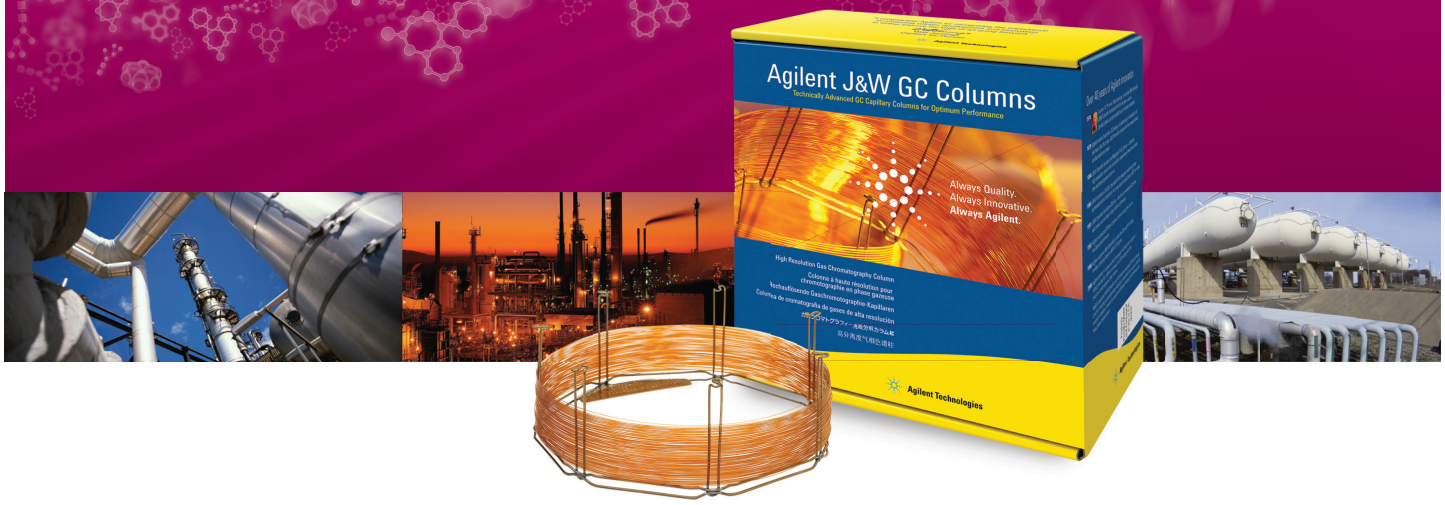
Agilent J&W GC Columns for Energy and Chemical Applications

# POWER YOUR PRODUCTIVITY AND ENSURE TOP PRODUCT QUALITY

The Measure of Confidence




Agilent Technologies

# *Ruggedness* and *reliability* to meet your lab's demands

From product quality and safety... to price-driven efficiency improvements... to environmental stewardship... the pressure to stay productive, profitable, and compliant is more intense than ever. You simply do not have room in your day for downtime caused by problems with your analytical column.

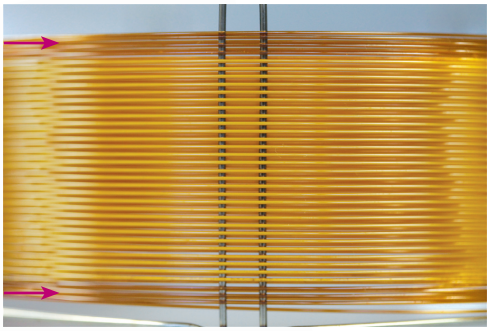
Porous layer open tubular (PLOT) columns are the GC columns of choice for the analysis of light gases and volatile compounds because of their high retentive character, and therefore, have been widely adopted in the hydrocarbon processing industry. However, the stationary phase layer in many PLOT columns is not mechanically stable – resulting in particle shedding – which can adversely affect your analysis.

Likewise, if you use Sulfur Chemiluminescence Detection (SCD) to analyze sulfur compounds in natural gas, petroleum products, and process streams, you may have experienced detector sensitivity issues. Column bleed from thick film polydimethylsiloxane (PDMS) phases, which are commonly used, can contribute to "fouling" phenomena on SCD ceramic burner tubes. This leads to frequent and costly tube replacement and associated downtime. In addition, since light sulfur gases are reactive, flow path inertness is critical to avoiding peak tailing.

But the *good news* is... Agilent has developed two new column technologies specifically designed to reduce GC system downtime and maintenance, while expanding your lab's analytical capabilities.

## Reduce maintenance costs and extend your capabilities with Agilent J&W PLOT PT GC columns

New integrated particle-trapping technology on *both ends* of Agilent PLOT PT GC columns minimizes particle shedding in all applications. That means you can worry less about signal spiking – and unnecessary downtime. Our particle-trapping design also takes the worry out of performing GC or GC/MS analysis with PLOT columns for more confident identification of unknowns.



*Integrated particle trap at column ends*

## Greatly improve SCD stability with Agilent J&W DB-Sulfur SCD columns

These new columns are optimized for low bleed, which reduces fouling of SCD ceramic tubes – minimizing instrument downtime and operational costs. In addition, DB-Sulfur SCD columns provide excellent peak shape and extended detector stability for all GC SCD methods that utilize PDMS stationary phases – such as ASTM D 5623 and 5504.

## Inside: our latest column technologies for overcoming productivity barriers



**To learn more about Agilent J&W PLOT PT GC and Agilent J&W DB-Sulfur SCD columns, visit agilent.com/chem/energyGC**

# AGILENT J&W PLOT PT GC COLUMNS

## Analyze light gases and VOCs without worrying about particle shedding

Most Porous Layer Open Tubular (PLOT) columns are prone to shedding stationary phase particles, which can flow into the detector and cause the signal to spike. This prevents your system software from accurately identifying and quantifying compounds.

You *could* simply live with the problem... or try to work around it, either by installing a particle trap on the end of the column, or by connecting an inline filter at valve and detector interfaces. However, these approaches can cause problems such as leaks, clogs, method adjustments, decreased system performance, increased downtime, and higher labor costs.

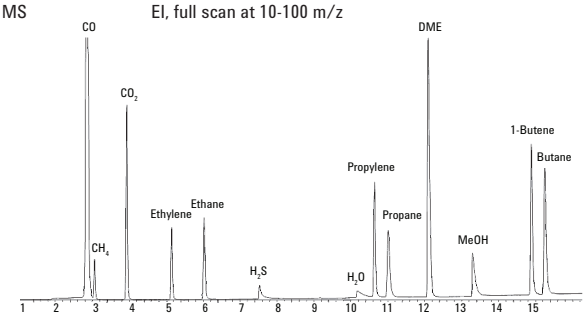
### Now, there's a *better* option: Agilent J&W PLOT PT GC columns

These unique columns virtually eliminate particle shedding through integrated particle-trapping technology on *both ends of the column* – giving you the advantages of:

- **No need for cumbersome (and leaky) unions or downstream filters:** The integrated particle trapping technology is *built directly into the column* as one continuous length of fused silica.
- **Worry-free GC/MS and switch valve applications:** PLOT PT columns protect your switch valves and detectors from PLOT phase particles, so you can perform reliable backflush/heart cut techniques and expand your analytical capability by using capillary flow technology (CFT) and mass spec detection.
- **Decreased system maintenance/downtime:** You won't waste time replacing filters and column switching valves, which can be damaged by particle shedding.
- **Easy upgrade:** No selectivity changes minimize method adjustments and revalidation.

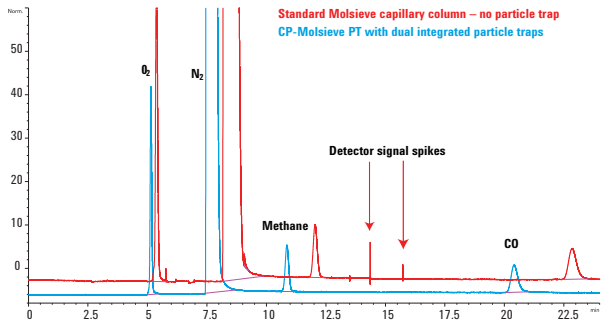
**Coal to Chemical process gases with MS detection.**

| | |
|---|---|
| Column | Agilent J&W HP-PLOT Q PT, 35 m x 0.32 mm, 20 µm (p/n 19091P-Q04PT) |
| Carrier | Helium at 1 mL/min |
| Oven | 32 °C for 3 min, 15 °C/min to 180 °C |
| Injection | 250 µL |
| Inlet | 170 °C, split ratio 5:1 |
| Liner | Ultra Inert liner (p/n 5190-2295) |
| MS temperature | 230 °C (source), 150 °C (quad) |
| Transfer line | 280 °C |
| MS | EI, full scan at 10-100 m/z |




*Coal-to-chemical process gas analysis on an Agilent J&W HP-PLOT Q PT GC column. Built-in particle trapping delivers greater stability than conventional PLOT columns, while enabling reliable operation with MS detection and capillary flow technology.*

**CP-Molsieve 5Å shows no particle traps or detector spikes.**




*Fixed-gas mix comparison between an Agilent J&W CP-Molsieve 5Å PT column and a standard Molsieve capillary column using TCD. The dual-ended, integrated particle traps eliminated spiking (blue trace).*

# ORDERING INFORMATION

| ASTM Method | Title | PLOT PT Phase | Dimensions* | Part Number |
|---|---|---|---|---|
| D 1945 | Standard Test Method for the Analysis of Natural Gas by GC | HP-PLOT Q PT | 15 m x 0.53 mm x 40 µm | 19095P-QO3PT |
| D 1946 | Standard Test Method for the Analysis of Reformed Gas by GC | HP-PLOT Q PT | 15 m x 0.53 mm x 40 µm | 19095P-QO3PT |
| D 2163 | Standard Test Method for the Analysis of Liquified Petroleum (LP) Gases and Propene Concentrates by GC | HP-PLOT $Al_2O_3$ KCl PT | 30 m x 0.53 mm x 15 µm | 19095P-K23PT |
| | | HP-PLOT $Al_2O_3$ S PT | 30 m x 0.53 mm x 15 µm | 19095P-S23PT |
| D 2427 | Standard Test Method for Determination of C2 through C5 Hydrocarbons in Gasoline by GC | CP-$Al_2O_3$ /KCl PT | 50 m x 0.53 mm x 10 µm | CP7518PT |
| | | GS-Alumina PT | 30 m x 0.53 mm | 115-3532PT |
| D 2593 | Standard Test Method for Butadiene Purity and Hydrocarbon Impurities by GC | CP-$Al_2O_3$ /KCl PT | 50 m x 0.32 mm x 5 µm | CP7515PT |
| | | CP-$Al_2O_3$ /KCl PT | 50 m x 0.53 mm x 10 µm | CP7518PT |
| | | GS-Alumina PT | 30 m x 0.53 mm | 115-3532PT |
| D 2712 | Standard Test Method for Hydrocarbon Traces in Propylene Concentrates by GC | GS-Alumina PT | 50 m x 0.53 mm | 115-3552PT |
| D 3271 | Standard Practice for Direct Injection of Solvent-Reducible Paints into a Gas Chromatograph for Solvent Analysis | PoraPLOT Q PT | 25 m x 0.53 mm x 20 µm | CP7554PT |
| D 3749 | Standard Test Method for Residual Vinyl Chloride Monomer in Poly(Vinyl Chloride) Resins by Gas Chromatographic Headspace Technique | PoraBOND Q PT | 10 m x 0.53 mm x 10 µm | CP7353PT |
| D 3792 | Standard Test Method for Water Content of Coatings by Direct Injection Into a Gas Chromatograph | PoraBOND Q PT | 25 m x 0.32 mm x 5 µm | CP7351PT |
| | | PoraBOND Q PT | 25 m x 0.53 mm x 10 µm | CP7354PT |
| D 4322 | Standard Test Method for Residual Acrylonitrile Monomer Styrene-Acrylonitrile Co-polymers and Nitrile Rubber by Headspace Gas Chromatography | PoraBOND Q PT | 25 m x 0.53 mm x 10 µm | CP7354PT |
| D 4424 | Standard Test Method for Butylene Analysis by GC | HP-PLOT $Al_2O_3$ S PT | 50 m x 0.53 mm x 15 µm | 19095P-S25PT |
| D 4509 | Standard Test Methods for Determining the 24-Hour Gas (AIR) Space Acetaldehyde Content of Freshly Blown PET Bottles | PoraBOND Q PT | 25 m x 0.32 mm x 5 µm | CP7351PT |
| | | PoraBOND Q PT | 25 m x 0.53 mm x 10 µm | CP7354PT |
| D 4961 | Standard Test Method for GC Analysis of Major Organic Impurities in Phenol Produced by the Cumene Process | HP-PLOT Q PT | 15 m x 0.53 mm x 40 µm | 19095P-QO3PT |
| D 5303 | Standard Test Method for Trace Carbonyl Sulfide in Propylene by GC | HP-PLOT Q PT | 30 m x 0.53 mm x 40 µm | 19095P-QO4PT |
| D 5507 | Standard Test Method for Determination of Trace Organic Impurities in Monomer Grade Vinyl Chloride by Capillary Column/Multi-dimensional GC | HP-PLOT Q PT | 15 m x 0.53 mm x 40 µm | 19095P-QO3PT |
| | | HP-PLOT U PT | 30 m x 0.53 mm x 20 µm | 19095P-UO4PT |
| D 5508 | Standard Test Method for Determination of Residual Acrylonitrile Monomer in Styrene-Acrylonitrile Co-polymer Resins and Nitrile-Butadiene Rubber by Headspace Capillary GC | HP-PLOT Q PT | 30 m x 0.53 mm x 40 µm | 19095P-QO4PT |
| D 6159 | Standard Test Method for Determination of Hydrocarbon Impurities in Ethylene by GC | HP-PLOT $Al_2O_3$ KCl PT | 50 m x 0.53 mm x 15 µm | 19095P-K25PT |
| | | GS-Alumina PT | 50 m x 0.53 mm | 115-3552PT |

Additional PLOT PT columns not associated with specific ASTM Methods

| PLOT PT Phase | Dimensions* | Part Number |
|---|---|---|
| PoraBOND Q PT | 25 m x 0.25 mm x 3 µm | CP7348PT |
| PoraBOND Q PT | 50 m x 0.32 mm x 5 µm | CP7352PT |
| PoraPLOT Q PT | 10 m x 0.32 mm x 10 µm | CP7551PT |
| PoraPLOT Q PT | 25 m x 0.32 mm x 10 µm | CP7551PT |
| PoraPLOT Q-HT PT | 25 m x 0.32 mm x 10 µm | CP7557PT |
| GS-Q PT | 30 m x 0.53 mm | 115-3432PT |
| HP-PLOT Q PT | 15 m x 0.32 mm x 20 µm | 19091P-QO3PT |
| HP-PLOT Q PT | 30 m x 0.32 mm x 20 µm | 19091P-QO4PT |
| PoraPLOT U PT | 25 m x 0.53 mm x 20 µm | CP7584PT |
| CP-$Al_2O_3$/KCl PT | 25 m x 0.53 mm x 10 µm | CP7517PT |

| PLOT PT Phase | Dimensions* | Part Number |
|---|---|---|
| HP-PLOT $Al_2O_3$ KCl PT | 50 m x 0.32 mm x 8 µm | 19091P-K15PT |
| CP-$Al_2O_3$/$Na_2SO_4$ PT | 50 m x 0.32 mm x 5 µm | CP7565PT |
| CP-$Al_2O_3$/$Na_2SO_4$ PT | 50 m x 0.53 mm x 10 µm | CP7568PT |
| HP-PLOT $Al_2O_3$ S PT | 25 m x 0.32 mm x 8 µm | 19091P-S12PT |
| HP-PLOT $Al_2O_3$ S PT | 50 m x 0.32 mm x 8 µm | 19091P-S15PT |
| HP-PLOT $Al_2O_3$ M PT | 50 m x 0.53 mm x 15 µm | 19095P-M25PT |
| CP-Molsieve 5Å PT | 30 m x 0.32 mm x 10 µm | CP7534PT |
| CP-Molsieve 5Å PT | 25 m x 0.32 mm x 30 µm | CP7536PT |
| CP-Molsieve 5Å PT | 25 m x 0.53 mm x 50 µm | CP7538PT |
| CP-Molsieve 5Å PT | 50 m x 0.53 mm x 50 µm | CP7539PT |

*PLOT PT columns have 2.5 m of integrated particle traps on both ends that extend the stated length of the column by 5 meters.

*Need a different configuration? The Agilent custom column shop can help you determine the right Agilent DB-Sulfur SCD column configuration for your application.*

**Minimize particle shedding and maximize productivity. Learn more at agilent.com/chem/energyGC**

# AGILENT J&W DB-SULFUR SCD COLUMNS FOR PETROLEUM/PETROCHEMICAL PROCESSING

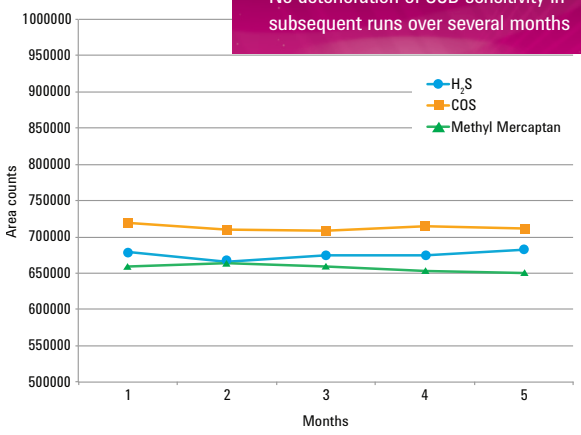
## Improve your SCD signal stability and system performance for sulfur compounds

Thick-film PDMS columns commonly used with SCD are prone to excessive bleed at high temperatures. When this happens, column bleed components accumulate and foul (coke) onto SCD burner ceramic tubes, destabilizing detector response over time. This leads to system downtime — as well as expensive ceramic tube and column replacement.

### Reduce bleed, improve data reliability, and lower maintenance costs with Agilent J&W DB-Sulfur SCD columns

DB-Sulfur SCD columns are engineered for optimal SCD stability and lower bleed – minimizing ceramic tube fouling. Less fouling increases the life of the tube, reducing downtime and operational costs.

No deterioration of SCD sensitivity in subsequent runs over several months




*Excellent long-term SCD stability. Here, an average of 10 injections of sulfur compound test mix was run over five months. Graph courtesy of Jim Luong, Ronda Gras, and Myron Hawryluk of Dow Chemical Canada*

Good resolution of $H_2S$ and COS at room temperature

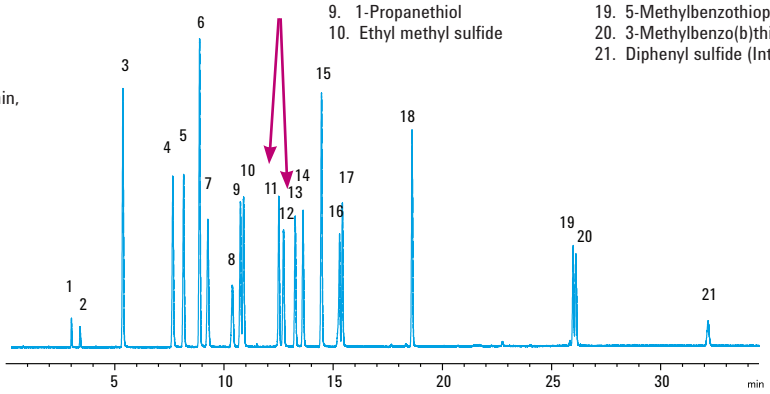
**7890A GC Conditions**

| | |
|---|---|
| Columns: | Agilent J&W DB-Sulfur SCD, 60 m x 0.32 mm, 4.2 µm (p/n G3903-63001) |
| Carrier: | Helium, constant flow mode, 2.8 mL/min |
| Inlet: | 275 °C, Split ratio 10:1 (Sulfinert-treated capillary inlet system) |
| Oven: | 35 °C for 3 min, 35 °C- 250 °C at 10 °C/min, 250 °C for 10 min |

**SCD conditions**

| | |
|---|---|
| Burner temperature: | 800 °C |
| Vacuum of burner: | 364 torr |
| Vacuum of reaction cell: | 5 torr |
| $H_2$: | 40 mL/min |
| Air: | 60 mL/min |

1. Hydrogen sulfide
2. Carbonyl sulfide
3. Methanethiol
4. Ethanethiol
5. Dimethyl sulfide
6. Carbon disulfide
7. 2-Propanethiol
8. 2-Methyl-2-propanethiol
9. 1-Propanethiol
10. Ethyl methyl sulfide
11. Thiophene
12. 2-Methyl-1-propanethiol
13. Diethyl sulfide
14. 1-Butanethiol
15. Methyl disulfide
16. 2-Methylthiophene
17. 3-Methylthiophene
18. Diethyl disulfide
19. 5-Methylbenzothiophene
20. 3-Methylbenzo(b)thiophene
21. Diphenyl sulfide (Int Std)

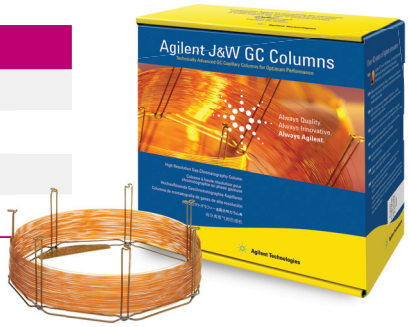



*This separation produced excellent peak shape for ASTM D 5623 target sulfur compounds, including baseline separation of $H_2S$ and COS at room temperature and resolution of Thiophene and 2-Methyl-1-propanethiol.*

# ORDERING INFORMATION

| Part Number | Description | Temperature Limit |
|---|---|---|
| G3903-63001 | DB-Sulfur SCD 60 m x 0.32 mm x 4.2 µm | -60 to 250/270 °C |
| G3903-63002 | DB-Sulfur SCD 40 m x 0.32 mm x 0.75 µm | -60 to 270/290 °C |
| G3903-63003 | DB-Sulfur SCD 70 m x 0.53 mm x 4.3 µm | -60 to 250/270 °C |
| G3903-63004 | DB-Sulfur SCD 40 m x 0.32 mm x 3.0 µm | -60 to 250/270 °C |

*Need a different configuration? The Agilent custom column shop can help you determine the right Agilent DB-Sulfur SCD column configuration for your application.*




## Protect the purity of your gas and the integrity of your results

### Agilent Gas Clean Filters

Gas contaminants – particularly moisture – can jeopardize sensitivity and cause shifts in retention time, elution time, and elution order. An Agilent Gas Clean Filter reduces oxygen, moisture, and hydrocarbons, giving you better PLOT analysis results. These filters provide:

- **Increased GC/MS sensitivity** for trace-level analysis
- **Instrument and column protection:** The filter changes color when it needs replacing, keeping moisture content <0.1 ppm
- **Easy replacement** *without tools or gas shut-off*

### Agilent Inert Flow Path solutions

Gaseous sulfur compounds pose sampling and analytical problems because they are polar, reactive, and need to be determined at trace levels. An Agilent inert flow path reduces active sites on the metal and glass surfaces that come into contact with the sample – ensuring less compound adsorption and more reliable trace-level results of sulfur components. Other advantages include:

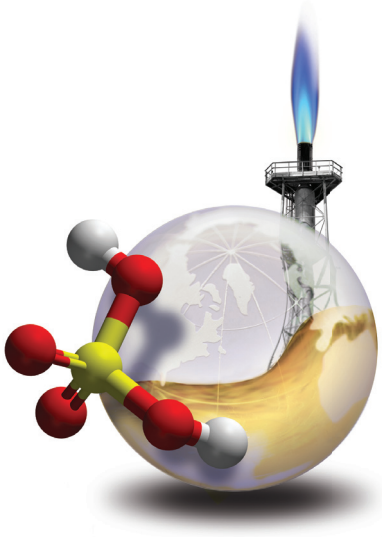
- **Reproducible sample vaporization:** highly inert glass wool in column liners creates an exceptional surface for vaporization and mixing *without losing active analytes*
- **Longer column life,** because nonvolatiles remain inside the inlet
- **Greater sensitivity,** allowing you to run more samples


Agilent Inert Flow Path components include:

- Ultra Inert inlet liners and CrossLab Ultra Inert liners
- Inert Flow Path split/splitless inlet
- Ultra Inert Gold Plated inlet seals
- UltiMetal Plus Flexible Metal ferrules
- Agilent J&W Ultra Inert GC columns
- Gas Clean purifier

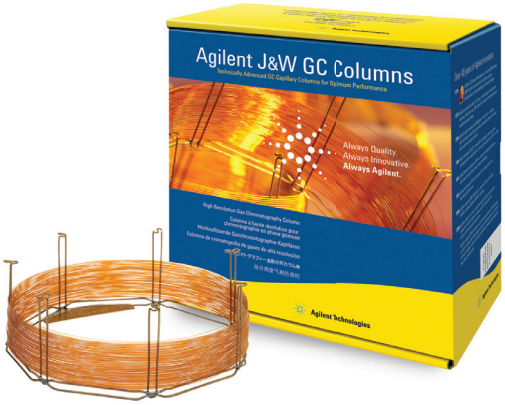
To learn more about building an inert flow path, visit **agilent.com/chem/inert**

**To learn more about preventing untimely burner failure, visit agilent.com/chem/energyGC**



# No time for downtime? Count on these rugged Agilent columns for energy and chemical applications

- **Agilent J&W PLOT PT GC columns** feature integrated trapping technology that prevents stationary phase particles from exiting the column. This virtually eliminates detector spikes and helps to prevent damage to switching valves for reduced instrument maintenance.
- **Low-bleed Agilent J&W DB-Sulfur SCD columns** maximize the life of SCD ceramics on your Chemiluminescence Detector – increasing instrument uptime and reducing operational costs.




**For more information**

To learn more about Agilent J&W PLOT PT GC and Agilent J&W DB-Sulfur SCD columns, visit
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