

## Rt®-Alumina BOND Columns

Restek® Rt®-Alumina BOND columns are highly selective for C1–C5 hydrocarbons and separate all saturated and unsaturated hydrocarbon isomers above ambient temperatures. The reactivity of the aluminum oxide stationary phase is minimized to improve column response for polar unsaturates, such as dienes, and the column's sensitivity (or response) ensures linear and quantitative chromatographic analysis for these compounds. Strong bonding prevents particle generation and release, which allows valve switching without harming the injection or detection systems. And because they are stable up to at least 200 °C, Rt®-Alumina BOND columns can be regenerated to restore full efficiency and selectivity by conditioning at their maximum temperature if water is adsorbed. High capacity and loadability give you exceptionally symmetrical peaks, making these columns ideal for volatile hydrocarbon separations at percent levels, as well as impurity analyses at ppm concentrations. Restek® Rt®-Alumina BOND PLOT columns are manufactured on fused silica tubing; select phases are also available on metal MXT® tubing.

To ensure reproducible retention times and predictable flow behavior column-to-column, each Rt®-Alumina BOND column is extensively tested. A hydrocarbon test mix confirms proper phase retention and selectivity. To calculate *k* (retention or capacity factor), which is a measure of phase retention, 1,3-butadiene is used, while selectivity is measured using retention indices for propadiene and methyl acetylene. The resolution of *trans*-2-butene and 1-butene is also verified and, to measure efficiency, plates per meter are checked using 1,3-butadiene.

### Rt®-Alumina BOND/Na<sub>2</sub>SO<sub>4</sub> Columns (fused silica PLOT) (Na<sub>2</sub>SO<sub>4</sub> deactivation)

- Acetylene and propadiene elute after butanes.
- Best separation for butene isomers (impurities in butene streams).
- Methyl acetylene elutes after 1,3-butadiene.
- Cyclopropane (impurity in propylene) elutes well before propylene.
- Stable to 200 °C.

| ID      | df    | temp. limits | 30-Meter cat.# | 50-Meter cat.# |
|---------|-------|--------------|----------------|----------------|
| 0.25 mm | 4 μm  | to 200 °C    | 19775          | —              |
| 0.32 mm | 5 μm  | to 200 °C    | 19757          | 19758          |
| 0.53 mm | 10 μm | to 200 °C    | 19755          | 19756          |

### similar phases

GS-Alumina, CP-Al<sub>2</sub>O<sub>3</sub>/Na<sub>2</sub>SO<sub>4</sub>, Alumina-Sulfate

### tech tip

#### Trace Water in the Carrier Gas

Traces of water in the carrier gas and samples will affect the retention and the selectivity of alumina. If exposed to water, the retention times will shorten. The column can be regenerated by conditioning for 15–30 minutes at 200 °C under normal carrier gas flow. Periodic conditioning ensures excellent run-to-run retention time reproducibility.

Unless noted, the maximum programmable temperature for an Rt®-Alumina BOND column is 200 °C. Temperatures higher than the stated maximum temperature can cause irreversible changes to the porous layer adsorption properties.

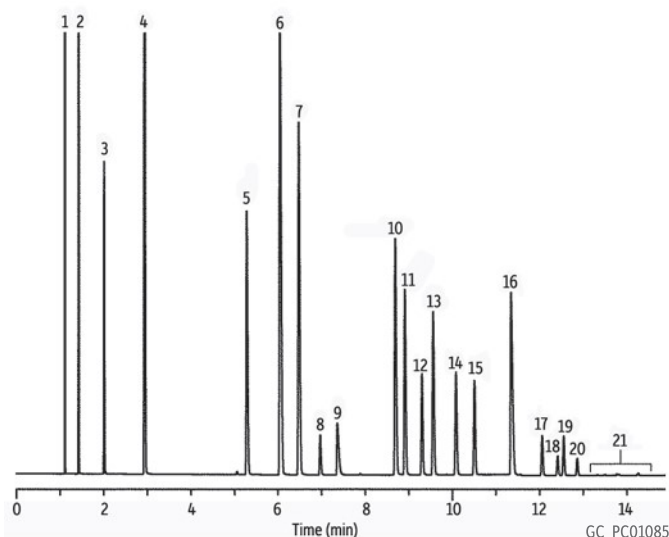
### also available

Metal MXT®  
PLOT Columns



See page 129.

### Refinery Gas on Rt®-Alumina BOND (Na<sub>2</sub>SO<sub>4</sub>)



| Peaks                      |                             |
|----------------------------|-----------------------------|
| 1. Methane                 | 11. 1-Butene                |
| 2. Ethane                  | 12. Isobutylene             |
| 3. Ethylene                | 13. <i>cis</i> -2-Butene    |
| 4. Propane                 | 14. <i>iso</i> -Pentane     |
| 5. Propylene               | 15. <i>n</i> -Pentane       |
| 6. Isobutane               | 16. 1,3-Butadiene           |
| 7. <i>n</i> -Butane        | 17. <i>trans</i> -2-Pentene |
| 8. Propadiene              | 18. 2-Methyl-2-butene       |
| 9. Acetylene               | 19. 1-Pentene               |
| 10. <i>trans</i> -2-Butene | 20. <i>cis</i> -2-Pentene   |
|                            | 21. Hexanes                 |

|                         |  |
|-------------------------|--|
| <b>Column</b>           | Rt®-Alumina BOND/Na <sub>2</sub> SO <sub>4</sub> , 50 m, 0.53 mm ID, 10 μm (cat.# 19756) |
| <b>Sample Injection</b> | Refinery gas   |
| Inj. Vol.:              | 10 μL split  |
| Liner:                  | Taper (2 mm) (cat.# 20795)   |
| Inj. Temp.:             | 200 °C   |
| Split Vent              |  |
| Flow Rate:              | 80 mL/min  |
| <b>Oven</b>             |  |
| Oven Temp.:             | 45 °C (hold 1 min) to 200 °C at 10 °C/min (hold 3.5 min)                                 |
| <b>Carrier Gas</b>      | H <sub>2</sub> , constant pressure (8.0 psi, 55.2 kPa)                                   |
| Linear Velocity:        | 74 cm/sec @ 45 °C  |
| <b>Detector</b>         | FID @ 200 °C   |

### similar phases

GC-Alumina KCl, HP-PLOT Al<sub>2</sub>O<sub>3</sub>/KCl,  
CP-Al<sub>2</sub>O<sub>3</sub>/KCl, Alumina-Chloride

### Rt®-Alumina BOND/KCl Columns (fused silica PLOT) (KCl deactivation)

- Restek's lowest polarity alumina column.
- Low moisture sensitivity reduces the need for frequent regeneration.
- Acetylene elutes before *n*-butane.
- Methyl acetylene (impurity in 1,3-butadiene) elutes before 1,3-butadiene.
- Stable to 200 °C.

| ID      | df    | temp. limits | 30-Meter<br>cat.# | 50-Meter<br>cat.# |
|---------|-------|--------------|-------------------|-------------------|
| 0.25 mm | 4 µm  | to 200 °C    | 19776             | —                 |
| 0.32 mm | 5 µm  | to 200 °C    | 19761             | 19762             |
| 0.53 mm | 10 µm | to 200 °C    | 19759             | 19760             |

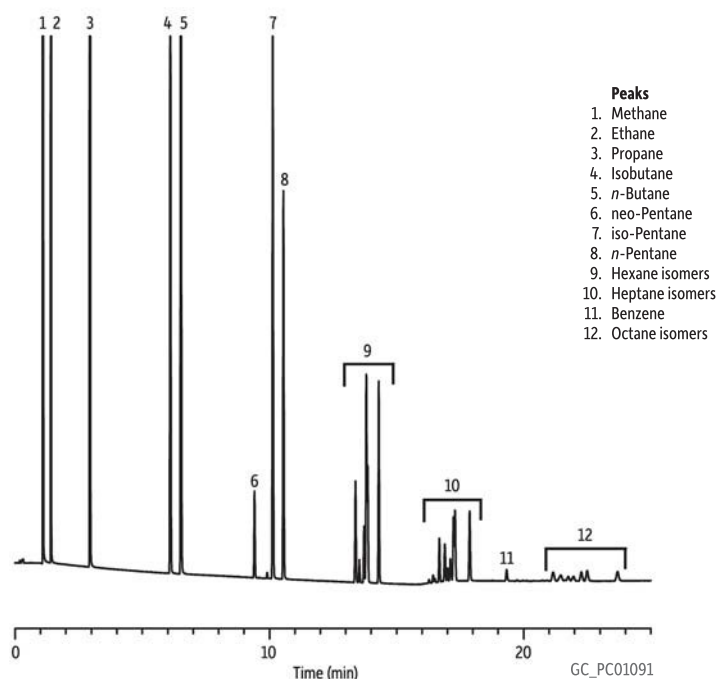
#### Fused Silica Capillary & PLOT Column Ferrule Guide

| GC Column ID | Ferrule ID |
|--------------|------------|
| 0.15 mm      | 0.4        |
| 0.18 mm      | 0.4        |
| 0.25 mm      | 0.4        |
| 0.32 mm      | 0.5        |
| 0.53 mm      | 0.8        |



We pack Restek quality into each and every column we ship.

#### Natural Gas on Rt®-Alumina BOND/KCl



**Column** Rt®-Alumina BOND/KCl, 50 m, 0.53 mm ID, 10 µm (cat.# 19760)  
**Sample** Natural gas  
**Injection**  
 Inj. Vol.: 500 µL split  
 Liner: 2.0 mm ID single taper (cat.# 20795)  
 Inj. Temp.: 200 °C  
 Split Vent  
 Flow Rate: 50 mL/min  
**Oven**  
 Oven Temp.: 45 °C (hold 1 min) to 200 °C at 10 °C/min (hold 8.5 min)  
**Carrier Gas** H<sub>2</sub>, constant pressure (8.0 psi, 55.2 kPa)  
 Linear Velocity: 45 cm/sec @ 45 °C  
**Detector** FID @ 200 °C  
 Make-up Gas  
 Type: N<sub>2</sub>  
 Data Rate: 20 Hz  
**Instrument** HP5890 GC

**Rt<sup>®</sup>-Alumina BOND/CFC Columns** (fused silica PLOT)

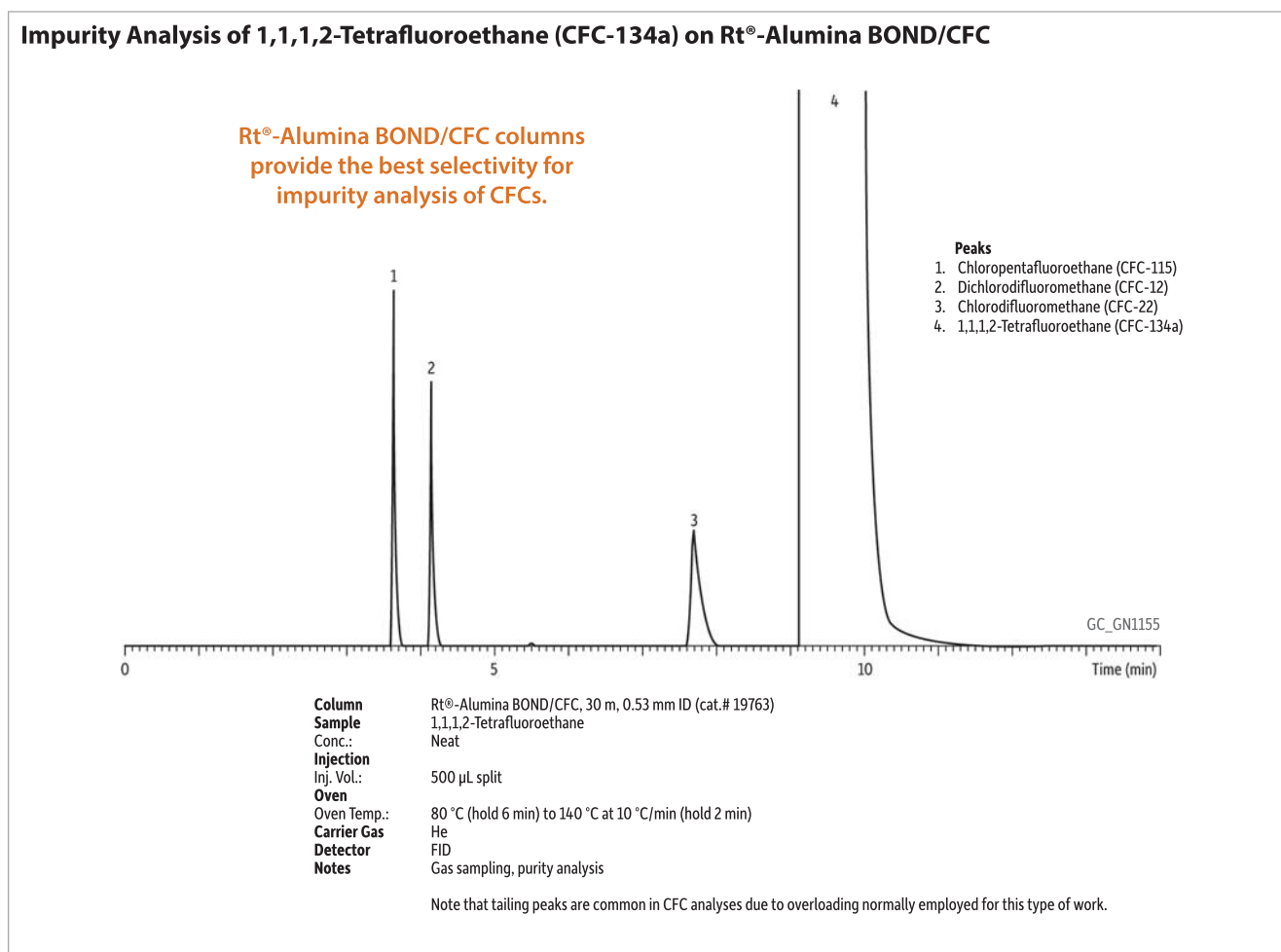
- Improved inertness for chlorofluorocarbon (CFC) compounds.
- Highly selective alumina-based column, separates most CFCs.
- High retention and capacity for CFCs.
- Stable to 200 °C.

The Alumina BOND/CFC adsorbent is ideal for retaining halogenated compounds, especially CFCs (chlorinated fluorocarbons) like Freon<sup>®</sup> products. It offers high selectivity, allowing a wide range of CFC isomers to be resolved at above ambient temperatures. The Rt<sup>®</sup>-Alumina BOND/CFC column is thoroughly deactivated to reduce the reactivity of alumina. Even though there is still some residual reactivity for some mono- or di-substituted CFCs, the majority of these compounds can be accurately quantified from main stream processes or in impurity analyses.

**did you know?**

All Restek PLOT columns come standard on a 7"-diameter, 11-pin cage.

| ID      | df    | temp. limits | 30-Meter cat.# |
|---------|-------|--------------|----------------|
| 0.53 mm | 10 µm | to 200 °C    | 19763          |



## similar phases

Select Al<sub>2</sub>O<sub>3</sub> MAPD

## free literature

Analyze Trace Polar Hydrocarbons More Accurately and Reliably With New Alumina BOND/MAPD PLOT Columns

Download your free copy from

[www.restek.com](http://www.restek.com)

lit. cat.#  
PCBR1412A-UNV



### Rt<sup>®</sup>-Alumina BOND/MAPD Columns (fused silica PLOT)

- Optimized deactivation produces maximum response when analyzing trace levels of acetylene, methyl acetylene, and propadiene.
- Stable response factors make this column ideal for process-type applications where recalibration must be minimized.
- High loadability reduces peak tailing and improves separations.
- Extended temperature range up to 250 °C for fast elution of high molecular weight (HMW) hydrocarbons and accelerated column regeneration following exposure to water.
- Stable to 250 °C.

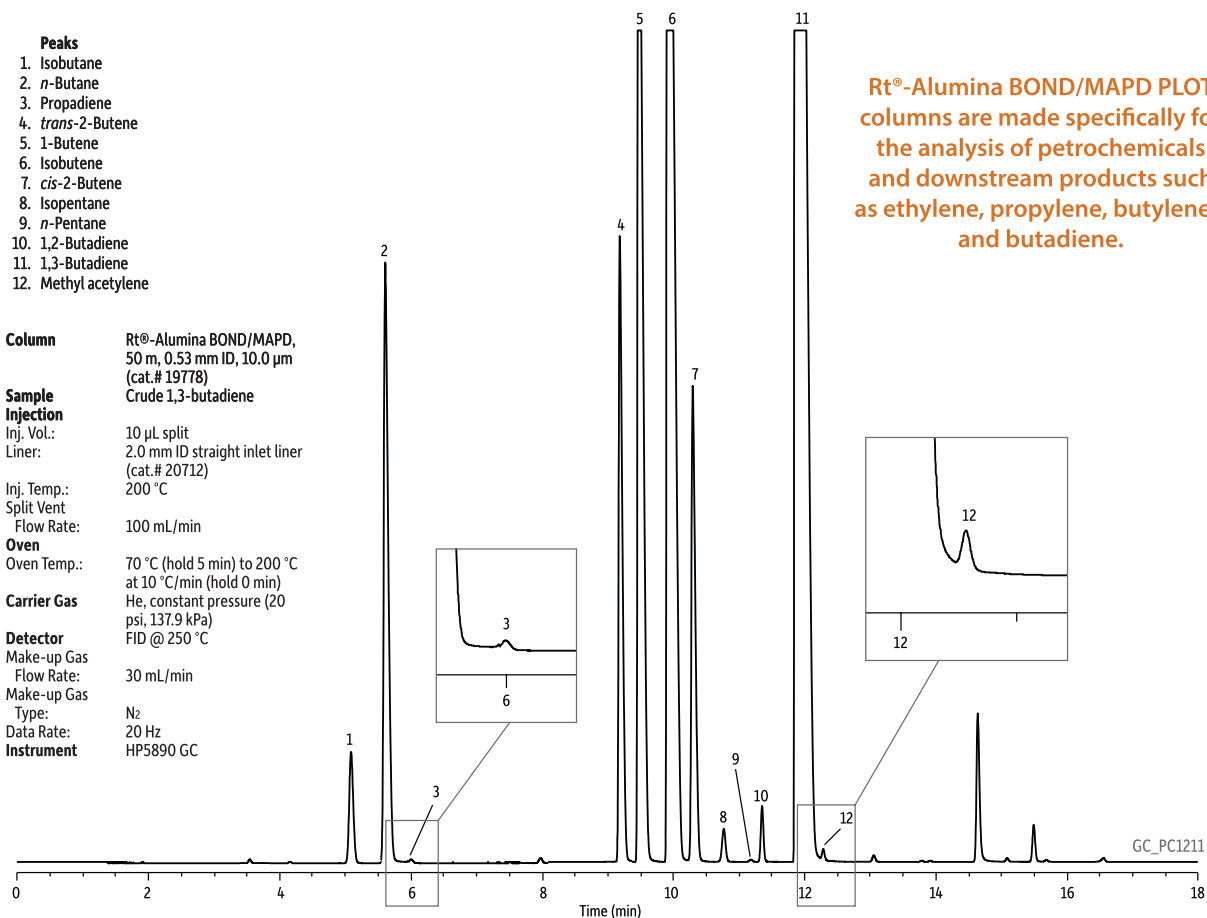
Restek's R&D chemists have optimized the deactivation technology applied to our Rt<sup>®</sup>-Alumina BOND/MAPD column for improved analysis of trace concentrations of polar hydrocarbons like acetylene, methyl acetylene, and propadiene in hydrocarbon streams containing higher levels of C1-C5 hydrocarbons. Our alumina PLOT deactivation produces an incredibly inert column that offers superior reproducibility and stable response factors to maximize the number of analyses before recalibration is required. Its high sample capacity reduces peak tailing, thereby improving the separation of target compounds. In addition, a 250 °C maximum operating temperature lets you more quickly elute hydrocarbons up to dodecane and reduces regeneration time when the column is exposed to water from samples or carrier gases.

| ID      | df    | temp. limits | 30-Meter cat.# | 50-Meter cat.# |
|---------|-------|--------------|----------------|----------------|
| 0.25 mm | 4 μm  | to 250 °C    | 19781          | —              |
| 0.32 mm | 5 μm  | to 250 °C    | 19779          | 19780          |
| 0.53 mm | 10 μm | to 250 °C    | 19777          | 19778          |

### 1,3-Butadiene on Rt<sup>®</sup>-Alumina BOND/MAPD (Purity Analysis)

- Peaks**
1. Isobutane
  2. *n*-Butane
  3. Propadiene
  4. *trans*-2-Butene
  5. 1-Butene
  6. Isobutene
  7. *cis*-2-Butene
  8. Isopentane
  9. *n*-Pentane
  10. 1,2-Butadiene
  11. 1,3-Butadiene
  12. Methyl acetylene

**Column** Rt<sup>®</sup>-Alumina BOND/MAPD, 50 m, 0.53 mm ID, 10.0 μm (cat.# 19778)  
**Sample** Crude 1,3-butadiene  
**Injection**  
 Inj. Vol.: 10 μL split  
 Liner: 2.0 mm ID straight inlet liner (cat.# 20712)  
 Inj. Temp.: 200 °C  
 Split Vent  
 Flow Rate: 100 mL/min  
**Oven**  
 Oven Temp.: 70 °C (hold 5 min) to 200 °C at 10 °C/min (hold 0 min)  
**Carrier Gas**  
 He, constant pressure (20 psi, 137.9 kPa)  
**Detector**  
 Make-up Gas FID @ 250 °C  
 Flow Rate: 30 mL/min  
 Make-up Gas Type: N<sub>2</sub>  
 Data Rate: 20 Hz  
**Instrument** HP5890 GC



Rt<sup>®</sup>-Alumina BOND/MAPD PLOT columns are made specifically for the analysis of petrochemicals and downstream products such as ethylene, propylene, butylenes, and butadiene.