoic acid (cat.# 31415), benzidine (cat.# 31441), 2,4-dinitrophenol (cat.# 31291)*, Acid Surrogate Mix (4/89 SOW) (cat.# 31063), B/N Surrogate Mix (4/89 SOW) (cat.# 31062), SV Internal Standard Mix (cat.# 31206)

Inj.: 0.5µL, 5ppm each component (2.5ng on column) (2,4-dinitrophenol at 10ppm/5ng on column; 3-methylphenol and 4-methylphenol at 2.5ppm/1.25ng on column), splitless (hold 0.15 min., pressure pulse 0.20 min. @ 30psi), 2mm cyclo double gooseneck inlet liner (cat.# 20907); Agilent 6890

Inj. temp.: 270°C

Carrier gas: helium, constant flow

Flow rate: 1.2mL/min.

Oven temp.: 40°C (hold 0.5 min.) to 90°C @ 14°C/min., to 330°C @ 22°C/min. (hold 1 min.)

Det.: Agilent 5973 GC/MS

Transfer line

temp.: 280°C

Scan range: 35-550 amu

Solvent Delay: 1 min.

Tune: DFTPP

Ionization: EI

Use this new column for sub-15 minute analysis of 78 Method 8270D target compounds.

Rtx®-5Sil MS Columns (fused silica)

(Selectivity equivalent to Crossbond® 5% diphenyl / 95% dimethyl polysiloxane)

ID	df (µm)	temp. limits	20-Meter	15-Meter	30-Meter
0.18mm	0.18	-60 to 330/350°C	42702		
0.25mm	0.25	-60 to 330/350°C	12720		12723
	0.50	-60 to 330/350°C	12735		12738
	1.00	-60 to 325/350°C	12750		12753
0.28mm	0.25	-60 to 330/350°C	12790		12793
	0.50	-60 to 330/350°C	12791		12794
	1.00	-60 to 325/350°C	12792		12795
0.32mm	0.25	-60 to 330/350°C	12721		12724
	0.50	-60 to 330/350°C	12736		12739
	1.00	-60 to 325/350°C	12751		12754

Acid Surrogate Mix (4/89 SOW)

2-fluorophenol 2,4,6-tribromophenol
phenol-d6

Each	5-pk.	10-pk.
2,000µg/mL each in methanol, 1mL/ampul		
31025	31025-510	—
w/ data pack		
31025-500	31025-520	31125
10,000µg/mL each in methanol, 1mL/ampul		
31063	31063-510	—
w/ data pack		
31063-500	31063-520	31163
10,000µg/mL each in methanol, 5mL/ampul		
31087	31087-510	—
w/ data pack		
31087-500	31087-520	31187

B/N Surrogate Mix (4/89 SOW)

2-fluorobiphenyl p-terphenyl-d14
nitrobenzene-d5

Each	5-pk.	10-pk.
1,000µg/mL each in methylene chloride, 1mL/ampul		
31024	31024-510	—
w/ data pack		
31024-500	31024-520	31124
5,000µg/mL each in methylene chloride, 1mL/ampul		
31062	31062-510	—
w/ data pack		
31062-500	31062-520	31162
5,000µg/mL each in methylene chloride, 5mL/ampul		
31086	31086-510	—
w/ data pack		
31086-500	31086-520	31186

8270 MegaMix™ (76 components)

Components listed in **bold** in Figure 1.

1,000µg/mL each (3-methylphenol and 4-methylphenol at 500µg/mL each) in methylene chloride:benzene (75:25), 1mL/ampul

Each	5-pk.	10-pk.
31686	31686-510	—
w/data pack		
31686-500	31686-520	31786

SV Internal Standard Mix

acenaphthene-d10 naphthalene-d8
chrysene-d12 perylene-d12
1,4-dichlorobenzene-d4 phenanthrene-d10

Each	5-pk.	10-pk.
2,000µg/mL each in methylene chloride, 1mL/ampul		
31206	31206-510	—
w/data pack		
31206-500	31206-520	31306
4,000µg/mL each in methylene chloride, 1mL/ampul		
31006	31006-510	—
w/ data pack		
31006-500	31006-520	31106

Benzidine

1,000µg/mL in methanol, 1mL/ampul

Each	5-pk.	10-pk.
31441	31441-510	—
w/data pack		
31441-500	31441-520	31541

Benzoic Acid

1,000µg/mL in methanol, 1mL/ampul

Each	5-pk.	10-pk.
31415	31415-510	—
w/data pack		
31415-500	31415-520	31515

2,4-Dinitrophenol

1,000µg/mL in methanol, 1mL/ampul

Each	5-pk.	10-pk.
31291	31291-510	—
w/data pack		
31291-500	31291-520	31391

Intermediate Polarity Capillary GC Column for Basic Compounds

Rtx[®]-35 Amine Column Improves Analysis of Amines and Nitrogen Heterocyclics

By Neil Mosesman, GC Columns Product Marketing Manager

- ✓ Improved responses compared to conventional columns.
- ✓ Symmetrical peaks for basic compounds.
- ✓ Resolve low molecular weight primary amines.

Amines and nitrogen heterocyclics are used to manufacture a wide variety of products, including dyes, chelating agents, stabilizers, pesticides, and pharmaceuticals. Gas chromatographic analysis of these and other basic compounds can be difficult, because the active compounds typically exhibit adsorption and peak tailing. An Rtx[®]-35 Amine column is ideal for analyses of these polar and low molecular weight amines.



The proprietary deactivation of the 35% phenyl Rtx[®]-35

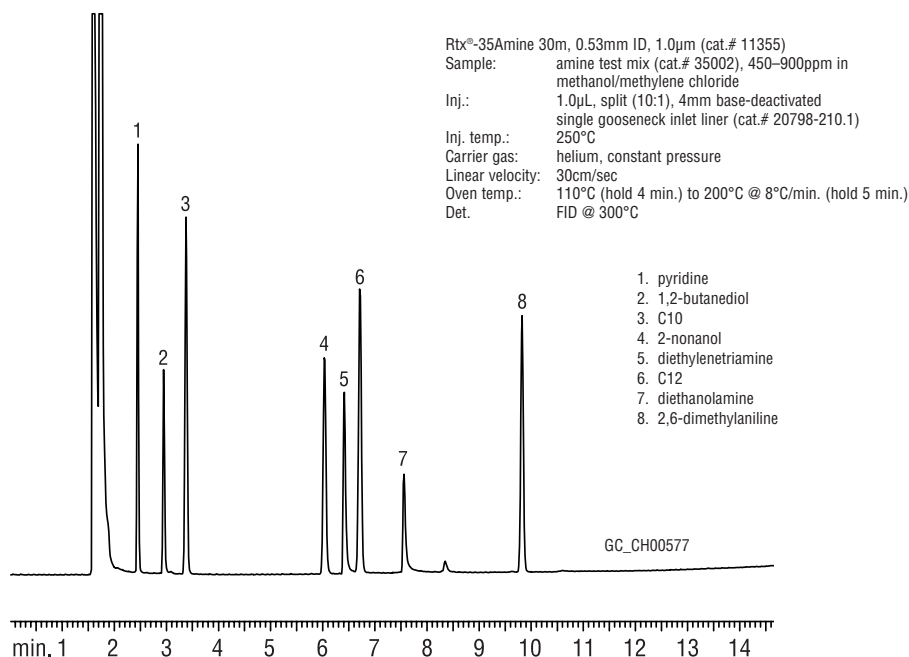
amine phase improves response and peak symmetry compared to conventional 35% phenyl columns. A test mixture of amines at concentrations of 10 to

15ng/μL was analyzed on an Rtx[®]-35 Amine column and a conventional 35% phenyl column.

Ethanolamines are particularly difficult to analyze because in addition to their basic nature they have a hydroxyl group that can interact with silanol groups on the inner surface of the column. The conventional column completely adsorbed diethylenetriamine and diethanolamine, but the Rtx[®]-35 Amine column gave excellent responses and peak shapes for all compounds (Figure 1).

Primary amines often are analyzed on a Stabilwax[®]-DB column because it resolves these compounds well. However, the maximum operating temperature of this column, 220°C, limits the molecular weight range of the analytes. Alternatively, an Rtx[®]-5 Amine column has a much higher maximum operating temperature, 315°C, but does not adequately resolve primary amines. An Rtx[®]-35 Amine column combines the advantages of a Stabilwax[®]-DB column and an

Figure 1 An Rtx[®]-35 Amine column minimizes adsorption and improves responses for amines.

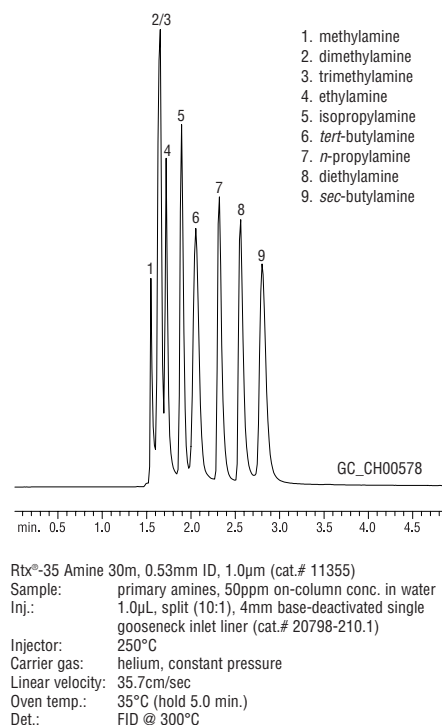


Rtx[®]-5 Amine column: it resolves primary amines and has high thermal stability. An Rtx[®]-35 Amine column offers excellent peak shape and high responses for these active compounds (Figure 2).

When analyzing basic drugs by GC, derivatization often is required to reduce peak tailing or improve response. These complex procedures can improve quantitative results, but they add time and cost to the analysis. An Rtx[®]-35 Amine column provides the selectivity to analyze a wide range of underivatized drug compounds. Many over-the-counter and prescribed medications for cold and flu relief contain amines and other basic compounds. The unique deactivation and selectivity of an Rtx[®]-35 Amine column, combined with its high thermal stability, simplifies the analysis for these components (Figure 3). Underivatized sympathomimetic amines also exhibit excellent peak shape and separation on an Rtx[®]-35 Amine column (request lit. cat.# 59380).

Because the Rtx[®]-35 Amine column offers excellent response and peak symmetry for amines and polar basic compounds, and has high thermal stability, analysts working with these analytes can improve the reliability and consistency of their data.

Figure 2 An Rtx[®]-35 Amine column offers good resolution of primary amines.



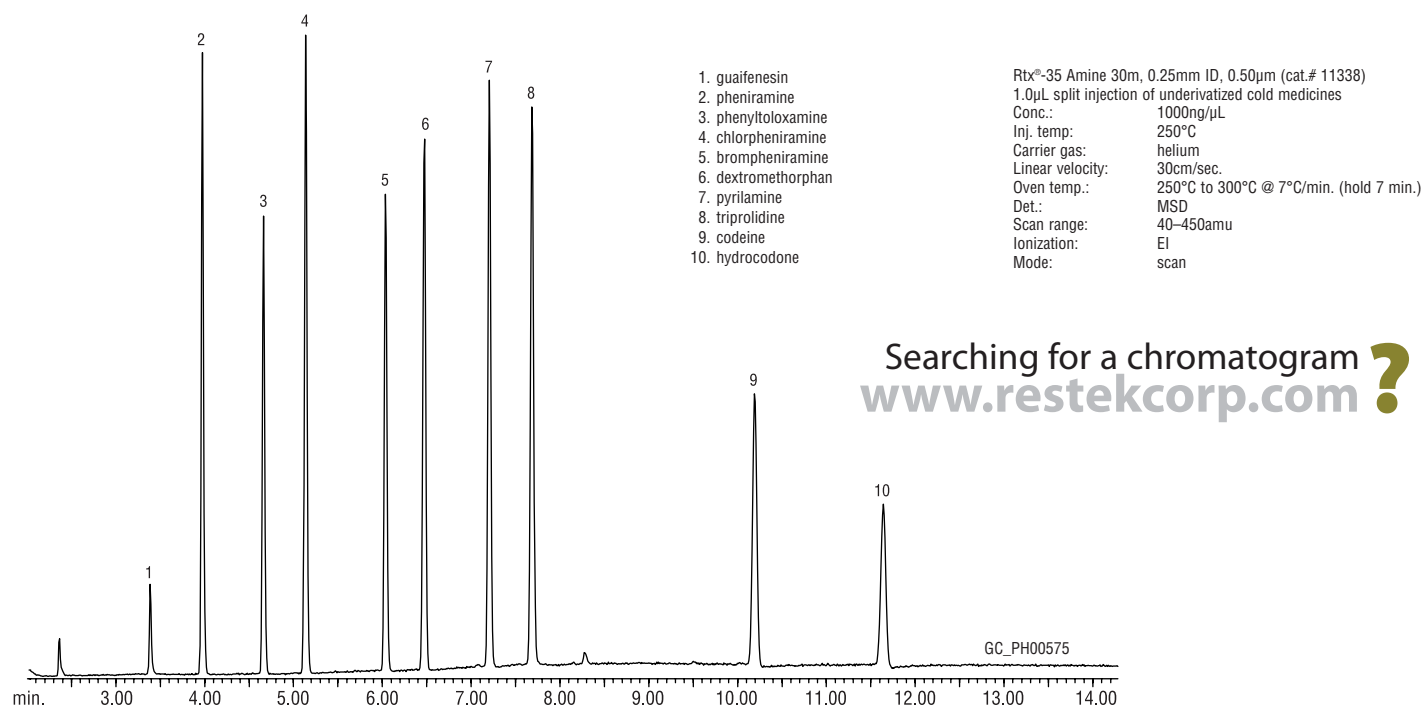
For more **info**
For chromatograms of ethanolamines and amphetamines on Rtx[®]-35 Amine columns, request lit. cat.# 59380.

Base-Deactivated Inlet Liners

Add the corresponding suffix number to the liner catalog number. For inlet liners, see our 2004 *Chromatography Products Guide* (lit. cat.# 59854).

qty.	Base-Deactivated		Base-Deactivated w/	Base-Deactivated Wool
each	-210.1	addl. cost	-211.1	addl. cost
5-pk.	-210.5	addl. cost	-211.5	addl. cost
25-pk.	-210.25	addl. cost	-211.25	addl. cost

Figure 3 An Rtx®-35 Amine column simplifies GC/MS analysis of common cold and flu medications.



Rtx®-35 Amine Columns (fused silica)

(Crossbond® 35% diphenyl/65% dimethyl polysiloxane)

ID	df (µm)	temp. limits	15-Meter	30-Meter
0.25mm	0.50	0 to 290/310°C	11335	11338
	1.00	0 to 280/300°C	11350	11353
0.32mm	1.00	0 to 280/300°C	11351	11354
	1.50	0 to 270/290°C	11366	11369
0.53mm	1.00	0 to 260/280°C	11352	11355
	3.00	0 to 240/260°C	11382	11385

Base-Deactivated Guard Columns

For analyzing basic compounds, use a base-deactivated guard column. For a 5m base-deactivated guard column, order cat. # 10000 (\$45), 10001 (\$50), or 10002 (\$65) (0.25, 0.32, or 0.53mm ID, respectively). For more information on guard columns, see our 2004 *Chromatography Products Guide* (lit. cat.# 59854).

Fast Analysis of Semivolatile Organic Analytes

Using a 0.18mm ID Rtx®-5Sil MS Column, continued from page 3

For stability, two analytes in Figure 1, benzoic acid and benzidine, are introduced separately (cat.# 31415 and cat.# 31441, respectively). 2,4-Dinitrophenol, a component of the 8270 MegaMix™, is supplemented (cat.# 31291), to double the on-column concentration for this low-level calibration (<20ng on column).

For analysts who cannot use the MegaMix™, we offer six simpler calibration mixes of Method 8270 semivolatiles, formulated by chemical class (8270 Calibration Mix #1—8270 Calibration Mix #6, cat.#s 31618–31623, described in the 2004 Restek catalog, page 359), and Organochlorine Pesticide Mix AB #3 (cat.# 32415, catalog page 358). EPA Appendix IX Mix #1 and Appendix IX Mix #2 (cat.#s 31625 and 31806, catalog page 358) complement this full set of mixes.

We developed each of these mixes, including the MegaMix™ mix, for maximum stability, through careful consideration of chemical properties of all potential components. Because 3-methylphenol and 4-methylphenol coelute, we include each in the 8270 MegaMix™ mix at half the concentration of the other components, to enable the user to calibrate at lower levels to quantify these compounds at the required limits. N-nitrosodiphenylamine, an amine target compound in Method 8270D, readily oxidizes to diphenylamine and nitric oxide, a highly reactive gas that can participate in many chemical reactions or act as a catalyst for other oxidation and reduction reactions in the mix. Consequently, we include diphenylamine, rather than N-nitrosodiphenylamine, in the 8270 MegaMix™ mix, to prevent degradation of other components of the mix. Another target compound, diphenylhydrazine, also oxidizes easily, form-

ing azobenzene, so we include azobenzene in the 8270 MegaMix™ mix to assure stability. The stability of an unopened ampul of 8270 MegaMix™ mix is 18 months, as determined by real-time analysis.

In addition to the best choice for analytical column, and stable calibration mixtures, we also have available internal and surrogate standards and the tuning compound recommended in Method 8270D: SV Internal Standard Mix, Acid Surrogate Mix (4/89 SOW), and B/N Surrogate Mix (4/89 SOW), described here (see page 3), and PFTBA (MS Tuning Compound), cat.# 30482, described on catalog page 357.

If you are analyzing for semivolatile compounds by GC/MS, we suggest you evaluate an Rtx®-5Sil MS column and our 8270 MegaMix™ and other reference mixes. Rtx®-5Sil MS columns are available in all common dimensions, or you can use the short, thin-film 20m, 0.18mm ID, 0.18µm column for fastest analyses and highest productivity.

GC/ECD Analysis of Organochlorine Pesticides or Polychlorinated Biphenyls

Using a Low-Bleed Rtx®-XLB Column and Restek Reference Materials

by Greg France, Innovations Chemist, Gary Stidsen, Innovations Team Manager, and Katia May, Ph.D., Senior R&D Chemist

- ✓ Rtx®-XLB column shows extremely low bleed and excellent inertness, improving sensitivity for active compounds.
- ✓ 20 common organochlorine pesticides in 3 convenient reference concentrations.
- ✓ 19 US EPA Method 8082A PCB congeners in one solution.

Various methods have provided guidelines for GC/electron capture detection (GC/ECD) analysis of organochlorine pesticides and PCBs in aqueous and soil matrices. Pesticides and PCB congeners now are analyzed by separate methods, to ensure more accurate PCB data and eliminate complications that arise in combined analysis. Analyses of individual PCB congeners greatly simplify quantitative studies, and improve data, relative to the difficult quantitative studies of PCBs as mixtures (e.g., Aroclor® mixtures)—especially with mixtures weathered by long exposure in the environment.

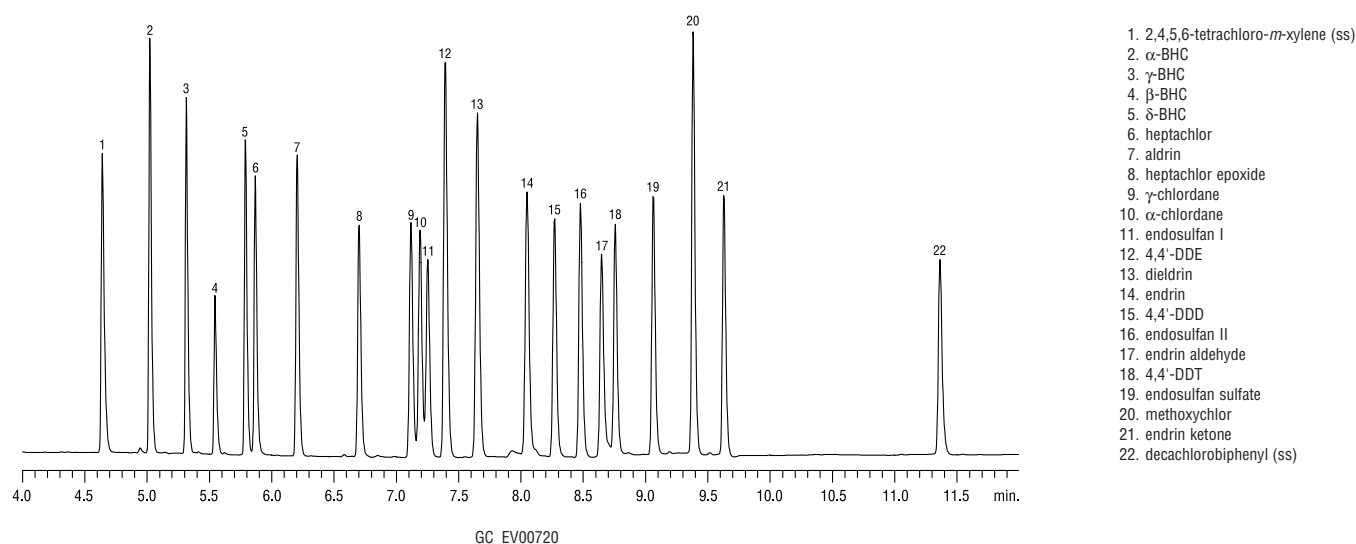
GC analysis of organochlorine pesticides and PCBs can be very challenging because of lengthy calibrations, linearity problems, and potential breakdown of some of the pesticides. In addition to adequate resolution of the target analytes, the column for this analysis must exhibit low bleed. A wide-bore (0.53mm ID) column is listed in US EPA Methods 8081A and 8082A for organochlorine pesticides,

but a narrow-bore column may be used in single-column analyses. Our new 0.32mm ID, 0.5µm phase Rtx®-XLB column is ideal for analyses of active compounds, due to improvements in polymer synthesis and tubing deactivation. Figure 1, an analyses of 20 organochlorine pesticides (Organochlorine Pesticide Mix AB #2, cat.# 32292), demonstrates the superior efficiency and low bleed characteristic of the new column, even at 330°C. The column, in combination with a high initial temperature, 120°C, reduced analysis time to 11.5 minutes, with excellent separation. Very low bleed and high thermal stability ensure reliable detection at the 80/160/800 ppb level. The very low bleed also minimizes detector contamination, prolonging intervals between cleanings and thus increasing throughput over time. Note that to minimize breakdown of labile pesticides we minimized sample contact with metal surfaces by using a Drilled Uniliner® inlet liner to convey the sample directly onto the column.

Restek chemists carefully reviewed EPA Methods 8080 and 8081A, then developed three calibration mixes that include 20 most often monitored organochlorine pesticides. The mix used to obtain Figure 1 has varied concentrations of the target analytes, from 8 to 80µg/mL, because these pesticides exhibit significantly differing responses.* The other two mixes include the 20 analytes at a single concentration, 200µg/mL or 2000µg/mL. The 2000µg/mL concentration often is more practical than lower concentrations, especially if several mixes must be combined. We also offer all surrogates and internal standards currently required for these analyses.

PCBs are persistent in the environment, and accurately determining their presence and concentrations is very important. A common question is whether such analyses should be focused on mixtures of PCBs (e.g., Aroclor® mixes) or on individual congeners. Congener-specific analyses have important advantages over analyses of mixtures: generally, congener analyses offer lower detection limits and greater information content. In addition, compositions of weathered, degraded, and metabolized PCB mixtures can be measured and interpreted more easily. Also, it is easier to detect interferences caused by other chemicals, and quantification of individual congeners is more accurate. However, coelution of analytes is a problem in a PCB congener analysis, so a strong quality assurance program and reliable reference materials are needed by the analyst. To facilitate congener-specific analyses, we now make a reference mix of 19 PCB congeners at 100µg/mL each in isoctane, suitable for EPA Method 8082A. Depending on regulatory and project requirements,

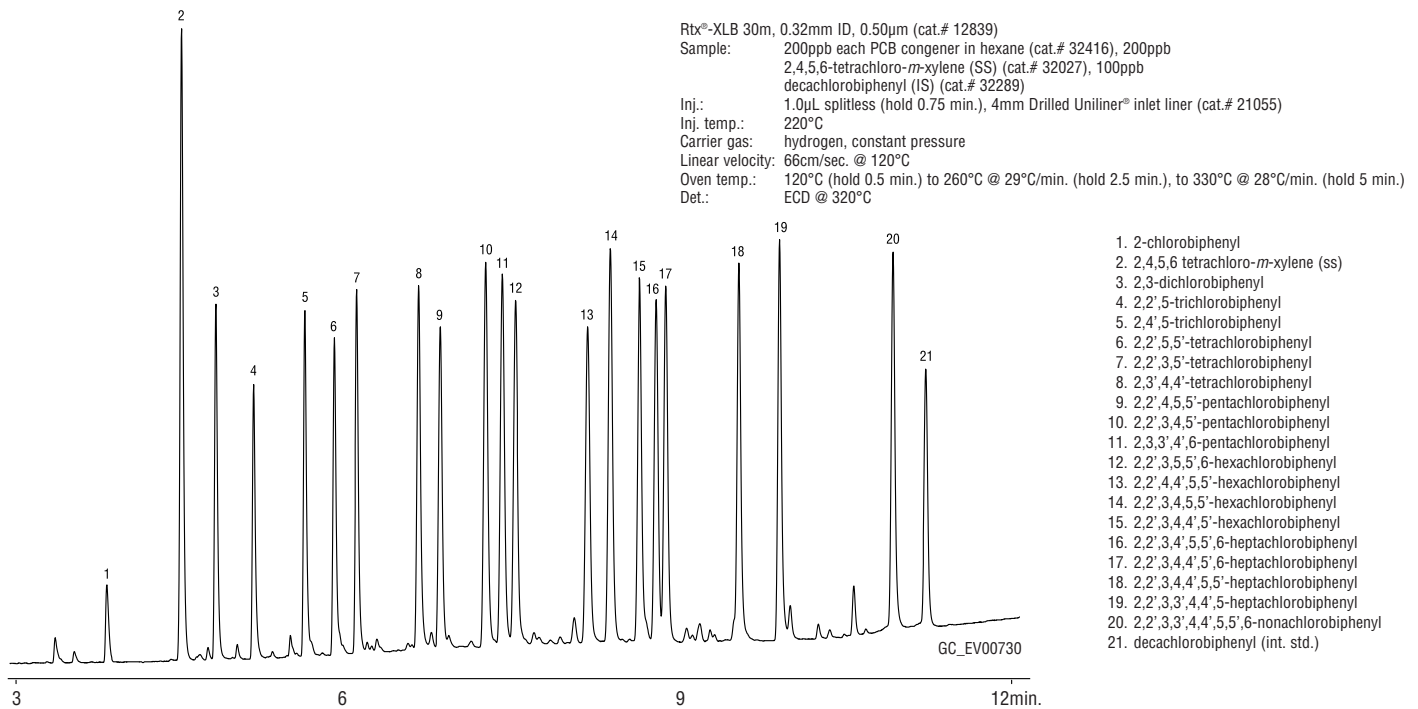
Figure 1 Organochlorine pesticides separated in less than 12 minutes, using an Rtx®-XLB column.



GC_EV00720
 Rtx®-XLB 30m, 0.32 ID, 0.5µm (cat.# 12839)
 Sample: Organochlorine Pesticide Mix AB (cat.# 32292) 80/160/800ppb in hexane
 2,4,5,6-tetrachloro-*m*-xylene (cat.# 32027) surrogate, 80ppb
 decachlorobiphenyl (cat.# 32029) surrogate, 160ppb
 Inj.: 1.0µL splitless (0.75 min. hold), 4mm Drilled Uniliner® inlet liner (cat.# 21055)
 Inj. temp.: 220°C
 Carrier gas: hydrogen, constant pressure
 Linear velocity: 60cm/sec. @ 120°C
 Oven temp.: 120°C (hold 0.5 min.) to 260°C @ 29°C/min. (hold 2.5 min.), to 330°C @ 28°C/min. (hold 3 min.)
 Det.: ECD @ 320°C

*For mix composition, see page 8 of this Advantage.

Figure 2 19 PCB congeners separated in less than 12 minutes, using an Rtx®-XLB column.



the mix can be used for reporting either PCB congener results or total PCBs. Decachlorobiphenyl and tetrachloro-*m*-xylene are appropriate as internal standard and surrogate standard, respectively. The PCB congener standard is a very useful addition to our group of Aroclor® reference mixes.

Figure 2 is a GC/ECD analysis of the 19 PCB congeners, with the internal and surrogate standards. To simplify the work of analysts who monitor both pesticides and PCBs, we used the same 30m, 0.32mm

ID, 0.5µm Rtx®-XLB column and the same conditions in both analyses: the conditions used to obtain Figure 2 are optimal for very rapid analysis (11.5 min.) of the Method 8082A PCB congeners, as was true for the pesticides.

If you are performing analyses of organochlorine pesticides and/or PCBs, an Rtx-XLB® column and Restek reference materials will save time, help simplify your analysis, improve the quality of your data, and increase your productivity.

PCB Congener Mix, Method 8082A

2-chlorobiphenyl (BZ #1)
 2,3-dichlorobiphenyl (BZ #5)
 2,2',5-trichlorobiphenyl (BZ #18)
 2,4',5-trichlorobiphenyl (BZ #31)
 2,2',3,5'-tetrachlorobiphenyl (BZ #44)
 2,2',5,5'-tetrachlorobiphenyl (BZ #52)
 2,3',4,4'-tetrachlorobiphenyl (BZ #66)
 2,2',3,4,5'-pentachlorobiphenyl (BZ #87)
 2,2',4,5,5'-pentachlorobiphenyl (BZ #101)
 2,3,3',4',6-pentachlorobiphenyl (BZ #110)
 2,2',3,4,4',5'-hexachlorobiphenyl (BZ #138)
 2,2',3,4,5,5'-hexachlorobiphenyl (BZ #141)
 2,2',3,5,5',6-hexachlorobiphenyl (BZ #151)
 2,2',4,4',5,5'-hexachlorobiphenyl (BZ #153)
 2,2',3,3',4,4',5'-heptachlorobiphenyl (BZ #170)
 2,2',3,4,4',5,5'-heptachlorobiphenyl (BZ #180)
 2,2',3,4,4',5',6-heptachlorobiphenyl (BZ #183)
 2,2',3,4',5,5',6-heptachlorobiphenyl (BZ #187)
 2,2',3,3',4,4',5,5',6-nonachlorobiphenyl (BZ #206)

Each	5-pk.	10-pk.
32416	32416-510	—
w/data pack		
32416-500	32416-520	32516

PCB Congener Standard #1

2,4,4'-trichlorobiphenyl (BZ #28)
 2,2',5,5'-tetrachlorobiphenyl (BZ #52)
 2,2',4,5,5'-pentachlorobiphenyl (BZ #101)
 2,2',3,4,4',5'-hexachlorobiphenyl (BZ #138)
 2,2',4,4',5,5'-hexachlorobiphenyl (BZ #153)
 2,2',3,4,4',5,5'-heptachlorobiphenyl (BZ #180)

Each	5-pk.	10-pk.
32290	32290-510	—
w/data pack		
32290-500	32290-520	32390

PCB Congener Standard #2

BZ #28, BZ #52, BZ #101, BZ #138, BZ #153, BZ #180, plus 2,3',4,4',5-pentachlorobiphenyl (BZ #118)
 10µg/mL each in isoctane, 1mL/ampul

Each	5-pk.	10-pk.
32294	32294-510	—
w/data pack		
32294-500	32294-520	32394

Rtx®-XLB Columns (fused silica)

(proprietary low-polarity phase)

ID	df (µm)	temp. limits*	15-Meter	30-Meter	60-Meter
0.25mm	0.10	30 to 340/360°C		12808	
	0.25	30 to 340/360°C	12820	12823	12826
	0.50	30 to 340/360°C		12838	
0.32mm	1.00	30 to 340/360°C	12850	12853	
	0.10	30 to 340/360°C		12809	
	0.25	30 to 340/360°C	12821	12824	12827
0.53mm	0.50	30 to 340/360°C		12839	
	1.00	30 to 340/360°C		12854	
	1.50	30 to 340/360°C	12867	12870	

ID	df (µm)	temp. limits	12-Meter	20-Meter	25-Meter
0.18mm	0.18	30 to 340/360°C		42802	
0.20mm	0.33	30 to 340/360°C	42815		42820

*Maximum temperatures listed are for 15- and 30-meter lengths. Longer lengths may have a slightly reduced maximum temperature.

Additional reference mixes listed on page 8.

Suitable for
**European Methods or
 ASTM D-4059-96**

For more **info** on the Rtx®-XLB column, request lit. cat.# 59957.

GC/ECD Analysis of Organochlorine Pesticides or Polychlorinated Biphenyls

continued from page 7

8140/8141 Internal & Surrogate Standards

1,000µg/mL in acetone, 1mL/ampul

Each	5-pk.	10-pk.
Internal Standard: 1-bromo-2-nitrobenzene		
32279	32279-510	—
w/ data pack		
32279-500	32279-520	32379
Surrogate: 4-chloro-3-nitrobenzotrifluoride		
32282	32282-510	—
w/ data pack		
32282-500	32282-520	32382

2,4,5,6-Tetrachloro-*m*-xylene

Each	5-pk.	10-pk.
200µg/mL in acetone, 1mL/ampul		
32027	32027-510	—
w/ data pack		
32027-500	32027-520	32127
200µg/mL in acetone, 5mL/ampul		
32028	32028-510	—
w/ data pack		
32028-500	32028-520	32128

Decachlorobiphenyl (BZ #209)

Each	5-pk.	10-pk.
10µg/mL in isoctane, 1mL/ampul		
32289	32289-510	—
w/ data pack		
32289-500	32289-520	32389
200µg/mL in acetone, 1mL/ampul		
32029	32029-510	—
w/ data pack		
32029-500	32029-520	32129
200µg/mL in acetone, 5mL/ampul		
32030	32030-510	—
w/ data pack		
32030-500	32030-520	32130

508.1 Internal Standard

pentachloronitrobenzene

100µg/mL in ethyl acetate, 1mL/ampul

Each	5-pk.	10-pk.
32091	32091-510	—
w/ data pack		
32091-500	32091-520	32191

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 (isomer B)	8
4,4'-DDT	16	methoxychlor	80

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

Each	5-pk.	10-pk.
32292	32292-510	—
w/ data pack		
32292-500	32292-520	32392

Organochlorine Pesticide Mix AB #1

20 compounds listed for cat.# 32292 above

200µg/mL each in hexane:toluene (1:1), 1mL/ampul

Each	5-pk.	10-pk.
32291	32291-510	—
w/ data pack		
32291-500	32291-520	32391

Organochlorine Pesticide Mix AB #3

20 compounds listed for cat.# 32292 above

2,000µg/mL each in hexane:toluene (1:1), 1mL/ampul

Each	5-pk.	10-pk.
32415	32415-510	—
w/ data pack		
32415-500	32415-520	32515

Recent Literature

Restek is Your Free Technical Literature Source!

You can review these and many more publications on our website, www.restekcorp.com

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New product flyer—lit.# 59901

Genuine Restek Replacement Parts for HPLC

Product flyer—lit.# 59012

Rtx®-XLB Low Bleed Capillary GC Columns

New product flyer—lit.# 59957

Rtx®-1701 / MXT®-1701 Capillary GC Columns

Fast Facts—lit.# 59016

"Cool Tools" for GC & HPLC

Product flyer—lit.# 59879

GC Essentials (Injection Port & Inlet)

Product flyer—lit.# 59208D

Vu2 Union™ & SeCure™ "Y" Connectors

New product flyer—lit.# 59878A

Drilled Uniliner® GC Inlet Liners

Fast Facts—lit.# 59877

Certified PAHs in #2 Diesel Fuel

Fast Facts—lit.# 59384B

Reference Mixes for Method 8260B Volatiles

Fast Facts—lit.# 59332B

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Services flyer—lit.# 59872

Restek 2004 On-the-Road Seminars

Description & schedule—lit.# 59282C

HPLC Method Development Course

Description & schedule—lit.# 59005



Congratulations!

Charles Roberts of Chemtron Corporation won the digital camera in our "Are You Game?" give-away at PittCon® 2004. We hope you're enjoying your camera, Charles.



Many thanks to everyone who visited our booth, and we look forward to seeing you again next year in Orlando.

Improved SilcoCan™ and TO-Can™ Canisters

By Donna Lidgett, Air Monitoring Product Marketing Manager

- ✓ Improved design: canister holder and valve bracket protect the canister, tube stub, and valve.
- ✓ Excellent long-term storage of polar and nonpolar volatile organics in ambient air.
- ✓ Eliminate adsorption of active compounds.

Optional gauge

- Quickly confirm vacuum or pressure inside canister.
- Monitor pressure changes.
- Fully protected by canister frame.
- Can be heated to 90°C during cleaning.

Newest coating technology

For high inertness, and to ensure sample stability, SilcoCan™ canisters are now deactivated with Restek's latest innovative surface treatment, which chemically bonds to the metal inner surface of the canister. This coating offers unsurpassed inertness for active compounds, including polar and sulfur-containing molecules, and will not crack, chip, or flake off, despite harsh handling in the field or during transport.



Enhanced valve and canister bracket

Canister holder and valve bracket protect canister, tube stub, and valve.

1/4" tube stub

Allows user to interchange valves.

Serial controlled

For quick, sure identification.

Improved SilcoCan™ Canisters (1/4" Valve)

w/Non-Treated Valve				w/SilcoSteel®-Treated Valve		
volume	qty.	cat.#	price	qty.	cat.#	price
1L	ea.	24180		ea.	24180-650	
3L	ea.	24181		ea.	24181-650	
6L	ea.	24182		ea.	24182-650	
15L	ea.	24183		ea.	24183-650	

w/Gauge & Non-Treated Valve				w/Gauge & SilcoSteel®-Treated Valve		
volume	qty.	cat.#	price	qty.	cat.#	price
1L	ea.	24140		ea.	24140-650	
3L	ea.	24141		ea.	24141-650	
6L	ea.	24142		ea.	24142-650	
15L	ea.	24143		ea.	24143-650	

Improved TO-Can™ Canisters (1/4" Valve)

volume	qty.	cat.#	price
1L	ea.	24172	
3L	ea.	24173	
6L	ea.	24174	
15L	ea.	24175	

Improved TO-Can™ Canisters (1/4" Valve, with Gauge)

volume	qty.	cat.#	price
1L	ea.	24176	
3L	ea.	24177	
6L	ea.	24178	
15L	ea.	24179	

1/4" Replacement Valves for Air Monitoring Canisters

Description	Non-Treated Valve			SilcoSteel®-Treated Valve		
	qty.	cat.#	price	qty.	cat.#	price
1/4" Replacement Valve (2-port)	ea.	24145		ea.	24144	
1/4" Replacement Valve (3-port)	ea.	24147		ea.	24146	

Restek
Innovation!

Air Canister Heating Jacket

The ultimate in controlled heating, for reliably cleaning your air canisters!

new!
★



- Closely simulates oven environment—heats entire canister.
- Easily fits canister up to 6 liters.
- Prevents sample condensation, for accurate sub-sampling.
- Lightweight; comfortable to the touch when heated.
- Connect up to five Canister Heating Jackets to one 15 amp circuit.

Whether you made your canister cleaning system or purchased a commercial system, the new Restek Canister Heating Jacket will help you clean your canisters faster and more efficiently. The novel design ensures the entire canister, including the valve, is heated during the cleaning cycle, to remove contaminants most effectively. It also can be used to keep the sample heated during aliquot removal, which helps prevent condensation and assure accurate data for larger molecules. The Canister Heating Jacket incorporates two heat settings—low (75°C) and high (150°C)—to let you match the temperature to the volatility of your sample components. Connect up to five Canister Heating Jackets to one 15 amp circuit. If you try one in your system, we think you'll want more.

Description	qty.	cat.#	price
Air Canister Heating Jacket (110 volt)	ea.	24123	



Restek
Performance
Coatings

Inert, High-Quality Fittings and Tubing for Demanding Applications

by Gary Barone, Restek Performance Coatings Division

Siltek™/Sulfinert® and Silcosteel®-CR Treated Swagelok® Fittings

- ✓ Siltek™/Sulfinert® treatment* ensures ultimate inertness.
- ✓ Silcosteel®-CR treatment enhances acid resistance tenfold, or more.
- ✓ Restek treatments cannot chip, flake, or delaminate.
- ✓ Custom treatment available.

Swagelok® fittings are world-renowned for meeting demanding standards. Now, Restek is pleased to set the new standard for inert or corrosion-resistant tubing system components: Swagelok® products with Restek's unparalleled surface treatments—Siltek™ or Silcosteel®-CR treatment—available from stock.

Siltek™ treatment, which is equivalent to Sulfinert® treatment, is the ideal choice for ultimate inertness, intended specifically for systems used to collect, store, and transfer active compounds. The most reactive sample components can be stored and transferred via a Siltek™ treated system: even at parts-per-billion levels, sulfur-containing or other

very active compounds exhibit virtually no adsorption. And, unlike coatings, Siltek™ and other Restek treatments produce a layer that is integral with the fitting surface—it will not chip, flake, or delaminate, even in the most stressful applications.

Silcosteel®-CR treatment is highly effective protection for stainless steel exposed to hydrochloric, nitric, or sulfuric acid, or to marine environments. In independent tests, Silcosteel®-CR treatment upgraded the corrosion resistance of 300-grade stainless steel samples by an order of magnitude (Table 1) and totally protected them against crevice corrosion (Figure 1).



If you need to construct a system for a demanding application, you will not find more suitable fittings than Restek treated Swagelok® fittings. Siltek™, Silcosteel®-CR, or other Restek surface treatments can be applied to other fittings or parts on request—contact our Technical Service chemists or your Restek representative.

Table 1 Silcosteel®-CR treated stainless steel coupons show little weight loss after exposure to 6% w/w ferric chloride solution.

Sample	Weight Loss (g/m ²)
Silcosteel®-CR 17	19
Silcosteel®-CR 28	25
Silcosteel®-CR 47	25
Bare Steel 27	231
Bare Steel 34	209
Bare Steel 37	228

Figure 1 Silcosteel®-CR treated 316L stainless steel coupons show no crevice corrosion and only slight pitting corrosion (top), while bare 316L stainless steel coupons exhibit severe crevice corrosion (bottom).



Fitting Type	Size	Similar to Swagelok® #	Siltek™/Sulfinert®			Silcosteel®-CR		
			qty.	cat.#	price	qty.	cat.#	price
Union	1/16"	SS-100-6	ea.	22540		ea.	22575	
	1/8"	SS-200-6	ea.	22541		ea.	22576	
	1/4"	SS-400-6	ea.	22542		ea.	22577	
Tee	1/16"	SS-100-3	ea.	22543		ea.	22578	
	1/8"	SS-200-3	ea.	22544		ea.	22579	
	1/4"	SS-400-3	ea.	22545		ea.	22580	
Reducing Union	1/8" to 1/16"	SS-200-6-1	ea.	22546		ea.	22581	
	1/4" to 1/16"	SS-400-6-1	ea.	22547		ea.	22582	
	1/4" to 1/8"	SS-400-6-2	ea.	22548		ea.	22583	
Union Elbow	1/8"	SS-200-9	ea.	22549		ea.	22584	
	1/4"	SS-400-9	ea.	22550		ea.	22585	
Plug	1/16"	SS-100-P	ea.	22572		ea.	22619	
	1/8"	SS-200-P	ea.	22573		ea.	22620	
	1/4"	SS-400-P	ea.	22574		ea.	22597	
Cross	1/8"	SS-200-4	ea.	22551		ea.	22586	
	1/4"	SS-400-4	ea.	22552		ea.	22587	
Tube End Reducer	1/8" tube to 1/16"	SS-100-R-2	ea.	22553		ea.	22588	
	1/4" tube to 1/16"	SS-100-R-4	ea.	22554		ea.	22589	
	1/8" tube to 1/4"	SS-400-R-2	ea.	22555		ea.	22590	
	1/4" tube to 1/8"	SS-200-R-4	ea.	22556		ea.	22591	
Port Connector	1/8"	SS-201-PC	ea.	22557		ea.	22592	
	1/4"	SS-401-PC	ea.	22558		ea.	22593	
	1/8" tube to 1/4"	SS-401-PC-2	ea.	22559		ea.	22594	
Male Connector	1/8" to 1/8" NPT	SS-200-1-2	ea.	22561		ea.	22595	
	1/4" to 1/4" NPT	SS-400-1-4	ea.	22562		ea.	22596	
	1/16" to 1/8" NPT	SS-100-1-2	ea.	22563		ea.	22610	
	1/8" to 1/4" NPT	SS-200-1-4	ea.	22564		ea.	22611	
	1/4" to 1/8" NPT	SS-400-1-2	ea.	22565		ea.	22612	
Female Connector	1/8" to 1/8" NPT	SS-200-7-2	ea.	22566		ea.	22613	
	1/4" to 1/4" NPT	SS-400-7-4	ea.	22567		ea.	22614	
	1/4" to 1/8" NPT	SS-400-7-2	ea.	22568		ea.	22615	
	1/8" to 1/4" NPT	SS-200-7-4	ea.	22569		ea.	22616	
Bulkhead Union	1/8"	SS-200-61	ea.	22570		ea.	22617	
	1/4"	SS-400-61	ea.	22571		ea.	22618	

Siltek™ and Silcosteel®-CR Treated Electropolished Stainless Steel Tubing

- ✓ Exceptional inertness.
- ✓ Improved reliability and reproducibility; longer lifetime.
- ✓ Use with treated fittings for the most inert sample pathway available.

Restek also sets the highest standard in transfer tubing for analytical and process applications. The near-mirror finish of this electropolished tubing (surface roughness of only 5-7 micro-inches) creates a very small surface area that, in combination with unequaled Restek surface treatments, ensures superior inertness (Siltek™) or greatly enhanced corrosion resistance (Silcosteel®-CR). Further, we can provide continuous coils of 1/8" tubing up to 100 feet (30.5m) or 1/4" tubing up to 300 feet (91.4m)—a first for electropolished tubing.

The extremely inert Siltek™ surface is ideal in sulfurs or automotive exhaust testing, stack gas sampling, process monitoring, or any other application in which a representative sample must be transferred without loss.

In systems used to transfer hydrochloric, nitric, sulfuric, or other acids, or seawater, Silcosteel®-CR treated electropolished stainless steel tubing will last longer and require less maintenance. Silcosteel®-CR treated samples were very well protected from pit-

ting and crevice corrosion, compared to bare steel samples (Table 1 and Figure 1, p. 10).

For maximum inertness, we recommend a sample transfer system constructed from Restek treated electropolished stainless steel tubing and Restek treated Swagelok® fittings. To find out how Restek treated components will improve your system's performance, contact our Technical Service Group (ext. 4), or your Restek representative, and ask to speak with our coatings experts.

Restek
Innovation



1/8" OD: 5 ft. to 100 ft. in one continuous coil;
1/4" OD: 5 ft. to 300 ft. in one continuous coil.
Longer lengths will be more than one coil.

Siltek™/Sulfinert® Treated Electropolished Stainless Steel Tubing

ID	OD	cat.#	Price-per-foot			
			5-24 ft.	25-99 ft.	100-299 ft.	> 300 ft.
0.085"	1/8"	22538				
0.180"	1/4"	22539				

Silcosteel®-CR Treated Electropolished Stainless Steel Tubing

ID	OD	cat.#	Price-per-foot			
			5-24 ft.	25-99 ft.	100-299 ft.	> 300 ft.
0.085"	1/8"	22536				
0.180"	1/4"	22537				

Deactivating Glass Surfaces with Dimethyldichlorosilane (DMDCS)

by Jack Crissman, Ph.D., Analytical Reference Materials Product Marketing Manager

- ✓ Convenient 20mL ampuls.
- ✓ Unopened ampuls have long shelf life.
- ✓ Detailed deactivation procedure available on request.

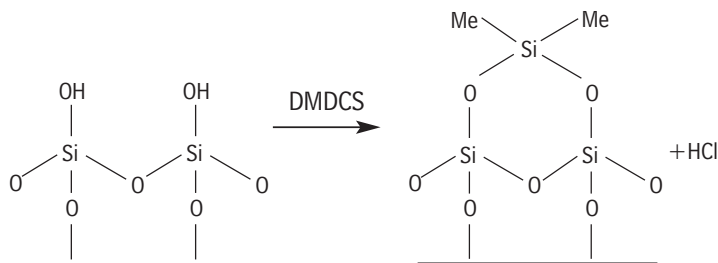
Although glass is widely thought of as an "inert" material, glass surfaces are, in fact, slightly acidic and highly adsorptive, due to the presence of silanol groups (SiOH). These reactive groups interact via hydrogen bonding with amine (-NH), carboxylic acid

(-COOH), hydroxyl (-OH), or thiol (-SH) functional groups, and compounds containing these groups adsorb to untreated glass surfaces. To minimize adsorption in sample preparation glassware and in the GC sample pathway, and prevent chromatographic

tailoring or loss of sensitivity at low sample concentrations, it is important to eliminate or mask the reactive silanol groups.

One popular way to deactivate glass surfaces is to chemically bond a non-adsorptive molecule to the active silanol groups (Figure 1). This typically is accomplished using dimethyldichlorosilane—DMDCS. The procedure is suitable for most analyses that involve concentrated samples and non-active matrices. It can be followed to clean and deactivate glass GC inlet liners, derivatization vials, and all glassware used for preparing analytical reference materials. Restek now offers DMDCS in 20mL ampuls, for analysts who wish to deactivate their glassware themselves.

Figure 1 Dimethyldichlorosilane deactivates silanol groups on a glass surface.



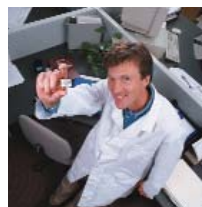
An alternative procedure, polymeric deactivation, provides maximum coverage of glass surfaces and should be used to treat inlet liners for critical analyses involving very low concentrations of highly active compounds (e.g., endrin, DDT, drugs). All liners supplied by Restek undergo polymeric deactivation.

For **ultimate inertness**, and most accurate data for trace levels of reactive analytes, we recommend Siltek™ deactivation. Siltek™ deactivated guard columns, inlet sleeves, and other glassware are listed in the Restek catalog. For other items, ask our Technical Service chemists or your Restek representative about deactivation.

Dimethyldichlorosilane (DMDCS)

Neat, 20mL/ampul

Each	5-pk.
31840	31840-510



Searching for
the Perfect
Solution?

Let Restek create the perfect reference mixture—to your exact specifications. Contact the Technical Service Team or visit us online at www.restekcorp.com/solutions

www.restekcorp.com

Restek HPLC Column Kits for Faster, Easier Method Development

by Rebecca Wittrig, Ph.D., HPLC Product Marketing Manager

- ✓ Multiple stationary phases, for quick optimization of selectivity.
- ✓ Specific kits for MS or UV detection—both include columns specifically for basic analytes.
- ✓ Fast LC kits use economical cartridge design.

When developing a new HPLC assay, method development chemists often start with a C18 or C8 stationary phase, because these phases have proven useful for analyzing a wide range of organic compounds. Many analysts have learned, however, that a C18 or C8 stationary phase is not the best choice for every separation. A cyano-, pentafluorophenyl, or amino-containing stationary phase, a phase with embedded polar groups, or a phase designed for compatibility with highly aqueous mobile phases might provide superior resolution of target compounds (Figure 1).

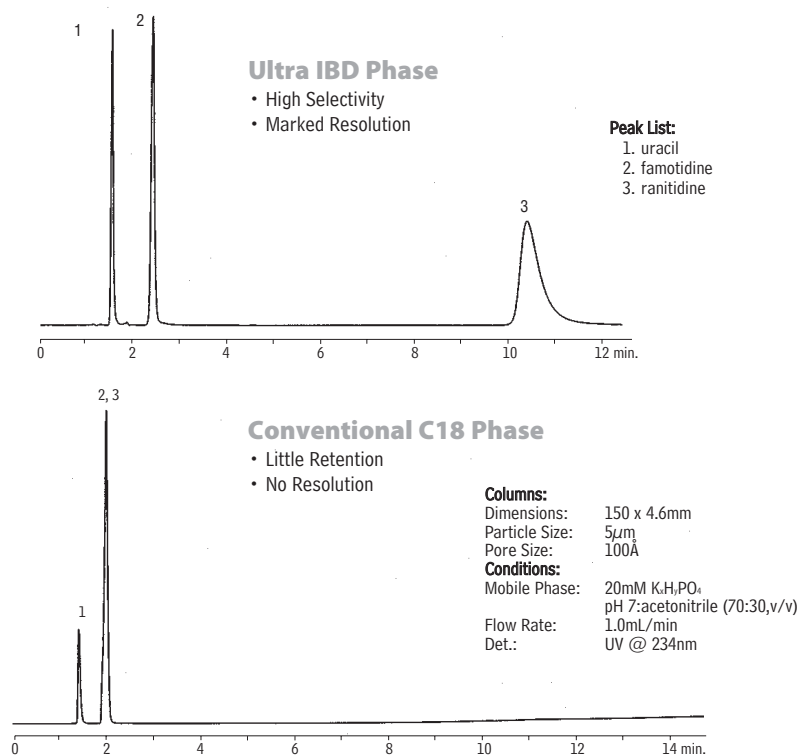
To help analysts efficiently select the optimum stationary phase, we have assembled kits of columns for use in HPLC method development. The four columns in each kit incorporate a range of stationary phase types, are configured for rapid analyses, and are optimized for the detector type: 50 x 4.6mm ID columns containing 5µm packings for use with UV detection, 30 x 2.1mm ID columns containing 3µm packings for LC/MS. The Fast LC method development kits include four 30 x 2.1mm ID or four 30 x 4.0mm ID cartridges containing 3µm packings, and a cartridge holder.



If the columns in the kits listed below don't appear to meet your needs, please contact our Technical Service group or your Restek distributor for information about custom kits.

Figure 1 Better chromatography for basic molecules, using an Ultra IBD column.

The base-deactivated column has a unique blend of hydrophobic and polar character for better resolution of closely related compounds.



Bulk Silica Available!



High Performance Silica Products

(lit. cat. # 59901)

Tight production specifications ensure highly consistent lot-to-lot performance from Restek's proprietary silica materials. This 6-page publication characterizes Pinnacle II™ and Pinnacle™ DB stock

bulk products—bare silica and silica with popular bonded phases—and illustrates typical results achieved by using them. Custom materials can be designed from a broad range of particle sizes, pore sizes, and phases.



HPLC Method Development Course

Many analysts anticipate developing a new HPLC method with apprehension. To help de-mystify this process, Restek, in cooperation with ChromVision, offers a dynamic, thorough two-day course on the subject, presented in a logical and systematic manner by an expert on the effects of adsorbent chemistry and structure on HPLC retention. It provides the knowledge and tools necessary for understanding why a particular stationary phase would be chosen for separating various analytes, and how to improve selectivity by choosing the proper eluent. Eight lectures cover all aspects of method development and are complemented and reinforced by four workshops. The course is especially useful to analysts working with pharmaceutical or biological/biochemical analytes. For more information about this and other Restek seminars, visit our seminars web page: www.restekcorp.com/seminar

HPLC and LC/MS Column Kits

Description	qty.	cat.#	price
LC/MS (1 Allure™ C18 (USP L1), 1 Allure™ PFP Propyl, 1 Allure™ Basix (USP L10), 1 Ultra Aqueous C18 (USP L1))	four 30 x 2.1mm, 3µm columns	25136	
LC/UV (1 Pinnacle™ DB C18 (USP L1), 1 Allure™ PFP Propyl, 1 Ultra Aqueous C18 (USP L1), 1 Ultra IBD)	four 50 x 4.6mm, 5µm columns	25137	

Fast LC Method Development Kit

Each kit includes four Fast LC Cartridges (Ultra C18 (USP L1), Ultra Aqueous C18 (USP L1), Ultra Cyano (USP L10), Ultra PFP (USP L43)) and a Fast LC cartridge holder.

Description	qty.	cat.#	price
Fast LC Development Kit	four 30 x 2.1mm columns	25296	
Fast LC Development Kit	four 30 x 4.0mm columns	25297	

Genuine Restek Replacement Parts for Beckman and Hitachi HPLC Systems

Keep Your System Running Smoothly

by Rebecca Wittrig, Ph.D., HPLC Product Marketing Manager

- ✓ Designed to meet or exceed original equipment performance.
- ✓ Simplify ordering—a single source for columns, tools, parts, reference mixes.
- ✓ Renowned Plus 1™ service.

Restek Replacement Parts for Beckman HPLC Systems

Description	Model #	Similar to Beckman part #	qty.	cat.#	price
Inlet Check Valve Assembly	110A&B, 112, 114M, 116, 118, 125, 126, 127, 128	240720	ea.	25439	
Outlet Check Valve Assembly	110A&B, 112, 114M, 116, 118, 125, 126, 127, 128	240721	ea.	25440	
Inlet Check Valve Cartridge for Check Valve Assembly	110A&B, 112, 114M, 116, 118, 125, 126, 127, 128	240620	ea.	25441	
Outlet Check Valve Cartridge for Check Valve Assembly	110A&B, 112, 114M, 116, 118, 125, 126, 127, 128	240621	ea.	25442	
Graphite Guide (Bushing)	Pumps	243714	ea.	25443	
Guide Sleeve for Graphite Plunger Guide	110 Series	243713	ea.	25444	
Outlet Check Filter Frit Assembly	Pumps	240619	ea.	25445	
Piston Guide Assembly	Pumps	243045	ea.	25446	
Plunger	110 Series and 112 Pumps	243053	ea.	25447	
Plunger Seal	110 Series	887138	ea.	25448	
Plunger Seal	112 Pumps	236797	ea.	25449	
Sapphire Plunger	114M, 116, 118, 125, 126, 127, 128 Pumps	240714	ea.	25450	
Plunger Seal	114M, 116, 118, 125, 126, 127, 128 Pumps	241037	ea.	25451	
Pump Seal, Gold	114, 116, 125, 126, 127, 128 Pumps	241037	ea.	25452	
Plunger Wash Seal	Pumps	238627	ea.	25453	
Deuterium Lamp	DU60, 62, 64, 65	596791	ea.	25454	

Restek Replacement Parts for Hitachi HPLC Systems

Description	Model #	Similar to Hitachi part #	qty.	cat.#	price
SS Check Valve Cartridges (1/16" Ruby Ball)	655/6000/6200	ANO-085	2-pk.	25455	
Inlet Check Valve Assembly	655/6000/6200	ANO-0833	ea.	25456	
Outlet Check Valve Assembly	655/6000/6200	ANO-0834	ea.	25457	
Plunger Assembly	655, 6000, 6200, 7100	810-1033	ea.	25458	
Plunger Assembly	L655A, 6000, 6200, 7100	655-1080	ea.	25459	
Plunger Assembly, Gold	655, 6000, 6200, 7100	655-1080	ea.	25460	
Inlet Check Valve Assembly	L-7100	ANO-0836	ea.	25461	
Outlet Check Valve Assembly	L-7100	ANO-0837	ea.	25462	
Rotor Assembly for Dilutor Valve	AS-7200 Autosampler AS-7200, AS-7250	810-3085	ea.	25463	
Rotor Seal Kit	Injection Valve	ANO-0818	ea.	25464	
Deuterium Lamp, Prealigned	L4000, L4200, L4250, L7400	885-3570	ea.	25465	

Sonic Debubbler

- ✓ Fast and neat—no breaking connections.
- ✓ Easy to use.
- ✓ Less solvent waste; less clean-up.

COOL TOOL!

Just touch the Sonic Debubbler to the inlet line or check valve — sonic vibrations will quickly dislodge or redissolve trapped air bubbles. Reduces downtime or conversion time from one mobile phase to another.

Description	qty.	cat.#	price
Sonic Debubbler	ea.	20444	
Sonic Debubbler (220V)	ea.	25098	



Genuine Restek Replacement Parts for HPLC Systems

(lit. cat.# 59012)
A listing of Restek parts for Agilent, Beckman, Hitachi, PerkinElmer, Shimadzu, and Waters instruments.



HPLC Column Selection Guide

(lit. cat.# 59454A)
A useful chart to keep with your workbooks, or post on a wall. Quickly scan important characteristics of Restek HPLC columns. Includes cross-references to similar phases.



HPLC Tech Tips Wall Chart

(lit. cat.# 59894A)
Almost everything you need to remember about HPLC, condensed into 3 feet by 2 feet: mobile phase basics, buffers (types, pK_as, pH ranges, formula masses, more), miscibility and solubility chart (invaluable!), system setup and optimization,

detector tips, pressure conversion factors, most-used chromatographic equations, column storage essentials. Post near your instrument to save time; perhaps save a column.

Free!

Call our literature hotline: 800-356-1688 or 814-353-1300, ext. 5, or contact your Restek representative.



PEAK PERFORMERS

Chromatography Accessories
and Tools You Can Rely On!

new!
★

Alumaseal™ Ferrules Eliminate Sealing Compromises

Tired of leaking fittings? Want a ferrule that seals every time?

These new aluminum ferrules combine the sealing ease of graphite with the security and reliability of metal ferrules.

by Brad Rightnour, Instrument Innovations Manager

- ✓ Aluminum construction, will not crack or fragment.
- ✓ Eliminates out-gassing, makes leak-tight seals, for less detector noise.
- ✓ No retightening after temperature cycles—excellent for GC/MS.
- ✓ Unique two-piece design permanently locks on fused silica tubing without causing breakage.
- ✓ Will not stick in fittings, like Vespel® or graphite.
- ✓ Use with any 1/16" compression-type fitting.

Alumaseal™ ferrules* combine the advantages of graphite and Vespel®/graphite ferrules, and eliminate the disadvantages, for enhanced performance in any application. The unique front and back ferrule design seals easily and surely, the ferrules will not fragment or off-gas, and they are stable to 550°C. Alumaseal™ ferrules will not allow oxygen to permeate into the system, and do not require retightening

after temperature cycles, making them ideal for GC/MS applications. They can be used with any standard 1/16" compression-type fitting, with fused silica columns.

For leak-tight seals, we highly recommend you try Alumaseal™ ferrules.



Ferrule ID	Fits Column ID	qty.	cat.#	price
0.4mm	0.25mm	10-pk.	21472	
0.5mm	0.32mm	10-pk.	21473	
0.8mm	0.53mm	10-pk.	21474	

*Patent pending.

New Vespel® Ferrules

new!
★

Now—A Complete Range of Ferrule Choices from Restek

by Donna Lidgett, GC Accessories Product Marketing Manager

- ✓ 100% high-temperature Vespel® polyimide.
- ✓ Stable to 350°C.
- ✓ Durable and leak-tight.



Fitting Size	Ferrule ID	qty.	cat.# / price
Capillary Ferrules for 1/16-inch compression-type fittings			
1/16"	0.3mm	10-pk.	22213
1/16"	0.4mm	10-pk.	22214
1/16"	0.5mm	10-pk.	22215
1/16"	0.8mm	10-pk.	22216
1/16"	1.0mm	10-pk.	22217
1/16"	1.2mm	10-pk.	22218
Standard Ferrules for 1/16-, 1/8-, and 1/4-inch fittings			
1/16"	1/16"	10-pk.	22210
1/8"	1/8"	10-pk.	22211
1/4"	1/4"	10-pk.	22212
1/4"	1/8"	10-pk.	22219

Encapsulated Ferrules

For 1/16-Inch Compression Fittings



- ✓ Will not deform and stick in fittings.
- ✓ Reusable.
- ✓ Less torque needed to seal ferrule.
- ✓ Restek's unique blend of graphite minimizes fragmentation and outgassing.

Ferrule ID	Fits Column ID	cat.#	price/10-pk.
0.4mm	0.25mm	21036	
0.5mm	0.32mm	21037	
0.8mm	0.53mm	21038	

**Please
note**

We offer a wide selection of ferrules. In addition to new Alumaseal™ and Vespel® ferrules, we have Vespel®/graphite, graphite, and Teflon® ferrules. To review these other choices, visit our website or refer to our 2004 catalog.

Restek Solid Phase Extraction Cartridges

For Cleanup of Environmental Samples

by Lydia Nolan, Instrument Support Chemist

- ✓ Special purpose SPE cartridges for specific methods.
- ✓ General purpose cartridges with normal, reversed, or ion exchange phases.
- ✓ Extraction manifolds and pressure/vacuum pump available.

Solid phase extraction is one of the most widely used forms of sample preparation. Ease of use, safety, conservative solvent usage, and cost effectiveness all contribute to its popularity.

We offer a range of SPE cartridges to meet demanding cleanup procedures. Our standard products include Florisil® sorbent, ion exchange resins, normal phase materials, and bonded reversed phase materials. In addition, we offer specialty products, including Florisil® in ultraclean glass tubes, mixed bed sorbents, and cartridges for specific applications. Our SPE manifolds and pressure/vacuum pump, described in our chromatography supplies catalog, will keep your system running efficiently.

Massachusetts TPH Cartridges

- Reduced background extractables.
- Easier quantification.
- Reproducible fractionation patterns, tube after tube, lot after lot.
- Lower cost than glass tubes.
- Efficient processing on vacuum manifolds.

If you are seeing aromatic hydrocarbons in your aliphatics fraction, use our Massachusetts TPH silica gel cartridges. We designed them specifically for separating aliphatic and aromatic hydrocarbons, to meet the requirements of the Massachusetts method-

ology, which has been adopted by other states as well. Capillary GC columns and reference materials for the Massachusetts methodology are described in Application Essentials 59744, available free on request.

Florisil® Cartridges

Florisil® adsorbent is an excellent material for cleanup of samples containing pesticides and/or PCBs. In addition, it can be used to separate mixtures of aliphatic and aromatic hydrocarbons. An effective cleanup procedure is summarized in Application Note 59562A, available free on request.



Resprep™ 12- or 24-Port Tube Manifolds

- Use with any standard male luer-end SPE tube or cartridge.
- Inert, Teflon® sample guides reduce cross-contamination and carryover.
- Flexible sample collection rack will accommodate a variety of receiving vessels.
- Quick vacuum-release valve for better control.
- Individual vacuum control for each tube—improves reproducibility.



Complete manifold includes glass basin with built-in vacuum regulator, polypropylene top plate with 12 or 24 individual control valves, 12- or 24-position collection rack, and 12 or 24 Teflon® sample guides.

Specialty Cartridges

Specifically designed to provide consistent and reproducible results for the listed method or application. Polypropylene tubes with polyethylene frits.

Description	Applications	Tube Volume, Bed Weight	qty.	cat.#	price
Massachusetts TPH	Extraction of hexane-extractable petroleum hydrocarbons from soil and waste samples. Specially treated to reduce contaminants and increase capacity. Silica.	20mL, 5g	20-pk.	26065	
EPA Method 548.1	Extraction of endothal from aqueous samples. Weak anion exchange resin.	6mL	30-pk.	26063	
EPA Method 552.1	Extraction of haloacetic acids from aqueous samples. Strong anion exchange resin.	1mL	100-pk.	26064	
Organo Tin	High-capacity cleanup of butyl and phenyl tin compounds from soil, water, and biota. Mixed bed.	60mL	16-pk.	24049	
RDX	Extraction of explosive compounds (EPA Method 8330) from water samples.	6mL, 500mg	30-pk.	26093	

Normal Phase Cartridges

Hydrophilic (polar) adsorbents used to extract hydrophilic analytes from nonpolar matrices, such as organic solvents (e.g., polar contaminants from sample extracts). Polypropylene tubes with polyethylene frits, except as indicated otherwise.

	3mL/200mg (50-pk.)	3mL/500mg (50-pk.)	6mL/500mg (30-pk.)	6mL/1000mg (30-pk.)
Florisil® (EPA SW 846 methods and CLP protocols)	—	24031	—	24034
	—	24032*	26086**	26085**
Silica (EPA SW 846 methods)	—	24035	—	24038
	—	24036*	—	—

*Teflon® frits

**Glass tubes with Teflon® frits

Description	qty.	cat.#	price
Resprep™ 12-Port Manifold	kit	26077	
Resprep™ 24-Port Manifold	kit	26080	

Massachusetts EPH/VPH/APH Methods

(lit. cat.# 59744)

Massachusetts' gas chromatographic methods for volatile (VPH), extractable (EPH), and air phase (APH) fractions of gasoline and other petroleum products have been adopted by other states, and in Canada. This 4-page publication lists many Restek products that can help a laboratory meet the requirements of the Massachusetts methods, including capillary columns (Restek columns are specified in each method), extraction cartridges, analytical reference materials, and air sampling canisters.

Free!

Call our literature hotline: 800-356-1688 or 814-353-1300, ext. 5, or contact your Restek representative.

Restek Seminars for 2004

We're on the Road Again!

by Rick Parmely, Director of Technical Training

Do you question which GC injection technique is best for your sample? Are you uncomfortable when formulating or adjusting HPLC mobile phases?

A comprehensive seminar with the experienced Restek chromatographers will help you reduce guesswork, improve throughput, and obtain more reliable data, without straining your schedule or travel budget. You'll appreciate your investment as you spend less time experimenting with analytical conditions or troubleshooting problems.

In our one-day courses, we present a wealth of information in an engaging multimedia format. Demonstrations and problem solving exercises rein-

force understanding of important principles. Basic, intermediate, and advanced elements make each seminar equally suitable for analysts with limited chromatographic experience and for experienced analysts who want to review the fundamentals and evaluate the newest developments. Our thorough two-day HPLC Method Development seminar will give you the tools you need to deal effectively with what often is the most challenging aspect of your analysis.

Choose the topic that matches your work, and the site that's most convenient. Additional dates and locations are in progress. For details, and updates to the schedule, please see www.restekcorp.com/seminar

Limited seating—please register today!

Online: www.restekcorp.com/seminar, **Phone:** 800-356-1688 or 814-353-1300 (ext. 3), **Fax:** 814-353-1309

Mail: Restek Corporation, 110 Benner Circle, Bellefonte, PA 16823

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Begin Earning STAR™ Points

By Doug Elliott, STAR™ Service Rewards Coordinator

- ✓ Order Restek products; receive credits toward instrument service and repair.



In 2002, Restek and some of the country's premiere independent instrument service providers formed an alliance, with a goal of bringing you the finest chromatography operating supplies, equipment service, and applications support available. Through that alliance we developed a program that pays you for

using Restek products, by reducing your costs for quality instrument service: STAR™ Service Rewards. Through this program, as of April 2004, more than 80,000 STAR™ Points have been distributed to labs across the US.

If you aren't yet registered to benefit from this valuable program, contact your Restek Account Representative today, and begin saving on your serv-

Comprehensive Capillary GC

Date	Location	cat.#
May 25	Nashville, TN	65392
Sept. 13	Boulder, CO	65375
Sept. 13	Blue Ash, OH	65387
Sept. 15	Columbus, OH	65376
Sept. 16	Salt Lake City, UT	65377
Sept. 17	Buffalo, NY	65384
Oct. 14	RTP, NC	65379
Oct. 21	Buena Park, CA	65378

GC/MS

Date	Location	cat.#
Nov. 1	Pleasanton, CA	65390
Nov. 3	Seattle, WA	65391

Comprehensive HPLC

Date	Location	cat.#
Aug. 3	Indianapolis, IN	65381
Oct. 5	Rockville, MD	65374
Oct. 6	Princeton, NJ	65370
Oct. 8	Plymouth Meeting / King of Prussia, PA	65371
Oct. 18	La Jolla / San Diego, CA	65389

HPLC Method Development (two days)

Date	Location	cat.#
June 24/25	Downers Grove, IL	65360
July 15/16	King of Prussia, PA	65361
Sept. 23/24	Indianapolis, IN	65362
Oct. 21/22	Foster City, CA	65363

ice expenses with your next Restek order. E-mail links and telephone extensions are listed on our web site, www.restekcorp.com

For details about the STAR™ Service Rewards Program, the current list of member service providers, and a map of national coverage, visit www.restekcorp.com/cis_starwelcome.asp Don't let another day pass without earning STAR™ Points. Other labs are already saving hundreds of instrument service dollars a year—start your lab's savings today!



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Please direct your comments on this publication to Carrie Sprout, Graphic Designer, at carrie.sprout@restekcorp.com or call 814-353-1300, ext. 2151.



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