



Aromatics Analysis

D3606 Application Column Set (2 column set)

- Complete resolution of benzene from ethanol—no compromising coelutions.
- Accurate quantification of benzene and toluene.
- Fully conditioned two column set—ready to use out of the box.
- Listed in the appendix of ASTM Method D3606 as an acceptable alternative to TCEP columns—get better separation of benzene and ethanol while still following ASTM method requirements.

Conforms to the specifications established in the current ASTM method D3606 for the quantitation of benzene and toluene in spark ignition fuel containing ethanol.

| Description | cat.#* |
|---|--------|
| D3606 Application Column (2 column set)** | |
| Column 1: 6' (1.8 m), 1/8" OD, 2.0 mm ID, nonpolar Rtx-1 | 83606- |
| Column 2: 16' (4.9 m), 1/8" OD, 2.0 mm ID, proprietary packing material | |

*Please add column instrument configuration suffix number to cat.# when ordering. See chart on page 141.

**The column set is designed to accommodate both valve injection and/or syringe injection. Column 1 is configured with a 2" inlet void to facilitate on-column injection. The inlet is identified on both column 1 and column 2. Note: The inlet of column 2 is identified for proper orientation for connection to the valve.

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Resolve Benzene and Toluene in Spark Ignition Fuels Containing Ethanol

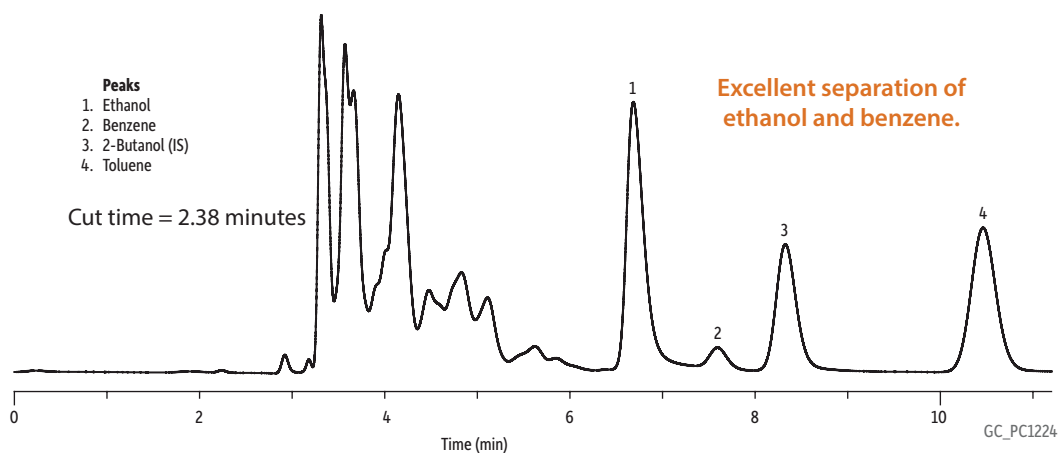
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lit. cat.#
PCTS1408-UNV



Gasoline Containing Ethanol on D3606 Application Column Set by ASTM D3606-10 (Modified)



| | |
|--------------------------|---|
| Column | D3606 application column (2 column set). Column 1: 6' (1.8 m), 1/8" OD, 2.0 mm ID, nonpolar Rtx®-1; Column 2: 16' (4.9 m), 1/8" OD, 2.0 mm ID, proprietary packing material (cat.# 83606-800) |
| Sample | Ethanol-containing gasoline with internal standard (IS) |
| Diluent: | |
| Injection | Sample valve |
| Sample Loop Vol.: | 1.5 µL |
| Valve Temp.: | 150 °C |
| Oven | |
| Oven Temp.: | 135 °C (hold 12 min) |
| Carrier Gas | He, constant flow |
| Flow Rate: | 20.0 mL/min |
| Detector | TCD @ 200 °C |
| Notes | 2.38 minute backflush (must be determined for each GC system). |

Light Hydrocarbon Analysis

Special Columns for Unsaturated Light Hydrocarbons

- Faster separations of C1 to C4 hydrocarbons.
- Res-Sil® packing replaces Porasil materials.

n-Octane on Res-Sil® C Packed Column

This packed column has unique selectivity for resolving unsaturated light hydrocarbons (Figure 1).

OPN on Res-Sil® C Packed Column

This column separates the light hydrocarbons, and baseline resolves *cis*-2-butene from 1,3-butadiene (Figure 2).

2abc Refinery Gas Column Set

This three-column set is finely tuned to resolve light hydrocarbons. When used in the proper valving system, it will elute C5+ hydrocarbons ahead of C1 through C4 hydrocarbons (Figure 3).

| Description | cat.#* |
|---|-----------|
| <i>n</i> -Octane on Res-Sil C, 80/100 (20', 2.0 mm ID, 1/8" Silcosmooth OD) | 80436- |
| OPN on Res-Sil C, 80/100 (12', 2.0 mm ID, 1/8" Silcosmooth OD) | 80437- |
| 2abc Refinery Gas Column Set (3 column set)** | 88000- |
| 2.1% Carbowax 1540 Porasil C (backflush column)*** | 88004-875 |

*Please add column instrument configuration suffix number to cat.# when ordering. See chart on page 141.

**This column set is for a valving system; therefore, packing material is filled to ends of columns.

***To be used with 2abc refinery gas column set (cat.# 88000-) to backflush and prevent C6+ hydrocarbons from entering column set.

Figure 1: *n*-Octane on Res-Sil® C packing demonstrates unique selectivity for unsaturated light hydrocarbons.

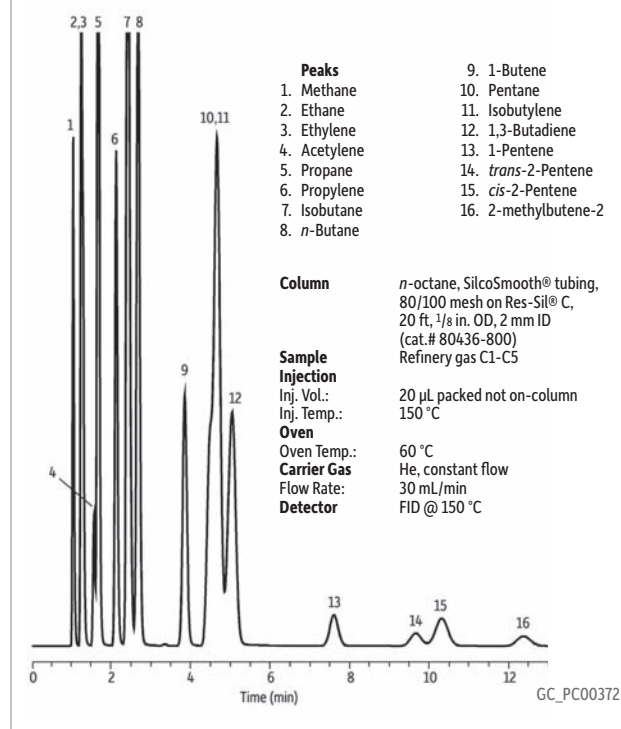


Figure 2: OPN on Res-Sil® C packing demonstrates unique selectivity for *cis*-2-butene and 1,3-butadiene.

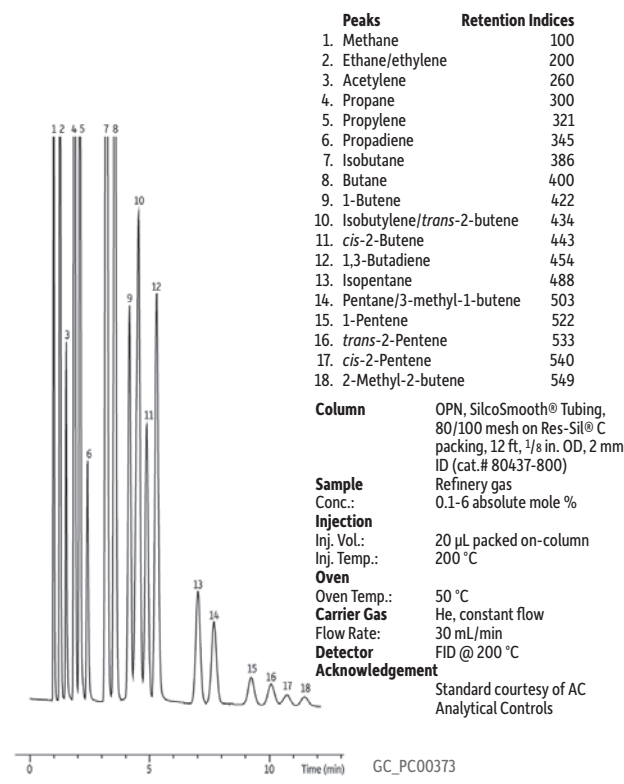
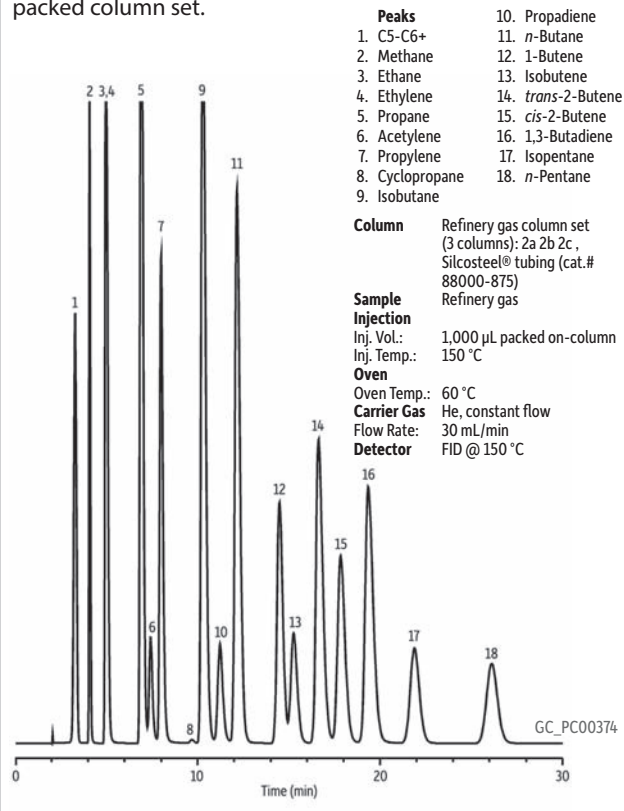


Figure 3: Refinery gas calibration standard on refinery gas packed column set.



for more info

See **page 144** for more information on Res-Sil® packing materials.

it's a fact

ShinCarbon ST is an ideal packing material for permanent gases, low molecular weight hydrocarbons, sulfur dioxide, and Freon® gases.

also available

Adapter kits for installing packed/micropacked columns.

See **page 142**.

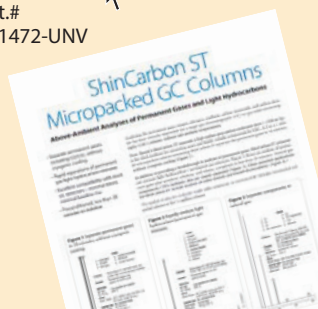
**free literature**

ShinCarbon ST
Micropacked GC Columns
Above-Ambient Analyses of
Permanent Gases and
Light Hydrocarbons

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lit. cat.#
PCTS1472-UNV

**Permanent Gases & Hydrocarbon Analysis**

ShinCarbon ST Columns (packed & micropacked)
(SilcoSmooth® Stainless Steel)

- Separate permanent gases, including carbon monoxide and carbon dioxide, without cryogenic cooling.
- Rapid separations of permanent gas/light hydrocarbon mixtures.
- Excellent compatibility with most GC detectors—minimal bleed, minimal baseline rise.
- Preconditioned, less than 30 minutes to stabilize.
- Maximum temperature of 280 °C/300 °C.

Analyze oxygen, nitrogen, methane, carbon monoxide, and carbon dioxide with one column at room temperature. ShinCarbon ST material, a high surface area carbon molecular sieve (~1,500 m²/g), is the ideal medium for separating gases and highly volatile compounds by gas solid chromatography (GSC). The rapid, above-ambient analyses these columns provide is a great convenience. Excellent thermal stability of the high surface area carbon, combined with careful conditioning during column manufacturing, ensures low-bleed operation and rapid stabilization when installing a new column. Custom-made ShinCarbon ST columns are available on request.

ShinCarbon ST is a highly stable material. Its 300 °C upper programmed temperature limit minimizes bleed and baseline rise during temperature programming, making the material compatible with most detection systems used for gas analysis, including TCD or HID. All ShinCarbon ST columns are fully conditioned in an oxygen/moisture-free environment for your convenience. This minimizes stabilization time (less than 30 minutes) when installing a new column which, in turn, reduces downtime.

ShinCarbon ST Columns (packed)*

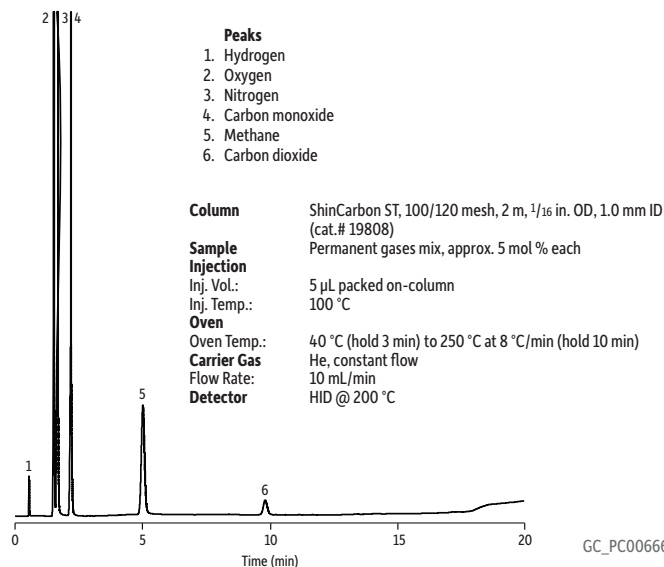
| OD | ID | Mesh | 2-Meter cat.#* | |
|------|-------------|--------|----------------|--------|
| 1/8" | Silcosmooth | 2.0 mm | 80/100 | 80486- |

ShinCarbon ST Columns (micropacked)

| OD | ID | Mesh | 1-Meter cat.# | 2-Meter cat.# |
|---------|---------|---------|---------------|---------------|
| 1/16" | 1.0 mm | 100/120 | 19809 | 19808 |
| 0.95 mm | 0.75 mm | 100/120 | 19810 | — |
| 0.74 mm | 0.53 mm | 80/100 | 19045 | 19043 |

*Please add column instrument configuration suffix number to cat.# when ordering. See chart on the next page.

Note: Columns do not include column nuts and ferrules. Optional installation kits can be ordered separately—see page 142.

Permanent Gases on ShinCarbon ST

Sulfur Analysis

Rt[®]-XLSulfur Columns (packed & micropacked)

- Optimized columns for low ppbv sulfur analyses.
- Eliminate the need for PTFE tubing.
- Column and end fittings are Sulfinert[®] treated for maximum inertness.
- Maximum temperature of 290 °C.

Sulfur analyses are traditionally performed using PTFE tubing to improve column inertness. Unfortunately, PTFE tubing is gas permeable, difficult to pack with high efficiency, prone to shrinkage, and has poor thermal stability. The Rt[®]-XLSulfur packed or micropacked column eliminates these problems. The packing material for Rt[®]-XLSulfur columns is extensively deactivated for analysis of low ppbv levels of hydrogen sulfide and methyl mercaptan. It is then treated to achieve effective separation of hydrocarbons from sulfur compounds. The interior wall and the end fittings of the Rt[®]-XLSulfur column are Sulfinert[®] treated, making the column as inert as PTFE. The extra care taken to manufacture this column ensures more accurate analyses of sulfur compounds.

Rt[®]-XLSulfur Columns (packed)*

| OD | ID | Mesh | 1-Meter cat.#* | 2-Meter cat.#* |
|-------|--------|---------|----------------|----------------|
| 1/8" | 2.0 mm | 100/120 | 80484- | 80485- |
| 3/16" | 3.2 mm | 100/120 | 80482- | 80483- |

Rt[®]-XLSulfur Columns (micropacked)

| OD | ID | Mesh | 1-Meter cat.# | 2-Meter cat.# |
|---------|---------|---------|---------------|---------------|
| 1/16" | 1.0 mm | 100/120 | 19804 | 19805 |
| 0.95 mm | 0.75 mm | 100/120 | 19806 | 19807 |
| 0.74 mm | 0.53 mm | 100/120 | | 19044 |

*Please add column instrument configuration suffix number to cat.# when ordering. See chart on this page.

NOTE: Columns do not include column nuts and ferrules. Optional installation kits can be ordered separately—see page 142.

did you know?

Rt[®]-XLSulfur columns are optimized for low ppbv-level sulfur analysis!

also available

Adapter kits for installing packed/micropacked columns.

See **page 142**.

free literature

Rt[®]-XLSulfur Packed Column
Specialized packed and micropacked columns for eXtra-Low Sulfur analysis

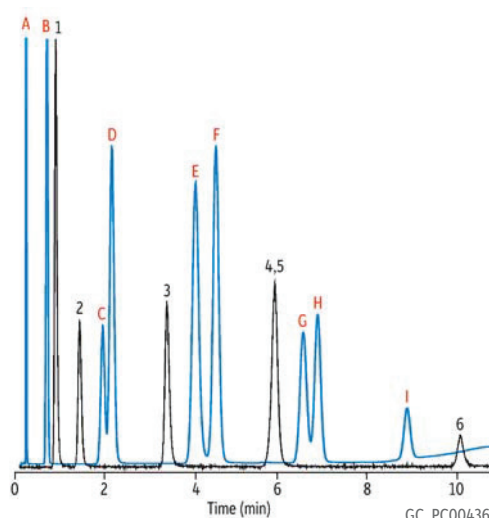
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PCTS1500A-UNV



Sulfur Compounds and Hydrocarbons on Rt[®]-XLSulfur



Sulfurs

1. Hydrogen sulfide
2. Carbonyl sulfide
3. Methyl mercaptan
4. Ethyl mercaptan
5. Dimethyl sulfide
6. Dimethyl disulfide

Hydrocarbons

- A. Methane
- B. Ethane
- C. Propylene
- D. Propane
- E. Isobutane
- F. Butane
- G. Isopentane
- H. Pentane
- I. Hexane

Column Rt[®]-XLSulfur, 1 m, 0.95 mm OD, 0.75 mm ID (cat.# 19806)
Sample
Conc.: 50 ppb each
Injection packed not on-column
Oven
Oven Temp.: 60 °C to 230 °C at 15 °C/min
Carrier Gas He, constant flow
Flow Rate: 9 mL/min
Detector SCD/FID
Acknowledgement Sulfur standards courtesy of DCG Partnership 1 Ltd., Pearland, TX.

Column Instrument Configurations



General Configuration
Suffix -800



Agilent 5880, 5890, 5987,
6890, 7890:
Suffix -810*



Bruker 430, 3700, Vista Series, FID:
Suffix -820



8 3/4" | PE 900-3920, Sigma 1,2,3:
Suffix -830



6 1/2" | PE Auto System 8300, 8400, 8700
Suffix -840

See page 151 for additional configurations.

Note: Initial 2" of column will be empty to accommodate a needle. For a completely filled column (not on-column) add suffix -901.

*-810 suffix also includes 1 1/2" void on detector side.

Note: Standard micropacked columns fit all instruments. No special instrument configuration suffix is required.