the RESTEK Advantage
Innovators of High Resolution Chromatography Products

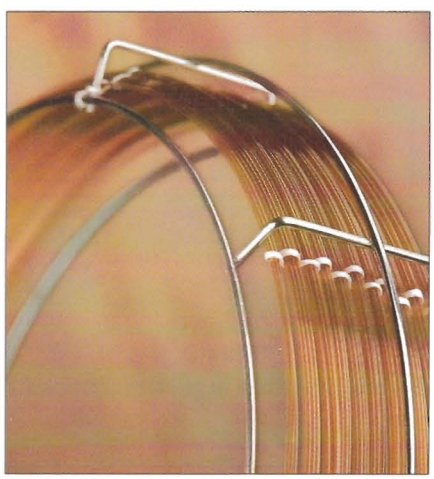
Rtx®-VGC Columns

Revolutionary New Column Designed for GC Volatiles Analysis

by Christopher English, Applications Chemist, and Christine Vargo, GC Columns Product Manager

- ✔ Better resolution than VRX phases.
- ✔ Designed specifically for volatiles analysis using PID/ELCD.
- ✔ Provides fast analysis times without coelutions for volatile organic compounds (VOCs).
- ✔ Increases lab productivity and sample throughput compared to traditional 502.2 and 624 columns.

Volatile organic compound (VOC) analysis employs purge and trap instrumentation to concentrate volatile contaminants in water, soil, and wastewater. While purge and trap significantly increases sensitivity relative to other sample introduction techniques, early eluting volatile compounds typically exhibit broad peak shape. This decreases the separation between closely eluting compounds, which places high demands on the analytical system. Another issue with VOC anlyses is the long analysis time caused by purge and trap cycle time, GC oven cycle time, and column length.



Restek designed the Rtx®-VGC column to provide the best GC separation of VOCs such as those listed in US Environmental Protection Agency (EPA) Methods 502.2 and 8021. Also, based on customer input, we added some commonly analyzed, but unregulated compounds to our target list, such as methyl-tert-butyl ether (MTBE), tert-butyl alcohol, and Freon® 113. Figures 1a and 1b show the analysis of this expanded VOC list on the new Rtx®-VGC column. The Rtx®-VGC provides excellent separation of the purgeable gases and trihalomethanes (see Figure 2 for examples). Notice the excellent resolution of these VOCs—there are no coelutions using PID/ELCD!

Why is resolution so important? Resolution requirements are compound- and method-dependent. The more toxic and common a pollutant is in the environment, the more important accurate deeper the valley between two peaks, the more accurate the quantitative results. The Rtx®-VGC column provides 30% resolution of 1,1,2,2-tetrachloroethane/ 2-chlorotoluene (Figure 1b, inset), and ≥60% resolution of all other volatile compounds found in US EPA Methods 502.2 and 8021, thereby increasing the quantitative reliability of your data!

If your lab is performing VOC analyses by PID/ELCD (e.g., US EPA Methods 502.2, 601, 602, 8010, 8020, or 8021), Restek's new Rtx®-VGC capillary column will provide the best resolution of any column

in this issue

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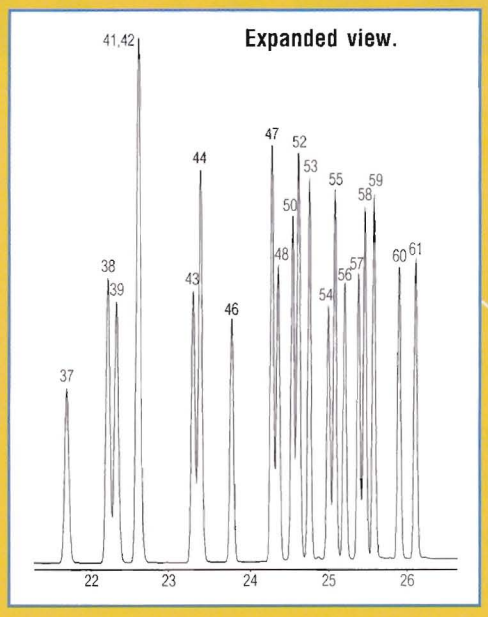
Figure 1a

The Rtx®-VGC column separates US EPA Method 8021 compounds — with better resolution and in less time than any other column available.

PID



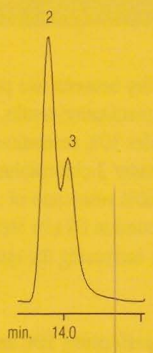
75m, 0.45mm ID, 2.55µm Rtx®-VGC (cat.#19409). 20ppb in 5mL of RO water. **Concentrator:** Tekmar LSC-3000 Purge and Trap; **Trap:** Vocarb™ 3000; **Purge:** 11 min. @ 40mL/min.; **Dry purge:** 1 min. @ 40mL/min. [MCS by-passed with Silcosteel® tubing (cat.# 21035)]; **Desorb preheat:** 245°C; **Desorb:** 250°C for 2 min.; **Bake:** 260°C for 8 min.; **Interface:** direct; **Transfer line:** 0.32mm ID Siltek™ tubing; **GC:** Finnigan 9001; **Oven temp.:** 35°C (hold 4 min.) to 75°C @ 3°C/min. (hold 2 min.) to 175°C @ 21°C/min. to 205°C @ 35°C/min. (hold 5 min.); **Carrier gas:** helium 11mL/min., constant pressure; **Detectors:** µGold Tandem PID/HALL; **PID:** makeup 7mL/min., purge 7mL/min., set @ 0.35mV, base temp. 200°C; **Hall 2000:** RxnGas 25mL/min., RxnTemp 940°C, propanol flow 470µL/min.

Acknowledgment: Finnigan 9001 GC, µGold Tandem Photoionization detector and Hall 2000 detector provided courtesy of **ThermoQuest/CE Instruments**, 2215 Grand Avenue Parkway, Austin, TX 78728.

Figure 2

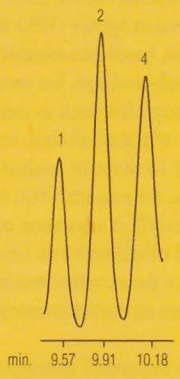
The Rtx®-VGC column resolves chloroform in drinking water better than VRX columns.

Disinfectant by-products of drinking water (i.e., trihalomethanes [THMs]) are the most commonly found contaminants in the public water supply. Chloroform—one of the THMs—is poorly resolved when using traditional VRX phases. The new Rtx®-VGC column provides better resolution of chloroform as well as all other compounds in US EPA Methods 502.2 and 8081. See Figure 1b for separation of all four THMs.



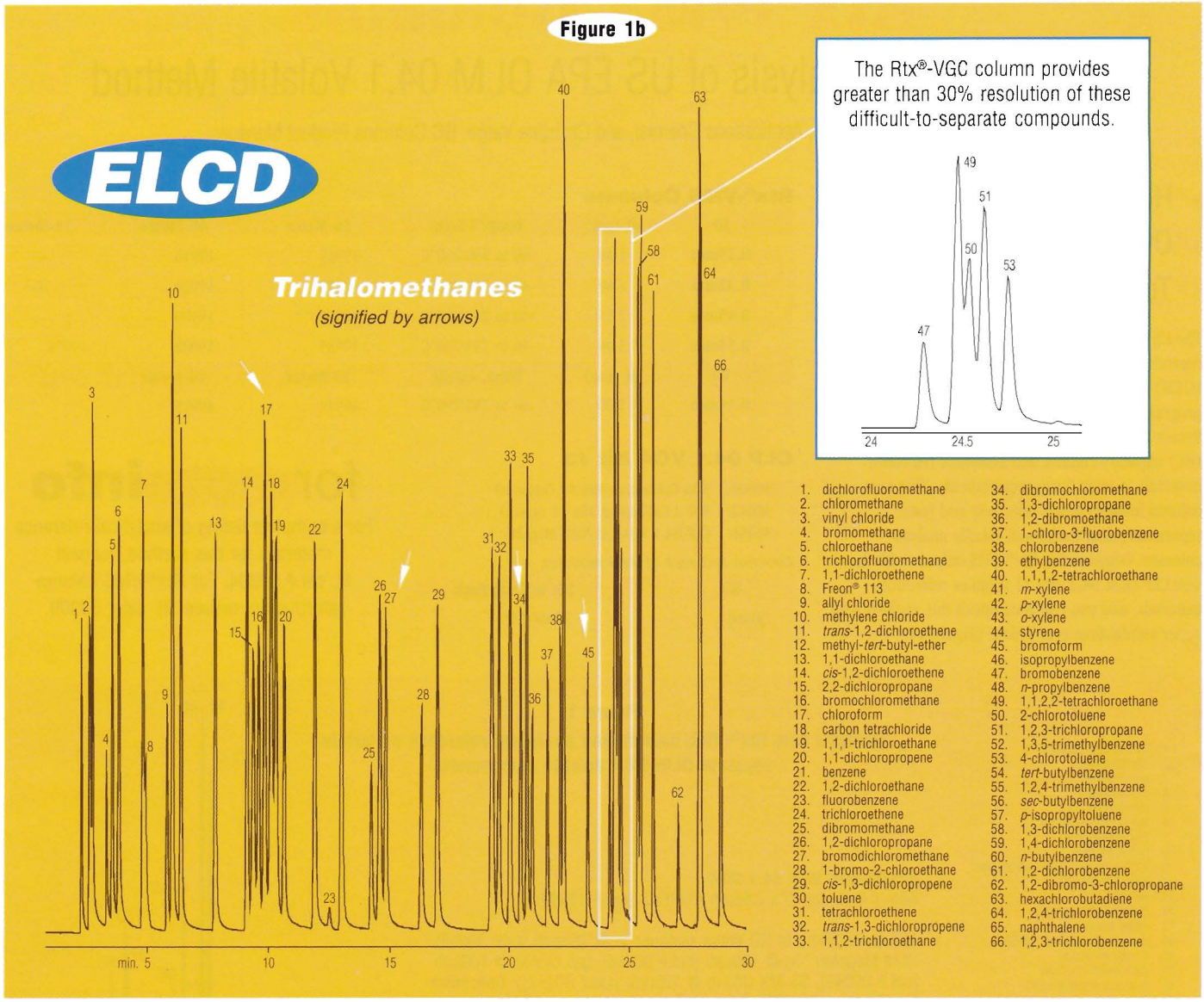
traditional VRX phase

1. bromochloromethane
2. chloroform
3. 2,2-dichloropropane
4. carbon tetrachloride



Rtx®-VGC column

Figure 1b



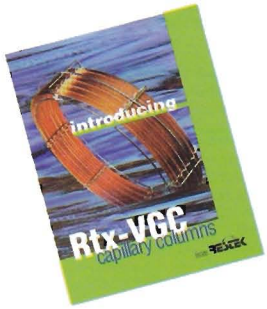
1. dichlorofluoromethane
2. chloromethane
3. vinyl chloride
4. bromomethane
5. chloroethane
6. trichlorofluoromethane
7. 1,1-dichloroethene
8. Freon® 113
9. allyl chloride
10. methylene chloride
11. *trans*-1,2-dichloroethene
12. methyl-*tert*-butyl-ether
13. 1,1-dichloroethane
14. *cis*-1,2-dichloroethene
15. 2,2-dichloropropane
16. bromochloromethane
17. chloroform
18. carbon tetrachloride
19. 1,1,1-trichloroethane
20. 1,1-dichloropropene
21. benzene
22. 1,2-dichloroethane
23. fluorobenzene
24. trichloroethene
25. dibromomethane
26. 1,2-dichloropropane
27. bromodichloromethane
28. 1-bromo-2-chloroethane
29. *cis*-1,3-dichloropropene
30. toluene
31. tetrachloroethene
32. *trans*-1,3-dichloropropene
33. 1,1,2-trichloroethane
34. dibromochloromethane
35. 1,3-dichloropropane
36. 1,2-dibromoethane
37. 1-chloro-3-fluorobenzene
38. chlorobenzene
39. ethylbenzene
40. 1,1,1,2-tetrachloroethane
41. *m*-xylene
42. *p*-xylene
43. *o*-xylene
44. styrene
45. bromoform
46. isopropylbenzene
47. bromobenzene
48. *n*-propylbenzene
49. 1,1,2,2-tetrachloroethane
50. 2-chlorotoluene
51. 1,2,3-trichloropropane
52. 1,3,5-trimethylbenzene
53. 4-chlorotoluene
54. *tert*-butylbenzene
55. 1,2,4-trimethylbenzene
56. *sec*-butylbenzene
57. *p*-isopropyltoluene
58. 1,3-dichlorobenzene
59. 1,4-dichlorobenzene
60. *n*-butylbenzene
61. 1,2-dichlorobenzene
62. 1,2-dibromo-3-chloropropane
63. hexachlorobutadiene
64. 1,2,4-trichlorobenzene
65. naphthalene
66. 1,2,3-trichlorobenzene

Rtx®-VGC Columns

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**	**75-Meter**	**105-Meter**
0.18mm	1.00	-40 to 240/260°C	49414	49415	—	—

Analytical Reference Materials

Restek manufactures a variety of volatile calibration mixtures for environmental applications. Individual laboratory target compound lists may vary, so we offer a range of stock and custom mixtures to meet specific requirements. Please contact our technical service team at 800-356-1688 or 814-353-1300, ext. 4, or call your local Restek representative to discuss your needs.



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For more information, request the "**Rtx®-VGC Columns Brouchure**" (lit. cat.# 59217). Call 800-356-1688 or 814-353-1300, ext. 5, or contact your local Restek representative.

Rtx®-VMS Columns

Fast, Accurate Analysis of US EPA OLM 04.1 Volatile Method

by Christopher English, Applications Chemist, and Christine Vargo, GC Columns Product Manager

- ✔Higher productivity.
- ✔Overcomes co-elutions.
- ✔Tuned selectivity.

The US Environmental Protection Agency (EPA) has recently awarded contracts for organic low medium (OLM) concentration samples within the Superfund program under the 04.2 revision Statement of Work. Restek has designed the perfect gas chromatography (GC) capillary column and analytical reference materials to meet these requirements. This new column features tuned selectivity and faster separations than traditional volatile analysis columns. Combine the Rtx®-VMS column with the new CLP OLM 04.1 (04.2) volatiles reference materials, and you can accomplish this analysis with better results than ever before (Figure 1).

Rtx®-VMS Columns

ID	df (µm)	Temp. Limits	30-Meter	60-Meter	75-Meter
0.25mm	1.40	-40 to 240/260°C	19915	19916	—
0.32mm	1.80	-40 to 240/260°C	19919	19920	—
0.45mm	2.55	-40 to 240/260°C	19908	19909	—
0.53mm	3.00	-40 to 240/260°C	19985	19988	19974
ID	**df (µm)**	**Temp. Limits**	**20-Meter**	**40-Meter**	
0.18mm	1.00	-40 to 240/260°C	49914	49915	

CLP 04.1 VOA Kit #3

30006: VOA Calibration Mix #1 (ketones)
30042: 502.2 Calibration Mix #1 (gases)
30456: CLP 04.1 VOA CAL2000 MegaMix™

Contains 1mL each of these mixtures.

Kit	Kit w/ Data Pack
30460	30460-500

for more info

For a complete listing of analytical reference materials for this method, request lit. cat.# 59304. For Rtx®-VMS column information, request lit. cat.# 59209.

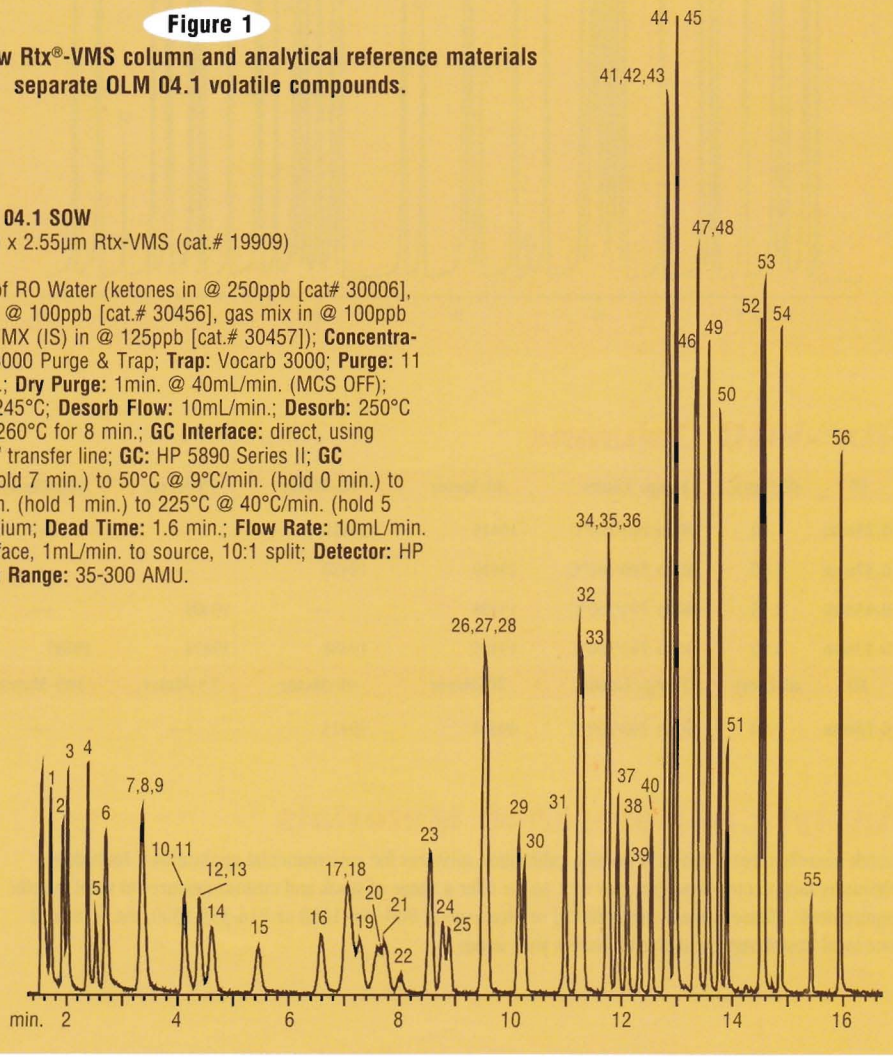
Figure 1

Restek's new Rtx®-VMS column and analytical reference materials separate OLM 04.1 volatile compounds.

1. dichlorofluoromethane
2. chloromethane
3. vinyl chloride
4. bromomethane
5. chloroethane
6. trichlorofluoromethane
7. 1,1-dichloroethene
8. carbon disulfide
9. 1,1,2-trichloro-1,2,2-trifluoroethane
10. methylene chloride
11. acetone
12. *trans*-1,2-dichloroethene
13. methyl acetate
14. methyl-*tert*-butyl-ether (MTBE)
15. 1,1-dichloroethane
16. *cis*-1,2-dichloroethene
17. bromochloromethane (IS)
18. cyclohexane
19. chloroform
20. carbon tetrachloride
21. 1,1,1-trichloroethane
22. 2-butanone
23. benzene
24. 1,2-dichloroethane-d4 (SMC)
25. 1,2-dichloroethane
26. trichloroethylene
27. methyl cyclohexane
28. 1,4-difluorobenzene (IS)
29. 1,2-dichloropropane
30. bromodichloromethane
31. *cis*-1,3-dichloropropene
32. toluene-d8 (SMC)
33. toluene
34. 4-methyl-2-pentanone
35. tetrachloroethene
36. *trans*-1,3-dichloropropene
37. 1,1,2-trichloroethane
38. dibromochloromethane
39. 1,2-dibromoethane
40. 2-hexanone
41. chlorobenzene-d5 (IS)
42. chlorobenzene
43. ethyl-benzene
44. *m*-xylene
45. *p*-xylene
46. *o*-xylene
47. styrene
48. bromoform
49. isopropyl benzene
50. 4-bromofluorobenzene (SMC)
51. 1,1,2,2-tetrachloroethane
52. 1,3-dichlorobenzene
53. 1,4-dichlorobenzene
54. 1,2-dichlorobenzene
55. 1,2-dibromo-3-chloropropane
56. 1,2,4-trichlorobenzene

EPA Method OLM 04.1 SOW
60m x 0.45mm ID x 2.55µm Rtx-VMS (cat.# 19909)

100ppb in 25mL of RO Water (ketones in @ 250ppb [cat# 30006], OLM MegaMix™ in @ 100ppb [cat.# 30456], gas mix in @ 100ppb [cat.# 30042], SS MX (IS) in @ 125ppb [cat.# 30457]); **Concentrator:** Tekmar LSC-3000 Purge & Trap; **Trap:** Vocarb 3000; **Purge:** 11 min. @ 40mL/min.; **Dry Purge:** 1min. @ 40mL/min. (MCS OFF); **Desorb Preheat:** 245°C; **Desorb Flow:** 10mL/min.; **Desorb:** 250°C for 2 min.; **Bake:** 260°C for 8 min.; **GC Interface:** direct, using 0.32mm ID Siltek™ transfer line; **GC:** HP 5890 Series II; **GC Program:** 40°C (hold 7 min.) to 50°C @ 9°C/min. (hold 0 min.) to 110°C @ 27°C/min. (hold 1 min.) to 225°C @ 40°C/min. (hold 5 min.); **Carrier:** Helium; **Dead Time:** 1.6 min.; **Flow Rate:** 10mL/min. to open-split interface, 1mL/min. to source, 10:1 split; **Detector:** HP 5971A MSD; **Scan Range:** 35-300 AMU.



GC Methods Validated for Saw Palmetto

Using Rtx®-5 and Stabilwax® Columns

by Sherry Navaroli, Food, Flavor, Fragrance Innovations Team Manager

Consumer demand for natural products and dietary supplements has grown exponentially, with increasing amounts of botanical materials being used in the manufacture of a large variety of products. The newly formed Institute for Nutraceutical Advancement (INA) has developed the Methods Validation Program (MVP) under the direction of a broad range of representatives from within the natural products industry. Companies from both the United States and Europe are represented. In addition, ten major natural products organizations and the Food and Drug Administration (FDA), have accepted seats on the INA MVP Advisory Committee as a way of ensuring that the process is inclusive.*

Two methods involve gas chromatography (GC) for the analysis of fatty acids and sterols in saw palmetto, a fruit which is thought to have physiological benefits.

Determination of Fatty Acids in Serenoa Repens (Saw Palmetto or Sabel) by GC

The INA assay can be used to determine fatty acid distribution in saw palmetto fruit, oil extract, and blended powders. Determination is performed using GC, after transesterification of the triglycerides into the fatty acid methyl esters. For more specific information on the method itself and all procedures involved, please refer to http://www.nutraceuticalinstitute.com/methods/fattyacids.html

The fatty acids from saw palmetto are separated in Figure 1, which was obtained using a Restek Stabilwax® column and a Shimadzu GC-14A, with split injection and a flame ionization detector (FID). The Stabilwax® column offers the necessary efficiency and selectivity to provide accurate identification of the fatty acids (as methyl esters).

Determination of Sterols in Serenoa Repens (Saw Palmetto or Sabel) by GC

This assay can be used to determine stigmasterol, campesterol, brassicasterol, and sitosterol in saw palmetto fruit, oil extract, and blended powders. Determination is performed using GC after hydrolysis, saponification, and derivatization. For more specific information on the method itself and all procedures involved, please refer to http://www.nutraceuticalinstitute.com/methods/sterols.html

The sterols from saw palmetto are shown in Figure 2, which was obtained by using a Restek Rtx®-5 column and a Hewlett Packard 5890 Series II GC equipped with an FID and an autosampler. The Restek Rtx®-5 column contains a 5% diphenyl/95% dimethyl polysiloxane phase, and has the thermal stability to provide elution and accurate quantitation of the phytosterols, even up to 340°C.

Special thanks to Dr. Mark Lange, Director, and to Kathryn Bass, Marketing Director, of MVP for allowing us to print this material.

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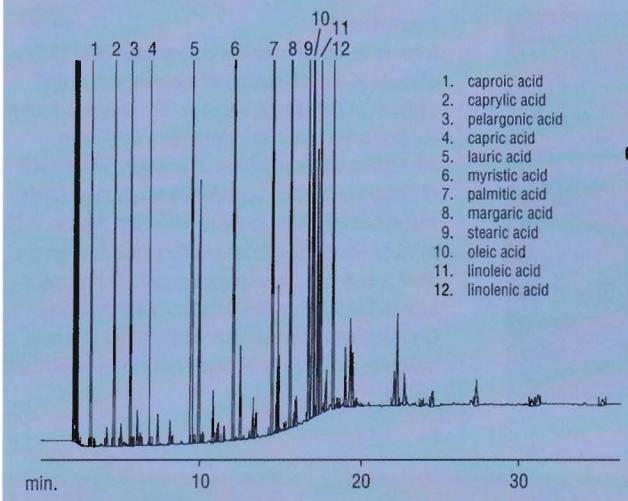
Request the Applications Note
lit. cat.# 59136.

Figure 1

The Stabilwax® column offers the necessary efficiency and selectivity to provide accurate identification of the fatty acids (as methyl esters).

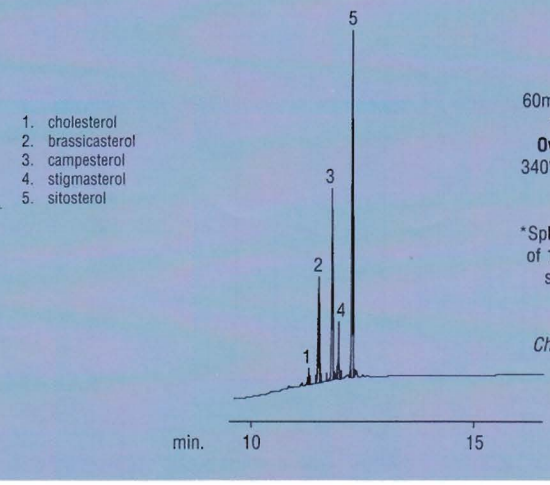


50m, 0.25mm ID, 0.25µm Stabilwax® (cat.# 10626-105). 1µL split injection. **Oven temp.:** 110°C (hold 1 min.) to 240°C @ 8°C/min. (hold 25 min.); **Inj./FID temp.:** 230°C/250°C; **Carrier gas:** Hydrogen @ 2.5mL/min.; **Split flow:** 37.5mL/min.; **Septum purge:** 3mL/min.

Chromatogram courtesy of INA MVP.

Figure 2

The Rtx®-5 column has the thermal stability to provide elution and accurate quantitation of the phytosterols, even up to 340°C.



60m, 0.25mm ID, 0.25µm Rtx®-5 (cat.# 10226). 1µL splitless injection*. **Oven temp.:** 200°C (hold 1 min.) to 340°C @ 15°C/min. (hold 10 min.); **Inj./FID temp.:** 345°C/355°C.

*Split injection may be used. A split flow of 112mL/min. is suggested. However, split injection may show a greater variability in results.

Chromatogram courtesy of INA MVP.

Stabilwax® Column

ID	df (µm)	Stable to	50m
0.25mm	0.25	250°C	10626-105

Rtx®-5 Column

ID	df (µm)	Stable to	60m
0.25mm	0.25	360°C	10226

All information about the INA can be viewed at their website: http://www.nutraceuticalinstitute.com/whoweare

Siltek™ Deactivation Delivers Inertness and Durability

by Deborah Salabsky, Applications Chemist

- ✔ Maximizes the inertness of sample pathway.
- ✔ Minimizes breakdown.
- ✔ Low bleed, thermally stable.
- ✔ Resistant to chemical attack.
- ✔ "Clean and green"—manufactured without the use of harmful organic solvents.

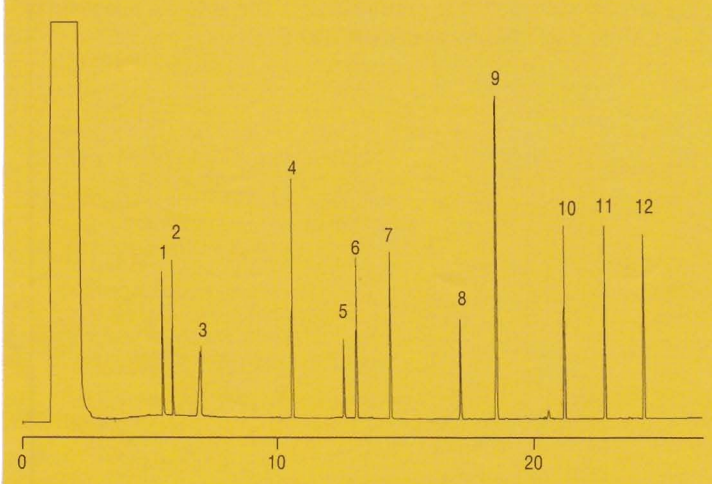
Siltek™—by Restek

Inertness

A common concern in gas chromatographic (GC) analyses is the interaction of analytes with active surfaces in the sample pathway. The injection port is the first source of active sites, often leading to adsorption and breakdown of analytes. Trace levels of compounds often are injected via splitless mode, and are more prone to these problems. With a splitless injection, carrier gas flow rate through the liner is very slow, increasing the sample residence time in the injector and the chance for reactivity. Complete and effective liner deactivation is crucial to minimize available active sites and ensure repeatable results.

Figure 1

Siltek™ liner shows excellent inertness for acidic and basic probes.



1. 1,2-hexanediol
2. *N*-nitroso-di-*n*-propylamine
3. benzoic acid
4. C14
5. 2,4-dinitrophenol
6. 4-nitrophenol
7. 4-nitroaniline
8. pentachlorophenol
9. carbazole
10. C20
11. C21
12. C22

30m, 0.25mm ID, 0.25µm XTI®-5 (cat.# 12223) with a Siltek™ 4mm splitless single gooseneck sleeve (cat.# 20798-214.1).
On-column concentration of 4-10ng. **Oven temp.:** 40°C (hold 2 min.) to 100°C @ 30°C/min., to 180°C @ 9°C/min., to 330°C @ 30°C/min. (hold 10 min.); **Inj. temp.:** 250°C; **Det.:** 330°C; **Carrier gas:** He.

Durability

Restek has designed Siltek™ deactivation to deliver both enhanced inertness and durability. Gas chromatography accessories coated with Siltek™ deactivation provide durability for matrices of pH extremes and high-temperature applications.

A splitless injection of the XTI® mix with an on-column concentration of 4-10ng shows an excellent response for all of the probes, including the active compounds dinitrophenol, 1,2-hexanediol, and benzoic acid (Figure 1).

Resistance to chemical attack.

Very low or very high pH samples can degrade the deactivation layer, eventually resulting in an active surface. For this study, a baseline XTI® injection was made via direct injection and relative response factors were calculated. Key probes, such as 2,4-dinitrophenol, pentachlorophenol, and 1,2-hexanediol, retained their responses up to at least 120µL injected (Figure 2). The experiment was repeated with an identical set-up using aqueous NH_4OH injections, pH 10.1. Under these demanding conditions, the response for the XTI® compounds was consistent for 70 injections.*

Conclusion

Siltek™ deactivation offers both inertness and resistance to temperature and pH extremes within a GC system. For more information, request Applications Note lit. cat.# 59113.

*Refer to Applications Note lit. cat.# 59113.

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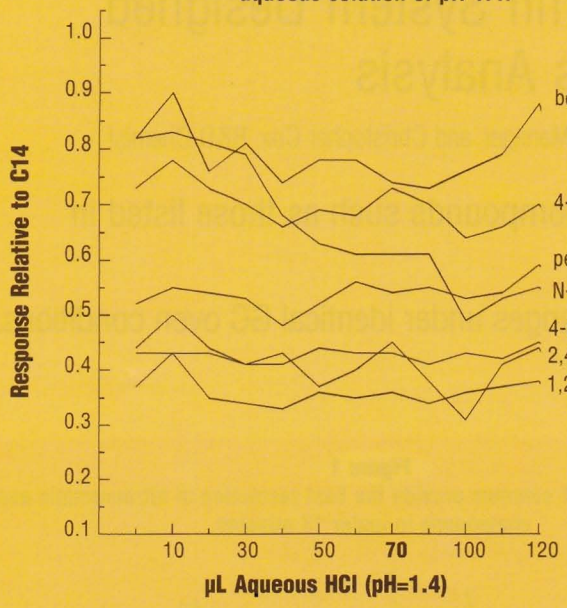
For more information on Siltek™ deactivation, request information packet lit. cat.# 59803.

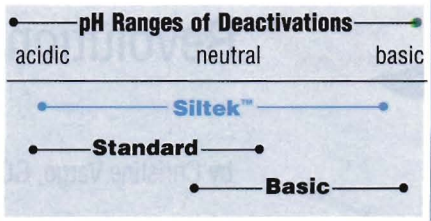
Figure 2

Difficult probes retain their response on Siltek™ deactivation up to 120µL of an aqueous solution of pH 1.4.

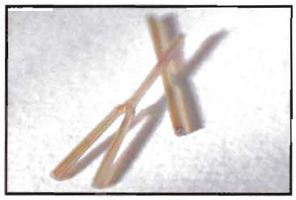


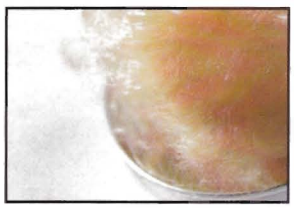
30m, 0.25mm ID, 0.25µm XTI®-5 (cat.# 12223) with a Siltek™-deactivated 4mm open-top Uniliner® w/o wool (cat.# 20843-214.1).
Oven temp.: 40°C (hold 2 min.) to 190°C @ 6°C/min., to 330°C @ 30°C/min. (hold 10 min.); Inj. temp.: 250°C; Det.: 330°C; Carrier gas: He.

Correction



In the Winter 2000 Restek Advantage (lit. cat.# 59402) article, "Siltek™ Deactivation" (p. 12), we inadvertently placed numerical pH indicators on a figure depicting the performance variations of various deactivation surfaces with acidic and basic analytes. The purpose of this figure is to present a general classification of analytes that are compatible with either Siltek™ deactivation, Restek standard deactivation, and Restek basic deactivation. The use of actual pH values is inappropriate for this purpose and the figure is reprinted correctly above.





Siltek™ Inlet Liners

For Siltek™-deactivated inlet liners, add the corresponding suffix number to your liner catalog number. Refer to the Annual Chromatography Products Guide for liner catalog numbers.

qty.	Siltek™	Siltek™ with Siltek™-deactivated wool	Siltek™ with CarboFrit™
each	-214.1	-213.1	-216.1
5-pk.	-214.5	-213.5	-216.5

Siltek™ Press-Tight™ Connectors

Type	ea.	3-pk.	5-pk.	25-pk.	100-pk.
straight	—	—	20480	20449	20481
angled	—	—	20482	20483	20484
"Y"	20485	20486	—	—	—
angled "Y"	20487	20469	—	—	—

Siltek™ Guard Columns

nominal ID	nominal OD	5-meter	10-meter
0.25mm	0.37 ±0.04mm	10026	10036
0.32mm	0.45 ±0.04mm	10027	10037
0.53mm	0.69 ±0.04mm	10028	10038

Siltek™ Borosilicate Wool

qty.	cat.#
10g	21100

Rtx®-TNT/TNT2 Columns

Revolutionary Dual-Column System Designed for Explosives Analysis

by Christine Vargo, GC Columns Product Marketing Manager, and Christopher Cox, R&D Chemist

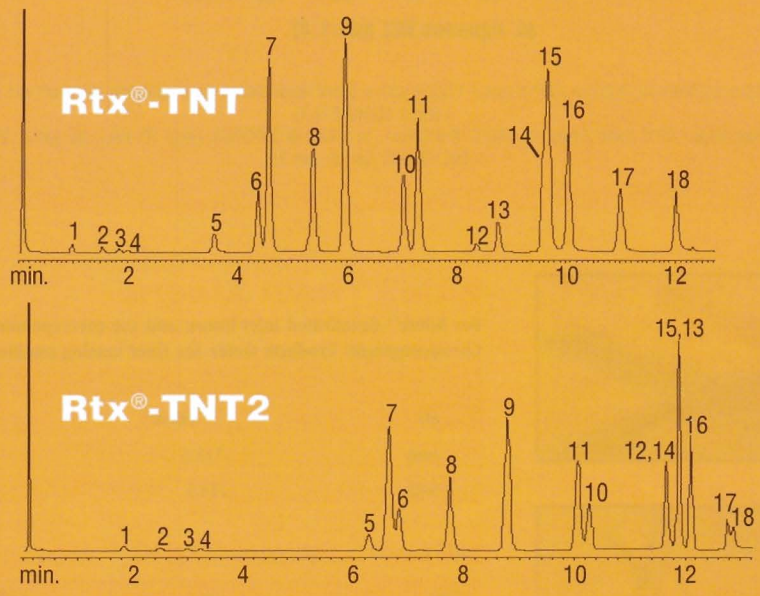
- ✔ Provides baseline resolution of nitroaromatic compounds such as those listed in US EPA Method 8095.
- ✔ Confirmation column achieves 8 elution order changes under identical GC oven conditions.
- ✔ High thermal stability for low ECD bleed.

Restek has designed the Rtx®-TNT and Rtx®-TNT2 columns specifically to analyze nitroaromatic compounds by GC/ECD, such as those listed in US Environmental Protection Agency (EPA) Method 8095. The TNT columns provide better resolution and higher thermal stability than any of the columns currently recommended in Method 8095. The Rtx®-TNT primary column and Rtx®-TNT2 confirmation column operate under identical GC oven temperature programs, allowing simultaneous dual-column confirmational analysis of all 16 nitroaromatic compounds.

Column stationary phase, dimensions, and injection technique have been optimized to ensure the best chromatographic performance. The Rtx®-TNT/Rtx®-TNT2 columns are optimized at 6 meters, 0.53mm ID, and 1.5µm film thickness. The 6-meter length minimizes surface area and contact times of thermally labile explosives such as octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX). For explosives analysis, a 100% dimethyl polysiloxane (Rtx®-1) phase typically is used for the primary column and either a 100% trifluoropropylmethyl polysiloxane phase (Rtx®-200) or a 50% cyanopropylmethyl/50% phenylmethyl polysiloxane (Rtx®-225) phase is used for the confirmational column. The Rtx®-TNT and Rtx®-TNT2 columns provide the best resolution of the nitroaromatics in the fastest analysis time compared to recommended columns (Figure 1). A direct injection of the explosives using a Siltek™ Uniliner® is recommended to minimize injection port discrimination, sample adsorption, and low response of HMX.

Figure 1

Rtx®-TNT and Rtx®-TNT2 columns provide the best resolution of nitroaromatic explosive compounds in under 13 minutes.



1. nitrobenzene
2. 2-nitrotoluene
3. 3-nitrotoluene
4. 4-nitrotoluene
5. nitroglycerine
6. 1,3-dinitrobenzene
7. 2,6-dinitrotoluene
8. 2,4-dinitrotoluene
9. 3,4-dinitrotoluene (IS)
10. 1,3,5-trinitrobenzene
11. trinitrotoluene
12. PETN
13. RDX
14. 4-amino-2,6-dinitrotoluene
15. 3,5-dinitroaniline
16. 2-amino-4,6-dinitrotoluene
17. tetryl
18. HMX

6m, 0.53mm ID, 1.50µm Rtx®-TNT (cat.# 12998) and 6m, 0.53mm ID, 1.50µm Rtx®-TNT2 (cat.# 12999). Direct injection using a 1mm Siltek™ Uniliner® (cat.# 21052-214.1). **On-column conc.:** 200-1000pg/compound. 8095 Calibration Mix A (cat.# 31607), 8095 Calibration Mix B (cat.# 31608), and 3,4-dinitrotoluene (cat.# 31452). **Oven temp.:** 80°C (hold 1 min.) to 180°C @ 10°C/min. to 300°C @ 30°C/min. (hold 3 min.); **Inj. temp.:** 250°C; **Det.:** ECD @ 330°C with anode purge; **Dead time:** 4.4 sec.; **Head pressure:** He @ 3psi (20.7 KPa); **Flow rate:** He @ 17mL/min. @ 80°C.

for more info

Request the Rtx®-TNT Columns Brochure (lit. cat.# 59218).

1mm Siltek™ Uniliner® Inlet Liner

For HP 5890 split/splitless injection ports

cat.# 21052-214.1 (ea.)
cat.# 21053-214.5 (5-pk.)

NEW

Rtx®-TNT & Rtx®-TNT2 Columns (Columns provided in a 3-pack without cages.)

Column	ID	df (µm)	Temp. Limits	6-Meter (3-pk.)
Rtx®-TNT	0.53mm	1.50	-20 to 300/310°C	12998
Rtx®-TNT2	0.53mm	1.50	-20 to 300/310°C	12999

US EPA 8095 explosive calibration mixtures are available from Restek. Request lit. cat.# 59229 for more information.

Rtx®-5Sil MS

Best Resolution of Gasoline Range Organic (GRO) Compounds

by Christopher English, Applications Chemist

The Alaska Department of Environmental Conservation (ADEC) developed a new technique for the gas chromatographic (GC) analysis of gasoline range organic (GRO) compounds in soil, water, and waste water—Method AK101AA. This method quantitates aromatic and aliphatic compounds from C6 (hexane) to C10 (decane), and is capable of a higher level of accuracy over existing GRO methods. Restek's Rtx®-5Sil MS column is ideal for the analysis of GRO compounds, and specifically meets the requirements of Method AK101AA.

Alaska UST Method AK101AA

benzene	toluene
ethylbenzene	1,2,3-trimethylbenzene
1-ethyl-2-methylbenzene	1,2,4-trimethylbenzene
1-ethyl-3-methylbenzene	1,3,5-trimethylbenzene
1-ethyl-4-methylbenzene	*o*-xylene
isopropylbenzene	*m*-xylene
n-propylbenzene	*p*-xylene

1,000µg/mL ea. in P&T methanol, 1mL/ampul.

Each	5-pk.	10-pk.
without data pack		
30461	30461-510	—
w/ data pack		
30461-500	30461-520	30561

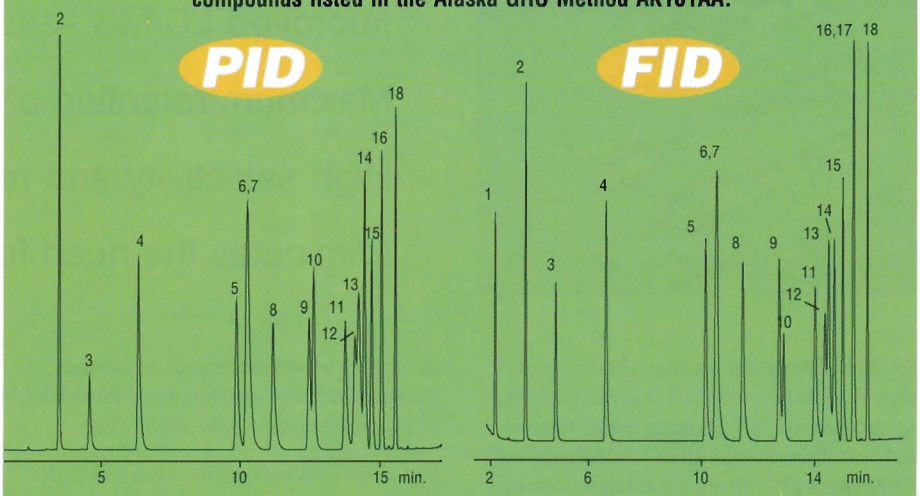
Rtx®-5Sil MS Columns

(Stable to 300/320°C)

ID	df (µm)	30m	40m	60m
0.45mm	1.50	—	12798	—

Figure 1

The Rtx®-5Sil MS column resolves the alkyl benzenes and all the branched aromatic compounds listed in the Alaska GRO Method AK101AA.

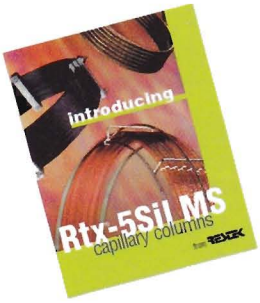


1. hexane
2. benzene
3. a,a,a-trifluorotoluene (ss)
4. toluene
5. ethylbenzene
6. *m*-xylene
7. *p*-xylene
8. *o*-xylene
9. isopropylbenzene
10. 4-bromo-fluorobenzene (ss)
11. *n*-propylbenzene
12. 1-ethyl-3-methylbenzene
13. 1-ethyl-4-methylbenzene
14. 1,3,5-trimethylbenzene
15. 1-ethyl-2-methylbenzene
16. 1,2,4-trimethylbenzene
17. decane
18. 1,2,3-trimethylbenzene

40m, 0.45mm ID, 1.50µm Rtx®-5Sil MS (cat.# 12798). Injection of 4-bromofluorobenzene (cat.# 30026); a,a,a-trifluorotoluene (cat.# 30048), decane, hexane, and Alaska aliphatic/aromatic GRO mix (cat.# 30461). 100ppb in 5mL RO water. **GC:** Finnigan 9001; **Column flow:** 9mL/min.; **Concentrator:** Tekmar LSC-3000 Purge & Trap, BTEX trap; **Interface:** direct with Siltek™ transfer line; **Oven temp.:** 40°C (hold 2 min.) to 85°C @ 4°C/min. (hold 1 min.) to 225°C @ 40°C/min. (hold 2 min.); **Det.:** FID (280°C)/PID (200°C); **Make-up flow rate:** 15mL/min.

for more info

For details on this analysis, request Applications Note lit. cat.# 59131. For more information on Rtx®-5Sil MS columns, request brochure lit. cat.# 59204.



Connecticut ETPH Method

New Analytical Reference Materials Available

by Christopher Cox, R&D Chemist

Connecticut has recently changed the analytical procedure to test for the presence of petroleum products in the nonane (C9) to hexatriacontane (C36) hydrocarbon range.[1] This new method uses methylene chloride extraction, high resolution gas chromatography (GC) separation, and flame ionization detection (FID). Restek offers the calibration mixtures, surrogates, internal standards, and composite petroleum standards needed for this method. Restek also offers the high resolution capillary columns, direct injection Uniliner® sleeves, and septa needed for this analysis.

1 Analysis of Extractable Total Petroleum Hydrocarbons (ETPH) Using Methylene Chloride Gas Chromatography/Flame Ionization Detection, Environmental Research Institute, University of Connecticut, March, 1999. Reference not available from Restek. Available from Department of Environmental Protection, 79 Elm Street, Hartford, CT 06106.

Connecticut ETPH Calibration Mixture

NEW

nonane (C9)	tetracosane (C24)
decane (C10)	hexacosane (C26)
dodecane (C12)	octacosane (C28)
tetradecane (C14)	triacontane (C30)
hexadecane (C16)	dotriacontane (C32)
octadecane (C18)	tetratriacontane (C34)
eicosane (C20)	hexatriacontane (C36)
docosane (C22)	

1000µg/mL each in methylene chloride, 1mL per ampul

Each	5-pk.	10-pk.
without data back		
31614	31614-510	—
w/ data back		
31614-500	31614-520	31714

Allure™ PFP Propyl Columns

Improved LC/MS Analysis of Basic Compounds

by C. Vernon Bartlett, HPLC Applications Manager

- ✔ Improved LC/MS sensitivity.
- ✔ Maximum retention of basic compounds.
- ✔ High selectivity and reproducibility.
- ✔ Eliminates the need for modifiers.

Selection of the proper stationary phase for your separation can improve liquid chromatography/mass spectrometry (LC/MS) sensitivity, analyte retention, and peak shape. Restek's Allure™ pentafluorophenyl (PFP) Propyl HPLC column demonstrates increased retention of basic analytes without the use of modifiers or ion pairing agents (Figure 1).

The Allure™ PFP Propyl column separates and retains analytes such as cocaine (COC) and its metabolite, ecgonine methyl ester (EME), using 90% acetonitrile in under 4.5 minutes (Figure 2). As the concentration of the organic solvent in the mobile phase increases, the desolvation process becomes more effective and the LC/MS ESI signal increases.[1]

Restek's Allure™ PFP Propyl column is the best choice for analysis of basic analytes. It provides superior retention and peak shape for analytes having pKa's >8 without the need for modifiers, and it provides increased sensitivity due to the high level of organic solvent used in the mobile phase.

1. P. Sjoberg and K. Markides., *J. Chromatogr. A.*, 855 (1999) 317-327.
Reference not available from Restek.

formoreinfo

For more information on this analysis and Allure™ HPLC columns, request the Applications Note lit. cat.# 59118.

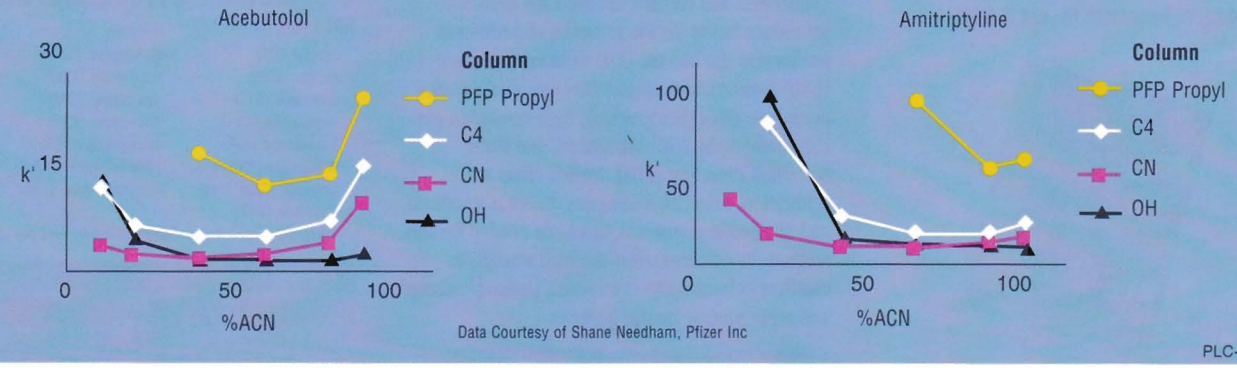
Free HPLC Wall Chart & LC/MS Catalog

To receive your free wall chart (lit. cat.# 59894) and catalog (lit. cat.# 59607) call 800-356-1688 or 814-353-1300, ext. 5, or visit us online at **www.restekcorp.com**.

Figure 1

Allure™ PFP Propyl demonstrates increased retention of basic analytes

5mM NH_4OAc, pH 4.5:ACN; 30x2.1mm; 0.4mL/min.



Data Courtesy of Shane Needham, Pfizer Inc

PLC-0001

Figure 2

Allure™ PFP Propyl achieves improved response for cocaine and its metabolites.

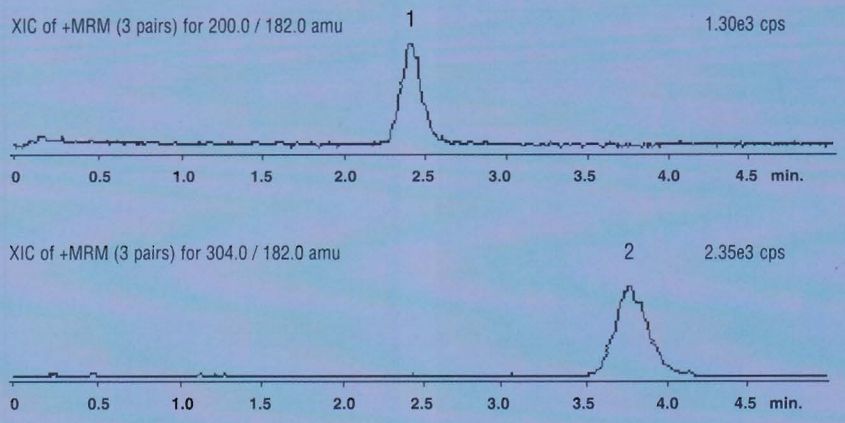
5mM NH_4OAc, pH 4.5:ACN; 30x2.1mm; 0.4mL/min.

Peak List:
1. EME (ecgonine methyl ester)
2. COC (cocaine)

Sample Conditions:

Inj.:	10µL
Conc.:	1µg/mL
Solvent:	water
Temp.:	4°C

Optimized mobile phase provides 12-fold increase in COC response!



Column:	**Allure™ PFP Propyl**
Catalog#:	9169532
Dimensions:	30mm x 2.1mm
Particle size:	5µm
Pore size:	60Å
Conditions:	
Mobile phase:	5mM pH 3.0 ammonium formate: acetonitrile (10:90)
Flow:	0.6mL/min.
Column temp.:	ambient
Det.:	PE/Sciex API 3000
Interface:	Turbo Ion Spray, ESI
Interface temp.:	150°C
Ion mode:	positive
ESI probe voltage:	5000V
Orifice:	+/- 71V
Ring:	+/- 265V
Collision gas:	Nitrogen
Collision gas pressure:	2.2 mTorr
Collision gas energy(COC):	28 eV
Collision gas energy(EME):	26 eV
Electron multiplier:	2100 volts
Auxillary gas flow:	7000cc/min.
Nebulizer gas setting:	15lb/in.²
Curtain gas setting:	12lb/in.²

Data Courtesy of Shane Needham, Pfizer Inc

LC_0126

Allure™ PFP Propyl, 5µm Columns

Particle Size: 5µm	1.0mm ID cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID cat.#
30mm length	9169531	9169532	9169533	9169535
50mm length	9169551	9169552	9169553	9169555
100mm length	9169511	9169512	9169513	9169515
150mm length	9169561	9169562	9169563	9169565
200mm length	9169521	9169522	9169523	9169525
250mm length	9169571	9169572	9169573	9169575

Allure™ PFP Propyl, 5µm Columns with Trident™ Inlet

Particle Size: 5µm		2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID cat.#
30mm length	—	9169532-700	9169533-700	9169535-700
50mm length	—	9169552-700	9169553-700	9169555-700
100mm length	—	9169512-700	9169513-700	9169515-700
150mm length	—	9169562-700	9169563-700	9169565-700
200mm length	—	9169522-700	9169523-700	9169525-700
250mm length	—	9169572-700	9169573-700	9169575-700

Restek Survival Kit for HPLC

The Restek Survival Kit is an invaluable analytical spare-parts kit that contains the essential tools and supplies to maintain and set-up your solvent delivery system. For start-up and standard use in all HPLC systems.
cat.# 25322

USP <467> Method Updates

GC Analysis of Organic Volatile Impurities

by Christopher Cox, R&D Chemist

Since its original appearance in the USP, the testing protocol for gas chromatographic (GC) analysis of Organic Volatile Impurities (OVI) in pharmaceutical products (USP <467>) has undergone many revisions and additions.[1-6] The most recent of which was published in USP 24, effective January 1, 2000.[7] The biggest change was to the limit test concentrations, which now match the European Pharmacopoeia (EP) concentrations and the ICH guidelines for the five USP <467>-regulated solvents (Table I).[8,9]

Table I

New limit test concentrations for USP <467>. Effective January 1, 2000.

benzene	2ppm
chloroform	60ppm
1,4-dioxane	380ppm
methylene chloride	600ppm
trichloroethene	80ppm

USP issued an in-process revision announcement that the limit test for benzene is not required unless a specific limit for benzene is included in the individual drug monograph (12). This was needed because of the inability to detect benzene at 2 ppm with method I and method IV. Method IV is currently the only method that detects benzene at 2 ppm. Our understanding, at the time of this printing, is that the FDA has not waived the need to test for benzene and that most laboratories running method I and V are testing for benzene at 100ppm. It is anticipated that USP will make more revisions to the benzene detection limits or testing procedures this year.

Figure 1 shows an analysis using USP <467> Method I on a G27 analytical column with a phenylmethyl guard column. Please note that the sample preparation used in this analysis deviates from the method-specified 1:50 dilution in distilled water. A 1:10 dilution in distilled water was used to obtain a detectable amount of benzene by direct injection.

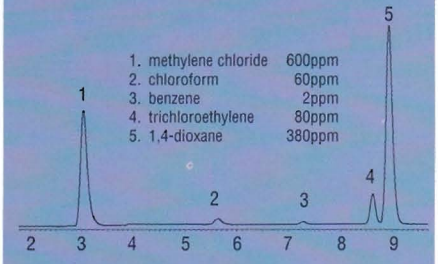
USP also has clarified that a 5m phenylmethyl guard column is not needed for the Method IV, headspace analysis.[10] **Figure 2** shows an analysis using Method IV at the revised concentrations, the method-specified sample preparation procedure, a G43 analytical column, and no guard column.

We have developed three new products to meet the current change:

- USP <467> Calibration Mix #4 (cat.# 36006, dissolved in methanol)
- USP <467> Calibration Mix #5 (cat.# 36007, dissolved in dimethylsulfoxide)
- Rtx®-G43 column without an Integra-Guard™ guard column

Figure 1

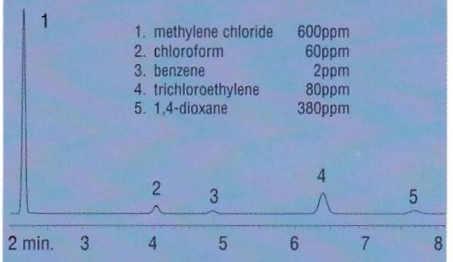
A minor modification of the dilution concentration for Method I allows analysis of 2ppm benzene using an Rtx®-G27 column.



Sample Preparation: 1:10 dilution of cat.# 36007 in distilled water (this deviation from the method's 1:50 dilution was needed to obtain a detectable benzene peak).
30m, 0.53mm ID, 5.0µm Rtx®-G27 with 5m phenylmethyl Integra-Guard™ (cat.# 10279-126).
Oven temp.: 35°C (hold 5 min.) to 175°C @ 8°C/min., to 260°C @ 35°C/min. (hold 16 min.); **Inj. port:** Uniliner® direct injection sleeve 70°C; **Inj. size:** 1µL; **Det. temp.:** 260°C; **FID sensitivity:** 1 x 10^{-12} AFS; **Carrier gas:** helium, 4.1psi constant pressure, 35cm/sec. set @ 35°C.

Figure 2

The Rtx®-G43 column provides the resolution and detection limits needed for USP 24th edition <467> revised limit test concentrations in USP Method IV.



Sample Preparation: 100µL of cat.# 36007 in 5mL distilled water, 1 gram sodium sulfate in a 20mL headspace vial.
30m, 0.53mm ID, 3.0µm Rtx®-G43 (cat.# 16085)
Oven temp.: 40°C (hold 20 min.) to 240°C @ 35°C/min. (hold 20 min.); **Inj. temp:** 140°C, 1mm split sleeve (cat.# 20916); **Det. temp.:** 260°C; **FID sensitivity:** 1.25 x 10^{-11} AFS; **Carrier gas:** helium, 3.5psi constant pressure, 35cm/sec. set @ 40°C; **Split ratio:** 2:1; ThermoQuest HS 2000 Headspace Autosampler Vial 80°C, 60 min. shaker on.

Rtx®-G27 with 5m phenylmethyl Integra-Guard™ (5% phenyl/95% methyl polysiloxane)

ID	df (µm)	Temp. Limits	30-Meter
0.53mm	5.00	-60 to 270/290°C	10279-126

Rtx®-G43 with 5m phenylmethyl Integra-Guard™

(6% cyanopropylphenyl/94% dimethyl polysiloxane)

ID	df (µm)	Temp. Limits	30-Meter
0.53mm	3.00	-20 to 240°C	16085-126

Rtx®-G43 w/out Integra-Guard™ USP <467> Method IV

(6% cyanopropylphenyl/94% dimethyl polysiloxane)

NEW

ID	df (µm)	Temp. Limits	30-Meter
0.53mm	3.00	-20 to 240°C	16085

USP 467 Calibration Mix #4

NEW

benzene	2µg/mL
chloroform	60
1,4-dioxane	380
methylene chloride	600
trichloroethene	80

Prepared in methanol, 1mL/ampul

each	10-pk.
36006	36106

USP 467 Calibration Mix #5

NEW

benzene	2µg/mL
chloroform	60
1,4-dioxane	380
methylene chloride	600
trichloroethene	80

Prepared in dimethylsulfoxide, 1mL/ampul

each	10-pk.
36007	36107

formoreinfo

For the latest details on this analysis and a list of references, request the Applications Note lit. cat.# 59577A.

[1-10] Request lit. cat# 59577A for a list of references.

New Stationary Phases and Solid Supports for USP Methods

by Barry Burger, Applications Chemist

- ✔ New Silcoport™ S1AB replacement for recently-discontinued Gas-Chrom® Q.
- ✔ New Rt-XE 60 liquid phase replacement for GE®-XE-60.
- ✔ Phases and solid supports fully tested to assure lot-to-lot reproducibility.

Two commonly-used products for the gas chromatographic (GC) analyses specified in US Pharmacopoeia (USP) methods are no longer available from their original manufacturers—Gas-Chrom Q (S1AB), a deactivated acid/base-modified solid support that is specified in over 40 USP methods, and GE® XE-60, a 25% cyanoethyl/75% methylpolysiloxane liquid phase specified as USP G26.

To meet continuing needs for these products, Restek offers a complete line of high-quality, fully-tested liquid phases and solid supports for USP methods (Tables 1 and 2). ***SilcoPort™ S1AB*** solid support, a deactivated acid/base-modified diatomaceous earth, was designed specifically for USP methods. Restek's polymer chemists also synthesized ***Rt-XE 60*** liquid phase, a direct replacement for the original GE®-XE-60 material. Figure 1 compares the Kovats data generated by the new Rt-XE 60 phase and the original GE®-XE-60 liquid phase. Each polymer batch is QA tested and must conform to rigid Kovats specifications.

All liquid phases and solid supports available from Restek are fully tested in accordance with our in-house Quality Control program. All solid supports are classified to meet stringent particle size distribution windows for maximum performance and subsequently are deactivated and tested.

Figure 1

Quality assurance testing includes retention indices for lot-to-lot reproducibility.

Kovats Retention Indices

		GE XE-60	Restek Rt-XE 60
X'	benzene	857	857
Y'	*n*-butanol	967	966
Z'	2-pentanone	967	966
U'	1-nitropropane	1147	1146
S'	pyridine	1064	1063

Table 1

Restek offers all GC liquid phases listed in the USP, 24th edition.

USP	Phase description	Restek equivalent
G1	Dimethylpolysiloxane oil	Rt-2100, OV-101, Rtx®-1
G2	Dimethylpolysiloxane gum	OV-1
G3	50% phenyl-50% methylpolysiloxane	Rt-2250, OV-17
G4	Diethylene glycol succinate polyester	Rt-DEGS
G5	3 cyanopropylpolysiloxane	Rt-2340
G6	trifluoropropylmethylpolysiloxane	Rt-2401, OV-210
G7	50% 3 cyanopropyl-50% phenylmethylsilicone	Rt-2300
G8	90% 3 cyanopropyl-10% phenylmethysilicone	Rt-2330
G9	methylvinylpolysiloxane	UCW 98
G10	Polyamide	Polyamide
G11	bis(2 ethylhexyl) sebecate polyester	bis(2 ethylhexyl) sebecate polyester
G12	phenyldiethanolamine succinate polyester	phenyldiethanolamine succinate polyester
G13	sorbitol	sorbitol
G14	polyethylene glycol (ave. mol. wt. 950-1050)	Carbowax® 1000
G15	polyethylene glycol (ave. mol. Wt 3000-3700)	Carbowax® 4000
G16	Polyethylene glycol compound (ave. mol. wt. 15,000) A high molecular weight compound of polyethylene glycol and a diepoxide linker.	Carbowax® 20M
G17	75% phenyl-25% methylpolysiloxane	OV-25
G18	Polyalkylene glycol	UCON LB 550X
G19	25% phenyl-25% cyanopropyl-50% methylsilicone	OV 225
G20	polyethylene glycol (ave. mol. wt. 380-420)	Carbowax® 400
G21	neopentyl glycol succinate	neopentyl glycol succinate
G22	bis(2 ethylhexyl) phthalate	bis(2 ethylhexyl) phthalate
G23	polyethylene glycol adipate	EGA
G24	diisodecyl phthalate	diisodecyl phthalate
G25	Polyethylene glycol compound TPA. A high molecular weight compound of a polyethylene glycol and a diepoxide that is esterified with terephthalic acid	Carbowax® 20M TPA
G26	25% 2-cyanoethyl-75% methylpolysiloxane	Rt-XE 60
G27	5% phenyl-95% methylpolysiloxane	SE-52
G28	25% pheny-75% methylpolysiloxane	DC 550
G29	3,3'-thiodipropionitrile	TDPN
G30	tetraethylene glycol dimethyl ether	tetraethylene glycol dimethyl ether
G31	nonylphenoxypoly(ethyleneoxy)ethanol (ave. ethyleneoxy chain length is 30): nonoxynol 30	Igepal® CO 880
G32	20% phenylmethyl-80% dimethylpolysiloxane	OV-7
G33	20% Carborane® 80% methylsilicone	Dexsil® 300
G34	Diethylene glycol succinate polyester stabilized with phosphoric acid	Rt-DEGS PS
G35	A high molecular weight compound of a polyethylene glycol and a diepoxide that is esterified with nitroterephthalic acid	Rt-1000
G36	1% vinyl 5% phenylmethylpolysiloxane	SE 54, Rtx®-5
G37	polyimide	polyimide
G38	phase G1 containing a small amount of tail inhibitor	Rt-2100/0.1% Carbowax 1500
G39	polyethylene glycol (ave mol. wt. 1500)	Carbowax® 1500
G40	ethylene glycol adipate	Rt-EGA

[1]USP 24/NF19 <621> Chromatography pp.1924–1926

New Stationary Phases and Solid Supports for USP Methods, (cont.)

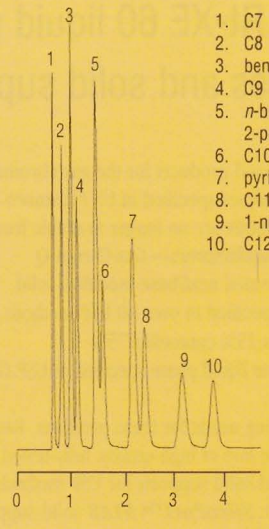
Table 2

Restek offers all GC solid supports listed in the USP, 24th edition.

USP	Support description	Restek equivalent
S1A	siliceous earth, see method [1] for details on treatment	Silcoport™
S1AB	siliceous earth, treated as S1A and both acid- and base-washed	Silcoport™ WBW
S1C	Crushed firebrick, calcined or burned with a clay binder above 900°C, acid-washed, may be silanized	Chromosorb® PAW or PAW DMDCS
SINS	untreated siliceous earth	Chromosorb® W- Non Acid Washed
S2	styrene-divinylbenzene copolymer with nominal surface area of less than 50m²/g and an ave. pore diameter of 0.3 to 0.4µm	Chromosorb® 101
S3	styrene-divinylbenzene copolymer with nominal surface area of 500 to 600m²/g and an ave. pore diameter of 0.0075µm	Hayesep® Q
S4	styrene-divinylbenzene copolymer with aromatic -O and -N groups having a nominal surface area of 400 to 600m²/g and an ave. pore diameter of 0.0076µm	Hayesep® R
S5	high molecular weight tetrafluorethylene polymer, 40- to 60-mesh	Chromosorb® T
S6	styrene-divinylbenzene copolymer having a nominal surface area of 250 to 350m²/g and an ave. pore diameter of 0.0091µm	Chromosorb® 102
S7	graphitized carbon having a nominal surface area of 12m²/g	CarboBlack™ C
S8	copolymer of 4-vinyl-pyridine and styrene divinylbenzene	Hayesep® S
S9	porous polymer based on 2,6-diphenyl-p-phenylene oxide	Tenax® TA
S10	highly cross-linked copolymer of acrylonitrite and divinylbenzene	HayeSep® C
S11	graphitized carbon having a nominal surface area of 100m²/g, modified with small amounts of petrolatum and polyethylene glycol compound	CarboBlack™ B 80/120 3% Rt 1500
S12	graphitized carbon having a nominal surface area of 100m²/g	CarboBlack™ B

Figure 2

Quality assurance determination shows liquid phase selectivity using Kovats retention indices.



20% Rt-XE60 on 100/120 Chromosorb® W NAW
2-Meter x 2mm ID Silcosteel® column

Col. temp.: 120°C; **Flow rate:** Helium, 20 mL/min.; **Inj. temp.**: 200°C; **Det. temp.**: 250°C; **Sample conc.**: neat; **Sample size:** 0.01µL

Precision™ Inlet Liners (Formerly called Focal liners)

- ✔ Wool is placed at the injection point to maximize vaporization and help wipe the needle during injection.
- ✔ Designed for easy changing of the wool—no more guessing where the wool should be placed.
- ✔ Wool stays in position during pressure pulses in the inlet and during injection.
- ✔ Available with all Restek deactivations and packing materials.
- ✔ Direct replacement for SGE's Focus™ liners.

Instrument	each	5-pk.
HP 5890/6890 4mm Split Precision Liner	21022	21023
Varian 1078/1079 Split Precision Liner	21024	21025
Shimadzu 17A Split Precision Liner	21020	21021
Varian 1075/1077 Split Precision Liner	21030	21031
Fisons, Trace, 8000 Series 5mm Split Precision Liner	21028	21029
PE Auto SYS Split Precision Liner	21026	21027

NEW

Capillary Column Caps

- ✔ Eliminates moisture and air from entering the column during storage.
- ✔ Color-coded for identifying detector and injector end.
- ✔ Attach to the column in seconds for an airtight seal.
- ✔ Increases column lifetime.
- ✔ Not recommended for reuse.

cat.# 21044, (10-pk.)

Peak Performers

by Brad Rightnour, Instrument Innovations Team Manager

New GC Accessories!

Drilled Uniliner® Sleeve for HP 6890 GCs

- ✔ Allows direct injections when using an EPC-equipped HP 6890.
- ✔ Minimizes injection port discrimination in splitless mode.
- ✔ Available with all Restek deactivations.

cat.# 21054, (ea.)
cat.# 21055, (5-pk.)

NEW

Varian Split 1177 Inlet Liner

- ✔ Meets or exceeds instrument manufacturer specifications.
- ✔ Available with all Restek deactivations.

cat.# 21045, (ea.)
cat.# 21046, (5-pk.)

NEW

ReadySpike™ Vial & Syringe Holders

NEW

21-Hole Holder

- ✔ Convenient storage for 2 syringes and 19 vials.
- ✔ Includes 19 pre-cleaned vials and Mininert® caps.
- ✔ Holds vials securely for easy transportation.
- ✔ Allows easy spiking of samples.

21-Hole Holder only: cat.# 21048, (ea.)
21-Hole Holder Kit: cat.# 21068, (kit)

5-Hole Holder

- ✔ Convenient storage for syringes and vials.
- ✔ Mounts onto GC for convenient accessibility.

cat.# 21049, (ea.)

Capillary Installation Gauge

NEW

- ✔ For use with HP-style nuts and ferrules.
- ✔ Pre-seats ferrule onto column for consistent installations.
- ✔ Made from high-quality stainless steel.

cat.# 21034, (ea.)

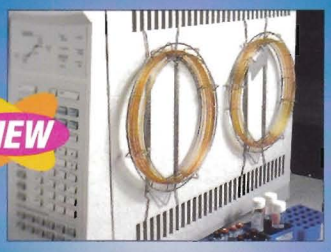
Finger-Tight Column Nuts

NEW

- ✔ Allows wrench-free column installations.
- ✔ Works with standard and compact (HP-style) ferrules.
- ✔ Made from high-quality stainless steel.

Finger-tight nut for use with compact (HP-style) ferrules: 21040, (2-pk.)
Finger-tight nut for use with standard (1/16") ferrules: 21041, (2-pk.)
Finger-tight nut for use with standard (1/16") compression fittings: 21042, (2-pk.)

GC Column Hangers



NEW

- ✔ Secure, short-term storage.
- ✔ Easily attaches to side of GC.
- ✔ Includes capillary column caps for sealing used columns.

GC Column Hangers: 21047, (2-pk.)

Encapsulated Ferrules

NEW

- ✔ Will not deform and stick in fittings.
- ✔ Allows re-usability of the ferrule.
- ✔ Less torque needed to seal ferrule.
- ✔ Unique blend of graphite provides less fragmentation and outgassing.
- ✔ For 1/16" compression fittings.

Ferrule ID (mm)	Fits column ID (mm)	cat.#	10-pk.
0.4	0.25	21036	
0.5	0.32	21037	
0.8	0.53	21038	

Moisture Control By-Pass Line for Tekmar 3000 Purge and Trap

NEW

- ✔ Increase response for ketones, alcohols, and acetates.
- ✔ Silcosteel®-treated tubing for increased inertness.
- ✔ Suitable for US EPA Methods 8260, 524.2, and OLM4.1.
- ✔ Easily attaches in minutes.

cat.# 21035, (ea.)

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