Rtx®-XLB

similar phases

DB-XLB

tech tip

In combination with an Rtx®-XLB column, simple adjustments to the injection conditions can greatly improve sensitivity for active and high molecular weight Method 525.2 target compounds.

- By eliminating contact between the sample and the hot metal surfaces in the injection port, a Drilled Uniliner® inlet liner prevents analytes from degrading in the injection port.
- A pulsed injection (30psi/0.4 min.) reduces the time the analytes spend in the injection port, and helps to minimize breakdown.

Rtx®-XLB (low-polarity proprietary phase)

- General purpose columns exhibiting extremely low bleed. Ideal for many GC/MS applications, including pesticides, PCB congeners or (e.g.) Aroclor® mixes, PAHs.
- Unique selectivity.
- Temperature range: 30°C to 360°C.

Improvements in polymer synthesis and tubing deactivation enable us to make inert, stable Rtx®-XLB columns especially well suited for analyzing active, high molecular weight compounds with sensitive GC/MS systems, including ion trap detectors. Excellent efficiency, coupled with inertness, low bleed, and high thermal stability, makes Rtx®-XLB columns ideal for analyzing semivolatile compounds in drinking water (e.g., US EPA Method 525).

Rtx®-XLB Columns (fused silica)

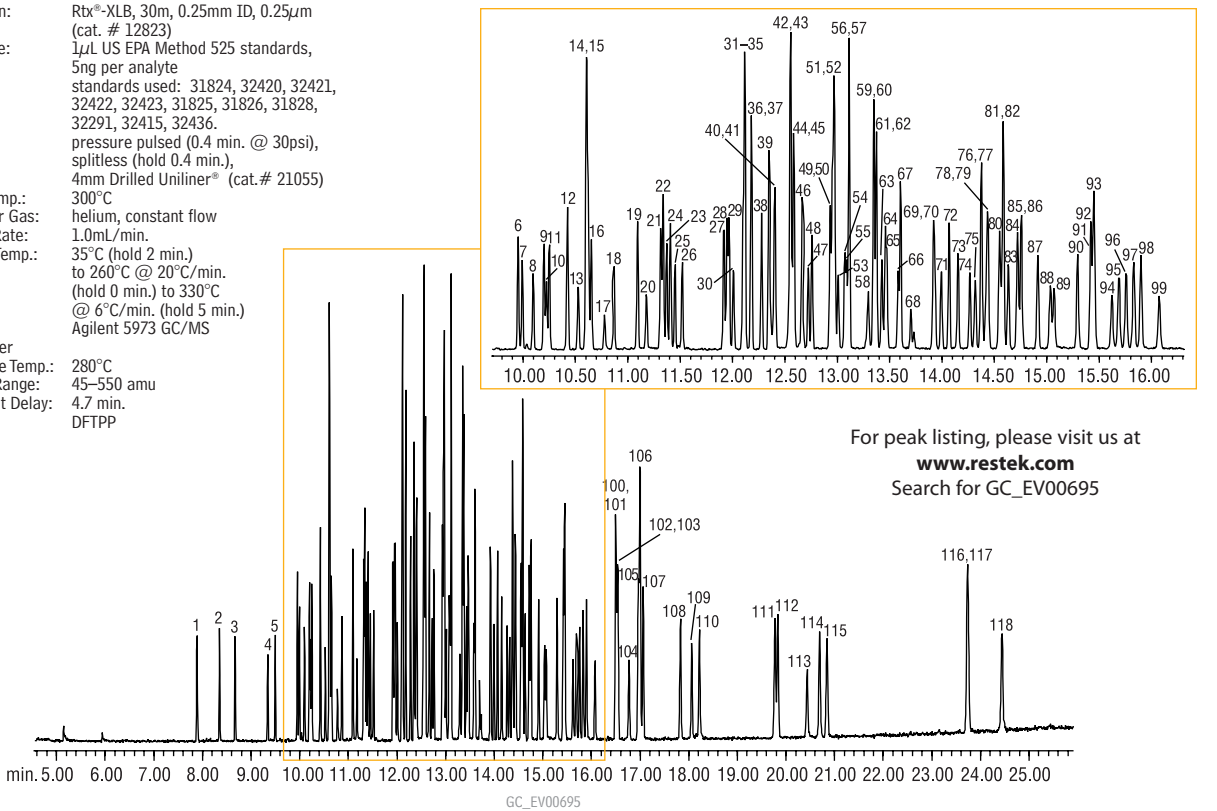
(low-polarity proprietary phase)

ID	df (µm)	temp. limits*	15-Meter	30-Meter	60-Meter
0.25mm	0.10	30 to 340/360°C		12808	
	0.25	30 to 340/360°C	12820	12823	12826
	0.50	30 to 340/360°C		12838	
	1.00	30 to 340/360°C	12850	12853	
0.32mm	0.10	30 to 340/360°C		12809	
	0.25	30 to 340/360°C	12821	12824	12827
	0.50	30 to 340/360°C		12839	
	1.00	30 to 340/360°C		12854	
0.53mm	0.50	30 to 340/360°C		12840	
	1.50	30 to 340/360°C	12867	12870	
ID	**df (µm)**	**temp. limits**	**12-Meter**	**20-Meter**	**25-Meter**
0.18mm	0.18	30 to 340/360°C		42802	
0.20mm	0.33	30 to 340/360°C	42815		42820

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

Semivolatile organics in US EPA Method 525, using an Rtx®-XLB column.

Column: Rtx®-XLB, 30m, 0.25mm ID, 0.25µm (cat. # 12823)
Sample: 1µL US EPA Method 525 standards, 5ng per analyte
standards used: 31824, 32420, 32421, 32422, 32423, 31825, 31826, 31828, 32291, 32415, 32436.
Inj.: pressure pulsed (0.4 min. @ 30psi), splitless (hold 0.4 min.), 4mm Drilled Uniliner® (cat.# 21055)
Inj. Temp.: 300°C
Carrier Gas: helium, constant flow
Flow Rate: 1.0mL/min.
Oven Temp.: 35°C (hold 2 min.) to 260°C @ 20°C/min. (hold 0 min.) to 330°C @ 6°C/min. (hold 5 min.)
Det: Agilent 5973 GC/MS
Transfer Line Temp.: 280°C
Scan Range: 45–550 amu
Solvent Delay: 4.7 min.
Tune: DFTPP



For peak listing, please visit us at **www.restek.com** Search for GC_EV00695

GC_EV00695

Rtx®-440 (intermediate-polarity proprietary Crossbond® phase)

- General purpose columns for pesticides, PAHs, or other semivolatiles. Ideal for low/trace level analyses.
- Low bleed, high-resolution columns with unique selectivity.
- Temperature range: 20°C to 340°C.

restek
innovation!

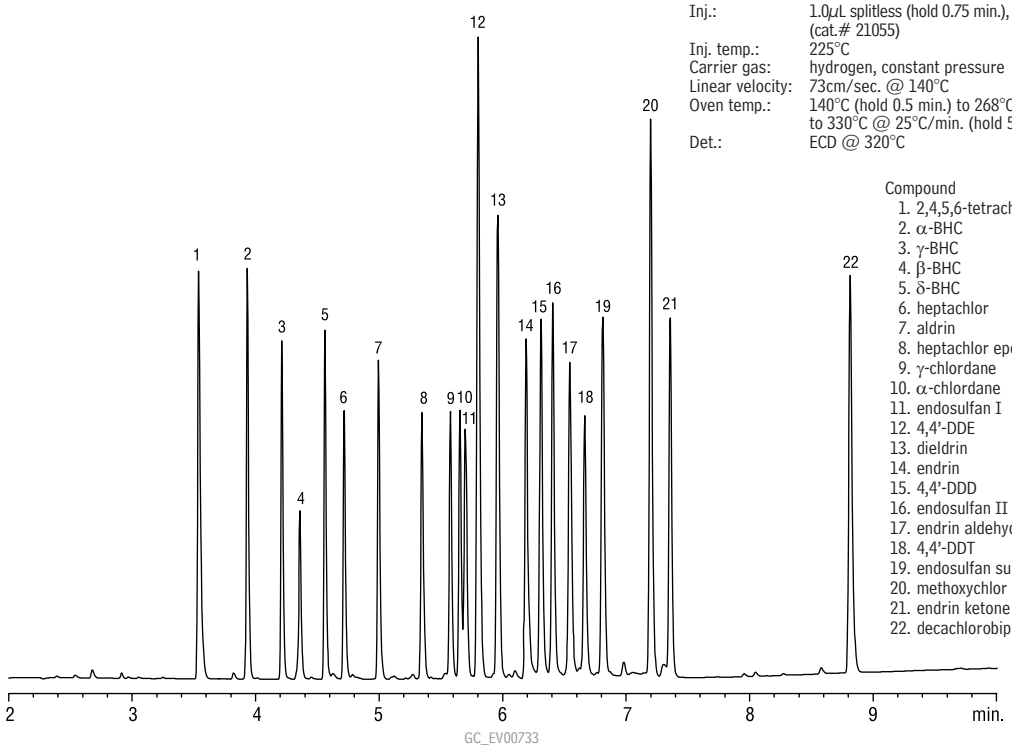
Rtx®-440 Columns (fused silica)

(intermediate-polarity proprietary Crossbond® phase)

ID	df (µm)	temp. limits	30-Meter	
0.25mm	0.25	20°C to 320/340°C	12923	
	0.50	20°C to 320/340°C	12938	
0.32mm	0.25	20°C to 320/340°C	12924	
	0.50	20°C to 320/340°C	12939	
0.53mm	0.50	20°C to 320/340°C	12940	
	1.00	20°C to 320/340°C	12955	
ID	**df (µm)**	**temp. limits**	**20-Meter**	**40-Meter**
0.18mm	0.18	20°C to 320/340°C	42902	42903

Dave Krantz
Vice President of Operations
4+ years of service!

Twenty organochlorine pesticides separated in less than 9 minutes on an Rtx®-440 column.

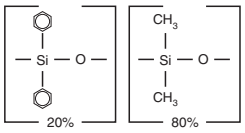


Rtx®-440 30m, 0.32mm ID, 0.50µm (cat.# 12939), intermediate-polarity deactivated guard column, 5m x 0.32mm ID (cat.# 10044)
Sample: Organochlorine Pesticide Mix AB #2 (cat.# 32292), 2,4,5,6-tetrachloro-*m*-xylene (ss) (cat.# 32027), decachlorobiphenyl (ss) (cat.# 32029), diluted in hexane, on-column amounts listed on figure
Inj.: 1.0µL splitless (hold 0.75 min.), 4mm Drilled Uniliner® inlet liner (cat.# 21055)
Inj. temp.: 225°C
Carrier gas: hydrogen, constant pressure
Linear velocity: 73cm/sec. @ 140°C
Oven temp.: 140°C (hold 0.5 min.) to 268°C @ 30°C/min., to 290°C @ 11°C/min., to 330°C @ 25°C/min. (hold 5 min.)
Det.: ECD @ 320°C

Compound	Conc. (ppb)	RT (min.)
1. 2,4,5,6-tetrachloro-*m*-xylene (ss)	80	3.538
2. α-BHC	80	3.931
3. γ-BHC	80	4.211
4. β-BHC	80	4.356
5. δ-BHC	80	4.560
6. heptachlor	80	4.715
7. aldrin	80	4.995
8. heptachlor epoxide	80	5.346
9. γ-chlordane	80	5.576
10. α-chlordane	80	5.653
11. endosulfan I	80	5.698
12. 4,4'-DDE	160	5.800
13. dieldrin	160	5.959
14. endrin	160	6.190
15. 4,4'-DDD	160	6.309
16. endosulfan II	160	6.404
17. endrin aldehyde	160	6.543
18. 4,4'-DDT	160	6.662
19. endosulfan sulfate	160	6.810
20. methoxychlor	800	7.198
21. endrin ketone	160	7.355
22. decachlorobiphenyl (ss)	160	8.813

Rtx®-20

Rtx®-20 Structure



Rtx®-20 (low/mid-polarity phase; Crossbond® 20% diphenyl / 80% dimethyl polysiloxane)

- General purpose columns for volatile compounds, flavor compounds, alcoholic beverages.
- Temperature range: -20°C to 320°C.
- Equivalent to USP G28, G32 phases.

Rtx®-20 polymer is synthesized to exacting standards. All residual catalysts and low molecular weight fragments are removed from the polymer, providing a tight mono-modal distribution and extremely low bleed.

similar phases

SPB-20

did you know?

Rtx®-20 columns are available with Integra-Guard™ built-in guard columns. Get the protection without the connection! See **page 29** for descriptions and ordering information.

also available

MXT® Columns
Rugged, flexible, Silcosteel® treated stainless steel tubing; inertness comparable to fused silica tubing. See **page 84** for our MXT®-20 columns.

Rtx®-20 Columns (fused silica)
(Crossbond® 20% diphenyl / 80% dimethyl polysiloxane)

ID	df (µm)	temp. limits*	15-Meter	30-Meter	60-Meter	105-Meter
0.25mm	0.10	-20 to 300/320°C	10305	10308	10311	10314
	0.25	-20 to 300/320°C	10320	10323	10326	10329
	0.50	-20 to 290/310°C	10335	10338	10341	10344
	1.00	-20 to 280/300°C	10350	10353	10356	10359
0.32mm	0.10	-20 to 300/320°C	10306	10309	10312	10315
	0.25	-20 to 300/320°C	10321	10324	10327	10330
	0.50	-20 to 290/310°C	10336	10339	10342	10345
	1.00	-20 to 280/300°C	10351	10354	10357	10360
	1.50	-20 to 270/290°C	10366	10369	10372	10375
	3.00	-20 to 250/270°C	10381	10384	10387	10390
0.53mm	0.10	-20 to 260/280°C	10307	10310	10313	
	0.25	-20 to 260/280°C	10322	10325	10328	
	0.50	-20 to 260/280°C	10337	10340	10343	
	1.00	-20 to 260/280°C	10352	10355	10358	
	1.50	-20 to 250/270°C	10367	10370	10373	
	3.00	-20 to 240/260°C	10382	10385	10388	

ID	df (µm)	temp. limits	10-Meter	20-Meter	40-Meter
0.18mm	0.20	-20 to 300/320°C	40301	40302	40303
	0.40	-20 to 300/320°C	40310	40311	40312

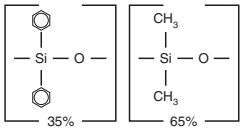
*Maximum temperatures listed are for 15- and 30-meter lengths. Longer lengths may have a slightly reduced maximum temperature.

Applied Sciences Group
Wendy Henninger, Brian Salisbury, Rick Crago, Tom Vezza

Rtx®-35 / Rtx®-35MS (mid-polarity phase; Crossbond® 35% diphenyl / 65% dimethyl polysiloxane)

- General purpose columns for organochlorine pesticides, PCB congeners or (e.g.) Aroclor® mixes, herbicides, pharmaceuticals, sterols, rosin acids, phthalate esters.
- Temperature range: 0°C to 320°C.
- Equivalent to USP G42 phase.

Rtx®-35 Structure



An Rtx®-35 column is a popular confirmation column for pesticides and herbicides, in conjunction with an Rtx®-5 or Rtx®-1701 column. The higher phenyl content causes useful elution order and retention time changes.

Rtx®-35 Columns (fused silica)

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

ID	df (µm)	temp. limits*	15-Meter	30-Meter	60-Meter	105-Meter
0.25mm	0.10	0 to 320°C	10405	10408	10411	10414
	0.25	0 to 320°C	10420	10423	10426	10429
	0.50	0 to 310°C	10435	10438	10441	10444
	1.00	0 to 290°C	10450	10453	10456	10459
0.32mm	0.10	0 to 320°C	10406	10409	10412	10415
	0.25	0 to 320°C	10421	10424	10427	10430
	0.50	0 to 310°C	10436	10439	10442	10445
	1.00	0 to 290°C	10451	10454	10457	10460
	1.50	0 to 270/290°C	10466	10469	10472	10475
	3.00	0 to 250/270°C	10481	10484	10487	10490
0.53mm	0.10	0 to 260/280°C	10407	10410	10413	
	0.25	0 to 260/280°C	10422	10425	10428	
	0.50	0 to 300°C	10437	10440	10443	
	1.00	0 to 290°C	10452	10455	10458	
	1.50	0 to 280°C	10467	10470	10473	
	3.00	0 to 240/260°C	10482	10485	10488	

ID	df (µm)	temp. limits	10-Meter	20-Meter	40-Meter
0.18mm	0.20	0 to 300/320°C	40401	40402	40403
	0.40	0 to 290/310°C	40410	40411	40412

Rtx®-35MS—Low-bleed GC/MS Columns (fused silica)

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

ID	df (µm)	temp. limits	15-Meter	30-Meter
0.25mm	0.10	0 to 320°C	14605	14608
	0.25	0 to 320/340°C	14620	14623
	0.50	0 to 310/330°C	14635	14638
	1.00	0 to 290/310°C	14650	14653
0.32mm	0.10	0 to 320/340°C	14606	14609
	0.25	0 to 320/340°C	14621	14624
	0.50	0 to 310/330°C	14636	14639
	1.00	0 to 290/310°C	14651	14654
0.53mm	0.50	0 to 300/320°C	14637	14640
	1.00	0 to 290°C	14652	14655
	1.50	0 to 280/300°C	14667	14670

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

similar phases

DB-35, HP-35, SPB-35, SPB-608

ordering note

Rtx®-35 columns are available with Integra-Guard™ built-in guard columns. Get the protection without the connection! See **page 29** for descriptions and ordering information.

also available

MXT® Columns
Rugged, flexible, Silcosteel® treated stainless steel tubing; inertness comparable to fused silica tubing. See **page 84** for our MXT®-35 columns.

Rtx®-35 Amine

restek
innovation!

Rtx®-35 Amine (mid-polarity phase; Crossbond® 35% diphenyl / 65% dimethyl polysiloxane)

- Application-specific columns for amines and other basic compounds, including alkylamines, diamines, triamines, ethanolamines, and nitrogen-containing heterocyclics.
- Stable to 220°C.

Active basic compounds that otherwise require derivatization, or an alternative analytical technique, can be analyzed on an Rtx®-35 Amine column. The tubing surface is chemically altered to reduce tailing of basic compounds, eliminating the need for column priming. An Rtx®-35 Amine column is ideal for analyzing a wide variety of basic compounds, but breakthrough technology also allows the analysis of neutral compounds, adsorptive compounds with oxygen groups susceptible to hydrogen bonding. Every Rtx®-35 Amine column is tested to ensure that it meets the requirements for analyzing ppm levels of amines, without priming, and to ensure low bleed at maximum operating temperature.

Julie Kowalski
Innovations Chemist
2+ years of service!

Rtx®-35 Amine Columns (fused silica)

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

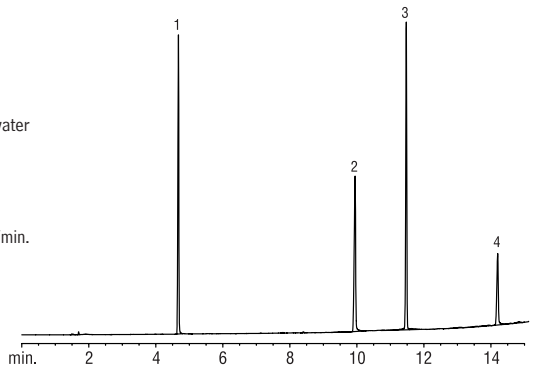
ID	df (µm)	temp. limits	15-Meter	30-Meter
0.25mm	0.50	0 to 220°C	11335	11338
	1.00	0 to 220°C	11350	11353
0.32mm	1.00	0 to 220°C	11351	11354
	1.50	0 to 220°C	11366	11369
0.53mm	1.00	0 to 220°C	11352	11355
	3.00	0 to 220°C	11382	11385

Table of Contents for
Applications
see **pages 510-513**

Sharp ethanolamine peaks, low bleed: Rtx®-35 Amine column.

1. monoethanolamine
2. diethanolamine
3. triethyleneglycol monomethylether
4. triethanolamine

Rtx®-35 Amine 30m, 0.32mm ID, 1.0µm (cat.# 11354)
Sample: 500µg/mL ethanolamine standard in water
Inj.: 1.0µL split (split ratio 10:1), cup splitter inlet liner (cat.# 20709)
Inj. temp.: 300°C
Carrier gas: helium, constant pressure
Linear velocity: 40cm/sec. @ 50°C
Oven temp.: 50°C (hold 0.50min.) to 280°C @15°C/min.
Det.: FID @ 300°C



GC_CH00585

Rtx®-65 (mid- to high polarity phase; Crossbond® 65% diphenyl / 35% dimethyl polysiloxane)

- General purpose columns for phenols, fatty acids.
- Temperature range: 50°C to 300°C.
- Equivalent to USP G17 phase.

The Rtx®-65 phase contains the highest phenyl content of any bonded stationary phase available, to improve separation of aromatic compounds through increased phase-analyte interaction. A unique polarity makes these columns ideal for a variety of analyses, from phenols to FAMEs. As a confirmation column for EPA Method 604 phenols, an Rtx®-65 column produces a different elution order, compared to the primary Rtx®-5 column. Rtx®-65 columns elute FAMEs according to equivalent chain length, similar to bonded Carbowax® columns, but the Rtx®-65 phase does not suffer the thermal stability limitations of other polar stationary phases.

Rtx®-65 Columns (fused silica)
(Crossbond® 65% diphenyl/35% dimethyl polysiloxane)

ID	df (µm)	temp. limits	15-Meter	30-Meter
0.25mm	0.25	50 to 300°C	17020	17023
	0.50	50 to 280/300°C	17035	17038
	1.00	50 to 260/280°C	17050	17053
0.32mm	0.25	50 to 300°C	17021	17024
	0.50	50 to 280/300°C	17036	17039
	1.00	50 to 260°C	17051	17054
0.53mm	0.25	50 to 290/300°C	17022	17025
	0.50	50 to 270/290°C	17037	17040
	1.00	50 to 250/270°C	17052	17055

Rtx®-65TG (high polarity phase; Crossbond® 65% diphenyl / 35% dimethyl polysiloxane)

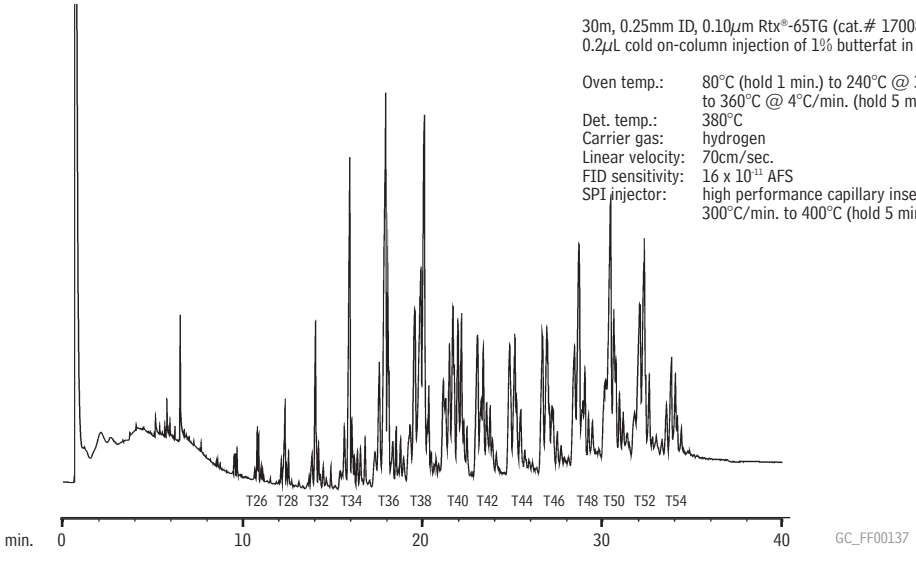
- Application-specific columns, specially tested for triglycerides.
- Stable to 370°C.

The Rtx®-65TG phase resolves triglycerides by degree of unsaturation as well as by carbon number. Because of the chemistry required to achieve 370°C thermal stability, an Rtx®-65TG column should not be used for analyses of compounds that contain active oxygenated groups.

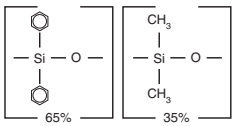
Rtx®-65TG Columns (fused silica)
(Crossbond® 65% diphenyl/35% dimethyl polysiloxane)

ID	df (µm)	temp. limits	15-Meter	30-Meter
0.25mm	0.10	40 to 370°C	17005	17008
0.32mm	0.10	40 to 370°C	17006	17009
0.53mm	0.10	40 to 370°C	17007	17010

Sharp resolution of butter triglycerides on an Rtx®-65TG column.



Rtx®-65/ Rtx®-65TG Structure



similar **phases**

TAP-CB, 400-65HT, 007-65HT

also **available**

MXT® Columns
Rugged, flexible, Silcosteel® treated stainless steel tubing; inertness comparable to fused silica tubing. See **page 85** for our MXT®-65 and MXT®-65TG columns.

crossbond® **technology**

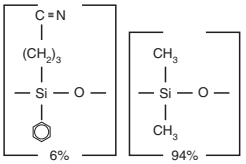
reduces bleed, prolongs column lifetime, and allows rejuvenation through solvent rinsing.

save **money**!

Get six columns for the price of five. **Call 800-356-1688, ext. 4**, or your Restek representative for details!

Rtx®-1301

Rtx®-1301 Structure



Rtx®-1301 (low to mid-polarity phase; Crossbond® 6% cyanopropylphenyl / 94% dimethyl polysiloxane)

- General purpose columns for residual solvents, alcohols, oxygenates, volatile organic compounds.
- Temperature range: -20°C to 280°C.
- Equivalent to USP G43 phase.

Many analysts feel the Rtx®-1301 column has the best cyanosilicone bonded stationary phase available, with no other column manufacturer providing lower bleed, longer lifetime, or better inertness. Our polymer is fully characterized to ensure long-term reproducibility, column-to-column consistency, and low bleed, even with sensitive detectors such as ECDs and MSDs.

similar phases

DB-1301, DB-624, HP-1301, SPB-1301, SPB-624

please note

Rtx®-1301 columns are available with Integra-Guard™ built-in guard columns. Get the protection without the connection! See page 29 for descriptions and ordering information.

also available

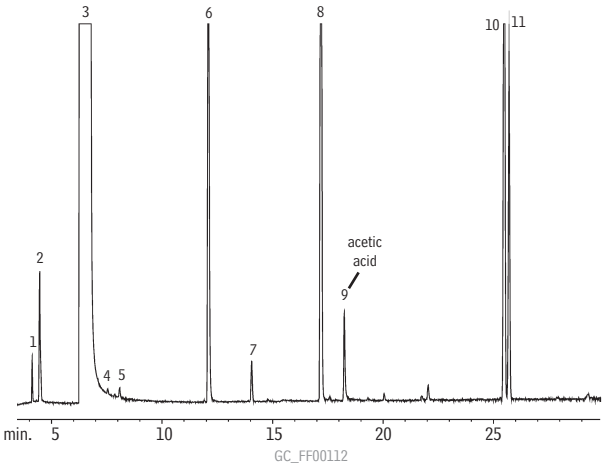
MXT® Columns
Rugged, flexible, Silcosteel® treated stainless steel tubing; inertness comparable to fused silica tubing. See page 86 for our MXT®-1301 columns.

Rtx®-1301 (G43) Columns (fused silica)
(Crossbond® 6% cyanopropylphenyl/94% dimethyl polysiloxane)

ID	df (µm)	temp. limits*	15-Meter	30-Meter	60-Meter	75-Meter	105-Meter
0.25mm	0.10	-20 to 280°C	16005	16008	16011		16014
	0.25	-20 to 280°C	16020	16023	16026		16029
	0.50	-20 to 270°C	16035	16038	16041		16044
	1.00	-20 to 260°C	16050	16053	16056		16059
	1.40	-20 to 240°C			16016		
0.32mm	0.10	-20 to 280°C	16006	16009	16012		16015
	0.25	-20 to 280°C	16021	16024	16027		16030
	0.50	-20 to 270°C	16036	16039	16042		16045
	1.00	-20 to 260°C	16051	16054	16057		16060
	1.50	-20 to 250°C	16066	16069	16072		16075
0.53mm	0.10	-20 to 280°C	16007	16010	16013		
	0.25	-20 to 280°C	16022	16025	16028		
	0.50	-20 to 270°C	16037	16040	16043		
	1.00	-20 to 260°C	16052	16055	16058		
	1.50	-20 to 250°C	16067	16070	16073		
	3.00	-20 to 240°C	16082	16085	16088	16076	16091

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

Scotch sample on an Rtx®-1301.



1. acetaldehyde
2. methanol
3. ethanol
4. acetone
5. isopropanol
6. *n*-propanol
7. ethyl acetate
8. isobutanol
9. acetic acid
10. isoamyl alcohol
11. active amyl alcohol

60m, 0.25mm ID, 1.4µm Rtx®-1301 (cat.# 16016)
1.0µL split injection using a Cyclosplitter® inlet liner (cat.# 20706).

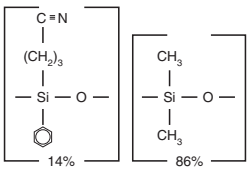
Conc.:	neat
Oven temp.:	35°C (hold 5 min.) to 100°C @ 1°C/min.
Inj./det. temp.:	150°C / 200°C
Carrier gas:	hydrogen @ 40cm/sec.
Split ratio:	100:1

Rtx®-1701 (mid-polarity phase; Crossbond® 14% cyanopropylphenyl / 86% dimethyl polysiloxane)

- General purpose columns for alcohols, oxygenates, PCB congeners or (e.g.) Aroclor® mixes, pesticides.
- Temperature range: -20°C to 280°C.
- Equivalent to USP G46 phase.

Rtx®-1701 is one of the more popular stationary phases used in capillary GC. The mix of cyano and phenyl functional groups increases the polarity, and offers a different elution order relative to less polar Rtx®-1 or Rtx®-5 columns. An Rtx®-1701 column is ideal for confirmation analysis, in combination with an Rtx®-35 or Rtx®-5 column. The polymer is fully characterized to ensure long-term reproducibility, column-to-column consistency, and low bleed, even with sensitive detectors such as ECDs and MSDs.

Rtx®-1701 Structure



Rtx®-1701 Columns (fused silica)

(Crossbond® 14% cyanopropylphenyl/86% dimethyl polysiloxane)

ID	df (µm)	temp. limits*	15-Meter	30-Meter	60-Meter	105-Meter
0.25mm	0.10	-20 to 280°C	12005	12008	12011	12014
	0.25	-20 to 280°C	12020	12023	12026	12029
	0.50	-20 to 270/280°C	12035	12038	12041	12044
	1.00	-20 to 260/280°C	12050	12053	12056	12059
0.32mm	0.10	-20 to 280°C	12006	12009	12012	12015
	0.25	-20 to 280°C	12021	12024	12027	12030
	0.50	-20 to 270/280°C	12036	12039	12042	12045
	1.00	-20 to 260/280°C	12051	12054	12057	12060
	1.50	-20 to 240/260°C	12066	12069	12072	12075
0.53mm	0.10	-20 to 270/280°C	12007	12010	12013	
	0.25	-20 to 270/280°C	12022	12025	12028	
	0.50	-20 to 260/270°C	12037	12040	12043	
	1.00	-20 to 250/270°C	12052	12055	12058	
	1.50	-20 to 240/260°C	12067	12070	12073	
	3.00	-20 to 230/250°C	12082	12085	12088	

ID	df (µm)	temp. limits	10-Meter	20-Meter	40-Meter
0.10mm	0.10	-20 to 280°C	42201	42202	
0.18mm	0.20	-20 to 280°C	42001	42002	42003
	0.40	-20 to 270/280°C	42010	42011	42012

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

similar phases

DB-1701, HP-1701, SPB-1701

please note

Rtx®-1701 columns are available with Integra-Guard™ built-in guard columns. Get the protection without the connection! See **page 29** for descriptions and ordering information.

crossbond® technology

reduces bleed, prolongs column lifetime, and allows rejuvenation through solvent rinsing.

also available

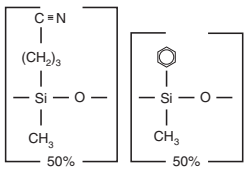
MXT® Columns
Rugged, flexible, Silcosteel® treated stainless steel tubing; inertness comparable to fused silica tubing. See **page 86** for our MXT®-1701 columns.

Need a column for a **volatiles analysis?**
see **page 577**

Searching for free technical literature?
www.restek.com

Rtx®-225

Rtx®-225 Structure



Rtx®-225 (polar phase; Crossbond® 50% cyanopropylmethyl / 50% phenylmethyl polysiloxane)

- General purpose columns for FAMEs, carbohydrates, sterols, flavor compounds.
- Temperature range: 40°C to 240°C.
- Equivalent to USP G7, G19 phases.

The cyanopropyl-containing Rtx®-225 phase is slightly less polar than bonded polyethylene glycol (PEG) phases, but it can be used for many of the same applications. Some popular applications for the Rtx®-225 column are analyses of fatty acid methyl esters (FAMES), sugar derivatives, and food and flavor compounds. As with all cyano phases, strongly acidic compounds can show non-linearity at ppm levels.

Improvements to the Rtx®-225 polymer have increased thermal stability, reduced bleed, and improved inertness. The Rtx®-225 column provides a 20°C thermal stability advantage over other "225" columns because of our unique polymer synthesis technology and proprietary siloxane deactivation. In most similar columns, the Carbowax® deactivation layer is not fully compatible with the cyanopropyl siloxane polymer, causing adsorption, tailing of active compounds, and lower efficiency.

similar phases

DB-225, HP-225, SPB-225

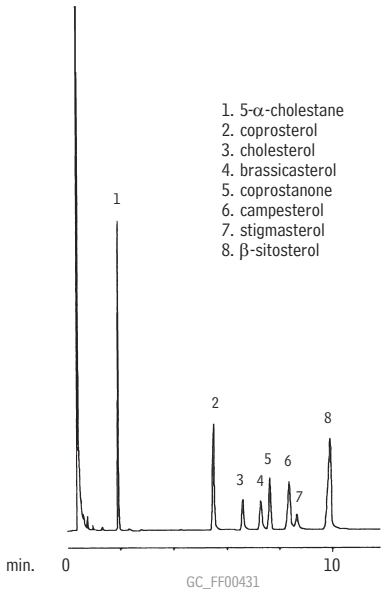
Rtx®-225 Columns (fused silica)

(Crossbond® 50% cyanopropylmethyl/50% phenylmethyl polysiloxane)

ID	df (µm)	temp. limits*	15-Meter	30-Meter	60-Meter
0.25mm	0.10	40 to 220/240°C	14005	14008	
	0.25	40 to 220/240°C	14020	14023	14026
	0.50	40 to 220/240°C	14035	14038	14041
0.32mm	0.10	40 to 220/240°C	14006	14009	
	0.25	40 to 220/240°C	14021	14024	14027
	0.50	40 to 220/240°C	14036	14039	14042
	1.00	40 to 200/220°C	14051	14054	14057
0.53mm	0.10	40 to 200/220°C	14007	14010	
	0.25	40 to 200/220°C	14022	14025	
	0.50	40 to 200/220°C	14037	14040	14043
	1.00	40 to 200/220°C	14052	14055	14058

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

Neutral sterols resolved on an Rtx®-225 column.



1. 5-α-cholestane
2. coprosterol
3. cholesterol
4. brassicasterol
5. coprostanone
6. campesterol
7. stigmasterol
8. β-sitosterol

15m, 0.25mm ID, 0.25µm Rtx®-225 (cat.# 14020)
1.5µL split injection of neutral sterols and phytosterols, 200ng on-column

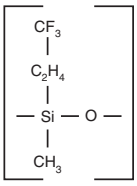
Oven temp.:	260°C
Inj. & det. temp.:	260°C
Carrier gas:	helium
Linear velocity:	45cm/sec. set @ 240°C
FID sensitivity:	8 x 10^{-11}AFS
Split ratio:	30:1

Rtx®-200 (mid-polarity phase; Crossbond® trifluoropropylmethyl polysiloxane)

- General purpose columns for solvents, Freon® fluorocarbons, alcohols, ketones, silanes, glycols. Excellent confirmation column, with an Rtx®-5 column, for phenols, nitrosamines, organochlorine pesticides, chlorinated hydrocarbons, chlorophenoxy herbicides.
- Temperature range: -20°C to 340°C.
- Equivalent to USP G6 phase.

Rtx®-200 columns have accomplished many difficult separations not possible on any other bonded stationary phase, and many analysts consider these the best, most inert mid-polarity columns available. The trifluoropropyl stationary phase has a unique selectivity that changes elution orders and resolves compounds that phenyl, cyano, or Carbowax® phases can not. Exceptional thermal stability, low bleed, and superior inertness, even for active compounds such as phenols, even with sensitive detectors such as ECDs, NPDs, and MSDs.

Rtx®-200 Structure



similar phases

DB-200, DB-210

Rob Freeman
Innovation Chemist

Rtx®-200 Columns (fused silica)

(Crossbond® trifluoropropylmethyl polysiloxane)

ID	df (µm)	temp. limits*	15-Meter	30-Meter	60-Meter	105-Meter
0.25mm	0.10	-20 to 320/340°C	15005	15008	15011	
	0.25	-20 to 320/340°C	15020	15023	15026	15029
	0.50	-20 to 310/330°C	15035	15038	15041	15044
	1.00	-20 to 290/310°C	15050	15053	15056	15059
0.32mm	0.10	-20 to 320/340°C	15006	15009	15012	
	0.25	-20 to 320/340°C	15021	15024	15027	15030
	0.50	-20 to 310/330°C	15036	15039	15042	15045
	1.00	-20 to 290/310°C	15051	15054	15057	15060
	1.50	-20 to 280/300°C	15066	15069	15072	15075
0.53mm	0.10	-20 to 310/330°C	15007	15010	15013	
	0.25	-20 to 310/330°C	15022	15025	15028	
	0.50	-20 to 300/320°C	15037	15040	15043	
	1.00	-20 to 290/310°C	15052	15055	15058	
	1.50	-20 to 280/300°C	15067	15070	15073	
	3.00	-20 to 260/280°C	15082	15085	15088	15091
ID	**df (µm)**	**temp. limits**	**10-Meter**	**20-Meter**	**40-Meter**	
0.18mm	0.20	-20 to 310/330°C	45001	45002	45003	
	0.40	-20 to 310/330°C	45010	45011	45012	

Rtx®-200MS—Low-bleed GC/MS Columns (fused silica)

(Crossbond® trifluoropropylmethyl polysiloxane)

ID	df (µm)	temp. limits	15-Meter	30-Meter
0.25mm	0.10	-20 to 320/340°C	15605	15608
	0.25	-20 to 320/340°C	15620	15623
	0.50	-20 to 310/330°C	15635	15638
	1.00	-20 to 290/310°C	15650	15653
0.32mm	0.10	-20 to 320/340°C	15606	15609
	0.25	-20 to 320/340°C	15621	15624
	0.50	-20 to 310/330°C	15636	15639
	1.00	-20 to 290/310°C	15651	15654
0.53mm	0.50	-20 to 300/320°C	15637	15640
	1.00	-20 to 290/310°C	15652	15655
	1.50	-20 to 280/300°C	15667	15670

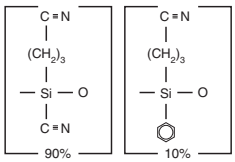
*Maximum temperatures listed are for 15- and 30-meter lengths. Longer lengths may have a slightly reduced maximum temperature.

also available

MXT® Columns
Rugged, flexible, Silcosteel® treated stainless steel tubing; inertness comparable to fused silica tubing. See page 87 for our MXT®-200 columns.

Rtx®-2330 and Rt-2560

Rtx®-2330 Structure



similar phases

DB-23, HP-23, SP-2330, SP-2380

Doing Dioxin Analysis?
Rtx®-Dioxin and Rtx®-Dioxin2 columns provide better resolution and higher maximum temperatures than conventional columns. See **pages 66 and 67**.

Rtx®-2330 (highly polar phase; 90% biscyanopropyl / 10% phenylcyanopropyl polysiloxane—not bonded)

- General purpose columns for *cis*/*trans* FAMEs, dioxin isomers.
- Temperature range: 0°C to 275°C.
- Equivalent to USP G48 phase.

Rtx®-2330 is one of the most polar capillary column stationary phases. Cyano groups on both sides of the polymer backbone give the phase a strong dipole moment and high selectivity for *cis*/*trans* compounds or compounds with conjugated double bonds. Highly polar columns typically exhibit poor column efficiencies, high bleed, and short column lifetimes when thermally cycled. To overcome some of these problems, we developed a surface treatment that is more compatible with the Rtx®-2330 phase. In addition, our improved polymer produces columns with improved column efficiency and lower bleed.

Because the Rtx®-2330 stationary phase is not bonded, it should not be solvent rinsed.

Rtx®-2330 Columns (fused silica)

(90% biscyanopropyl/10% phenylcyanopropyl polysiloxane)

ID	df (µm)	temp. limits*	15-Meter	30-Meter	60-Meter	105-Meter
0.25mm	0.10	0 to 260/275°C	10705	10708	10711	10714
	0.20	0 to 260/275°C	10720	10723	10726	10729
0.32mm	0.10	0 to 260/275°C	10706	10709	10712	10715
	0.20	0 to 260/275°C	10721	10724	10727	10730
0.53mm	0.10	0 to 260/275°C	10707	10710	10713	
	0.20	0 to 260/275°C	10722	10725	10728	

ID	df (µm)	temp. limits	10-Meter	20-Meter	40-Meter
0.18mm	0.10	0 to 260/275°C	40701	40702	40703

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

Rt-2560 (highly polar phase; biscyanopropyl polysiloxane—not bonded)

- Application-specific column for *cis*/*trans* FAMEs.
- Stable to 250°C.

similar phases

SPB-2560

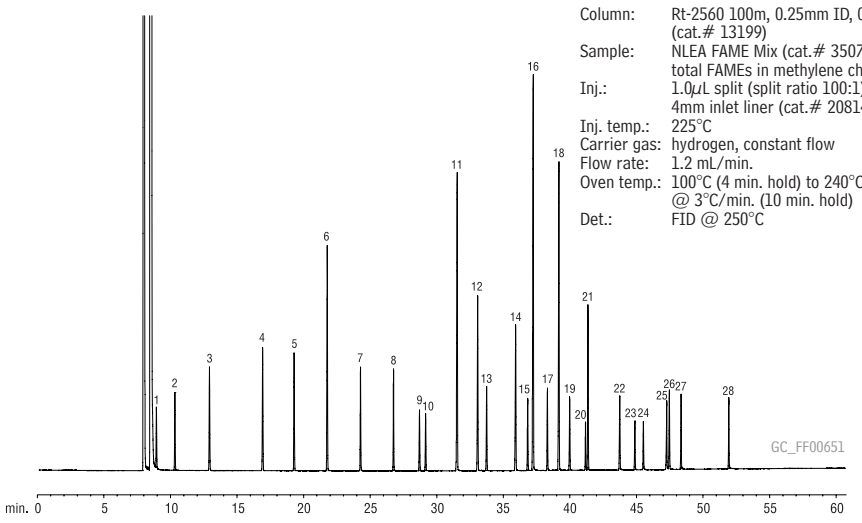
Because the Rt-2560 stationary phase is not bonded, it should not be solvent rinsed.

Rt-2560 Column (fused silica)

(biscyanopropyl polysiloxane)

ID	df (µm)	temp. limits	100-Meter
0.25mm	0.20	20 to 250°C	13199

NLEA FAMEs resolved on an Rt-2560 column.



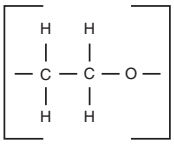
1. C4:0 methyl butyrate
2. C6:0 methyl hexanoate
3. C8:0 methyl octanoate
4. C10:0 methyl decanoate
5. C11:0 methyl undecanoate
6. C12:0 methyl laurate
7. C13:0 methyl tridecanoate
8. C14:0 methyl myristate
9. C14:1 methyl myristoleate (*cis*-9)
10. C15:0 methyl pentadecanoate
11. C16:0 methyl palmitate
12. C16:1 methyl palmitoleate (*cis*-9)
13. C17:0 methyl heptadecanoate
14. C18:0 methyl stearate
15. C18:1 methyl elaidate (*trans*-9)
16. C18:1 methyl oleate (*cis*-9)
17. C18:2 methyl linoelaidate (*trans*-9,12)
18. C18:2 methyl linoleate (*cis*-9,12)
19. C20:0 methyl arachidate
20. C20:1 methyl eicosenoate (*cis*-11)
21. C18:3 methyl linolenate (*cis*-9,12,15)
22. C22:0 methyl behenate
23. C22:1 methyl erucate (*cis*-13)
24. C23:0 methyl tricosanoate
25. C24:0 methyl lignocerate
26. C20:5 methyl eicosapentaenoate (*cis*-5,8,11,14,17)
27. C24:1 methyl nervonate (*cis*-15)
28. C22:6 methyl docosahexaenoate (*cis*-4,7,10,13,16,19)

Stabilwax® (polar phase; Crossbond® Carbowax® polyethylene glycol)

- General purpose columns for FAMEs, flavor compounds, essential oils, amines, solvents, xylene isomers, US EPA Method 603 (acrolein/acrylonitrile).
- Resistant to oxidative damage.
- Temperature range: 40°C to 250°C.
- Equivalent to USP G14, G15, G16, G20, G39 phases.

Our polar-deactivated surface tightly binds the Carbowax® polymer and increases thermal stability, relative to competitive columns. The bonding mechanisms produce a column that can be rejuvenated by solvent washing. Compared to silicone stationary phases, PEG phases are more resistant to damage from strongly acidic or basic volatile compounds, including inorganic acids and volatile inorganic bases.

Stabilwax® Structure



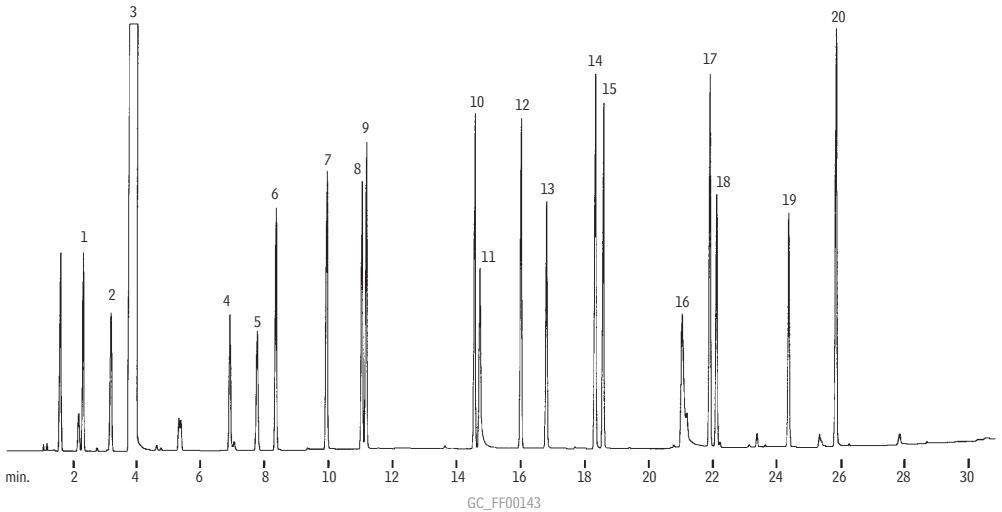
Stabilwax® Columns (fused silica)

(Crossbond® Carbowax® polyethylene glycol)

ID	df (µm)	temp. limits	15-Meter	30-Meter	30-Meter/6-pk.	60-Meter
0.25mm	0.10	40 to 250°C	10605	10608		10611
	0.25	40 to 250°C	10620	10623		10626
	0.50	40 to 250°C	10635	10638		10641
0.32mm	0.10	40 to 250°C	10606	10609		10612
	0.25	40 to 250°C	10621	10624		10627
	0.50	40 to 250°C	10636	10639		10642
	1.00	40 to 240/250°C	10651	10654	10654-600	10657
0.53mm	0.10	40 to 250°C	10607	10610		10613
	0.25	40 to 250°C	10622	10625		10628
	0.50	40 to 250°C	10637	10640		10643
	1.00	40 to 240/250°C	10652	10655	10655-600	10658
	1.50	40 to 230/240°C	10666	10669		10672
	2.00	40 to 220/230°C	10667	10670		

Synthetic mushroom aroma on a Stabilwax®column.

1. acetone
2. ethyl acetate
3. methylene chloride (solvent)
4. hexanal
5. amyl acetate
6. 1-butanol
7. 3-methyl-1-butanol
8. 1-pentanol
9. 3-octanone
10. 3-octanol
11. nonanal
12. 1-octen-3-ol
13. furfural
14. benzaldehyde
15. octyl alcohol
16. phenylacetaldehyde
17. α-terpineol
18. 2,4-nonadienal
19. 2,4-decadienal
20. benzyl alcohol



GC_FF00143

30m, 0.32mm ID, 1.0µm Stabilwax® (cat.# 10654)
1.0µL split injection of a synthetic mushroom aroma

Conc.:	10ng per component
Oven temp.:	40°C to 220°C @ 6°C/min.
Inj. & det. temp.:	260°C
Carrier gas:	hydrogen
Linear velocity:	40cm/sec.
FID sensitivity:	4 x 10^{-11} AFS
Split ratio:	100:1

similar phases

DB-WAX, DB-WAXetr, HP-Wax, HP-Innowax, Supelcowax 10

ordering note

Stabilwax® columns are available with Integra-Guard™ built-in guard columns. Get the protection without the connection! See **page 29** for descriptions and ordering information.

also available

MXT® Columns
Rugged, flexible, Silcosteel® treated stainless steel tubing; inertness comparable to fused silica tubing. See **page 87** for our MXT®-WAX columns.

Stabilwax®-DA

Stabilwax®-DA (polar phase; Crossbond® acid-deactivated Carbowax® polyethylene glycol)

- Application-specific columns for free (underivatized) acids, some inorganic acids.
- Resistant to oxidative damage.
- Temperature range: 40°C to 250°C.
- Equivalent to USP G25, G35 phases.

Stabilwax®-DA bonded polyethylene glycol has an acidic functionality incorporated into the polymer structure. This permits analysis of acidic compounds without derivatization, significantly reduces adsorption of acids, and increases sample capacity for volatile free acids. Stabilwax®-DA columns last longer and give better peak shapes for high molecular weight acids. Some inorganic acids also chromatograph well on a Stabilwax®-DA column; the limitation is the volatility of the acidic compound.

similar phases

DB-FFAP, HP-FFAP, NUKOL, OV-351

crossbond® technology

reduces bleed, prolongs column lifetime, and allows rejuvenation through solvent rinsing.

Stabilwax®-DA Columns (fused silica)

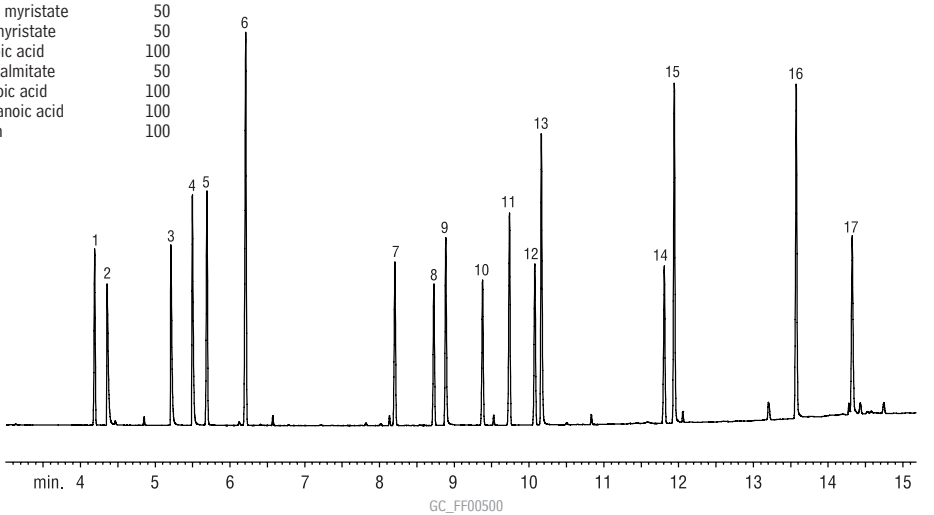
(Crossbond® Carbowax® polyethylene glycol for acidic compounds)

ID	df (µm)	temp. limits	15-Meter	30-Meter	60-Meter
0.25mm	0.10	40 to 250°C	11005	11008	11011
	0.25	40 to 250°C	11020	11023	11026
	0.50	40 to 250°C	11035	11038	11041
0.32mm	0.10	40 to 250°C	11006	11009	11012
	0.25	40 to 250°C	11021	11024	11027
	0.50	40 to 250°C	11036	11039	11042
	1.00	40 to 240/250°C	11051	11054	11057
0.53mm	0.10	40 to 250°C	11007	11010	11013
	0.25	40 to 250°C	11022	11025	11028
	0.50	40 to 250°C	11037	11040	11043
	1.00	40 to 240/250°C	11052	11055	11058
	1.50	40 to 230/240°C	11062	11065	11068

Underivatized alcoholic beverage acids and methyl esters on a Stabilwax®-DA column.

Peak List	Conc. (ppm)
1. ethyl octanoate	100
2. acetic acid	100
3. propionic acid	100
4. isobutyric acid	100
5. 3-decanol	50
6. ethyl decanoate	50
7. ethyl laurate	50
8. *cis*-lactone	100
9. 2-phenylethanol	50
10. *trans*-lactone	100
11. methyl myristate	50
12. ethyl myristate	50
13. octanoic acid	100
14. ethyl palmitate	50
15. decanoic acid	100
16. dodecanoic acid	100
17. vanillin	100

Stabilwax®-DA 30m, 0.18mm ID, 0.18µm (cat.# 550752)
Inj.: 1µL splitless (hold 0.5 min.) at conc. shown in peak list, in ethyl acetate, 4mm ID splitless liner w/wool (cat.# 20814-202.1)
Inj. temp.: 240°C
Carrier gas: hydrogen
Make-up gas: nitrogen
Linear velocity: 28psi @ 240°C
Oven temp.: 70°C to 240°C at 12°C/min. (hold 3 min.)
Det.: FID



Stabilwax®-DB (polar phase; Crossbond® base-deactivated Carbowax® polyethylene glycol)

- Application-specific columns for underivatized amines and other basic compounds, including alkylamines, diamines, triamines, nitrogen-containing heterocyclics. No need for column priming.
- Temperature range: 40°C to 220°C.

Stabilwax®-DB columns reduce adsorption and improve responses for many basic compounds, without analyte derivatization or column priming. For different selectivity for basic compounds, or higher oven temperatures, use an Rtx®-5 Amine or Rtx®-35 Amine column.

Stabilwax®-DB is a bonded stationary phase, but avoid rinsing these columns with water or alcohols.

Mark Lawrence
Northeast Area
Sales Representative
9+ years of service!

Stabilwax®-DB Columns (fused silica)

(Crossbond® Carbowax® polyethylene glycol for amines and basic compounds)

ID	df (µm)	temp. limits	15-Meter	30-Meter	60-Meter
0.25mm	0.25	40 to 210/220°C	10820	10823	
	0.50	40 to 210/220°C		10838	
0.32mm	0.25	40 to 210/220°C	10821	10824	
	0.50	40 to 210/220°C		10839	
	1.00	40 to 210/220°C	10851	10854	10857
0.53mm	0.50	40 to 210/220°C		10840	
	1.00	40 to 210/220°C	10852	10855	10858
	1.50	40 to 210/220°C		10869	

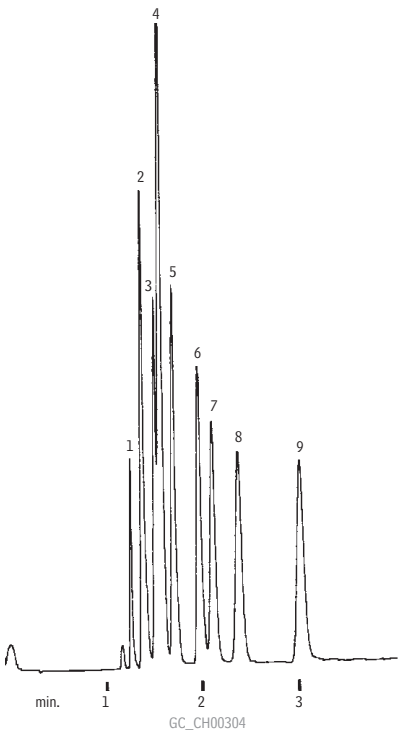
similar phases

DB-CAM, Carbowax® Amine, CP Wax 51

Effective resolution and sharp peaks for low molecular weight primary amines, using a Stabilwax®-DB column.

1. trimethylamine
2. dimethylamine
3. ethylamine
4. methylamine
5. isopropylamine
6. *n*-propylamine
7. *tert*-butylamine
8. diethylamine
9. *sec*-butylamine

30m, 0.53mm ID, 1.0µm Stabilwax®-DB (cat.# 10855)
1.0µL direct injection of amines in water
Oven temp.: 45°C
Inj. & det. temp.: 250°C
Carrier gas: hydrogen
Linear velocity: 40cm/sec. (flow rate: 5cc/min.)
FID sensitivity: 1 x 10^{-11} AFS
Recommended inlet liner: Uniliner®



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