# Low-Bleed Column, New Reference Mixes for Semivolatile Organic Analytes in Drinking Water

Using Gas Chromatography/Mass Spectrometry (EPA Method 525.2)

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

# Rtx®-5Sil MS column provides:

- ✓ extremely low bleed, for greater sensitivity in GC/MS applications.
- excellent resolution of 110 target semivolatile compounds in EPA Method 525.2.

# EPA 525.2 reference materials are:

- ✓ economical calibration mixtures at 1000µg/mL concentration, for more analyses per ampul.
- ✓ convenient 106 compounds in only six mixtures.
- calibration mixtures formulated by chemical class: semivolatiles, PCB congeners, organochlorine pesticides, nitrogen/phosphorus pesticides.
- ✓ six nitrogen/phosphorus pesticides in a separate mix, for stability.

Gas chromatographic analyses for semivolatile analytes in drinking water require an inert, thermally stable, low-bleed stationary phase. EPA Method 525, a liquid-solid extraction / capillary GC/MS analysis, is applicable for monitoring a wide range of semivolatiles in an aqueous matrix. The new revision, Method 525.2, includes 110 target compounds. Restek provides the materials needed for this analysis: extraction disks, reference materials, and an inert column capable of excellent response for acids and bases, even at single digit nanogram on-column quantities.

Of the EPA GC/MS methods for analyzing semivolatiles, Method 525.2 is the most demanding for column inertness. Method 525.2 target analytes include many active compounds, e.g., endrin, methoxychlor, DDT, pentachlorophenol. Simple adjustments to the injection conditions can yield great improvements in

sensitivity, especially for active and high molecular weight compounds. Analytes can degrade in the injection port and exhibit excessive tailing. To prevent this, we use a Drilled Uniliner® inlet liner: a Press-Tight® seal between the fused silica column and the internal surface of the liner eliminates contact between the sample and the hot metal surfaces in the injection port. A pulsed injection (30psi, 0.5 min.) reduces the time the analytes spend in the injection port, and helps to minimize breakdown. Pulsed pressure injection increases the possibility of breaking the seal between the column and the liner. Therefore, head pressure should not exceed 50psi when using the pulsed splitless mode. A starting temperature of 35°C helps ensure excellent peak shapes for early eluting target analytes.

To reduce bleed and activity, Restek continues to explore new synthesis routes for both column deactivation and the stationary phase polymer. Improvements in technology allow our Rtx<sup>9</sup>-5Sil MS columns to withstand high bake-out temperatures without loss of deactivation. The inset in Figure 1 is an example of superior efficiency and low bleed for a mid-point standard, at 330°C. Peak shape and

Low-Bleed GC Column, New Reference Mixes for Semivolatile Organics in Drinking Water

Verify Fruit Juice Quality from Organic Acid Profiles, Using HPLC

Special-Purpose HPLC Column for PAHs

Cleaning and Personal Hygiene Products Analysis

Semivolatiles Reference Mix for Wastewater Analysis by GC/MS

Rtx®-5Sil MS Columns

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# **RESTEK Advantage**

response are excellent for the very active compounds endrin, DDT, and methoxychlor, peaks 89, 95, and 102, respectively.

Low-bleed Rtx®-5Sil MS columns ensure low detection limits and excellent instrument stability in semivolatiles analysis.

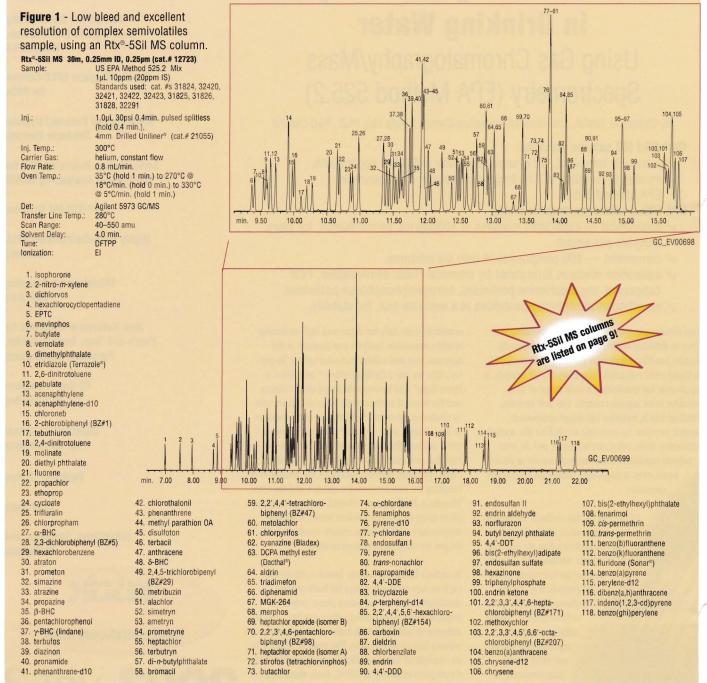
We incorporate 106 Method 525.2 target compounds in six new, stable mixtures. The concentration of each component in these mixes, 1000µg/mL,¹ is considerably higher than in mixes from other sources, and significantly more analyses can be conducted from each ampul of material. We have formulated the new calibration mixes by chemical class: semivolatiles, PCB congeners, organochlorine pesticides, nitrogen/phosphorous pesticides.² Pentachlorophenol is included in the semivolatiles mix at a concentration four times higher than the other analytes, as required by the method. For the convenience of our customers we include heptachlor epoxide isomer A, an analyte not on the target list for Method 525.2, in Chlorinated Pesticides Mix #2. Six of the nitrogen/phosphorous pesticide analytes on the target list are unstable in aqueous matrices; we combine these analytes in

a separate mix (cat.# 32423). We do not include two compounds, disulfoton sulfoxide and disulfoton sulfone, in either our new mixes or our existing mixes. In water, disulfoton is rapidly oxidized by chemical reaction to the analogous sulfoxide and sulfone. Consequently, the sulfoxide and sulfone cannot be included in the mix with disulfoton. We offer individual solutions of the two analytes — please refer to our catalog or web site.<sup>3</sup>

In addition to calibration mixes for Method 525, we also have all needed quality control standards: internal and surrogate standards, a fortification recovery standard, and a GC/MS performance check standard. New Method 525.2 Surrogate Standards Mix includes optional pyrene-d10. All new mixes are described on page 3.

### Reference

- ' Components in Method 525.2 PCB Congeners Mix (cat.# 32420) are at 200µg/mL each.
- <sup>2</sup> Previously available mixes for Method 525 include Organochlorine Pesticides Mix AB #3 (cat.# 32415), individual Aroclor<sup>a</sup> PCB solutions (cat.# 32075, 32077, 32079, 32081, 32083, 32085, 32087), and TCLP Toxaphene (cat.# 32015).
- 3 Catalog # MET 652-A and MET 652-B, respectively.



# Method 525.2 Semivolatile Mix (25 components)

acenaphthylene	1,000µg/mL	2.4-dinitrotoluene	1,000
anthracene	1.000	2,6-dinitrotoluene	1,000
benzo(a)anthracene	1,000	fluorene	1,000
benzo(a)pyrene	1,000	hexachlorobenzene	1,000
benzo(b)fluoranthene	1,000	hexachlorocyclopentadiene	1,000
benzo(ghi)perylene	1,000	indeno(1,2,3-cd)pyrene	1,000
benzo(k)fluoranthene	1,000	isophorone	1,000
benzylbutylphthalate	1,000	pentachlorophenol	4,000
bis(2-ethylhexyl)adipate	1,000	phenanthrene	1,000
bis(2-ethylhexyl)phthalate	1,000	pyrene	1.000
chrysene	1,000		
dibenzo(a,h)anthracene	1,000		
diethylphthalate	1,000		
dimethylphthalate	1.000		
di-n-butylphthalate	1,000		

### In acetone, 1mL/ampul

5-pk.	10-pk.
31824-510	_
w/data pack	
31824-520	31924
	31824-510 w/data pack

# Method 525.2 PCB Congener Mix (8 components)

2-chlorobiphenyl (BZ#1)	2,2',3',4,6-pentachlorobiphenyl (BZ#98)
2,3-dichlorobiphenyl (BZ#5)	2,2',4,4',5,6'~hexachlorobiphenyl (BZ#154)
2,4,5-trichlorobiphenyl (BZ#29)	2,2',3,3',4,4',6-heptachlorobiphenyl (BZ#171)
2,2',4,4'-tetrachlorobiphenyl (BZ#47)	2,2',3,3',4,5',6.6'-octachlorobiphenyl (BZ#200)

### 200µg/mL each in acetone, 1mL/ampul

5-pk.	10-pk.
32420-510	_
w/data pack	
32420-520	32520
	32420-510 w/data pack

# Method 525.2 Chlorinated Pesticide Mix #2 (12 components)

chlorobenzilate	е
chloroneb	h
chlorothalonil	t
chlorpyrifos	C
cyanazine (Bladex)	t
DCPA methyl ester (Dacthal®)	ρ

etridiazole (Terrazole®) heptachlor epoxide (isomer A) trans-nonachlor cis-permethrin trans-permethrin propachlor

# 1.000µg/mL each in acetone, 1mL/ampul

5-pk.	10-pk.
32421-510	<del></del> a
w/data pack	
32421-520	32521
	32421-510 w/data pack

# Organochlorine Pesticide Mix AB # 3 (20 components)

aldala	4.41.000	andria
aldrin	4,4'-DDD	endrin
a-BHC	4,4'-DDE	endrin aldehyde
b-BHC	4,4'-DDT	endrin ketone
d-BHC	dieldrin	heptachlor
g-BHC (lindane)	endosulfan I	heptachlor epoxide (isomer B)
a-chlordane	endosulfan II	methoxychlor
g-chlordane	endosulfan sulfate	

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

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

# Method 525.2 Nitrogen/Phosphorous Pesticide Mix #2 (6 components)

carboxin	fenamiphos
diazinon	merphos (tributylphosphorotrithioite)
disulfoton	terbufos

1.000µg/mL each in acetone, 1mL/ampul

Each	5-pk.	10-pk.
32423	32423-510	
	w/data pack	
32423-500	32423-520	32523

# Method 525.2 Nitrogen/Phosphorous Pesticide Mix #1 (39 components)

alachlor	MGK-264
ametryn	molinate
atraton	napropamide
atrazine	norflurazon
bromacil	pebulate
butachlor	prometon
butylate	prometryne
chlorpropham	pronamide
cycloate	propazine
dichlorvos (DDVP)	simazine
diphenamid	simetryn
EPTC	stirofos (tetrachlorvinphos)
ethoprop (ethoprophos)	tebuthiuron
fenarimol	terbacil
fluridone (Sonar®)	terbutryn
hexazinone	triadimefon
methyl parathion OA	tricyclazole
metolachlor	trifluralin

mevinphos (phosdrin)

metribuzin\*

1,000µg/mL each in acetone, ImL/ampul

Each	5-pk.	10-pk.
32422	32422-510	_
	w/data pack	
32422-500	32422-520	32522

vernolate

# **Method 525.2 Internal Standard Mix**

acenaphthene-d10	phenanthrene-d10
chrysene-d12	

1,000µg/mL each in acetone, ImL/ampul

1,000µg/mL each in acetone. ImL/ampul

Each	5-pk.	10-pk.
31825	31825-510	_
	w/data pack	
31825-500	31825-520	31925

# Method 525.2 GC/MS Performance Check Mix

mountain sected and more a street minimum of	
4,4'-DDT	endrin
DFTPP (decafluorotriphenylphosphine)	

Each	5-pk.	10-pk.
31827	31827-510	_
	w/data pack	
31827-500	31827-520	31927

# Method 525.2 Surrogate Standard Mix

2-nitro- <i>m</i> -xylene	pyrene-d10
(1,3-dimethyl-2-nitrobenzene)	triphenylphosphate
perylene-d12	

1,000µg/mL each in acetone, ImL/ampul

Each	5-pk.	10-pk.
31826	31826-510	<del>-</del>
	w/data pack	
31826-500	31826-520	31926

# **Method 525.2 Fortification Recovery Standard**

# p-terphenyl-d14

1,000µg/ml in acetone, 1ml/ampul

5-pk.	10-pk.
31828-510	
w/data pack	
31828-520	31928
	31828-510 w/data pack

- 47mm glass fiber embedded with C18 bonded silica.
- · Deep-pore design reduces clogging and allows faster flow rates.

Description	qty.	cat.#	
Resprep <sup>™</sup> -C18-47 Disks	20-pk.	24004	



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<sup>\*</sup>Offered independently: please inquire.

# **Verify Fruit Juice Quality from Organic Acid Profiles**

# Using New Allure™ Organic Acids HPLC Column

By Rebecca Wittrig, Ph.D., Senior Innovations Chemist

- ✓ One 30cm Allure™ Organic Acids column replaces two C18 columns in AOAC methodology.
- Stable and reproducible retention, even with 100% aqueous mobile phases, as in AOAC method 986.13.
- Facilitates detection of fruit juice adulteration.

The fruit juice industry in the US alone is worth over \$12 billion per year' and is many times that worldwide. High-value juices have been replaced or extended through substitution of sugars for juice solids, or by dilution with less expensive juices, such as white grape juice or pear juice. To detect adulteration, investigators examine sugar profiles and sorbitol content; minerals; anthocyanin pigments; phenolics; oligosaccharides; carbon stable isotope ratio for various components; and/or organic acid profiles. Because juices are chemically complex, several complementary analyses should be performed to verify authenticity. The resolving power of high performance liquid chromatography (HPLC) is invaluable for accurately quantifying many of these components.

The organic acids that give fruit products their characteristic tartness vary in combination and in concentrations among different juices, and the organic acid profile can be used to identify a juice or verify its purity. For example, malic acid is a major component of the organic acid content of apple juice. If apple juice has been diluted, e.g., with sugar water, the malic acid content will be low. Cranberry juice contains quinic, malic, and citric acids; grape juice, on the other hand, contains relatively high levels of tartaric acid. A "cranberry juice" that contains measurable amounts of tartaric acid should be suspect.

Typically, organic acids in fruit juices are identified and quantified by using methods such as AOAC method 986.13.2 In this procedure, reversed phase HPLC is used to separate the acids. Because several of the analytes are extremely difficult to resolve, a 100% aqueous mobile phase is needed to enhance interaction between the acids and the C18 stationary phase, but the C18 chains in conventional columns collapse in a totally aqueous environment, greatly reducing the resolving capability of the column. To compensate, two columns must be used in series.

Now there is a simpler and more reliable approach: a single 30cm Allure<sup>76</sup> Organic Acids column effectively resolves key organic acids, under the chromatographic conditions specified in AOAC method 986.13. Figure 1 shows a separation of typical fruit juice organic acids: tartaric, quinic, malic, citric, and fumaric acids. Note the excellent resolution of

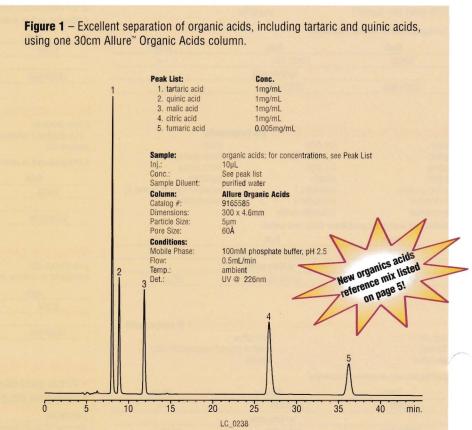
tartaric and quinic acids! This superior performance makes interpretation of the data more reliable. Similarly, note the distinct organic acid profiles for grape juice and cranberry juice cocktail in Figure 2.

Analysis of polar organic acids is difficult at best on conventional reversed phase columns. In contrast, an Allure™ Organic Acids column provides excellent retention and selectivity for these compounds, allowing the separation to be performed on a single column. Retention is stable and reproducible, even with a 100% aqueous mobile phase as specified in AOAC method 986.13. If you are monitoring fruit juice quality, and want a trouble-free analysis with accurate results, we highly recommend an Allure™ Organic Acids column.

Organic acids are difficult to analyze on conventional reversed phase columns. A 100% aqueous mobile phase increases interaction between the acids and the stationary phase, but C18 chains collapse in a totally aqueous environment. The Allure™ Organic Acids column was designed to enhance retention and selectivity for this challenging application. Novel binding chemistry ensures the alkyl groups in Allure™ Organic Acids columns remain extended in 100% aqueous mobile phases; retention is stable and reproducible.

### References

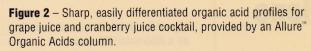
- Authenticity of Apple Juice Technical Bulletin #2 (1996), Analytical Chemical Services of Columbia, Inc.
- Gfficial Methods of Analysis (2000), AOAC International, 17th edition, method #986.13.

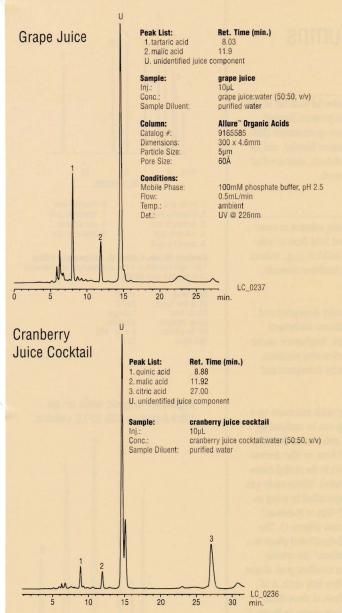


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## Allure" Organic Acids Column (Sum silica: 4 Smm ID)

rinaro	Length	cat.#
	150mm	9165565
	250mm	9165575
	300mm	9165585

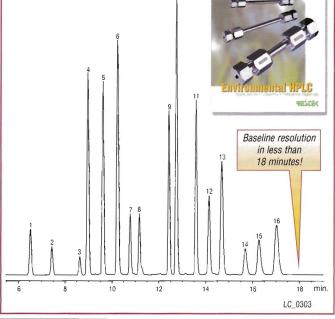
Organic Acid	ts Reference l	Vixture	
citric acid	$2000\mu g/mL$	quinic acid	2000
fumaric acid	10	tartaric acid	2000
malic acid	2000		
Eac	ch	5-pk.	10-pk.
In water, 1mL/	ampul		
35080		35080-510	<del>-</del>
35080-500	*	35080-520*	35180*
In water, 5mL/a	ampul		
35081		35081-510	_
35081-500	*	35081-520*	35181*
*w/data pack			

# **Baseline Separation of** PAHs by HPLC, Using a Pinnacle II™ PAH Column

- ✓ Fast analysis resolve 16 target PAHs in less than 18 minutes!
- Excellent resolution cross-linked C18 phase gives baseline separation.
- ✓ Column-to-column reproducibility we control the entire manufacturing process: silica production column manufacture - final testing. You will see the same outstanding performance from every Pinnacle II™ PAH column you use!

Figure 1 - Baseline separation of US EPA Method 610 PAHs in <18 minutes.

Column:	Pinnacle II™ PAH	Peak List:	Conc. (µg/mL
Catalog #:	9219563	<ol> <li>naphthalene</li> </ol>	100
Dimensions:	150 x 3.2mm	<ol><li>acenaphthylene</li></ol>	100
Particle Size:	5µm	<ol><li>acenaphthene</li></ol>	100
Pore Size.	110Å	4. fluorene	100
Conditions:		<ol><li>phenanthrene</li></ol>	50
Mobile Phase: A:	purified water, B: acetonitrile	<ol><li>anthracene</li></ol>	100
	Time (min.) %B	<ol><li>fluoranthene</li></ol>	50
	0 40	8. pyrene	50
	7 60	<ol><li>benzo(a)anthracene</li></ol>	50
	11 100 17.9 100	10. chrysene	50
	17.9 100 18 40	<ol> <li>benzo(b)fluoranthene</li> </ol>	50
Flow:	1.2 mL/min	12. benzo(k)fluoranthene	50
Temp	ambient	<ol><li>benzo(a)pyrene</li></ol>	50
Det :	UV @ 254nm	14. dibenzo(a,h)anthracene	50
Sample:	0.00 20	<ol><li>benzo(ghi)perylene</li></ol>	50
Inj	5µL PAH standard (cat.#31264)	16. indeno(1,2,3-cd)pyrene	50
Conc.	see peak list	Other reference mixes availa	ble
Sample Diluent:	1:9 methylene chloride.acetonitrile	please see our catalog or we	ebsite.
Sample Temp	ambient		
An example	e chromatogram from ou Request your copy to	ır new <b>Environmental HP</b> day! lit. cat.#59741	<b>LC</b> flyer.
		10	P



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# **Cleaning and Personal Hygiene Products Analysis**

# Using Restek GC and HPLC Columns

By Rebecca Wittrig, Ph.D., Senior Innovations Chemist

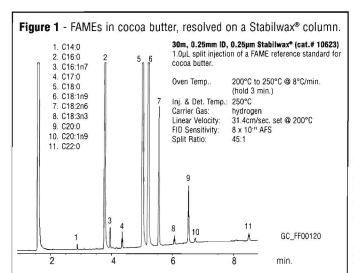
# Introduction

Gas chromatography (GC) and high performance liquid chromatography (HPLC) are powerful tools for analyzing ingredients in cleaning and personal hygiene products. In GC assays, either a general-purpose detector, such as a flame ionization detector (FID), or an information-rich detector, such as a mass spectrometer (MS), can be used. GC/MS is particularly useful for analyzing complex formulations (e.g., fragrance blends), and for identifying unknown components or contaminants. HPLC is well suited to analysis of acidulants, antimicrobial agents, and some surfactants. In general, UV-visible or light-scattering detectors can be used.

# Ingredients in Cleaning / Hygiene Products

Surfactants (surface active agents) reduce the surface tension of water, enabling a cleaning solution to more efficiently wet the surface to be cleaned. Also, surfactants emulsify oils and other soils, and hold them in solution so they can be rinsed away. Builders increase the effectiveness of surfactants. Some builders (e.g., sodium citrate, ethylenediamine tetraacetic acid) act by chelating with metal ions from dissolved hardness minerals, others (e.g., calcium carbonate) form insoluble precipitates with these metals.

Anionic surfactants (e.g., alcohol ethoxysulfates, alkyl sulfates, soaps), are used in laundry detergents and some dishwashing detergents, household cleaners, and personal cleaning products. Cationic surfactants (e.g., quaternary ammonium compounds) are used in products such as fabric softeners. Amphoteric surfactants, which can be either positively or negatively charged, often are used in personal cleansing products, due to their mildness. Nonionic surfactants (e.g., alcohol ethoxylates) are used in laundry detergents and automatic dishwasher detergents.



Fatty acids that make up a soap can be analyzed by GC, either in the free fatty acid form or after derivatization to the methyl esters (FAMEs). FAMEs easily can be quantified by using an Rtx®-Wax or Stabilwax® column (Figure 1). The acid-deactivated phase in a Stabilwax® DA column gives excellent peak shapes for free fatty acids. A GC analysis of short-chain acids is shown in Figure 2.

Solvents are used primarily to dissolve organic soils. Alcohols and glycols are popular solvents. Many

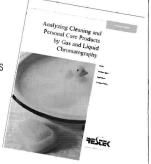
cleaning solvents can be analyzed by GC on an Rtx®-Wax column or an Rtx®-VMS column. An Rtx®-VMS column gives excellent selectivity and peak shape for a wide range of cleaning solvents - for example analyses, see Advantage 2003 vol. 2, page 3.

Organic acids (e.g., acetic and citric acids) are used to lower the pH of cleaning products to remove mineral buildup. They also have roles as fragrance and antimicrobial agents. Organic acids can be analyzed either by HPLC or by GC.

# Analyzing Cleaning and **Personal Care Products** by Gas and Liquid Chromatography

For many additional examples of GC and HPLC analyses of the diverse ingredients in cleaning products, request this free 16-page technical auide.

lit. cat.# 59738.

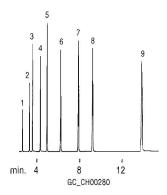


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Figure 2 - Short-chain organic acids on a Stabilwax®-DA column.



1. acetic acid 2. propionic acid 3. isobutyric acid 4 n-butyric acid

5. isovaleric acid

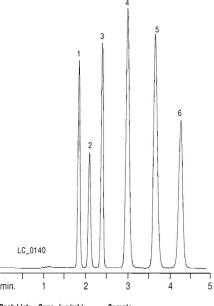
6. n-valeric acid isocaproic acid 8. caproic acid

9 hentanoic acid

Stabilwax-DA 30m, 0.25mm ID, 0.25µm (cat.# 11023) 1.0µL split injection of a free acid standard, approximately 10 to 20ng/µL each analyte.

Oven Temp.: Inj. & Det. Temp.: 250°C Carrier Gas: hydrogen Linear Velocity: 40cm/sec FID Sensitivity: 2 x 10" AFS Split Ratio:

Figure 3 - Organic acids on an Ultra Aqueous C18 HPLC column.



Peak List: Conc. (µg/mL): 1. malonic acid 500 2. lactic acid 1000 3. acetic acid 4. citric acid 5. succinic acid 2000 6. fumaric acid

Dimensions:

Pore size:

Sample: HPLC-grade water Solvent:

Conditions:

Ultra Aqueous C18 Catalog #

150 x 4.6mm

Flow Temp.:

1.5mL/min. UV @ 210nm

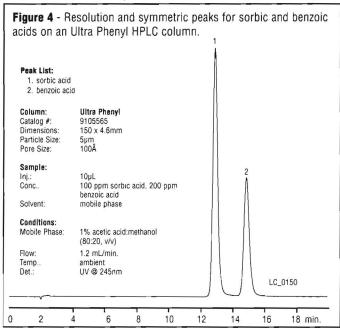
Mobile phase: 50mM potassium phosphate, pH 2.5: acetonitrile (99:1)

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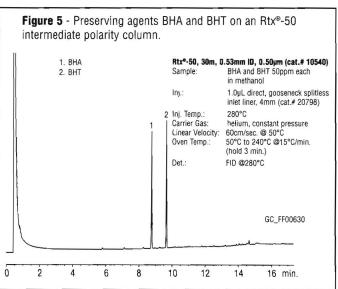
but HPLC typically provides better results for dicarboxylic acids. Figure 3 shows a separation of organic acids on an Ultra Aqueous C18 HPLC column.

Alkalis (bases), including ethanolamines, ammonium hydroxide, and sodium silicate, are used to neutralize acidic ingredients, or to raise the pH for dissolving fatty or oily soils. The more basic compounds (e.g., ethanolamines) can be analyzed by GC; a base-deactivated Rtx\*-5Amine column will minimize peak tailing.

Disease and odor are controlled by restricting microbial growth. *Antimicrobial agents* can be categorized as sterilizers, disinfectants, sanitizers, or antiseptics / germicides. Sterilizers eliminate fungi, viruses, and bacteria; disinfectants destroy or control fungi and bacteria, but not necessarily their spores; sanitizers reduce microorganisms on surfaces; antiseptics are applied on living people and animals. Examples of antimicrobial agents are quaternary ammonium compounds, sodium hypochlorite, alcohols, benzoic and sorbic acids, iodine, Triclosan, and PCMX (4-chloro-3,5-dimethylphenol). Figure 4 demonstrates the separation of benzoic and sorbic acids on an Ultra Phenyl HPLC column.



BHT (3,5-di-*tert*-butyl-4-hydroxytoluene), BHA (2- & 3-*tert*-butyl-4-hydroxyanisole), EDTA (ethylenediamine tetraacetic acid), glutaraldehyde, and other compounds are used as preserving agents, to extend product shelf life. BHT and BHA are phenolic antioxidants that can be analyzed either by GC (Figure 5) or by HPLC.



Fragrances and colorants give a product a unique scent and appearance. In general, GC is effective for monitoring or identifying fragrance components, as demonstrated by many application chromatograms in the Restek chromatography products catalog (lit. cat.# 59473, available from your Restek representative on request).

# Summary

GC and HPLC are highly effective approaches to monitoring a broad and diverse array of ingredients in cleaning and personal hygiene products. Restek chromatographic columns and supplies ensure peak performance of these chromatographic assays.

# **HPLC Columns**

# Ultra Phenyl particle: 5μm, spherical pore size: 100Å 4.6mm ID Length cat.# 150mm 9105565

# **Ultra Aqueous C18**

pore size: 100Å
cat.#
9178565

# GC Columns (fused silica)

## Rtx®-50

Crossbond® 50% methyl/50% phenyl polysiloxane temp. limits: 0 to 270/290°C

Length	ID (mm)	df (μm)	cat.#
30m	0.53	0.50	10540

## Stabilwax®-DA

Crossbond® Carbowax® polyethylene glycol for acidic samples temp. limits: 40 to 250°C

Length	ID (mm)	df (µm)	cat.#
30m	0.25	0.25	11023

## Stabilwax®

Crossbond® Carbowax® polyethylene glycol temp. limits: 40 to 250°C

Length	ID (mm)	df (µm)	cat.#
30m	0.25	0.25	10623

# **Organic Acids Reference Mixture**

In water, 1mL/	empul		
Each		5-pk.	10-pk.
malic acid	2000		
fumaric acid	10	tartaric acid	2000
citric acid	$2000\mu \mathrm{g/mL}$	quinic acid	2000

Each	5-pk.	10-pk.
In water, 1mL/ampul		
35080	35080-510	_
35080-500*	35080-520*	35180*
In water, 5mL/ampul		
35081	35081-510	_
35081-500*	35081-520*	35181*
*w/data pack		



# New Semivolatiles Reference Mix for Wastewater Analysis

# by Gas Chromatography/Mass Spectrometry

By Katia May, Ph.D., R&D Chemist, Chris English, Environmental Innovations Chemist, and John Lidgett, Analytical Reference Materials Manager

- New MegaMix<sup>™</sup> formulation of all 54 target compounds, for fast preparation of working solutions.
- Mix includes "additional" extractable Method 625 compounds.
- ✓ Inert, low-bleed Rtx®-5Sil MS column ensures fast analysis, reliable data.

US EPA Method 625 is a GC/MS method applicable to analysis of organic compounds in water and soil. The sample is serially extracted with methylene chloride at pH >11, then at pH <2; the extract is dried, concentrated to 1mL, and analyzed.

Method 625 is appropriate for several classes of chemicals: phenols, benzidines, phthalate esters, polyaromatic hydrocarbons, chlorinated pesticides, toxaphene, and Aroclor<sup>ω</sup> PCBs. Our new calibration mix, Semivolatiles MegaMix<sup>™</sup>, EPA Method 625, combines many of these analytes in a single mix, for faster and more convenient preparation. For com-

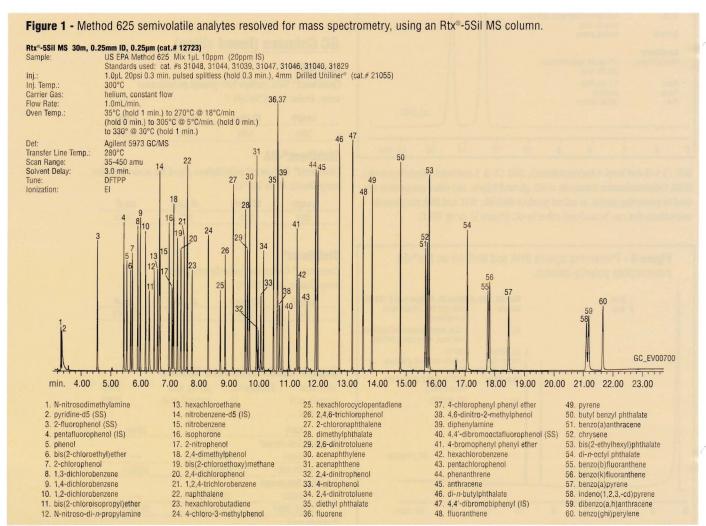
pleteness, we also include target compounds listed as "additional" in Method 625. The mixture has been formulated carefully, to ensure maximum stability, and two independently prepared lots are available. The components of the mix are listed in Figure 1.

Some of the target compounds in Method 625 are subject to thermal or chemical degradation in the heated GC injection port. The most labile compound, N-nitrosodiphenylamine, totally decomposes to diphenylamine at the GC inlet. In formulating the new MegaMix™ we have taken steps to compensate for the degradation problem. For example, we include the

compound that is analyzed, diphenylamine, rather than the parent compound, N-nitrosodiphenylamine, in the mix.

Hexachlorocyclopentadiene, pentachlorophenol, 2,4-dinitrophenol, and other compounds will degrade to varying degrees on contact with active sites in the injection port. To minimize this problem, we use a Drilled Uniliner® inlet liner to prevent the sample from coming into contact with the metal surface below the inlet sleeve. The end of the column seals against the tapered end of the Drilled Uniliner® inlet liner, and the sample is channeled directly from the liner into the column, eliminating the most active portion of the sample flow path. A hole in the side of the liner allows carrier gas to flow normally during split/splitless injections.

Method 625 calls for a column that exhibits low bleed, in addition to providing adequate analyte separation. We recommend a 30m, 0.25mm ID, 0.25µm Rtx®-5Sil MS column (cat.# 12723) — these columns are characterized by effective selectivity for the target analytes, low bleed, excellent inertness, and a high maximum operating temperature. A 30m, 0.25µm ID, 0.25µm column separates critical analyte pairs in less than 22 minutes (Figure 1).



Rtx®-5Sil MS columns are especially well suited for Method 625. Extracts of environmental samples analyzed using this method commonly contain high molecular weight contaminants, and high bake-out temperatures are needed to remove these from the column. The Rtx®-5Sil MS stationary phase and the proprietary deactivation used to prepare these columns can reliably withstand sustained temperatures of 330°C, and will not exhibit the activity that often is caused by subjecting a column to these conditions. Analysts using Rtx®-5Sil MS columns can program their GCs to 350°C for especially persistent contamination. Figure 1 shows Restek analytical reference materials analyzed on an Rtx®-5Sil MS column programmed to 330°C. Bleed is negligible, relative to the 10ng on-column concentration of the target analytes, such as benzo(ghi)perylene.

To obtain Figure 1, conditions were optimized to achieve the fastest analysis without sacrificing resolution of analytes that share quantification ions, such as benzo(b)fluoranthene and benzo(k)fluoranthene (peaks 55 & 56). Steps were taken to focus Nnitrosodimethylamine. To minimize tailing, the pulsed-splitless hold-time was reduced to 0.3 minutes to reduce the time the analytes spend in the injection port. This step also sends a higher percentage of solvent to the split vent, allowing resolution of the amine from the solvent. The initial temperature, 35°C, allows better analyte focus at the column inlet. The pulsed pressure was reduced from 30psi to 20psi to allow even transfer of N-nitrosodimethylamine to the column. Finally, the flow rate was reduced from 1.1mL/min. to 1.0mL/min. Analytes present at higher concentrations will exhibit less tailing at the lower rate.

# Semivolatiles MegaMix", EPA Method 625

## (54 components)

acenaphthene di-n-butylphthalate acenaphthylene 4.6-dinitro-2-methylphenol 2.4-dinitrophenol anthracene benzo(a)anthracene 2,4-dinitrotoluene 2,6-dinitrotoluene benzo(a)pyrene benzo(b)fluoranthene di-n-octylphthalate benzo(ghi)perylene diphenylamine fluoranthene benzo(k)fluoranthene benzyl butyl phthalate fluorene bis(2-chloroethoxy)methane hexachlorobenzene bis(2-chloroethyl)ether hexachloro-1,3-butadiene bis(2-chloroisopropyl)ether hexachlorocyclopentadiene\* bis(2-ethylhexyl)phthalate hexachloroethane 4-bromophenyl phenyl ether indeno(1,2,3-cd)pyrene 4-chloro-3-methylphenol isophorone 2-chloronaphthalene naphthalene 4-chlororphenyl phenyl ether nitrobenzene 2-chlorophenol 2-nitrophenol chrysene 4-nitrophenol dibenzo(a,h)anthracene N-nitrosodimethylamine\* N-nitroso-di-n-propylamine 1,2-dichlorobenzene 1,3-dichlorobenzene pentachlorophenol phenanthrene 1.4-dichlorobenzene 2 4-dichlorophenol ohenol diethylphthalate pyrene 1,2,4-trichlorobenzene 2,4-dimethylphenol 2,4,6-trichlorophenol dimethylphthalate

1.000µg/mL each in methylene chloride:benzene (75:25), ImL/ambul

Each	5-pk.	10-pk.
31829	31829-510	_
	w/data pack	
31829-500	31829-520	31929

\*Listed as an "additional" compound in Method 625 (diphenylamine is included in this mix in place of unstable N-nitrosodiphenylamine). The six other "additional" compounds are components in other Restek reference mixes used for Method 625: benzidine is included in cat.# 31030; \$\beta\$-BHC, endosulfan I, endosulfan II, endrin are in cat.# 32291.

# **SV Internal Standard Mix**

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

5-pk.	10-pk.
h in methylene chlorid	e, 1mL/ampul
31206-510	_
w/data pack	
31206-520	31306
h in methylene chlorid	e, lmL/ampul**
31006-510	-
w/data pack	
31006-520	31106
	h in methylene chlorid 31206-510 w/data pack 31206-520 h in methylene chlorid 31006-510 w/data pack

<sup>\*\*</sup>Requires special handling (warming and sonication) before use.

### **605 Benzidines Calibration Mix**

benzidine 3,3'-dichlorobenzidine 2,000µg/mL each in methanol, 1mL/ampul

5-pk.	10-pk.
31030-510	<del>-</del> -
w/data pack	
31030-520	31130
	w/data pack

## Rtx®-5Sil MS Column (fused silica)

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

ID	df (µm)	temp. limits	30-Meter
0.25mm	0.25	-60 to 330/350°C	12723

Let us create the right solution for you!

We can make **CUSTOM MIXTURES**to meet your specific compound lists.

Call us at 800-356-1688 or 814-353-1300 or use the Custom Reference Materials Request Form on our website:

www.restekcorp.com

# Rtx®-5Sil MS Columns: Ideal for Semivolatiles Extracts!

- Excellent low bleed column for semivolatile pollutants, pesticides, PCBs, other environmental applications.
- ✓ Thermally stable to 350°C.
- ✓ Silarylene phase with polarity similar to 5% diphenyl/95% dimethyl polysiloxane.

The silarylene stationary phase in Rtx®-5Sil MS columns incorporates phenyl rings into the polymer backbone. This improves thermal stability and makes the phase less prone to oxidative degradation, significantly reducing bleed. Rtx®-5Sil MS columns are ideal for use with GC/MS systems, including ion trap systems. The 0.28mm ID columns increase sample capacity, relative to 0.25mm ID columns, without significant loss in resolution. We recommend them for environmental analyses.

# Rtx®-5Sil MS Columns (fused silica)

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

ID	df (µm)	temp. limits	15-Meter	30-Meter
0.25mm	0.10	-60 to 330/350°C	12705	12708
	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

For Rtx®-5Sil MS columns of other IDs, refer to our chromatography supplies catalog, or visit our website.





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# Highly Base-Deactivated HPLC Columns from Restek

# Pinnacle<sup>™</sup> DB Columns: the Performance of Popular BDS Columns, with Plus 1<sup>™</sup> Quality and Service

By Greg France, HPLC Products Marketing Manager, and Vernon Bartlett, HPLC Innovations Team Manager

- ✓ Performance-equivalent replacement for Hypersil® BDS columns.
- ✓ In stock, ready to ship.
- Stock columns in analytical to prep scale.

When we set out to create a new base-deactivated silica, we had five specific goals:

- A material that would match or exceed the performance of any base-deactivated "Type B" silica.
- A material that would provide chromatographic separations equivalent to Hypersil® BDS silica.
- A material with low metals content, for sharp, symmetric peaks for basic analytes.
- A material capable of long lifetime in challenging HPLC environments.
- An effective and efficient manufacturing process, to ensure columns are always available.

Pinnacle™ DB silica meets all of these goals.

Pinnacle™ DB silica performs as well as any basedeactivated Type B silica, or better, and closely matches the desirable physical characteristics of Hypersil® BDS silica. For certain physical parameters we intentionally deviated from Hypersil® BDS material — total metals content, for example. Fewer metal ions on the surface of Pinnacle™ DB silica particles ensure sharper and more symmetric peaks for basic analytes.

Of course, what really matters is how separations on columns made with the two silicas compare. Figure 1 pairs chromatograms for a neutral/base test mix from a C18 bonded phase Pinnacle<sup>14</sup> DB column and a Hypersil<sup>9</sup> BDS column, obtained using the same instrument, mobile phase, and conditions. Retention, peak shape, and efficiency are nearly identical in the two chromatograms.

If physical data and chromatographic comparisons show Pinnacle™ DB and Hypersil® BDS materials are

very closely matched, why use Pinnacle™ DB columns? In brief: competitive prices, fast delivery, and unsurpassed Restek service. Why settle for less? But, we want you to be completely comfortable in evaluating our columns. With that in mind, we *guarantee* separations of your samples on Pinnacle™ DB columns will be comparable to separations on Hypersil™ BDS columns. If a Pinnacle™ DB column does not meet your satisfaction, simply send us copies of chromatograms for your application on the Pinnacle™ DB column and on a Hypersil™ BDS column. We will credit your account for the price of the Pinnacle™ DB column, and you can keep the column - free!

The Pinnacle™ DB line currently includes C18, C8, and cyano bonded phases, and bare silica. Example applications for each of the bonded phase columns, including fast LC analysis, and Pinnacle™ DB / Hypersil® BDS comparisons, are shown in *Pinnacle™ DB HPLC Columns as Replacements for Hypersil® BDS*, Restek lit. cat.# 59742, available on request.

If you need a second source for Hypersil® BDS column performance, if you want a rugged, high quality, base-deactivated material, or if you simply are looking for a reliable supplier who provides columns quickly, Pinnacle $^{**}$  DB columns are your answer. Of course, as always, you'll get Plus  $1^{**}$  service and prompt, expert technical help when you deal with Restek.

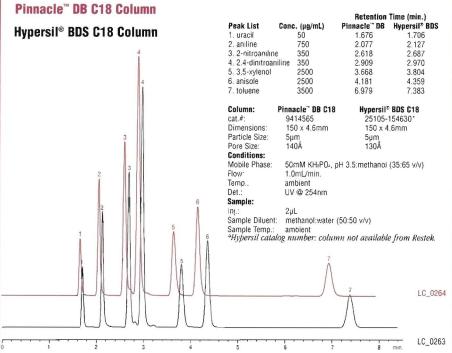
# Pinnacle™ DB C18 Column (USP L1) (5µm silica, 4.6mm ID)

Length	cat.#	
150mm	9414565	

For the complete selection of Pinnacle™ DB Columns, visit our website, www.restekcorp.com, or request Applications Note 59742.

More information and additional Pinnacle™ DB / Hypersil® BDS comparisons are included in **Applications Note 59742** (free on request).

**Figure 1-** Pinnacle<sup>™</sup> DB columns and Hypersil<sup>®</sup> BDS columns provide nearly identical retention, peak symmetry, and efficiency.

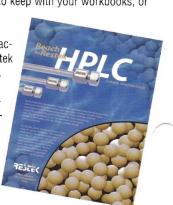




# HPLC Column Selection Guide (lit. cat.# 59454A)

A useful chart to keep with your workbooks, or

post on a wall.
Quickly scan
important characteristics of Restek
HPLC columns.
Includes brief,
practical guidelines for choosing stationary
phase, particle
size, pore
diameter, and
column
dimensions.



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2003 Volume 3

# **New Reference Materials**

# Purge and Trap Analysis – Environmental – Forensics

By Katia May, Ph.D., R&D Chemist

# **Antifoam Agent for Purge & Trap Samples**

- Efficiently controls foam; effective over a wide pH range.
- Add an antifoaming agent, rather than diluting the sample, to ensure lower detection limits.
- Effective at less than 0.1% of sample volume.

Methods for monitoring volatile organic compounds (VOC) in waste streams, such as US EPA methods 624 and 8260, involve purge & trap techniques. Often, foam is generated as the purge gas passes through the sample. Foam can enter the analytical trap and potentialy be carried into the GC column. Silica/silicone antifoam agents easily control polyglymes and alkaline detergent-based foams, the most commonly encountered foams in these analyses. Our new silica-containing antifoam agent generally is effective at very low concentration: 1µL per 5mL.¹ By eliminating the need to dilute samples, it allows lower detection limits.

 Good laboratory practices call for assaying an antifoam blank as a control.

# **Antifoam Agent for Purge & Trap Samples**

Neat, 1mL/ampul

Each	5-pk.	
31822	31822-510	

# **Explosives Standard**

- Propylene glycol dinitrate (PGDN), the main component of Otto Fuel II for torpedoes and other weapons.
- Convenient 1,000µg/mL concentration.

PGDN is very similar to nitroglycerin, but is significantly safer to handle, and can be stored for long periods of time. Nonetheless, the material is an environmental hazard; the National Institute for Occupational Safety and Health (NIOSH) recommended limit of exposure to airborne PGDN is 0.05ppm over a 40-hour work week. Otto Fuel II is in at least 2 National Priorities List sites identified by the US EPA. PGDN enters the environment primarily in wastewater from naval facilities.

Many of our customers have asked us to include PGDN among our stock offerings. We are now able to comply with this request.

# **PGDN Standard (Propylene Glycol Dinitrate)**

1,000µg/mL in methanol. ImL/ampul

Each	5-pk.	10-pk.
31821	31821-510	_
	w/data pack	
31821-500	31821-520	31921

# **Bank Dye Standard**

Qualitative standard of red dye used to thwart bank robberies.

The dye pack or "security pack" used in over 75% of the banks in the United States contains a red dye, 1-N-methylaminoanthraquinone (MAAQ). The dye pack, which is activated when it is taken outside the bank, explodes and releases an aerosol of red smoke, and burns at a temperature of about 400°F. When events go as planned, the thief discards the bag, the money is recovered, and stained hands and clothes expose the robber. The dye pack has contributed to the recovery of \$20 million in stolen money and apprehension of 2500 criminals. Restek offers this new qualitative standard to help investigators in municipal police stations and criminal laboratories fight crime.

# Bank Dye Standard (MAAQ)

1-(methylamino)anthraquinone
100µg/mL in methylene chloride, ImL/ampul

Each	5-pk.	10-pk.
31823	31823-510	31923

# **Miniature Air Sampling Canisters**

- ✓ 400cc ideal for indoor air, personal, emergency response, or soil gas sampling.
- Available with quick-connect fitting that is compatible with sampling and analysis instruments.
- ✓ Also available with non-treated or Sulfinert\*-treated valve.

These small canisters are designed for controlled sampling, such as personal air sampling, as an alternative to tube and pump samplers.

Restek offers these products in stainless steel or with Sulfinert<sup>™</sup> coating for greatest inertness. We continue to offer passive coating technologies that are unmatched in the air sampling industry—try a Sulfinert<sup>™</sup>-treated canister and achieve the ultimate in analyte stability.

# **Miniature Air Sampling Canisters with Quick-Connect Stem Fittings**

Description	Volume	qty.	cat.#
Electro-Polished Miniature Canister with Quick-Connect Stem Fitting	400cc	ea.	24188
Sulfinert™-Coated Miniature Canister with Quick-Connect Stem Fitting	400cc	ea.	24189
Sulfinert™-Coated Miniature Canister with Sulfinert™-Treated Quick-Connect Stem Fitting	400cc	ea.	24190

# Miniature Air Sampling Canisters with Metal-Seated Diaphragm Valve

Description	Volume	qty.	cat.#
Electro-Polished Miniature Canister with Metal-Seated Diaphragm Valve	400cc	ea.	24191
Sulfinert™-Coated Miniature Canister with Metal-Seated Diaphragm Valve	400cc	ea.	24192
Sulfinert™-Coated Miniature Canister with Sulfinert™-Treated Diaphragm Valve	400cc	ea.	24193

# **Fittings for Miniature Air Sampling Canisters**

qty.	cat.#
ea.	24185
ea.	24186
ea.	24187
	ea. ea.





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# **Canisters Optimized for Air Sampling** by EPA Methods T0-14 and T0-15

By Donna Lidgett, Air Sampling Products Marketing Manager

- SUMMA® canister equivalent.
- Excellent analyte recovery even after 14 days of storage.



High-purity, <sup>2</sup>/<sub>3</sub>-turn valve with stainless steel diaphragms.

Vacuum/pressure gauge (optional).

Variety of sizes.

Temperature stability to 250°C.

US Environmental Protection Agency (EPA) Compendium of Air Methods TO-14 and TO-15 regulate the collection, storage, and analysis of volatile organic compounds (VOCs) using treated air sampling canisters.

Restek offers a line of TO-Can" canisters (SUMMA® can equivalent), which are electropolished and extensively cleaned using proprietary processes. This ensures a high-quality, passivated surface to maintain stability of the TO-14/TO-15 compounds during storage. The design of the frame surrounding the electropolished canister eliminates welds on the sphere, thereby eliminating active sites. A Parker Hannifin metal-to-metal diaphragm valve further improves the performance of the canister.

Benefit

No sample adsorption, for more accurate results; easy to use.

Indicates internal conditions.

Meet a range of sampling needs.

Higher temperature cleaning saves time.

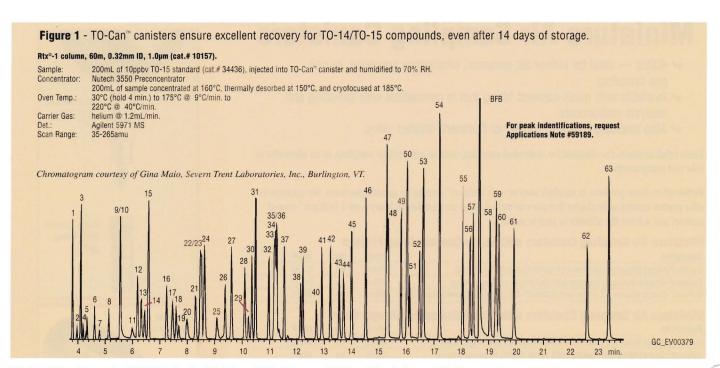
To collect VOCs in ambient air, TO-Can' canisters should be cleaned and evacuated prior to being sent to the field. In the field, the sample is drawn through a sampling train that regulates the rate and duration of sampling. The TO-Can" canister is then sent to the analytical laboratory. In the laboratory, a known amount of sample is drawn from the canister and concentrated onto a trap. The sample is analyzed according to Method TO-14/TO-15, typically using a 60m, 0.32mm ID, 1.0µm Rtx<sup>®</sup>-1 capillary column in a GC/MS system.

To show the inertness of these canisters, and how well they meet the holding time criteria for Methods TO-14/15, a 62-component TO-15 standard

(10ppbv) was injected into a TO-Can™ canister and humidified to 70% relative humidity. The standard was analyzed on day 1, day 7, and day 14. The TO-Can" canister ensured excellent stability for these polar and non-polar compounds, even after 14 days of storage (for data, request lit. cat.# 59189). We also offer sampling kits, sampling bags, thermal desorption tubes, and a range of gas reference standards to meet your environmental gas sampling requirements.

For more information, request our Air Monitoring Products Catalog (lit. cat. #59661A).

For information about environmental gas reference mixes, request lit. cat.#59276A.



TO-Can™ Canisters for EPA Methods TO-14 and TO-15

# **TO-Can™ Canisters with Vacuum/Pressure Gauge**

volume	qty.	cat.#	volume	qty.	cat.#	
1L	ea.	24150	1L	ea.	24155	
3L	ea.	24152	3L	ea.	24156	
6L	ea.	24153	6L	ea.	24157	
15L	ea.	24154	15L	ea.	24158	

HROMalytic +61(0)3 9762 2034

Australian Distributors Importers & Manufacurers www.chromtech.net.au

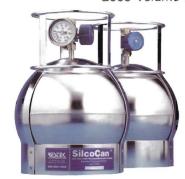
www.restekcorp.com 12 of 16 2003 Vol. 3 Website NEW: www.chromalytic.net.au E-mail: info@chromtech.net.au Tel: 03 9762 2034 . . . in AUSTRALIA

# SilcoCan™ Canisters

# Ideal for Low-Level (1ppb-20ppb) Reactive Sulfur Compounds

By Donna Lidgett, Air Sampling Products Marketing Manager

- Stable, long-term storage of sulfur volatile organic compounds.
- More accurate data than with electropolished canisters.



# **Feature**

Silcosteel® coated.

High-purity, 3/2-turn valve with stainless steel valve diaphragms.

Vacuum/pressure gauge (optional).

Variety of sizes.

Temperature stability to 250°C.

Silcosteel® valve available (add suffix "-650" to cat. #).

Analysis of low-level sulfur volatile organic compounds (VOCs), such as hydrogen sulfide (H.S), methyl mercaptan (CH<sub>3</sub>SH), ethyl mercaptan (C2H5SH), and dimethyl disulfide (CH3SSCH3) is important because of health concerns and odor complaints near manufacturing sites and refineries. Collection and measurement of these compounds in the atmosphere is very difficult because of their low concentrations and high reactivity. Sulfur VOCs can react not only with each other, but also with the

vessels in which they are collected. This causes low recoveries. SilcoCan<sup>™</sup> air monitoring canisters, which feature a Silcosteel®-treated surface, ensure stability of low-level sulfur VOCs.

We evaluated the stability of sulfur VOCs in SilcoCan<sup>™</sup> canisters at very low levels (1–20ppbv) for six days.1 Comparison of dry vs. humidified standards demonstrates the ability of SilcoCan™ canisters to store low-level sulfur VOCs in real-world

# Benefit

Inert surface, ideal for containing low-level sulfur compounds. No sample adsorption, for more accurate results; easy to use. Indicates internal conditions.

Meet extensive range of sampling needs.

Can be cleaned at higher temperature, producing a cleaner can. Completely passive sample pathway ensures sample stability.

> conditions (Figure 1). Electropolished canisters allowed rapid degradation of hydrogen sulfide, methyl mercaptan, and ethyl mercaptan during a similar study.

When you need to perform sensitive air monitoring analyses for sulfur VOCs, use SilcoCan™ canisters to collect and store your samples.

# SilcoCan™ Air Sampling Canisters

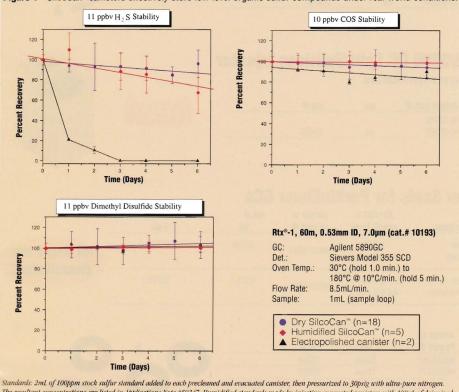
L.#	e qıy.	voiume
112	ea.	1L
113	ea.	3L
114	ea.	6L
115	ea.	15L
	ea.	15L

# SilcoCan™ Canisters with Vacuum/Pressure Gauge

11	ea.	24116	
3L	ea.	24117	
6L	ea.	24118	
15L	ea.	24119	
_			

Our 20-page technical guide describes the components of a passive sampling train, and presents procedures for sampling, for cleaning, and for certifying the sampling train and canister. Request lit. cat.# 59977A. A Guide to Passive Air Sampling, Using Canisters

Figure 1 - SilcoCan™ canisters effectively store low-level organic sulfur compounds under real-world conditions.



The resultant concentrations are listed in Applications Note #59347. Humidified standards made by injecting evacuated canisters with 100µL of deionized water prior to adding 2mL aliquot of stock standard (50% RH).

Stability study of Low-Level (1ppb-20ppb) Reactive Sulfurs in SilcoCan™ Canisters. Restek Corporation, 2001. Available on request: lit. cat.# 59347



www.restekcorp.com

# **Peak Performers**

By Donna Lidgett, GC Accessories Products Marketing Manager

Direct Replacement Split/Splitless Injection Port Weldments for Agilent GCs, for use with Purge and Trap Systems

✓ Easily attach your purge and trap with pre-installed low dead volume fittings.

# For Agilent GCs with Tekmar purge and trap systems

Description	qty.	cat.#	
Weldment for Agilent 6890 GCs	ea.	22664	
Weldment for Agilent 6890 GCs with optional canister filter	ea.	22668	
Weldment for Agilent 5890 GCs	ea.	22666	

# For Agilent GCs with OI purge and trap systems

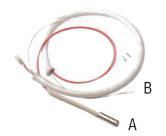
Description	qty.	cat.#	
Weldment for Agilent 6890 GCs	ea.	22665	
Weldment for Agilent 6890 GCs with optional canister filter	ea.	22669	
Weldment for Agilent 5890 GCs	ea.	22667	



# Injector/FID Heater & PRT Sensor for Agilent 5890 GCs

- ✓ Use with 5890 FID and split/splitless weldments.
- ✓ Meets or exceeds OEM specifications.

Description	Similar to Agilent part #	qty.	cat.#	
A+B Injector/FID Heater/PRT Sensor Assembly	05890-61140	ea.	22068	
A Injector/FID Heater	19231-60620	ea.	22069	
B Injector/FID PRT Sensor	19231-60660	ea.	22070	



# Heat Sink for Agilent 5890/6890/6850 GC Split/Splitless Injector

✓ Meets or exceeds original equipment manufacturer's specifications.

Description	Similar to Agilent part #	qty.	cat.#	
	18740-20940			
Heat Sink for Agilent 5890/6890/6850 GCs	G1544-20570	ea.	20409	





# PSS Inlet Liners and O-Ring Liner Seals for PerkinElmer GCs

PSS Liners for PerkinElmer GCs	Benefits/Uses:	ID*/OD & Length (mm)	Similar to PE part #	cat.# ea.	cat.# 5-pk.
PSS Split/Splitless (1mm ID)	trace samples	1.0 ID 4.0 OD x 86.2	N612-1006	20738	20741
Auto SYS® XL PSS Split/Splitless w/ FS Wool	most common analyses	2.0 ID 4.0 OD x 86.2	N612-1004	21717	21718



\*Nominal ID at syringe needle expulsion point.

	Similar to			
Description	PE part #	Qty.	cat.#	
A O-Ring Liner Seals for PerkinElmer PSS	N6101747	10-pk.	20366	
B O-Rings Liner Seals for PerkinElmer Auto SYS® GCs	N6101374	10-pk.	20262	

For more information: Request our current catalog (lit. cat.# 59473) for a complete listing of our consumables for Agilent, Varian, Shimadzu, PerkinElmer, and Thermo instruments.



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2003 Volume 3



# For Easier GC Maintenance Try These Tools from Restek

by Brad Rightnour and Michael Goss, Instrument Innovations Team

# **Ceramic Scoring Wafers**—Clean, square cuts for better connections



- ✓ Four scoring edges for cutting fused silica tubing, four serrated edges for cutting MXT® metal capillary columns.
- Sure-grip handle included.

Description	qty.	cat.#	
Ceramic Scoring Wafers	5-pk.	20116	



Hold the scoring wafer at a 45° angle to the tubing. Use gentle pressure and a smooth, perpendicular stroke.



Check the cut against the white of the scoring wafer. Look for a clean, square

# Rethreading Tool—Save the cost of replacing expensive injectors

- Achieve a better seal.
- Repair worn or damaged threads.
- Built-in guide, to prevent cross-threading.



ig ea.	23016	
g ea.	23017	
9		
ea.	23018	
ng.		
ea.	23019	
envil		
ea.	21893	
	g ea. g ea.	g ea. 23017 g ea. 23018 ng ea. 23019



Due to constant installation, removal, and exposure to extreme temperature changes. threads on GC parts become worn and damaged This can cause a poor seal, and oxygen can enter the system, compromising analytical results and possibly destroying expensive analytical columns.



Screw the rethreading tool completely onto the injection port in a clockwise direction



Unscrew the rethreading tool and inspect the threads. Repeat as necessary

# Injection Port Repair Tool—Remove contaminants, achieve a better seal

- Resurfaces critical inlet seal areas.
- ✓ For Agilent split/splitless injection ports.\*



Description	qty.	cat.#	
Injection Port Repair Tool	ea.	21393	
Replacement Sanding Disks			
(5 fine & 5 medium)	10-pk.	22689	

The inlet seal at the base of a split/splitless injector forms a seal between the injection port and the inlet liner. This inlet seal wears over time and may become scratched or pitted, which compromises the sealing ability of the injector. Use the Restek injection port repair tool to easily resurface the inlet seal and remove contaminants, it saves time and money by preventing leaks.





\*Should not be used on Siltek™-treated injection ports.

Try Our Exclusive



For more information, request newly updated *Genuine Restek Replacement Parts for Agilent GCs* (lit. cat.#59627D)



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# **Exhibitions, Seminars, and Workshops: Autumn 2003**

Kemia 2003 - The Finnish Chemical Exhibition, Helsinki, Finland, 11-13 November. HNU Nordion Ltd. Oy, booth number 6 c 9

For more information: Lea Julin: leajulin@hnunordion.fi / tel.: +358 9 565 7240 / fax: +358 9 562 6801

BioTechnica 2003, Hannover, Germany, 7-10 October.

Restek GmbH

For more information: Cornelia Pahlke: info@restekgmbh.de or 06172-2797-0

Analytik aktuell - Gaschromatographische Bestimmung von ineralölkohlenwasserstoffen Karlsuhe, Germany, 28 November.

Forschungszentrum Karlsruhe - Restek GmbH For more information: Cornelia Pahlke: info@restekgmbh.de or 06172-2797-0

Seminars: GC/MS

Vienna, Austria, 27 October, Contact: info@cp-analytica.at Budapest, Hungary, 28 October. Contact: LabComp@lab-comp.hu Copenhagen, Denmark, 30 October. Contact: peter.milland@analytical.dk Arhus, Denmark, 31 October. Contact: peter.milland@analytical.dk

### LC/MS and Food & Flavours Seminars: UK

Hemel Hempstead, Ramada Jarvis Hotel LC/MS 3 November Food & Flavours 4 November Warrington, Best Western, Fir Grove Hotel LC/MS 6 November Food & Flavours 7 November

Thames Restek

For more information: Dave Pearse, Thames Restek: Sales@Thamesrestek.co.uk

### Seminar-Workshops

Pesticide Analysis in Agriculture Products by GC/MS Chaing Mai University, Chaing Mai, Thailand. 29-30 October. Pesticide Analysis in Agriculture Products by GC/MS Bangkok, Thailand, 5-6 November. C.E. Combination Co., Ltd., Warin Chungpattanawadee, General Manager For more information: warin@cecombination.com and request@cecombination.com

# **New / Recent Literature**

Environmental HPLC Applications-Columns-Reference Materials (lit. cat.# 59741-INT) Gas Purification Essentials (lit. cat.# 59216D-INT) Miniature Air Sampling Canisters (lit. cat.# 59491-INT) Passive Air Sampling Kits (lit. cat.# 59290A-INT)

### Minicatalog

Genuine Restek Replacement Parts for Agilent GCs (lit. cat.# 59627D-INT) Applications Notes

Single-Column Method for HPLC of Organic Acids in Fruit Juices (lit. cat.# 59530) USP 467 OVIs (lit. cat.# 59577C)

Pinnacle™ DB HPLC Columns as Replacements for Hypersil® BDS (lit. cat.# 59742)

### Fast Facts

ASTM 2887-01 Simulated Distillation (lit. cat.# 59383A) Ethanol Reference Materials (lit. cat.# 59382A) Explosives Reference Materials (lit. cat.# 59381A) PAHs in Diesel Fuel (lit, cat.# 59384A) US EPA 8260B Reference Mixes (lit. cat.# 59332A) UST Monitoring: Alaska (lit. cat.# 59503) UST Monitoring: California (lit. cat.# 59433) UST Monitoring: Iowa (lit. cat.# 59504) Rtx®-1 Capillary GC Columns (lit. cat.# 59308) ShinCarbon ST Micropacked Columns (lit. cat.# 59519A)

### Technical Guide

Cleaning and Personal Care Products - Gas and Liquid Chromatography (lit. cat.# 59738)

### Wall Charts

HPLC Column Selection Guide (lit. cat.# 59454A) HPLC Technical Tips (lit. cat.# 59894A)



# Lit. Cat. # 59852-INT

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Please direct your comments on this publication to Brett Tyson, Graphic Designer, at btyson@restekcorp.com or call 814-353-1300, ext. 2113.





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