

Detailed Hydrocarbon Analysis (DHA)

Rtx®-1PONA (nonpolar phase; Crossbond® 100% dimethyl polysiloxane)

- Application-specific columns meet ASTM and CGSB requirements for detailed hydrocarbon analysis.
- Stable to 340°C.

please **note**

To achieve critical resolutions, a 5-meter tuning column is connected to the analytical column and adjusted to the needed length through a series of trial analyses.

The Rtx®-1PONA polymer was designed to offer the exact polarity necessary to resolve hydrocarbons in the specific order requested by petrochemical companies. In order to meet the demanding resolution and retention criteria of the American Society for Testing and Materials (ASTM) and the Canadian General Standards Board (CGSB), Restek has developed unique quality control tests and specifications for the Rtx®-1PONA column. The measured values for retention (*k*), efficiency (*n*), and stationary phase selectivity (RI) are controlled so that each column exceeds the requirements of the ASTM and CGSB methods.

Rtx®-1PONA Column (fused silica)

(Crossbond® 100% dimethyl polysiloxane—optimized for hydrocarbon analysis)

ID	df (μm)	temp. limits	100-Meter
0.25mm	0.50	-60 to 300/340°C	10195

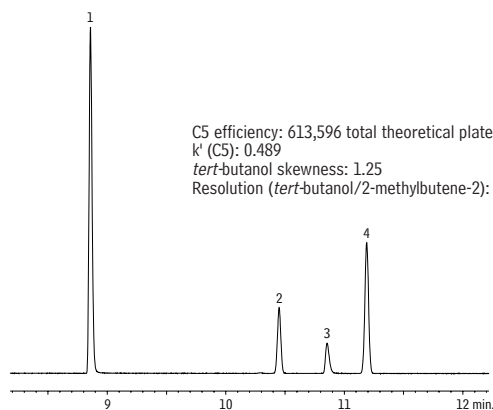
similar **phases**

Petrocol DH, DB-Petro,
HP-PONA

Rtx®-5PONA Tuning Column (fused silica)

(Crossbond® 5% diphenyl/95% dimethyl polysiloxane)

ID	df (μm)	temp. limits	5-Meter
0.25mm	1.0	-60 to 325°C	10196

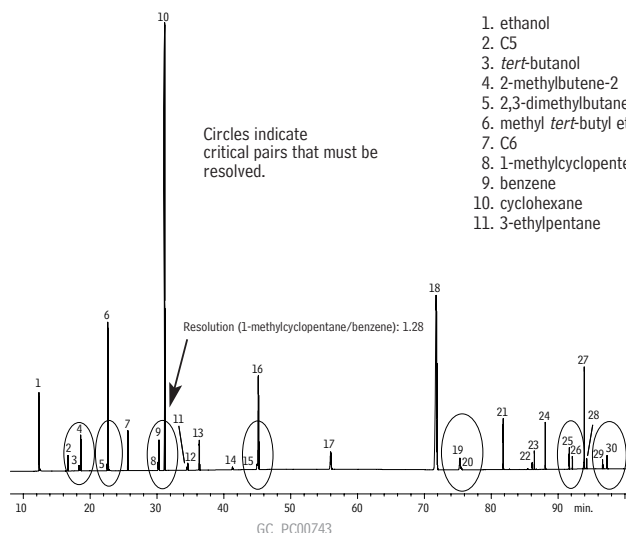
Sharp, symmetric peak for ethanol (gasoline oxygenate), using an Rtx®-1PONA column.**

C5 efficiency: 613,596 total theoretical plates
k' (C5): 0.489
tert-butanol skewness: 1.25
Resolution (*tert*-butanol/2-methylbutene-2): 5.60

1. ethanol
2. C5
3. *tert*-butanol
4. 2-methylbutene-2

**Rtx®-1PONA column
produces near
symmetrical alcohol peaks!**

**P=paraffins; O=olefins; N=naphthenes; A=aromatics.
In alternate terminology: paraffins & isoparaffins = alkanes;
naphthenes = cyclic alkanes; olefins = alkenes.

Critical pairs of gasoline components resolved per ASTM specifications, using an Rtx®-1PONA column.

Circles indicate
critical pairs that must be
resolved.

1. ethanol
2. C5
3. *tert*-butanol
4. 2-methylbutene-2
5. 2,3-dimethylbutane
6. methyl *tert*-butyl ether (MTBE)
7. C6
8. 1-methylcyclopentane
9. benzene
10. cyclohexane
11. 3-ethylpentane
12. 1-*tert*-2-dimethylcyclopentane
13. C7
14. 2,2,3-trimethylpentane
15. 2,3,3-trimethylpentane
16. toluene
17. C8
18. ethylbenzene
19. *p*-xylene
20. 2,3-dimethylheptane
21. C9
22. 5-methylnonane
23. 1,2-methylethylbenzene
24. C10
25. C11 (undecane)
26. 1,2,3,5-tetramethylbenzene
27. naphthalene
28. C12 (dodecane)
29. 1-methylnaphthalene
30. C13 (tridecane)

Column: Rtx®-1PONA, 100m, 0.25mm ID, 0.5μm (cat.# 10195)
plus Rtx®-5PONA tuning column, 2.62m, 0.25mm ID,
1.0μm, connected via Press-Tight® connector
(cat.# 20446)
Sample: custom detailed hydrocarbon analysis
(DHA) mix, neat
Inj.: 0.01μL, split (split ratio 150:1), 4mm cup
inlet liner (cat.# 20709)
Inj. temp.: 200°C
Carrier gas: helium, constant flow
Linear velocity: 28cm/sec. (2.3mL/min.)
Oven temp.: 5°C (hold 15 min.) to 50°C @ 5°C/min. (hold
50 min.) to 200°C @ 8°C/min. (hold 10 min.)
Det.: FID @ 250°C

Simulated Distillation (C5-C44) Analysis

Rtx®-2887 (nonpolar phase; Crossbond® 100% dimethyl polysiloxane)

- Application-specific columns for simulated distillation.
- Stable to 360°C.

Rtx®-2887 columns' stationary phase, column dimensions, and film thickness have been optimized to exceed the resolution and skewing factor requirements currently specified in ASTM method D2887. Each column is individually tested to guarantee a stable baseline with low bleed and reproducible retention times. The Crossbond® methyl silicone stationary phase has increased stability compared to packed columns, ensuring stable baselines and shorter conditioning times.

Rtx®-2887 Column (fused silica)

(Crossbond® 100% dimethyl polysiloxane—for simulated distillation)

ID	df (μm)	temp. limits	10-Meter
0.53mm	2.65	-60 to 360°C	10199

MXT®-2887 Column (Siltek® treated stainless steel)

(Crossbond® 100% dimethyl polysiloxane—for simulated distillation)

ID	df (μm)	temp. limits	10-Meter
0.53mm	2.65	-60 to 400°C	70199

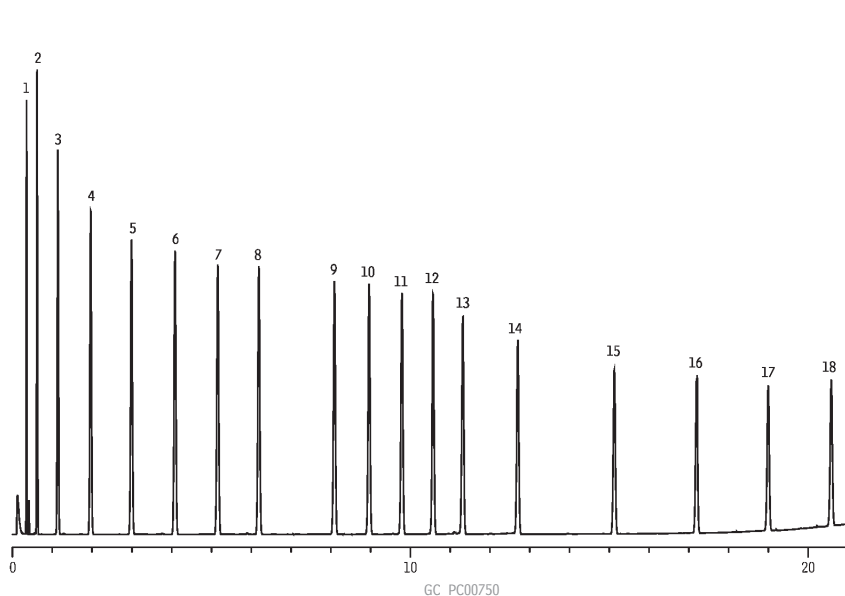


Jason Fisher
GC Column
Manufacturing Supervisor

similar **phases**

DB-2887, Petrocol EX2887

Negligible baseline rise for C5 to C44 hydrocarbons on an Rtx®-2887 column.



1. C5
2. C6
3. C7
4. C8
5. C9
6. C10
7. C11
8. C12
9. C14
10. C16
11. C18
12. C20
13. C24
14. C28
15. C32
16. C36
17. C40
18. C44

Column: Rtx®-2887, 10m, 0.53mm ID, 2.65μm (cat.# 10199)
 Sample: 1μL direct injection of 0.01-0.1 wt. % C5 to C44 hydrocarbon standard in carbon disulfide
 Inj. temp.: 360°C
 Det. temp.: 360°C
 Carrier gas: helium (constant flow)
 Linear velocity: 15mL/min. (112cm/sec.)
 Oven temp.: 35°C to 360°C @ 15°C/min. (hold 5 min.)

Simulated Distillation (C44-C100) Analysis

MXT®-1HT Sim Dist/MXT®-1 Sim Dist/MXT®-500 Sim Dist (nonpolar phases)

- Application-specific columns in unbreakable Siltek® treated stainless steel tubing meet all resolution criteria for high temperature simulated distillation (e.g., ASTM Method D2887 Extended).
- MXT®-1HT Sim Dist and MXT®-1 Sim Dist phases offer true methyl silicone polarity; MXT®-500 Sim Dist phase is a carborane siloxane polymer.
- Stable to 430°C.

Manufactured from Siltek® treated stainless steel tubing, MXT® columns are the most durable high temperature GC columns available. As outlined in ASTM Method D6352, high temperature simulated distillation requires a column that can withstand temperatures to 430°C. MXT®-1HT Sim Dist and MXT®-500 Sim Dist columns exhibit excellent peak shape and low bleed, even at 430°C! The unique MXT®-1HT Sim Dist methyl silicone polymer gives the correct retention time/boiling point curve. The MXT®-500 Sim Dist carborane siloxane polymer offers a slight shift in the calculated boiling range distribution for petroleum samples containing aromatic hydrocarbons.

MXT®-1HT Sim Dist Column (Siltek® treated stainless steel)

ID	df (μm)	temp. limits	5-Meter
0.53mm	0.10	-60 to 430°C	70100

similar phases

DB-1HT, HT-Simdist CB

MXT®-1 Sim Dist Column (Siltek® treated stainless steel)

ID	df (μm)	temp. limits	6-Meter
0.53mm	0.15	-60 to 430°C	70101

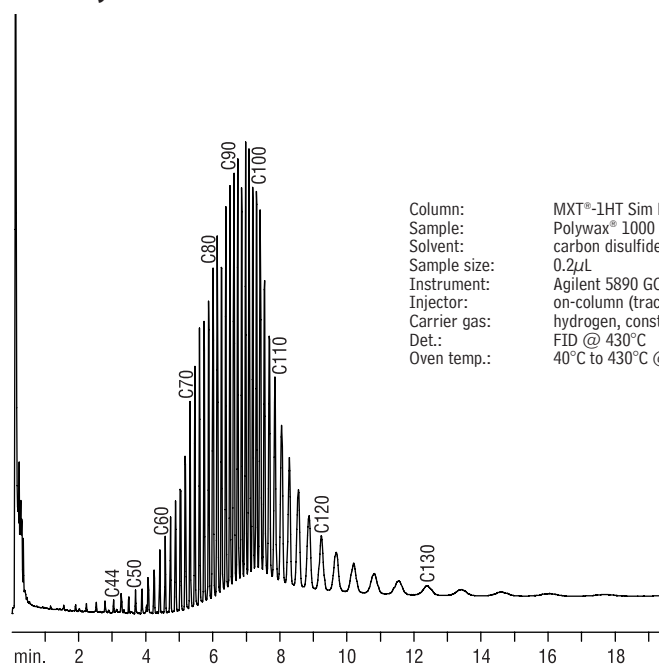
MXT®-500 Sim Dist Column (Siltek® treated stainless steel)

ID	df (μm)	temp. limits	6-Meter
0.53mm	0.15	-60 to 430°C	70104

Polywax® Calibration Materials

Description	qty.	cat.#
Polywax® 655 calibration material	1g	36225
Polywax® 1000 calibration material	1g	36227

C44-C130 hydrocarbons on an MXT®-1HT Sim Dist column.



Column: MXT®-1HT Sim Dist, 5m, 0.53mm ID, 0.10μm (cat.# 70100)
 Sample: Polywax® 1000 (cat.# 36227)
 Solvent: carbon disulfide
 Sample size: 0.2μL
 Instrument: Agilent 5890 GC w/GC Racer
 Injector: on-column (track oven)
 Carrier gas: hydrogen, constant pressure (1.0psi)
 Det.: FID @ 430°C
 Oven temp.: 40°C to 430°C @ 60°C/min. (hold 30 min.)

GC_PC00543

Aromatics & Oxygenates in Gasoline Analysis

Rt™-TCEP (highly polar phase; 1,2,3-tris[2-cyanoethoxy]propane—not bonded)

- General purpose columns, ideal for aromatics and oxygenates in gasoline.
- Temperature range: 0°C to 135°C.

Most gasolines contain aliphatic hydrocarbons up to *n*-dodecane (C12). To improve identification of the aromatics and oxygenates, it is desirable to elute benzene after C11 and toluene after C12. The extremely polar Rt™-TCEP stationary phase provides a retention index for benzene greater than 1100 and permits the separation of alcohols and aromatics from the aliphatic constituents in gasoline.

Rt™-TCEP columns have the same high polarity as TCEP packed columns (precolumns in ASTM Method D4815 for the analysis of petroleum oxygenates), with the efficiency of a capillary column. The result is a column that can separate a wide variety of compounds with an elution pattern unattainable using other high polarity siloxanes.

The Rt™-TCEP column incorporates a nonbonded stationary phase coated on a surface specialized for enhanced polymer stability and extended column lifetime. Solvent rinsing should be avoided. Conditioning is necessary only if the column is to be used at temperatures near the maximum operating temperature.

Rt™-TCEP Columns (fused silica)

(1,2,3-tris[2-cyanoethoxy]propane)

ID	df (μm)	temp. limits	30-Meter	60-Meter
0.25mm	0.40	0 to 135°C	10998	10999

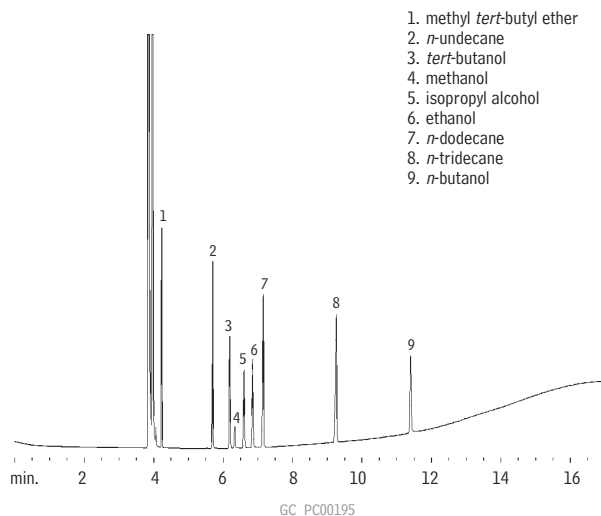


Brian Salisbury
ASG Chemist
1+ year of service!

similar phases

SPB-TCEP, CP-TCEP

Petroleum oxygenates on an Rt™-TCEP column.



Column: Rt™-TCEP 60m, 0.25mm ID, 0.4μm (cat.# 10999)
Inj.: 1.0μL split injection, components @ 500ppm.
Oven temp.: 60°C (hold 5 min.) to 100°C @ 5°C/min. (hold 10 min.)
Inj./det. temp.: 200°C
Carrier gas: helium
Linear velocity: 30cm/sec. set @ 80°C
FID sensitivity: 6.4 x 10⁻¹¹ AFS
Split flow: 46mL/min.

Biodiesel Fuels Analysis

new!

Rtx®-Biodiesel TG

- Linearity for all reference compounds exceeds method requirements.
- Alumaseal™ connector provides leak-free connection; guard column extends column life.
- Low column bleed at high temperatures.
- For glycerine and glyceride analysis, according to ASTM D6584 and EN 14105 methods.

Rtx®-Biodiesel TG Columns (fused silica)

ID	df (μm)	temp. limits	10-Meter
0.32mm	0.10	to 330/380°C	10292
10-Meter w/2m x 0.53mm IP Guard Column attached using Alumaseal™ Connector			
ID	df (μm)	temp. limits	10-Meter
0.32mm	0.10	to 330/380°C	10291

MXT®-Biodiesel TG

- Fast analysis times and sharp mono-, di-, and triglyceride peaks.
- Stable at 430°C for reliable, consistent performance.
- Integra-Gap™ built-in retention gap on a 0.53mm ID column eliminates column coupling completely.

MXT®-Biodiesel TG Columns (Siltek® treated stainless steel)

ID	df (μm)	temp. limits	14-Meter w/2m Integra-Gap™**
0.53mm	0.16	-60 to 380/430°C	70289
ID	df (μm)	temp. limits	10-Meter w/2m x 0.53mm retention gap**
0.32mm	0.10	-60 to 380/430°C	70290

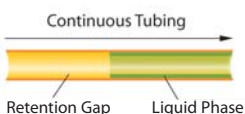
*Total column length=16 meters.

**Connected with low-dead-volume Alumaseal™ connector.

new!

Integra-Gap™ technology.

- Built-in retention gap
- Eliminates connector



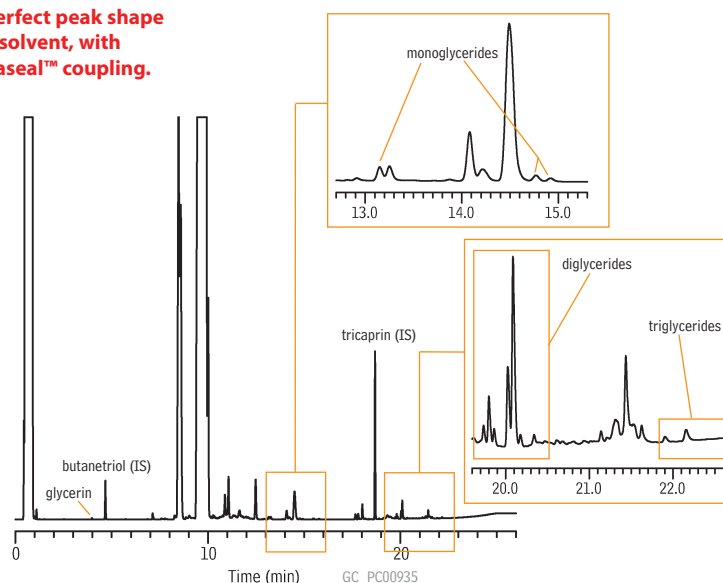
Michelle Long
Innovations Chemist

also available

See pages 678 and 680 for more applications on our new Rtx®-Biodiesel TG and MXT®-Biodiesel TG columns.

Derivatized B100 and internal standards on an MXT®-Biodiesel TG column with 2m x 0.53mm ID retention gap, according to ASTM D6584.

Note perfect peak shape of solvent, with Alumaseal™ coupling.



Column: MXT®-Biodiesel TG, 10m, 0.32mm ID, 0.1μm with 2m x 0.53mm retention gap (cat.# 70290)
 Sample: B100 + IS Butanetriol & Tricaprin derivatized with MSTFA as per ASTM D-6584
 Inj.: 1.0μL cool on-column
 Inj. temp.: oven track
 Carrier gas: hydrogen, constant flow
 Flow rate: 4mL/min.
 Oven temp.: 50°C (hold 1 min.) to 180°C @ 15°C/min., to 230°C @ 7°C/min., to 430°C @ 30°C/min. (hold 5 min.)
 Det.: FID @ 430°C