

Cooperate with Global Chromatographic Scientists



# CHROMATOGRAPHY SUPPLIES CATALOG



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# GsBP GC Columns

GS-Tek has manufactured high quality and high performance GC columns under brand name General separation Bonded Phase (GsBP) for a few years. Our comprehensive GsBP Column product comprises of polysiloxane phases, polyethylene glycol phases, porous-layer-open tubular (PLOT) phases, low column bleed or MS (Mass Spec) grade columns across all stationary phases, and custom-made columns. GS-Tek develops its own proprietary column technologies, manufacturing process, and high standard quality control. Each GsBP column is carefully prepared and signature made for quality and performance excellence to deliver to our customers worldwide.

## Mission, Passion and Capability

GS-Tek is striving to exceed performance expectations through our GC columns for each chromatographer customer in the world. Our mission is to satisfy customers with quality products and trusted performances without the extra efforts from brand name switching.

We are strongly passionate and committed to developing and delivering the best valued chromatography solutions to our customer in a timely manner. We have been this since our humble beginning. We will continue to do so in our everyday business practices.

Most GC column end users have used brand name GC columns for years, thus are reluctant to newcomer column products. In response, our aim is to ease the transition effort of column switching from a brand name to GsBP. In order to achieve this, GS-Tek fine tunes its GsBP stationary phases to yield similar or identical chromatographic performances to brand ones. GS-Tek carefully controls its manufacturing process. GS-Tek tests 100% all GsBP columns with the industry's highest standard to ensure quality and performance of products delivery to our customers.

### GS-Tek's manufacturing capabilities consist of:

- Carefully selective quality raw material and suppliers
- Team of highly regarded tech gurus, production master technicians, and sophisticated production planner/schedulers that are committed to meeting customer needs with quality, efficiency and in a timely manner.
- Proprietary manufacturing process for producing quality columns
- Industry's high quality standards that we adhere by to deliver consistently performing columns to our customers
- Continuous process improvements within our business to meet new or challenging application needs
- Passion to make challenging custom-made columns used for push-limit applications through research and development collaborations

Through GS-Tek's mission, passion and capabilities, we deliver GsBP columns with the utmost quality and performance to many global customers throughout different industries. For the very short time we have been on the market, our customers are pleased with their decision to switch to GsBP columns for improved results and virtually minimal impact transitioning from another column brand.

As an innovative column manufacturer, we are always striving to improve performance and delivery. From the cumulative years of experience in column technology, manufacturing and sales and marketing, we realize there are unlimited opportunities to improve column performance in order to meet increasing customers' expectations. Our efforts up until now clearly demonstrate the following features and benefits in each GsBP column.

## Excellent Column Inertness

Our columns are designed and manufactured to achieve the highest level of inertness by a novel and proprietary surface deactivation technique. The column inertness is tested with probes of acid, bases and alcohol in our column test sample mix. GsBP columns excellent degree of inertness results in improved quantification accuracy and reliability for many challenging analyses. One example of such challenging analyses is EPA 8270. Fig 1 A and B demonstrate the advantage and benefits of excellent column inertness of GsBP-5MS column on which both benzidine and pentachloropenol show very symmetric and sharp peak shapes even at low levels of 1ppm sample introduction. Because of the high degree of column inertness, there is no need to use 0.5um film thickness column to shield surface activity, as some brand suppliers are recommending. The analysis on 0.25um film thickness column can be done quickly without sacrificing lower accurate results.

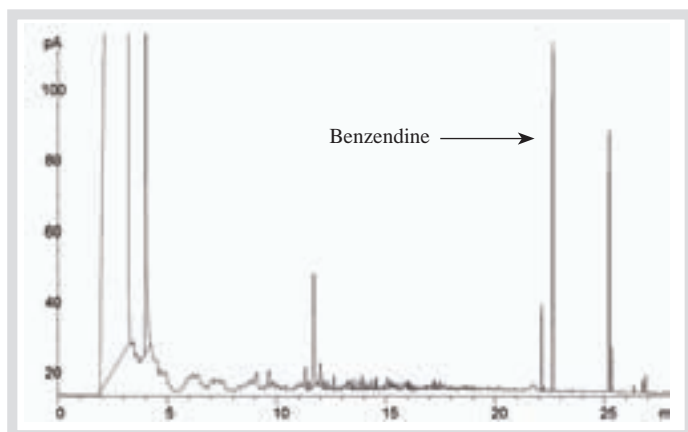


Figure 1A EPA method 8270 on GSBP-5MS column 30m x 0.25mm x 0.25um. Benzidine

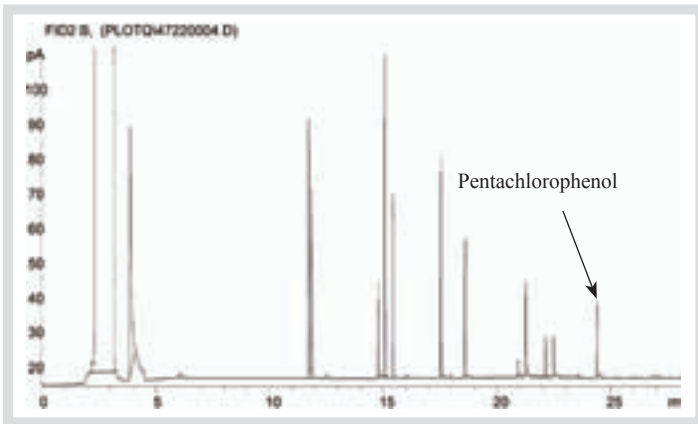


Figure 1B EPA method 625 on GsBP-5MS column, 30m x 0.25mm x 0.25um. Pentachlorophenol

### Low Bleed Columns

The current industry trend is to push column detection limits and prolong column lifespans that demand lower column bleed and higher temperature limits. GsBP low bleed columns are engineered with our rigorous process control and innovative cross-link technology. Almost all GsBP columns are rigorously tested for column bleed. Figure 2 shows the production data distribution of GsBP-5MS column bleeds as a demonstration of its product quality control and consistency. Table I demonstrates the equivalent performance of GsBP-5MS column batch compared to other competitor columns.

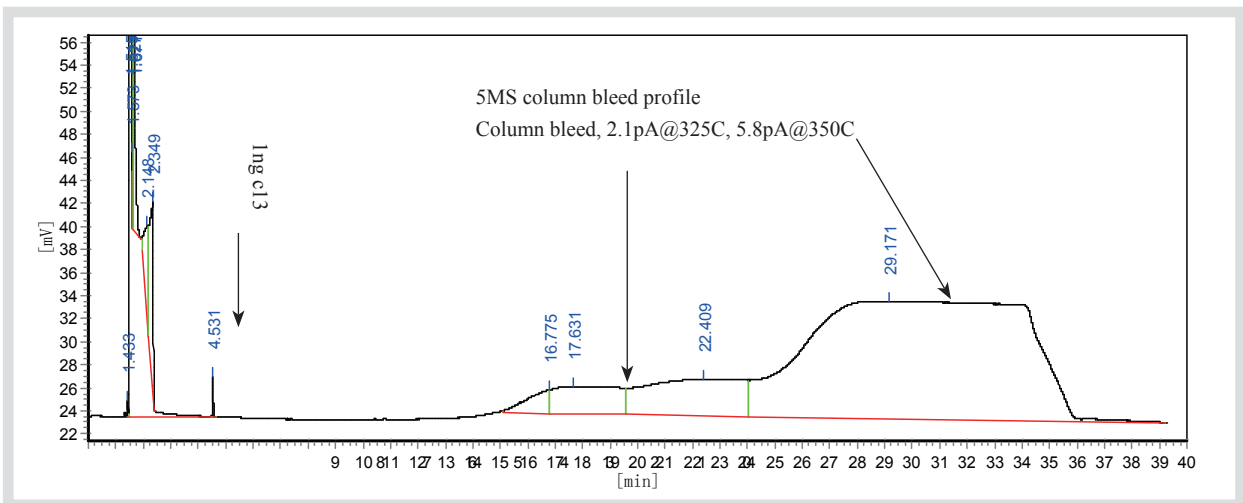
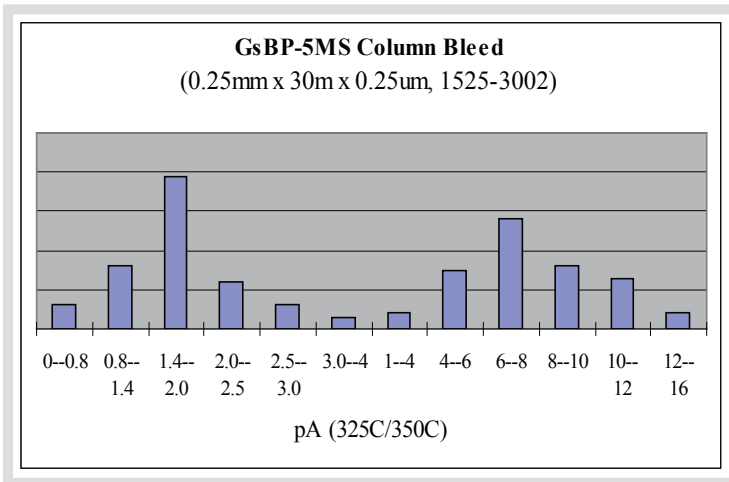


Figure 2 (A) Production data distribution of GsBP-5MS column bleed. Column: 0.25mm x 30m x 0.25um. (B) Typical column bleed test profile.

Table 1 Column Bleed Comparison

Brand	GsBP-5MS	Brand H-5MS	Brand D-5MS
Bleed Specifications	<4pA @325°C	<4pA @325°C	<4pA@325°C
Temperature Limit (°C)	-60-325/350	-60-325/350	-60-325/350

GsBP low bleed columns are not limited to conventional 5% phenyl polysiloxane phases, but are also offered in all other stationary phases, from non-polar polysiloxane, mid polar polysiloxane, PEG to PLOT columns. One of our exceptional low bleed column families, GsBP -VMS as shown in Fig 3A, benefit GC-MSD instrumentation analysis for complex samples such as VOC samples for many go-green applications. Another example of a low column bleed is our GsBP PLOT-Q columns as shown in Fig 3B.

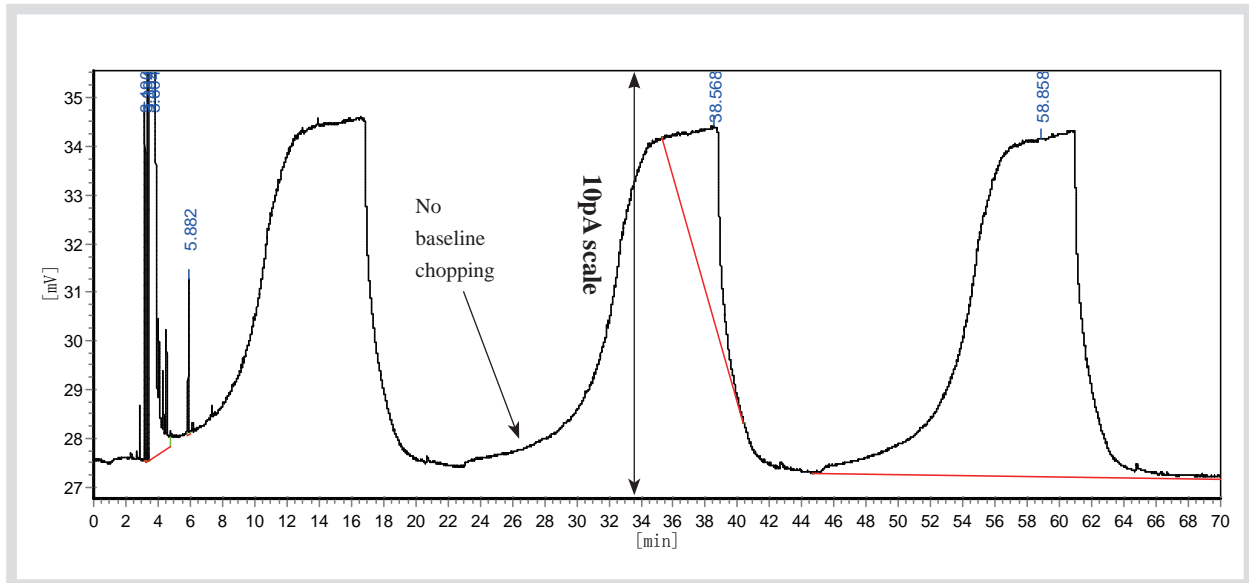


Figure 3A GsBP-VMS column bleed profile. Column: GsBP-VMS, 0.32mm x 60m x 1.8um. Oven: 65°C (1min) 20°C/min to 260°C (5min), 3 times of consequent runs.

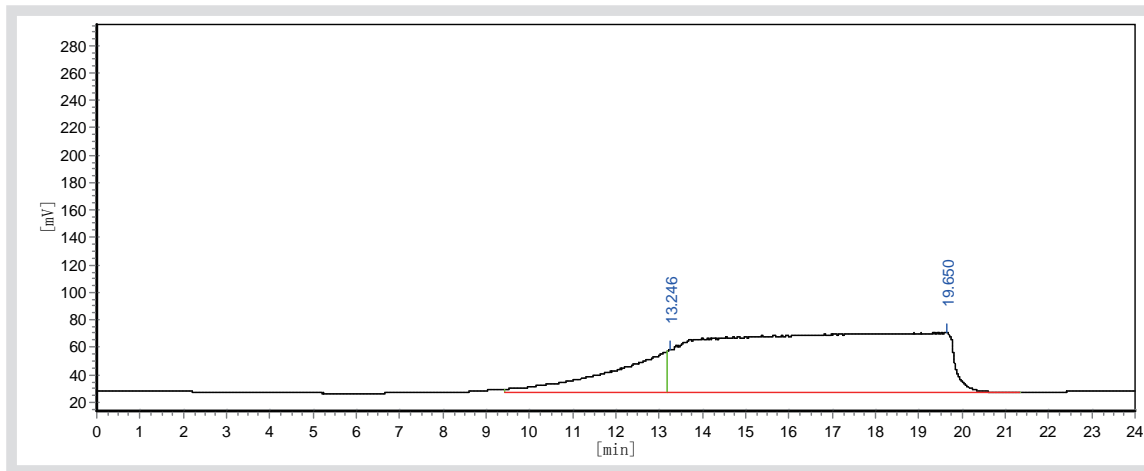


Figure 3B GsBP PLOT-Q Column bleed profile. Column, GsBP-PLOT Q, 0.53mm x 30m x 30um, Bleed temperature at 280°C

## High Plate Number

High column plate numbers improve many separations by increasing resolution and the detection limits. This is very important for applications of complex samples, such as EPA-8260 test gas mix, DHA of petroleum products such as gasoline, and environmental sample such as PAH.

With our controllable process, we produce all GsBP columns with high plate numbers. GS-Tek routinely produces 100 meter x 0.25mm x 0.5um columns with more than 400,000 plate numbers. Such columns are widely used for DHA, PONA and VOC sample analyses. Another example of high plate number columns is GsBP- 624/ GsBP-VMS columns that are used for EPA 8260, a complex separation application demanding high plate numbers. Also, our signature PLOT columns with high plate numbers exhibit improved separation results, as one of the many column benefits that many of our customers are recognizing and enjoying.

## Stable Stationary Phases

We strive to achieve the highest quality GC column which, in turn, has led us to produce stable stationary phases to withstand extended temperature limits. GsBP columns are proprietary cross-linked and bonded, solvent rinseable, and have an extended lifetime. They have better oxidation resistance for many robust and challenging applications. Furthermore, GsBP columns have increased upper temperature limits, such as our PEG family columns, PLOT columns, and cyano-base VMS columns. We do not special label our column as 'High Temp', but our customers are enjoying our columns for application that requires oven temperature to 400°C or above.

## Adequately Tuned Column Selectivity

In addition to all the GsBP column attributes, our column selectivity is adequately tuned to meet a variety of application needs. Figure 4 shows the separation of residue solvents, isopropyl alcohol peak elutes before the dichloromethane peak in a pharmaceutical quality control. The MOH requires such an elution order for history reason. This separation can be easily improved on a GsBP 624 column from adequate column selectivity, with the same elution order.

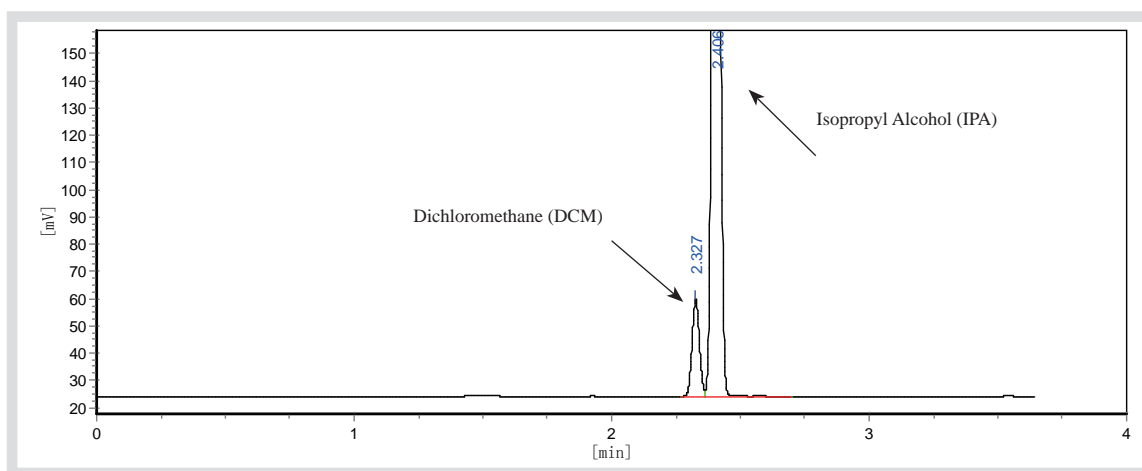


Figure 4 Separation of IPA/DCM on a GsBP Inowax column. Column: 0.53mm x 30m x 1.0um.

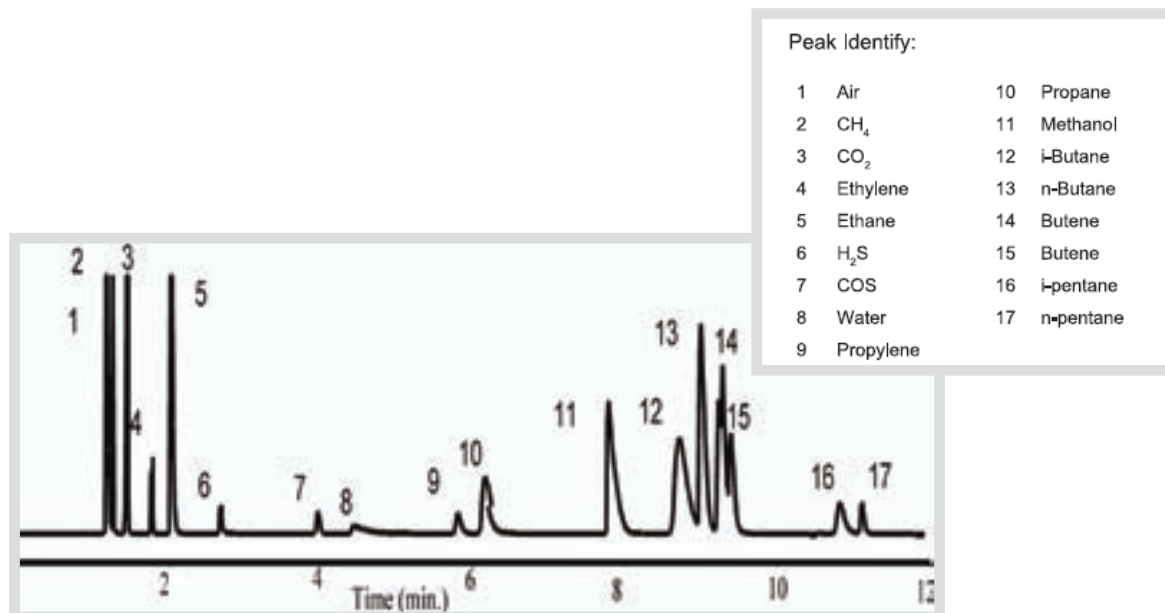


Figure 5 shows a GsBP PLOT Q column performance whose fine-tuned column selectivity plus adequate separation of Air/CO<sub>2</sub>/CH<sub>4</sub> makes this type of column ideally suitable for the separation of a refinery gas samples.

Figure 6 demonstrates another benefit of column selectivity. The application was an analysis of 5 ppm acetone spiked in a reagent alcohol. Because of the tuned column selectivity of GsBP-Inowax, 30m x 0.53mm x 1.0um, a low level concentration of acetone was eluted earlier than methanol with baseline separation resolution achieved above 50°C.

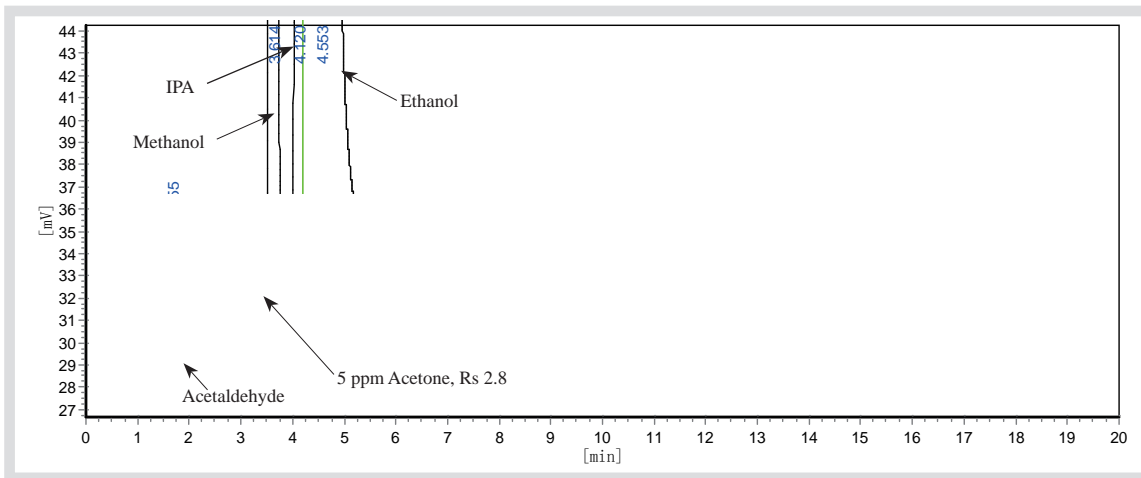


Figure 6 Low Level Acetone in Ethyl Alcohol by GsBP-Inowax column, 30m x 0.53mm x 1.0um, Oven temperature: 50°C (5min) 10°C/min to 250°C

## Improved Results

In combination with the a high degree of inertness, low bleed, high efficiency, and extended temperature range, GsBP columns can improve results for many challenging applications. For example, GsBP-5MS column worked well for an application to detect low levels of melamine that was blended in baby formula as shown in Figure 7.

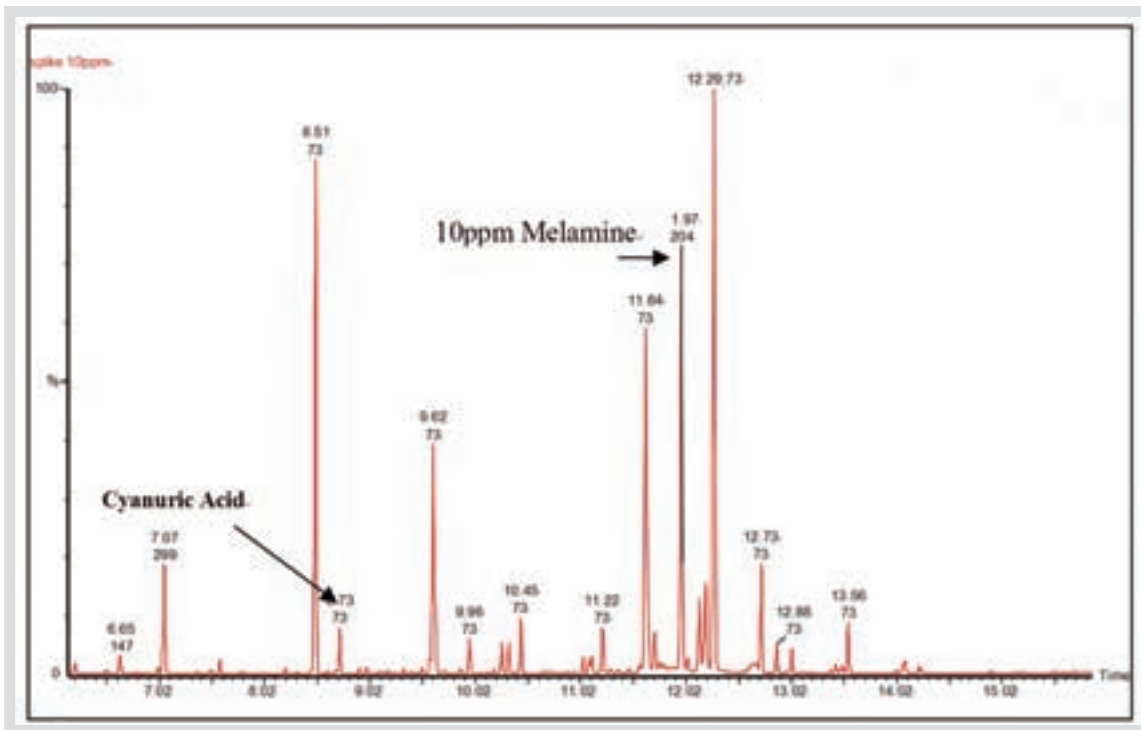


Figure 7 Analysis of a baby formula spiked with 10ppm Melamine on GsBP-5MS column by GC/MS. Column: GsBP-5MS, 30mx0.25mmx0.25um (P/N 1525-3002). Oven: 75°C (hold) 1min, 5°C/min to 300°C (hold 5 min). Sample: 10ppm spiking melamine in baby formula, TMS derivative

## Custom Made Columns for Research and Collaborations

GS-Tek offers Custom made columns for research and development collaborations at a nominal fee and very quick turnaround time. Our mission, passion and capabilities enable us to keenly search for opportunities and never say NO to our customers. Your time is valuable so we work around the clock to deliver custom-made column as fast as possible. Please contact us if you are interested in this service.

## Best Value

With our proprietary manufacturing technology, we produce GC columns with great success. This increases production efficiency and in turn, transfers our production cost savings to our customer. Customers enjoy for cost efficiency, speedy delivery along with quality, stable, and low bleed products.

Here at GS-Tek, our expertise combined with innovative manufacturing knowledge lead to quality GC columns that meet a variety of applications on the market without the typical hassle of lengthy revalidation from another brand. Not only are GsBP columns held under rigorous standards, they are priced competitively making them the best value GC columns in the market today.

Throughout our years in business, we have collected an impressive amount of feedback from our customers worldwide that our GC columns perform similar or better than the leading brand. This feedback fuels our commitment to continue our mission to provide superior columns at the best value.

**We believe that...**

**with your support, GsBP will become the premier column brand you can trust!**



# GC Column by Applications

## Life Sciences/Pharmaceutical

GC is a common tool for quality control in drug production, small molecule study in medicine chemistry and discovery, metabolism research and other areas. The complexity of application demands special columns to provide separation with a high degree of column inertness and low column bleed for advanced GC, HS-GC, HS-GC-MSD and other instrumentation. Based on the expertise and knowledge of both our customers and us, GS-Tek makes the following column selection recommendations.

### Residual Solvents

Suggested Column Description	P/N
GsBP-VMS, 20m x 0.18mm x 1.0um	6418-2010
GsBP-VMS, 30m x 0.25mm x 1.4um	6425-3014
GsBP-624, 30m x 0.32mm x 1.8um	6232-3018
GsBP-624, 30m x 0.53mm x 3.0um	6253-3030
GsBP-5, 30m x 0.53mm x 5.0um	0553-3050
GsBP-Inowax, 30m x 0.25mm x 0.5um	2025-3005
GsBP-Inowax, 30m x 0.53mm x 1.0um	2053-3010
GsBP-Carbowax, 30m x 0.53mm x 1.3um	2253-3013
GsBP-1701, 30m x 0.25mm x 0.25um	6125-3002

Longer lengths and thicker films may improve separation as needed. Contact GS-Tek for details.



### Intermediate Drug Compounds

Suggested Column Description	P/N
GsBP-5MS, 30m x 0.25mm x 0.25um	1525-3002
GsBP-1MS, 30m x 0.25mm x 0.25um	1125-3002
GsBP-50MS, 30m x 0.25mm x 0.25um	5025-3002
GsBP-Inowax, 30m x 0.25mm x 0.25um	2025-3002

### Packaging Protection Gas

Suggested Column Description	P/N
GsBP-PLOT Molesieve 5A, 30m x 0.53mm x 50um	8453-3050
GsBP-PLOT Q, 30m x 0.53mm x 30um	8653-3030

### Alcohols

Suggested Column Description	P/N
GsBP-1MS, 30m x 0.25mm x 1.0um	1125-3010
GsBP-Inowax, 60m x 0.32mm x 0.5um	2032-6005
GsBP-Blood alcohol, 7.5m x 0.32mm x 10um	8832-0710
GsBP-624, 30m x 0.53mm x 3.0um	6253-3030

### DMSO, DMO, Pyridines

Suggested Column Description	P/N
GsBP-624, 25m x 0.18mm x 1.0um	6218-2510
GsBP-1MS, 30m x 0.25mm x 1.0um	1125-3010

### Drugs of Abuse

Suggested Column Description	P/N
GsBP-50+MS, 30m x 0.25mm x 0.25um	5025-3002
GsBP-5MS, 30m x 0.25mm x 0.25um	1525-3002

## Blood Alcohol, Breath Gases

Suggested Column Description	P/N
GsBP-1, 30m x 0.53mm x 5.0um	0153-3050
GsBP-Blood alcohol, 7.5m x 0.32mm x 10um	8832-0710

## Anesthetic Gas

Suggested Column Description	P/N
GsBP-Gaspro, 30m x 0.32mm x 5um	8532-3005

## Lipid Panel

Suggested Column Description	P/N
GsBP-FFAP, 30m x 0.25mm x 0.25um	2125-3002
GsBP-Inowax, 30m x 0.25mm x 0.15um	2025-3001

## Metabolism

Suggested Column Description	P/N
GsBP-5MS, 30m x 0.25mm x 0.25um	1525-3002
GsBP-1MS, 30m x 0.25mm x 0.25um	1125-3002

## Petroleum and Petrochemical

Using a GC for analysis is a critical and important tool for these two industries. Reliable and consistent separations of complex samples for most applications in the industry are determined by the type of column used. With the environmental concerns of going-green and increasing quality control needs, the industry demands quality columns with a high level of inertness. As a result GS-Tek has taken its experience and expertise to recommend the best suited column for your compound separation needs.



## Natural Gas

Suggested Column Description	P/N	Separations
GsBP-PLOT Al2O3, S, 30m x 0.53mm x 15um	8253-3015	HC to C5
GsBP-1, 0.53mm x 30m x 2.65um	0153-3026	HCs to C6+
GsBP-PLOT Q, 30m x 0.53mm x 30um	8653-3030	CO2, Water, Sulfur, Mercaptans
GsBP-PLOT Molesieve, 30m x 0.53mm x 25um	8453-3025	CO, N2, and C1
GsBP-GasPro, 30m x 0.32mm x 5um	8532-3005	Low Level Sulfurs

## Refinery Gas

Suggested Column Description	P/N	Separations
GsBP-PLOT Al2O3, S, 15m x 0.53mm x 15um	8253-1515	Fast Separation of C1 to C6
GsBP-PLOT Al2O3, S, 50m x 0.53mm x 15um	8253-5015	Extended Separation of C1 to C5
GsBP-PLOT Molesieve, 30m x 0.53mm x 50um	8453-3050	CO, C1, N2, O2, H2
GsBP-PLOT Q, 30m x 0.53mm x 30um	8653-3030	CO2, H2O, Sulfurs
GsBP-1, 30m x 0.25mm x 1.0um	0125-3010	C6+

## Liquefied Petroleum Gas

Suggested Column Description	P/N	Separations
GsBP-PLOT Al2O3, S, 30m x 0.53mm x 15um	8253-3015	C1 to C6
GsBP-PLOT Al2O3, S, 50m x 0.53mm x 15um	8253-5015	C1 to C5
GsBP-1, 60m x 0.53mm x 5um	0153-6050	Oxygenates in HC
GsBP-PLOT Molesieve, 30m x 0.53mm x 50um	8453-3050	CO, C1, N2, O2, H2
GsBP-PLOT Q, 30m x 0.53mm x 30um	8653-3030	CO2, H2O, Sulfurs

## PhH3/AsH3 in Petroleum Streams

Suggested Column Description	P/N	Separations
GsBP-PLOT U, 50m x 0.53mm x 20um	8753-5020	Low level of PhH3/AsH3
GsBP-PLOT Al2O3, KCl, 50m x 0.53mm x 15um	8153-5015	Elution after C3s

## Sulfurs in Petroleum Streams

Suggested Column Description	P/N	Separations
GsBP-PONA, 100m x 0.25mm x 0.5um	9006-PONA	Sulfurs from HCs
GsBP-1, 100m x 0.25mm x 1.0um	0125-A010	Sulfurs from HCs
GsBP-GasPro, 60m x 0.32mm x 5um	8532-6010	Sulfurs from C1 to C4s
GsBP-1MS, 30m x 0.25mm x 1.0um	1125-3010	Fast screening

## Hydrocarbon/Nitrogen/Zero Air

Suggested Column Description	P/N
GsBP-PLOT Molesieve, 30m x 0.53mm x 50um	8453-3050
GsBP-PLOT Q, 30m x 0.53mm x 30um	8653-3030
GsBP-PLOT Al2O3, S, 30m x 0.53mm x 15um	8253-3015

## Butadienes

Suggested Column Description	P/N
GsBP-PLOT Al2O3, M, 30m x 0.53mm x 15um	8353-3015
GsBP-PLOT Al2O3, M, 50m x 0.53mm x 15um	8353-5015
GsBP-1, 60m x 0.32mm x 4um	0132-6040
GsBP-624, 60m x 0.53mm x 3.0um	6253-6030

## Cracking gases

Suggested Column Description	P/N	Separations
GsBP-PLOT Q, 30m x 0.53mm x 30um	8653-3030	CO2/Water from N2
GsBP-PLOT U, 30m x 0.53mm x 20um	8753-3020	Improved separation CO2/H2O from N2
GsBP-PLOT Molesieve, 30m x 0.53mm x 50um	8453-3050	H2, CO/from N2
GsBP-PLOT Al2O3, S, 15m x 0.53mm x 15um	8253-1515	Total Hydrocarbons
GsBP-GasPro, 60m x 0.32mm x 5um	8532-6010	Sulfurs

## Ethylene/Propylene

Suggested Column Description	P/N	Separations
GsBP-PLOT Al2O3, S, 50m x 0.53mm x 15um	8253-5015	C1 to C5s
GsBP-PLOT Al2O3, KCl, 50m x 0.53mm x 15um	8153-5015	C1 to C5s
GsBP-PLOT Carbons, 30m x 0.53mm x 3.0um	8853-3003	acetylene
GsBP-GasPro, 60m x 0.32mm x 5um	8532-6005	Sulfurs
GsBP-Inowax, 30m x 0.53mm x 1.0um	2053-3010	low level of oxygenates

## Sim-Dis

Suggested Column Description	P/N	Separations
GsBP-1MS, 30m x 0.25mm x 0.25um	1125-3002	C4 to C40
GsBP-1MS, 30m x 0.25mm x 1.0um	1125-3010	C1 to C20
GsBP-1MS, 10m x 0.10mm x 0.33um	1110-1003	C4 to C70
GsBP-1, 5m x 0.53mm x 0.15um	0153-0501	C4 to C70/100
GsBP-1, 5m x 0.53mm x 2.65um	0153-0526	C5 to C40
GsBP-1, 10m x 0.53mm x 0.88um	0153-1008	C5 to C80
GsBP-1, 10m x 0.53mm x 3um	0132-1030	ASTM-2887
GsBP-1, 5m x 0.53mm x 0.15um, metal tubing	90153-0501	C5 to C120

## Gasoline

Suggested Column Description	P/N	Separations
GsBP -PONA, 100m x 0.25mm x 0.5um	9006-PONA	
GsBP -PONA, 50m x 0.20mm x 0.5um	9002-PONA	
GsBP-1, 10m x 0.53mm x 3um	0132-1030	ASTM-2887
GsBP-1MS, 30m x 0.25mm x 1.0um	1125-3010	Alcohols in Gasoline
GsBP-PLOT-OX 10m x 0.53mm x 5um	8953-1005	Low level oxygenates in Gasoline

## BioDiesel

Suggested Column Description	P/N	Separations
GsBP-1 15m x 0.32mm x 0.1um	1132-1501-BD	Glycerin, ASTM D6584
GsBP-I, 10m x 0.32mm x 0.1um	1132-1001-BD	Total Glycerin, EP 14105
GsBP-Inowax, 30m x 0.32mm x 0.25um	2032-3002-BD	FAME, 14103
GsBP-624, 30m x 0.32mm x 1.8um	6232-3018-BD	Methanol, EN14110

## Diesel

Suggested Column Description	P/N
GsBP -PONA, 100m x 0.25mm x 0.5um	9006-PONA
GsBP-1MS, 30m x 0.25mm x 1.0um	1125-3010
GsBP-1MS, 15m x 0.25mm x 1.0um	1125-1510
GsBP-5MS, 30m x 0.25mm x 0.25um	1525-3002

## Butenes

Suggested Column Description	P/N
GsBP-PLOT Al2O3, S, 50m x 0.53mm x 15um	8253-5015
GsBP-PLOT Al2O3, S, 30m x 0.53mm x 15um	8253-3015

## MAPP

Suggested Column Description	P/N
GsBP-PLOT Al2O3, M, 30m x 0.53mm x 15um	8353-3015
GsBP-PLOT Al2O3, M, 50m x 0.53mm x 15um	8353-5015

## Propane

Suggested Column Description	P/N
GsBP-PLOT Al2O3, S, 30m x 0.53mm x 15um	8253-3015
GsBP-PLOT Al2O3, KCl, 30m x 0.53mm x 15um	8153-3015

## DHA

Suggested Column Description	P/N
GsBP-PONA, 100m x 0.25mm x 0.5um	9006-PONA
GsBP-1MS, 30m x 0.25mm x 1.0um	1125-3010

## Aromatics, styrene

Suggested Column Description	P/N
GsBP-Inowax, 30m x 0.25mm x 0.25um	2025-3002
GsBP-Inowax, 60m x 0.32mm x 0.5um	2032-6005

## Aromatics, solvents

Suggested Column Description	P/N
GsBP-Inowax, 60m x 0.25mm x 0.25um	2025-6002

Suggested Column Description	P/N
GsBP-Inowax, 60m x 0.25mm x 0.5um	2025-6005
GsBP-Inowax, 60m x 0.32mm x 0.5um	2032-6005
GsBP-Inowax, 30m x 0.53mm x 1.0um	2053-3010

## BTEX

Suggested Column Description	P/N
GsBP-Inowax, 30m x 0.25mm x 0.5um	2025-3005
GsBP-Inowax, 60m x 0.32mm x 0.5um	2032-6005

## VOCs, underground waters

Suggested Column Description	P/N
GsBP-624, 30m x 0.53mm x3.0um	6253-3030
GsBP-624, 60m x 0.32mm x1.8um	6232-6018
GsBP-624,105m x 0.53mm x3.0um	6253-0530
GsBP-624, 20m x 0.18mm x1.0um	6218-2010
GsBP-624, 60m x 0.25mm x 1.4um	6225-6014

## VOCs in Air

Suggested Column Description	P/N
GsBP-624, 30m x 0.53mm x3.0um	6253-3030
GsBP-5, 30m x 0.53mm x 5.0um	0553-3050

## Volatile amines

Suggested Column Description	P/N
GsBP-PLOT U, 30m x 0.53mm x 20um	8753-3020
GsBP-1MS, 30m x 0.25mm x 1.0um	1125-3010
GsBP-Carbowax, 60m x 0.53mm x 1.3um	2253-6013
GsBP-PONA, 100m x 0.25mm x 0.5um	9006-PONA

## Oxygenate

Suggested Column Description	P/N
GsBP-Inowax, 30m x 0.25mm x 0.25um	2025-3002
GsBP-1, 30m x 0.53mm x 5.0um	0153-3050
GsBP-1MS, 30m x 0.25mm x 1.0um	1125-3010

## Pyridines

Suggested Column Description	P/N
GsBP-1MS, 30m x 0.25mm x 1.0um	1125-3010

## Alcohols

Suggested Column Description	P/N
GsBP-Inowax, 30m x 0.53mm x 2.0um	2053-3020
GsBP-Inowax, 60m x 0.32mm x 0.5um	2032-6005
GsBP-624, 30m x 0.53mm x3.0um	6253-3030
GsBP-1, 30m x 0.53mm x 5.0um	0153-3050
GsBP-PONA, 100m x 0.25mm x 0.5um	9006-PONA

## Ethylene oxides

Suggested Column Description	P/N
GsBP-PLOT Q, 30m x 0.32mm x 15um	8632-3015

## CFCs

Suggested Column Description	P/N
GsBP-PLOT Al <sub>2</sub> O <sub>3</sub> , KCl, 50m x 0.53mm x 15um	8153-5015
GsBP-PLOT Al <sub>2</sub> O <sub>3</sub> , S, 50m x 0.53mm x 15um	8253-5015
GsBP-GasPro, 30m x 0.32mm x 5um	8532-3005
GsBP-PLOT Q, 30m x 0.53mm x 30um	8653-3030

## Vinyl Chloride

Suggested Column Description	P/N
GsBP-PLOT Q, 30m x 0.53mm x 30um	8653-3030
GsBP-PLOT Al <sub>2</sub> O <sub>3</sub> , "M", 50m x 0.53mm x 15um	8353-5015

## Benzene Contamination

Suggested Column Description	P/N
GsBP-624, 30m x 0.53mm x 3.0um	6253-3030
GsBP-Inowax, 30m x 0.25mm x 0.5um	2025-3005
GsBP-1, 60m x 0.32mm x 1.0um	0132-6010

## Halogenated Compounds

Suggested Column Description	P/N
GsBP-624, 30m x 0.53mm x 3.0um	6253-3030
GsBP-624, 60m x 0.32mm x 1.8um	6232-6018

## Total Petroleum Hydrocarbons

Suggested Column Description	P/N
GsBP-1, 30m x 0.32mm x 0.25um	0132-3002
GsBP-1MS, 30m x 0.25mm x 0.25um	1125-3002

## MTBE

Suggested Column Description	P/N
GsBP-1MS, 30m x 0.25mm x 1.0um	1125-3010
GsBP-1, 30m x 0.53mm x 5.0um	0153-3050

## Nitrous, NO, N<sub>2</sub>O, NO<sub>2</sub>

Suggested Column Description	P/N
GsBP-PLOT Q, 30m x 0.53mm x 30um	8653-3030
GsBP-PLOT Q, 50m x 0.53mm x 50um	8653-5050
GsBP-PLOT Molesieve, 30m x 0.53mm x 25um	8453-3025

## Permanent Gases

Suggested Column Description	P/N
GsBP-PLOT Molesieve, 30m x 0.53mm x 25um	8453-3025
GsBP-PLOT Q, 30m x 0.53mm x 30um	8653-3030
GsBP-PLOT Molesieve, 30m x 0.53mm x 50um	8453-3050

## CO<sub>2</sub>, water in a gaseous sample

Suggested Column Description	P/N
GsBP-PLOT Q, 30m x 0.53mm x 30um	8653-3030
GsBP-PLOT Q, 50m x 0.53mm x 20um	8653-5020

## Noble Gases

Suggested Column Description	P/N
GsBP-PLOT Molesieve, 30m x 0.53mm x 50um	8453-3050

## Environmental

Going green social consciousness and recent economic developments has renewed the need for GC applications in the environmental protection industry. So whether it is tracking organic pollutants or analyzing pesticides, GS-Tek has recommendations for your analysis that demands a high degree of inertness, low bleed and separation performance criteria.



## VOCs

Suggested Column Description	P/N	Separations
GsBP-VMS 60m x 0.25mm x 1.4um	6425-6014	EPA 8260
GsBP-624, 30m x 0.53mm x 3.0um	6253-3030	Fast VOCs separations
GsBP-624, 20m x 0.18mm x 1.0um	6218-2010	Fast VOCs separations
GsBP-624, 60m x 0.32mm x 1.8um	6232-6018	VOCs separations
GsBP-624, 105m x 0.53mm x 3.0um	6253-A530	VOCs separations
GsBP-5, 60m x 0.53mm x 5um	0553-6050	VOCs separations

## Semi VOCs

Suggested Column Description	P/N	Separations
GsBP-5MS, 30m x 0.25mm x 0.25um	1525-3002	EPA 625, 1625, 8270
GsBP-5MS, 30m x 0.25mm x 0.5um	1525-3005	EPA 625, 1625, 8270
GsBP-5MS, 30m x 0.25mm x 1.0um	1525-3010	EPA 625, 1625, 8270
GsBP-5MS, 30m x 0.32mm x 0.25um	1532-3002	Fast Screen

## Pesticides/herbicides

Suggested Column Description	P/N	Separations
GsBP-5MS, 30m x 0.53mm x 1.5um	1553-3015	Large sample loading
GsBP-5MS, 30m x 0.25mm x 0.25um	1525-3002	Fast separation
GsBP-5MS, 60m x 0.25mm x 0.25um	1525-6002	Comprehensive separation
GsBP-5MS, 30m x 0.32mm x 0.25um	1532-3002	Fast separation
GsBP-50MS, 30m x 0.25mm x 0.25um	5025-3002	Confirmation
GsBP-35MS, 30m x 0.25mm x 0.25um	3525-3002	Confirmation
GsBP-1701, 30m x 0.25mm x 0.25um	6125-3002	Confirmation
GsBP-50MS, 30m x 0.25mm x 0.25um w/ 5m guard column	5025-3002-5	Wide boiling point compounds

## Purgeable Halogenated Organics

Suggested Column Description	P/N	Separations
GsBP-624, 30m x 0.32mm x 1.8um	6232-3018	601, 8010
GsBP-624, 60m x 0.32mm x 1.8um	6232-6018	601, 8010

## PCBs

Suggested Column Description	P/N
GsBP-5MS, 30m x 0.25mm x 0.25um	1525-3002
GsBP-5MS, 30m x 0.25mm x 0.25um w/ 5m guard column	1525-3502
GsBP-XLB, 30m x 0.25mm x 0.25um	1625-3002

## PAHs

Suggested Column Description	P/N
GsBP-5MS, 30m x 0.25mm x 0.25um	1525-3002
GsBP-1MS, 30m x 0.25mm x 0.25um	1125-3002
GsBP-5MS, 30m x 0.25mm x 0.25um w/ 5m guard column	1525-3502
GsBP-XLB, 30m x 0.25mm x 0.25um	1625-3002

## Explosives

Suggested Column Description	P/N
GsBP-1, 5m x 0.53mm x 1.5um	0153-0515

## Drugs

Suggested Column Description	P/N
GsBP-5MS, 30m x 0.25mm x 0.25um	1525-3002
GsBP-1MS, 30m x 0.25mm x 0.25um	1125-3002

## EPA 8270

Suggested Column Description	P/N
GsBP-5MS, 30m x 0.25mm x 0.25um	1525-3002
GsBP-5MS, 30m x 0.25mm x 0.5um	1525-3005

## EPA 502.2

Suggested Column Description	P/N
GsBP-502.2, 20m x 0.18mm x 1.0um	6318-2010
GsBP-502.2, 60m x 0.25mm x 1.4um	6325-6014
GsBP-502.2, 60m x 0.32mm x 1.8um	6332-6018
GsBP-502.2, 105m x 0.53mm x 3.0um	6353-A530

## EPA 1614, PBDE

Suggested Column Description	P/N
GsBP-5MS, 15m x 0.25mm x 0.1um	1525-1501
GsBP-5MS, 30m x 0.25mm x 0.1um	1525-3001

## CFCs

Suggested Column Description	P/N
GsBP-PLOT Al <sub>2</sub> O <sub>3</sub> , "S", 30m x 0.53mm x 15um	8253-3015
GsBP-PLOT Q, 30m x 0.53mm x 30um	8653-3030
GsBP-GasPro 30m x 0.32mm x 5um	8532-3005

## Organ Mercury

Suggested Column Description	P/N
GsBP-5MS, 30m x 0.25mm x 0.25um	1525-3002

## Water analysis

Suggested Column Description	P/N
GsBP-624, 60m x 0.32mm x 1.8um	6232-6018
GsBP-VMS, 20m x 0.18mm x 1.0um	6418-2010
GsBP-VMS, 60m x 0.25mm x 1.4um	6425-6014



## NOISH methods

Suggested Column Description	P/N
GsBP-624, 25m x 0.18mm x 1.0um	6218-2510
GsBP-624, 30m x 0.53mm x 3.0um	6253-3030
GsBP-5, 30m x 0.53mm x 5um	0553-3050
GsBP-5MS, 30m x 0.25mm x 0.25um	1525-3002
GsBP-Inowax, 30m x 0.25mm x 0.25um	2025-3002
GsBP-1MS, 30m x 0.25mm x 0.25um	1125-3002
GsBP-Inowax, 30m x 0.53mm x 1.0um	2053-3010

## Food and Beverage Industry

Due to food and beverage processes, contamination is always possible at certain critical control points (CCP). Contamination from a quality standpoint poses a health risk for the public consumer. Under these growing concerns of food safety, chemists are feeling the pressure more and more to improve the Quality standards. So, using the right GC column in the lab for the right application is detrimental in achieving top-notch performance in separation and low bleed. GS-Tek has listed recommended columns for selected applications. If you are unsure, please call our technical support team so we can provide the best method.



### Beverages

Suggested Column Description	P/N
GsBP-FFAP, 25m x 0.20mm x 0.3um	2120-2503
GsBP-FFAP, 50m x 0.20mm x 0.3um	2120-5003

### Flavor/Fragrance

Suggested Column Description	P/N
GsBP-1MS, 30m x 0.25mm x 0.25um	1125-3002
GsBP-1MS, 30m x 0.32mm x 0.5um	1132-3005
GsBP-Inowax, 30m x 0.25mm x 0.25um	2025-3002
GsBP-Inowax, 60m x 0.25mm x 0.25um	2025-6002

### FAMEs

Suggested Column Description	P/N
GsBP-5MS, 30m x 0.25mm x 0.25um	1525-3002
GsBP-Inowax, 30m x 0.25mm x 0.25um	2025-3002
GsBP-Carbowax, 60m x 0.25mm x 0.25um	2225-6002
GsBP-50MS, 30m x 0.25mm x 0.25um	5025-3002

### Wine/Liqueur

Suggested Column Description	P/N
GsBP-Inowax, 30m x 0.25mm x 0.25um	2025-3002

### Perfume

Suggested Column Description	P/N
GsBP-Inowax, 30m x 0.25mm x 0.25um	2025-3002
GsBP-Inowax, 60m x 0.25mm x 0.25um	2025-6002
GsBP-1MS, 30m x 0.25mm x 0.25um	1125-3002

### Essential Oil

Suggested Column Description	P/N
GsBP-Inowax, 60m x 0.25mm x 0.25um	2025-6002

## Chiral compounds

Suggested Column Description	P/N
Please inquiry	

## Natural Product Extracts

Suggested Column Description	P/N
GsBP-5MS, 30m x 0.25mm x 0.25um	1525-3002
GsBP-50MS, 30m x 0.25mm x 0.25um	5025-3002
GsBP-Inowax, 30m x 0.25mm x 0.25um	2025-3002

## Syrup

Suggested Column Description	P/N
GsBP-Inowax, 30m x 0.32mm x 0.5um	2032-3005

## Aspirin and Ibuprofen

Suggested Column Description	P/N
GsBP-FFAP, 30m x 0.25mm x 0.25um	2125-3002
GsBP-5MS, 30m x 0.25mm x 0.25um	1525-3002

## Steroids

Suggested Column Description	P/N
GsBP-1MS, 30mm x 0.25mm x 0.1um	1125-3001
GsBP-50MS, 30m x 0.25mm x 0.15um	5025-3001

## VOCs in Consumables Products

Suggested Column Description	P/N
GsBP-624, 30m x 0.32mm x 1.8m	6232-3018

## Alcohols

Suggested Column Description	P/N
GsBP-Inowax, 30m x 0.32mm x 0.5um	2032-3005
GsBP-Blood Alcohol, 7m x 0.32mm x 10um	8832-0710

## Sulfurs/Benzene in Beverage grade CO2

Suggested Column Description	P/N
GsBP-1, 60m x 0.32mm x 1.0um	0132-6010
GsBP-1MS, 30m x 0.25mm x 1.0um	1125-3010

## Moisture in Tobacco

Suggested Column Description	P/N
GsBP-PLOT Q, 30m x 0.53mm x 20um	8653-3020

## Tobacco

Suggested Column Description	P/N
GsBP-1MS, 30m x 0.25mm x 1.0um	1125-3010
GsBP-1MS, 15m x 0.25mm x 0.1um	1125-1501

## Lotions

Suggested Column Description	P/N
GsBP-1MS, 30m x 0.25mm x 1.0um	1125-3010
GsBP-5MS, 30m x 0.25mm x 0.25um	1525-3002

## VOCs in Package Materials

Suggested Column Description	P/N
GsBP-624, 30m x 0.32mm x 1.8m	6232-3018

## Melamine in Dairy and other foods

Suggested Column Description	P/N
GsBP-5MS, 30m x 0.25mm x 0.25um	1525-3002

## Food Additive/Preservatives

Suggested Column Description	P/N
GsBP-1, 10m x 0.53mm x 1.5um	0153-1515
GsBP-1, 15m x 0.53mm x 0.88um	0153-1008

## Legal and Forensics Applications

Now a days GC has become one of the most important analytical instrument used in forensic laboratories. It is used in the analysis of body fluids for the presence of illegal substances, to test blood or any small suspect or any residues from the crime scene. Therefore to analyze such samples, GS-Tek columns are recommended as they are very good at separation and provide you with accurate results.



## Forensics

Suggested Column Description	P/N
GsBP-624, 20m x 0.18mm x 1.0um	6218-2010
GsBP-Inowax, 30m x 0.25mm x 0.5um	2025-3005
GsBP-5MS, 30m x 0.25mm x 0.25um	1525-3002
GsBP-1701, 30m x 0.25mm x 0.25um	6125-3002

## Alcohols

Suggested Column Description	P/N
GsBP-1MS, 30m x 0.25mm x 1.0um	1125-3010
GsBP-Inowax, 60m x 0.32mm x 0.5um	2032-6005
GsBP-Blood alcohol, 7.5m x 0.32mm x 10um	8832-0710
GsBP-624, 30m x 0.53mm x 3.0um	6253-3030

## Drugs of Abuse

Suggested Column Description	P/N
GsBP-5MS, 30m x 0.25mm x 0.25um	1525-3002

## Blood Alcohol, Breath Gases

Suggested Column Description	P/N
GsBP-Blood alcohol, 7.5m x 0.32mm x 10um	8832-0710

## Anesthetic Gas

Suggested Column Description	P/N
GsBP-Gaspro, 30m x 0.32mm x 5um	8532-3005

## Lipid Panel

Suggested Column Description	P/N
GsBP-FFAP, 30m x 0.25mm x 0.25um	2125-3002
GsBP-Inowax, 30m x 0.25mm x 0.15um	2025-3001

## Steroids

Suggested Column Description	P/N
GsBP-1MS, 30m x 0.25mm x 0.1um	1125-3001
GsBP-50MS, 30m x 0.25mm x 0.15um	5025-3001

## Anti-Doping

Suggested Column Description	P/N
GsBP-1MS, 30m x 0.25mm x 0.25um	1125-3002
GsBP-5MS, 30m x 0.25mm x 0.25um	1525-3002
GsBP-5MS, 17m x 0.20mm x 0.33um	1520-1703

## Unconventional Weapon Media

Suggested Column Description	P/N
GsBP-1701, 30m x 0.25mm x 0.25um	6125-3002
GsBP-5MS, 30m x 0.25mm x 0.25um	1525-3002
GsBP-1701, 30m x 0.53mm x 1.0um	6153-3010
GsBP-624, 30m x 0.53mm x 3.0um	6253-3030
GsBP-Gaspro, 30m x 0.32mm x 5um	8532-3005
GsBP-PLOT Al2O3, 30m x 0.25mm x 5um	8225-3005

## Explosives

Suggested Column Description	P/N
GsBP-1, 10m x 0.53mm x 0.15um	0153-1001

## Fire Cause Investigation

Suggested Column Description	P/N
GsBP-1MS, 30m x 0.25mm x 1.0um	1125-3010
GsBP-FFAP, 30m x 0.25mm x 0.25um	2125-3002
GsBP-5, 30m x 0.53mm x 5.0um	0553-3050

## Poison /Toxins

Suggested Column Description	P/N
GsBP-5MS, 30m x 0.25mm x 0.25um	1525-3002
GsBP-1MS, 30m x 0.25mm x 0.25um	1125-3002

## Breathing Gases, protection gases

Suggested Column Description	P/N
GsBP-PLOT Molesieve, 5A, 30m x 0.53mm x 50um	8453-3050
GsBP-GasPro, 30m x 0.32mm x 5um	8532-3005

## Commodity Inspection, Insurance Investigation Labs

Suggested Column Description	P/N
GsBP-1MS, 30m x 0.25mm x 1.0um	1125-3010
GsBP-5MS, 30m x 0.25mm x 0.25um	1525-3002
GsBP-1701, 30m x 0.25mm x 0.25um	6125-3002

Suggested Column Description	P/N
GsBP-624, 30m x 0.53mm x 3.0um	6253-3030

## NOISH Methods

Suggested Column Description	P/N
GsBP-624, 25m x 0.18mm x 1.0um	6218-2510
GsBP-624, 30m x 0.53mm x 3.0um	6253-3030
GsBP-5, 30m x 0.53mm x 5um	0553-3050
GsBP-5MS, 30m x 0.25mm x 0.25um	1525-3002
GsBP-Inowax, 30m x 0.25mm x 0.25um	2025-3002
GsBP-1MS, 30m x 0.25mm x 0.25um	1125-3002
GsBP-Inowax, 30m x 0.53mm x 1.0um	2053-3010

## Collaborative Research Columns

GS-Tek offers columns to be used in your research studies. Please contact GS-Tek for collaborations inquiries.

Suggested Column Description	P/N
GsBP-1MS, 30m x 0.25mm x 0.25um	1125-3002
GsBP-5MS, 30m x 0.25mm x 0.25um	1525-3002
GsBP-Inowax, 30m x 0.25mm x 0.25um	2025-3002
GsBP-50MS, 30m x 0.25mm x 0.25um	5025-3002
GsBP-624, 30m x 0.25mm x 1.4um	6225-3014



# GC Column Catalog Number Guide

Example: GsBP-5 column 30m x 0.32mm x 0.25um

Internal Diameter 0.32mm

Film Thicknesses 0.25um

0532-3002

Type of Phase Length 30m

Phase	Code	Internal Diameter	Code	Film Thickness	Code
GsBP-1	01	0.1mm	10	0.1um	01
GsBP-1MS	11	0.18mm	18	0.15um	01
GsBP-5	05	0.20mm	20	0.25um	02
GsBP-5MS	15	0.25mm	25	0.33um	03
GsBP-XLB	16	0.32mm	32	0.5um	05
GsBP-35MS	35	0.53mm	53	1.0um	10
GsBP-50+MS	50			1.5um	15
GsBP-1301	60			2.65um	26
GsBP-1701	61			3.0um	30
GsBP-624	62			5.0um	50
GsBP-502.2	63				
GsBP-VMS	64				
GsBP-FVOC	65				
GsBP-225	66				
GsBP-FAME	68				
GsBP-Inowax	20				
GsBP-FFAP	21				
GsBP-Carbowax 20M	22	Length	Code	PLOT Column Only	
GsBP-Inowax-MS	24	5m	05	Coating Thickness	Code
GsBP PLOT Al2O3, KCl	81	10m	10	5 um	05
GsBP PLOT Al2O3, S	82	15m	15	8 um	08
GsBP PLOT Al2O3, M	83	25m	25	10 um	10
GsBP PLOT Molesieve	84	30m	30	15 um	15
GsBP PLOT GasPro	85	50m	50	20 um	20
GsBP PLOT Q	86	60m	60	25 um	25
GsBP PLOT U	87	75m	75	30 um	30
GsBP-Blood Alcohol	88	100m	A0	40 um	40
Guard Tubing	91	105m	A5	50 um	50
Customization	99	150m	5A		

# GC Columns by Stationary Phases

GS-Tek offers wide ranges of GC columns coated with the stationary phases equivalent or similar to commercially available phases. All stationary phases are carefully prepared to control its purity, polarity and thermal stability. Table I lists out general information for all stationary phases GS-Tek offers.

**Table 1 Overview of GsBP Stationary Phases**

Stationary phase	Composite	Temperature limit °C
GsBP-1, GsBP-1MS	100% dimethyl polysiloxane	-60 to 325/350
GsBP-5, GsBP-5MS	95% dimethyl/ 5% diphenyl polysiloxane	-60 to 325/350
GsBP-XLB	Proprietary phase	-60 to 325/350
GsBP-35MS	65% dimethyl/ 35% diphenyl polysiloxane	-20 to 320/340
GsBP-50+MS	Poly(50% diphenyl, 50%dimethylsiloxane)	-20 to 320/340
GsBP-1301, GsBP-624, GsBP-VMS	Approximately 6% cyanopropylphenol/ 94% dimethyl polysiloxane	-20 to 260/280
GsBP-1701, GsBP-1701-MS	14% cyanopropylphenol/ 86% dimethyl polysiloxane	-20 to 280/300
GsBP-Inowax, GsBP-Inowax-MS	Crosslinked Polyethylene glycol (PEG)	40 to 260/280
GsBP-FFAP	PEG modified w/ acids	40 to 260/280
GsBP-225	50%cyanopropylmethyl 50% phenylmethylpolysiloxane	40 to 240/260
GsBP-FAME	High content of cyanopropylphenyl polysiloxane	20 to 260
GsBP-PLOT Al2O3/ "KCl", "S", "M"	Aluminum oxide, modified with KCL, Na2SO4 or Na2MoO4	-60 to 200/250
GsBP-PLOT Molesieve 5A	Molecular Sieve zeolite, 5A	-60 to 300
GsBP-PLOT Q	Crosslinked divinylbenzene polymer	-60 to 260/280
GsBP-PLOT U	Crosslinked divinylbenzene ethylene glycol dimethacrylate copolymer	-60 to 200/210
GsBP-PLOT GasPro	Modified porous silica layer	-60 to 300
GsBP-PLOT Carbon	Porous carbon	-60 to 350

## Polysiloxane Based Stationary Phases

Polysiloxanes are the most common stationary phases for general separations. They are relatively stable, robust and versatile to a wide range of applications. Different functional groups that substitute to the methyl group on the silicon atom characterize the polarity of polysiloxane. Carefully controlling the polymer synthesis, capillary tubing surface treatment and other manufacturing processes can control column characteristics, such as polarity, retention, efficiency and inertness, and replication of column performance with very small variation margins.

GS-Tek offers non-polar and mid-polar polysiloxane phase columns. GsBP-1 and GsBP-5 are examples of non-polar phases, GsBP-35MS, GsBP-50+MS, GsBP-1301, and GsBP-1701 are examples of mid-polar phases. Some examples of specially designed mid-polar phases for environmental applications are GsBP-624, GsBP-VMS and GsBP-XLB. GS-Tek offers a broad line of low bleed columns for GS-MSD, GC and other instrument applications.

### GsBP-1

General column for most popular applications, particularly for petroleum and petrochemical industries  
100% Poly(dimethylsiloxane), cross-linked and bonded

- Solvent rinse-able and high temperature limit
- Low column bleed, inert and neutral surface, high plate number
- Wide range of column dimensions and stationary phase film thicknesses
- Non-polar, equivalent to USP G1, G2, G38

**Similar Phases:** DB-1, HP-1, Ultra-1, SPB-1, RTX-1, CP-Sil 5CB, BP-1, ZB-1, AT-1, MDN-1, OV-1, OV101, Optima-1

#### Typical Applications:

Aldehyde and Ketone	EPA TO-14 Compounds	Inorganic Hydride Gases	Pyrethrins
Anabolic Steroids	Esters I	Kerosine	Pyrolysates of Polystyrene
Anticonvulsants	Ethylene Glycol Mixture	Massachusetts APH Mix	Pyrolysis of High density Polyethylene
Aromatics I	Eucalyptus Oil, Camphor, Menthol	Methanol in ethanol	Regular Unleaded Gasoline
Aromatics in Gasoline - ASTM Method 5769	Fatty Acids (Free)	Mineral Spirits	Solvents IV
Citronella Java Oil	Flavor Volatiles	Nitrogen Based Solvent II	Steroids: Sex Hormones
Common Industrial Solvents	Fragrance Reference Standard I	Organotin Compounds	Sulfur in Gasoline
Denatured Fuel Ethanol-ASTM D5501	Freon® 12 & Ethylene Oxide	Oxygenates in Gasoline ASTM D5599	Sulfur in Naphtha

Aldehyde and Ketone	EPA TO-14 Compounds	Inorganic Hydride Gases	Pyrethrins
Diesel Fuel	Glycols III	Ozone Precursors- C2-C9 Gas Standard	Sulfur Compounds in Natural Gas
DNPH Derivative	Glycols/Diols	PFBHA Derivative	Synthetic Essential Oil Mixture
Drug Screen	Halogenated Hydrocarbons II	Polyethylene	Triethylene Glycol and Impurities
EPA Method 551	Hydrocarbons Sim-Dis	Inorganic Hydride Gases	Volatile Amines

## GsBP-1 Ordering Info

ID (mm)	Length (m)	Film (µm)	Temperature Limit (°C)	P/N
0.20	12	0.33	-60 to 325/350	0120-1203
	25	0.11	-60 to 325/350	0120-2501
	25	0.33	-60 to 325/350	0120-2503
	25	0.50	-60 to 325/350	0120-2505
	50	0.11	-60 to 325/350	0120-5001
	50	0.33	-60 to 325/350	0120-5003
0.25	15	0.10	-60 to 325/350	0125-1501
	15	0.25	-60 to 325/350	0125-1502
	15	1.00	-60 to 325/350	0125-1510
	30	0.10	-60 to 325/350	0125-3001
	30	0.25	-60 to 325/350	0125-3002
	30	0.50	-60 to 325/350	0125-3005
	60	0.25	-60 to 325/350	0125-6002
	60	0.50	-60 to 325/350	0125-6005
	60	1.00	-60 to 325/350	0125-6010
	0.32	15	0.10	-60 to 325/350
15		0.25	-60 to 325/350	0132-1502
15		1.00	-60 to 325/350	0132-1510
25		0.17	-60 to 325/350	0132-2501
25		0.52	-60 to 325/350	0132-2505
25		1.05	-60 to 325/350	0132-2510
30		0.10	-60 to 325/350	0132-3001
30		0.25	-60 to 325/350	0132-3002
30		0.50	-60 to 325/350	0132-3005
30		1.00	-60 to 325/350	0132-3010
30		3.00	-60 to 260/280	0132-3030
30		4.00	-60 to 260/280	0132-3040
30		5.00	-60 to 260/280	0132-3050
50		0.17	-60 to 325/350	0132-5001
50		0.52	-60 to 325/350	0132-5005
50		1.05	-60 to 325/350	0132-5010
60		0.10	-60 to 325/350	0132-6001
60		0.25	-60 to 325/350	0132-6002
60		0.50	-60 to 325/350	0132-6005
60		1.00	-60 to 325/350	0132-6010
60	3.00	-60 to 260/280	0132-6030	
60	5.00	-60 to 260/280	0132-6050	
0.53	5	0.15	-60 to 320/350	0153-0501
	5	0.88	-60 to 300/320	0153-0508
	5	2.65	-60 to 260/280	0153-0526
	5	5.00	-60 to 260/280	0153-0550
	7.5	1.50	-60 to 280/300	0153-0715
	7.5	5.00	-60 to 260/280	0153-0750
	10	0.88	-60 to 300/320	0153-1008
	10	2.65	-60 to 260/280	0153-1026
	10	5.00	-60 to 260/280	0153-1050
	15	0.15	-60 to 320/350	0153-1501



ID (mm)	Length (m)	Film (µm)	Temperature Limit (°C)	P/N
15	15	0.25	-60 to 320/350	0153-1502
15	15	0.50	-60 to 300/320	0153-1505
15	15	1.00	-60 to 300/320	0153-1510
15	15	1.50	-60 to 300/320	0153-1515
15	15	3.00	-60 to 260/280	0153-1530
15	15	5.00	-60 to 260/280	0153-1550
30	30	0.10	-60 to 300/320	0153-3001
30	30	0.25	-60 to 300/320	0153-3002
30	30	0.50	-60 to 300/320	0153-3005
30	30	0.88	-60 to 300/320	0153-3008
30	30	1.00	-60 to 300/320	0153-3010
30	30	1.50	-60 to 300/320	0153-3015
30	30	2.65	-60 to 260/280	0153-3026
30	30	3.00	-60 to 260/280	0153-3030
30	30	5.00	-60 to 260/280	0153-3050
50	50	3.00	-60 to 260/280	0153-5030
50	50	5.00	-60 to 260/280	0153-5050
60	60	1.00	-60 to 300/320	0153-6010
60	60	3.00	-60 to 260/280	0153-6030
60	60	5.00	-60 to 260/280	0153-6050

**TIP:** Use premium septum to minimize 'Baseline' increases.

## GsBP-5

General column for most popular applications, particularly for environmental, chemical, pharmaceutical, agriculture, food, drug and others. Good start columns for method development

- Poly(5% diphenyl, 95% dimethylsiloxane), crosslinked and bonded
- Solvent rinseable, high temperature limit
- Low column bleed, inert and neutral surface, high plate numbers
- Wide range of column dimensions and stationary phase film thicknesses
- Non-polar, equivalent to USP G27, G66, G41

**Similar Phases:** DB-5, HP-5, Ultra-5, SPB-5, RTX-5, Rxi-5sil, CP-Sil 8CB, BP-5, ZB-5, AT-5, MDN-5, OV-5, Optima-5

### Typical Applications:

Amines & Phenols	Chlorinated hydrocarbons	Garlic Oil	Organomercury Compounds
Amphetamines and Precursors - TMS Derivative	CLP Pesticides	Herbicides	Organotin Compounds II
Antihistamines	Cocaine & Metabolites (TMS Derivatives)	Lemon Oil	Pain Killers - TMS Derivatives
Aroclors 1016-1268 (without 1221)	Cold Medication	Marijuana - TMS Derivatives	PBDEs
Bacterial Fatty Acid Methyl Esters	Cold-Pressed Orange Oil	Major Metabolites - TMS Derivatives	PCBs by EPA Method 8083
Basic Drugs (Underivatized)	Common Drug Screen	Motor Oil	Phencyclidine (PCP)
Benzodiazepines (Basic Drugs-Underivatized)	Congeners in DIN Method PCBs	Narcotics and Adulterants	Phytosterols (Saw Palmetto)
Bergamot Oil	Ethanolamines	Opiates (TMS Derivatives)	Steroids: Anabolic (Underivatized)
Butter Triglycerides	Ethyleneamines	Organic Volatile Impurities	Sympathomimetic Amines Derivatives
Cannabinoids (TMS Derivatives)	European Red List Volatiles	Organochlorine Pesticides	Ylang Ylang Oil

## GsBP-5 Ordering Info

ID (mm)	Length (m)	Film ( $\mu\text{m}$ )	Temperature Limit ( $^{\circ}\text{C}$ )	P/N	
0.20	12	0.33	-60 to 325/350	0520-1203	
	17	0.33	-60 to 325/350	0520-1703	
	25	0.11	-60 to 325/350	0520-2501	
	25	0.33	-60 to 325/350	0520-2503	
	25	0.50	-60 to 325/350	0520-2505	
	50	0.11	-60 to 325/350	0520-5001	
	50	0.33	-60 to 325/350	0520-5003	
	50	0.50	-60 to 325/350	0520-5005	
	0.25	15	0.10	-60 to 325/350	0525-1501
		15	0.25	-60 to 325/350	0525-1502
15		0.50	-60 to 325/350	0525-1505	
15		1.0	-60 to 325/350	0525-1510	
30		0.10	-60 to 325/350	0525-3001	
30		0.25	-60 to 325/350	0525-3002	
30		0.50	-60 to 325/350	0525-3005	
30		1.00	-60 to 325/350	0525-3010	
60		0.10	-60 to 325/350	0525-6001	
60		0.25	-60 to 325/350	0525-6002	
60		0.50	-60 to 325/350	0525-6005	
60		1.00	-60 to 325/350	0525-6010	
0.32		15	0.10	-60 to 325/350	0532-1501
		15	0.25	-60 to 325/350	0532-1502
	15	0.50	-60 to 325/350	0532-1505	
	15	1.00	-60 to 325/350	0532-1510	
	25	0.17	-60 to 325/350	0532-2501	
	25	0.52	-60 to 325/350	0532-2505	
	25	1.05	-60 to 325/350	0532-2510	
	30	0.10	-60 to 325/350	0532-3001	
	30	0.25	-60 to 325/350	0532-3002	
	30	0.50	-60 to 325/350	0532-3005	
	30	1.00	-60 to 300/320	0532-3010	
	50	0.17	-60 to 325/350	0532-5001	
	50	0.25	-60 to 325/350	0532-5002	
	50	0.52	-60 to 325/350	0532-5005	
	50	1.05	-60 to 300/320	0532-5010	
	60	0.10	-60 to 325/350	0532-6001	
	60	0.25	-60 to 325/350	0532-6002	
	60	1.00	-60 to 325/350	0532-6010	
	0.53	10	2.65	-60 to 260/280	0553-1026
		10	5.00	-60 to 260/280	0553-1050
		15	1.50	-60 to 300/320	0553-1515
		15	3.00	-60 to 260/280	0553-1530
15		5.00	-60 to 260/280	0553-1550	
30		0.25	-60 to 300/320	0553-3002	
30		0.88	-60 to 300/320	0553-3008	
30		1.00	-60 to 300/320	0553-3010	
30		1.50	-60 to 300/320	0553-3015	
30		2.65	-60 to 260/280	0553-3026	
30		3.00	-60 to 260/280	0553-3030	
30		5.00	-60 to 260/280	0553-3050	
60		3.00	-60 to 260/280	0553-6030	
60		5.00	-60 to 260/280	0553-6050	

## GsBP-1MS

General column for most popular applications, particularly petroleum and petrochemical industries

- 100% Poly(dimethylsiloxane), crosslinked and bonded
- Solvent rinseable and high temperature limit
- Exceptionally low column bleed, inert surface and neutral surface, high plate numbers
- Wide range of column dimensions and stationary phase film thicknesses for GCs and GC/MS
- Non-polar, equivalent to USP G1, G2, G38

**Similar Phases:** DB-1MS, HP-1MS, SPB-1, Equity-1, Rxi-1MS, VF-1MS, CP-Sil 5CB, ZB-1MS, AT-1, MDN-1, OV-1, Optima-1MS

### Typical Applications:

Amines, volatile	Drug Screen	Hydrocarbons Sim-Dis	Steroids: Sex Hormones
Diesel / Gasoline	Ethylene Glycol Mixture	Pyrolysates of Polystyrene	Sulfur Compounds

## GsBP-1MS Ordering Info

ID (mm)	Length (m)	Film (µm)	Temperature Limit (°C)	P/N
0.20	15	0.33	-60 to 325/350	1120-1503
	17	0.33	-60 to 325/350	1120-1703
	25	0.33	-60 to 325/350	1120-2503
0.25	15	0.10	-60 to 325/350	1125-1501
	15	0.25	-60 to 325/350	1125-1502
	15	1.00	-60 to 325/350	1125-1510
	30	0.10	-60 to 325/350	1125-3001
	30	0.25	-60 to 325/350	1125-3002
	30	0.50	-60 to 325/350	1125-3005
	30	1.00	-60 to 325/350	1125-3010
	60	0.25	-60 to 325/350	1125-6002
	60	0.25	-60 to 325/350	1125-6002
0.32	15	0.25	-60 to 325/350	1132-1502
	25	0.52	-60 to 325/350	1132-2505
	30	0.10	-60 to 325/350	1132-3001
	30	0.25	-60 to 325/350	1132-3002
	30	1.00	-60 to 325/350	1132-3010
	60	0.25	-60 to 325/350	1132-6002

## GsBP-5MS

General column for most popular applications, particularly environmental, chemical, pharmaceutical, agriculture, food, drug and others; ideal column for new method development

- Poly(5% diphenyl, 95% dimethylsiloxane), crosslinked and bonded
- Solvent rinseable, high temperature limit
- Exceptionally low column bleed, inert and neutral surface, high plate numbers
- Wide range of column dimensions and stationary phase film thicknesses for GC and GC/MS
- Non-polar, equivalent to USP G27, G66, G41

**Similar Phases:** DB-5MS, HP-5MS, Ultra-5, SLB-5, Rxi-5MS, Rxi-5sil MS, Rxi-5HT, VF-5MS, CP-Sil 8CB low bleed MS, BPX-5, ZB-5MS, ZB-5HT, AT-5MS, Optima-5MS

### Typical Applications:

Acidic/Neutral Drugs	Endocrine Disruptors: Phthalate Esters	Formaldehyde, 50ppb	Polybrominated Diphenyl Esters (PBDE)
Alkaloids	EPA 608.1	Fragrance Allergens	Polyethyleneamines
Amines and Nitriles	EPA Air Analysis Method TO-15	Gasoline	Polynuclear Aromatic Hydrocarbons (PAHs)
Amphetamine and Methamphetamine	EPA Method 525.2	Halogenated Compounds	Semivolatile Compounds
Antiepileptic	EPA Method 551.1	Local Anesthetics	Semivolatile Organics
Basic Drugs	EPA Method 610	Nitrogen/Phosphorus Containing Pesticides, EPA 507	Substituted Anilines

Acidic/Neutral Drugs	Endocrine Disruptors: Phthalate Esters	Formaldehyde, 50ppb	Polybrominated Diphenyl Esters (PBDE)
Chlorinated Pesticides, EPA Method 508	EPA Method 8061 (Phthalate Ester)	Organochlorine Pesticides	Sulfur in air
CLP Standard, Semivolatiles Organics	EPA method 8270	Organochlorine Pesticides II EPA Method 8081A	Trace Active Amines, 10 ng on-column
Diesel Fuel	EPA-625 Phenols	Organohalide Pesticides in water, EPA 505	Tricyclic Antipsychotics
Drug of abuse	Flavor Mixture	Organophosphorus Pesticides I EPA 8141A	Urine Drug Screen
Endocrine Disruptors: Alkyl Phenols	Food Packaging Volatiles	Phenols, I and II	US EOA Method 8270D mix

## GsBP-5MS Ordering Info

ID (mm)	Length (m)	Film (µm)	Temperature Limit (°C)	P/N
0.20	12	0.33	-60 to 325/350	1520-1203
	17	0.33	-60 to 325/350	1520-1703
	25	0.33	-60 to 325/350	1520-2503
	50	0.33	-60 to 325/350	1520-5003
0.25	15	0.10	-60 to 325/350	1525-1501
	15	0.25	-60 to 325/350	1525-1502
	15	0.50	-60 to 325/350	1525-1505
	15	1.00	-60 to 325/350	1525-1510
	30	0.10	-60 to 325/350	1525-3001
	30	0.25	-60 to 325/350	1525-3002
	30	0.50	-60 to 325/350	1525-3005
	30	1.00	-60 to 325/350	1525-3010
	60	0.10	-60 to 325/350	1525-6001
	60	0.25	-60 to 325/350	1525-6002
	60	0.50	-60 to 325/350	1525-6005
	60	1.00	-60 to 320/340	1525-6010
0.32	15	0.10	-60 to 325/350	1532-1501
	15	0.25	-60 to 325/350	1532-1502
	15	0.50	-60 to 325/350	1532-1505
	15	1.00	-60 to 325/350	1532-1510
	25	0.52	-60 to 325/350	1532-2505
	30	0.10	-60 to 325/350	1532-3001
	30	0.25	-60 to 325/350	1532-3002
	30	0.50	-60 to 325/350	1532-3005
	30	1.00	-60 to 325/350	1532-3010
	60	0.10	-60 to 325/350	1532-6001
	60	0.25	-60 to 325/350	1532-6002
	60	0.50	-60 to 325/350	1532-6005
60	1.00	-60 to 300/325	1532-6010	
0.53	30	0.50	-60 to 300/320	1553-3005
	30	0.88	-60 to 300/320	1553-3008
	30	1.50	-60 to 300/320	1553-3015

## GsBP-5MS with Integrated Guard Column

In addition to all features of GsBP-5MS columns, the integrated guard columns provide:

- Extended column life
- Improved sample applications
- Same inertness as regular 5-MS columns
- Improved peak shapes for low boiling point compounds with presence of high boiling point compounds

**Similar Phases:** DB-5MS, HP-5MS, Ultra-5, SLB-5, Rxi-5MS, Rxi-5sil MS, Rxi-5HT, VF-5MS, CP-Sil 8CB low bleed MS, BPX-5, ZB-5MS, ZB-5HT, AT-5MS, Optima-5MS

## GsBP-5MS with Integrated Guard Column Ordering Info

ID (mm)	Description	Length (m)	Film (um)	Temperature Limit (C)	P/N
0.25	GsBP-5MS, 30m x 0.25mm x 0.25um	30	0.25	-60 to 325/350	
	w/ 5m guard column	5			1525-3502
	w/ 10m guard column	10			1525-4002
0.25	GsBP-5MS, 30m x 0.25mm x 0.50um	30	0.5	-60 to 325/350	
	w/ 5m guard column	5			1525-3505
	w/ 10m guard column	10			1525-4005

## GsBP-XLB

General purpose column for environmental, pharmaceutical and other applications. Great separations for PCB, PAH congeners. Low bleed column idea for GC/MSD instrumentation.

- Proprietary stationary phase, crosslinked and bonded
- Solvent rinseable, high temperature limit
- Low column bleed, inert and neutral surface, high plate numbers
- Non-polar

**Similar Phases:** DB-XLB, Rtx-XLB

### Typical Applications:

PAH	PCB	Benzene	Dioxane
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## GsBP-XLB Ordering Info

ID (mm)	Length (m)	Film (um)	Temperature Limit (°C)	P/N	
0.25	15	0.25	-60 to 325/350	1625-1502	
	30	0.10	-60 to 325/350	1625-3001	
	30	0.25	-60 to 325/350	1625-3002	
	60	0.25	-60 to 325/350	1625-6002	
	30	0.50	-60 to 325/350	1625-3005	
0.32	30	1.00	-60 to 320/340	1625-3010	
	0.53	15	0.25	-60 to 325/350	1632-1502
		30	0.10	-60 to 325/350	1632-3001
		30	0.25	-60 to 325/350	1632-3002
		60	0.25	-60 to 325/350	1632-6002
30		0.50	-60 to 325/350	1632-3005	
0.53	30	1.00	-60 to 300/320	1632-3010	
	0.53	15	0.50	-60 to 300/320	1653-1505
		30	0.50	-60 to 300/320	1653-3005
30		1.50	-60 to 300/320	1653-3015	

## GsBP-35MS

General column for environmental, pharmaceutical, agriculture, food, drug and others; good confirmation columns to GsBP-5MS applications

- Poly(35% diphenyl, 65%dimethylsiloxane), crosslinked and bonded
- Solvent rinseable, high temperature limit
- Low column bleed, inert and neutral surface, high plate numbers
- Wide range of column dimensions and stationary phase film thicknesses for GC and GC/MS
- Mid-polar, equivalent to USP G28, G32 and G42

**Similar Phases:** DB-35, DB-35MS, HP-35MS, SPB-35, Rtx-35, Rxi-35sil MS, VF-35MS, BPX-35, BPX-608, ZB-35, MR-2, AT-35

### Typical Applications:

Amytriptyline and Nortriptyline	CLP Pesticides	Fentanyl	PCBs by EPA Method 8082
Anilines	Cold Medication (Basic Drugs-Underivatized)	Organo Tins	Phenols
Barbiturates (Acidic/Neutral Drugs)	Endocrine Disruptors: Butyl Tins (hexyl derivatives)	Organochlorine Pesticides I EPA Method 8081A	Phenoxy Acid Herbicides - Methyl Derivative, EPA 8151A

Amytriptyline and Nortriptyline Basic Drugs (Underivatized)	CLP Pesticides EPA Method 552.2	Fentanyl Organochlorine Pesticides IV	PCBs by EPA Method 8082 Primary Amines
Benzodiazepines Chlordane	EPA Method 615- Chlorophenoxyacid Herbicides Ethanolamines	Pesticides, EPA 508.1 Organophosphorus Pesticides II EPA 8141A	Sympathomimetic Amines (Basic Drugs- Underivatized) Toxaphene

## GsBP-35MS Ordering Info

ID (mm)	Length (m)	Film (µm)	Temperature Limit (°C)	P/N
0.20	15	0.33	40 to 320/340	3520-1503
	25	0.33	40 to 320/340	3520-2503
0.25	15	0.25	40 to 320/340	3525-1502
	30	0.15	40 to 320/340	3525-3001
	30	0.25	40 to 320/340	3525-3002
0.32	60	0.25	40 to 320/340	3525-6002
	15	0.25	40 to 320/340	3532-1502
	30	0.25	40 to 320/340	3532-3002
0.53	60	0.25	40 to 320/340	3532-6002
	15	1.00	40 to 300/320	3553-1510
	30	0.50	40 to 300/320	3553-3005
30	1.00	40 to 300/320	3553-3010	

## GsBP-50+MS

General column for environmental, pharmaceutical, agriculture, food, drug, toppings, PAHs, Pesticides and herbicides. Good confirmation columns to GsBP-5MS or GsBP-35MS applications

- Poly(50% diphenyl, 50%dimethylsiloxane), crosslinked and bonded
- Solvent rinseable, high temperature limit
- Low column bleed, inert and neutral surface, high plate numbers
- Wide range of column dimensions and stationary phase film thicknesses for GC and GC/MS
- Mid-polar, equivalent to USP G3 and G17

**Similar Phases:** DB-17, DB-17MS, HP-50MS, SPB-50, Rtx-50, Rxi-17, VF-17MS, CP-Sil 24CB, BPX-50, ZB-50, AT-50, Optima-17

### Typical Applications:

Antidepressant and anticonvulsant drug	EPA 625, Phenols	Hallucinogens	Phenols
BHA and BHT	EPA 8081 Organochlorine Pesticides	PAHs	Tocopherols
Butter Triglycerides	Free Steroids	PCBs	Triazine Herbicides II

## GsBP-50+MS Ordering Info

ID (mm)	Length (m)	Film (µm)	Temperature Limit (°C)	P/N
0.20	12	0.16	40 to 325	5020-1201
	12	0.31	40 to 325	5020-1203
	25	0.16	40 to 325	5020-2501
	25	0.31	40 to 325	5020-2503
	50	0.31	40 to 325	5020-5003
0.25	15	0.15	40 to 325	5025-1501
	15	0.25	40 to 325	5025-1502
	15	0.50	40 to 325	5025-1505
	30	0.15	40 to 325	5025-3001
	30	0.25	40 to 325	5025-3002
	30	0.50	40 to 325	5025-3005
	60	0.25	40 to 325	5025-6002
	0.32	15	0.15	40 to 325
15	0.25	40 to 325	5032-1502	

ID (mm)	Length (m)	Film ( $\mu\text{m}$ )	Temperature Limit ( $^{\circ}\text{C}$ )	P/N
	15	0.50	40 to 325	5032-1505
	30	0.15	40 to 325	5032-3001
	30	0.25	40 to 325	5032-3002
	30	0.50	40 to 325	5032-3005
	60	0.25	40 to 325	5032-6002
	60	0.50	40 to 325	5032-6005
0.53	10	2.00	40 to 280	5053-1020
	15	1.00	40 to 300	5053-1510
	30	0.50	40 to 300	5053-3005
	30	1.00	40 to 300	5053-3010

**TIP:** Check for indications of inlet leaks occasionally, when peaks begin to decrease.

# Columns for VOCs

## GsBP-624, GsBP-VMS, GsBP-FVOC and GsBP-502.2

Great columns for EPA methods, pharmaceutical QC, petrochemicals, petroleum, VOC's, residue solvents, halogenated, and others. Popular column choices for go-green applications

- Proprietary phase, close to 6% cyanopropyl phenyl and 94% dimethyl polysiloxane
- Solvent rinseable, highest temperature limits
- Exceptionally low column bleed, inert and neutral surface, consistent column selectivity, very high plate numbers
- Fine tuned column selectivity to resolve 97 components of EPA 8260 mix
- Wide range of column dimensions and stationary phase film thicknesses for Purge/trap GC, GC/ECD and GC/MSD and old methods/latest updates
- Special version for fast VOC separations (FVOC), 1/3 conventional analysis times
- Mid-polar
- Close to USP G43

**Similar Phases:** DB-624, DB-502.2, DB-VRX, Rtx-624, Rtx-VRX, Rtx-VMS, Rtx-502.2, VF-624MS, CP-1301, SPB-624, VOCOL, BP-624, ZB-624, AT-624, Optima-624

### Typical Applications:

Samples	General Chemicals	Solvents	EPA method
Air	Alcohols	Alcohols	524.2
water-drinking	FAME	DMA	601
water-underground	Halogenated Hydrocarbons	DMSO	602
water-waste	Gasoline	Esters	624
Packaging	Nitrogen Based Solvents II	Ethers	8010
Cosmetics	Residual Solvents, USP 467	Glycols II	8015
Healthcare	Residue Solvents	EPA method	8020
Drinking	Volatile Amines	501.3	8021
Tobacco	Volatile Petroleum Hydrocarbons (VPH)	503.1	8240
Nutrition	Volatile Sulfurs	504	8260

### GsBP-624 Ordering Info

ID(mm)	Length (m)	Film (µm)	Temperature Limit (°C)	P/N
0.20	25	1.12	-20 to 260/280	6220-2511
0.25	30	1.40	-20 to 260/280	6225-3014
	60	1.40	-20 to 260/280	6225-6014
0.32	30	1.80	-20 to 260/280	6232-3018
	60	1.80	-20 to 260	6232-6018
0.53	30	3.00	-20 to 260	6253-3030
	60	3.00	-20 to 260	6253-6030
	75	3.00	-20 to 260	6253-7530
	105	3.00	-20 to 260	6253-A530

### GsBP-502.2 Ordering Info

ID (mm)	Length (m)	Film (µm)	Temperature Limit (°C)	P/N
0.25	60	1.40	-20 to 260/280	6325-6014
0.32	60	1.80	-20 to 260/280	6332-6018
0.53	60	3.00	-20 to 260/280	6353-6030

### Low Bleed GsBP-VMS Ordering Info

ID (mm)	Length (m)	Film (µm)	Temperature Limit (°C)	P/N
0.10	10	0.55	-20 to 260/280	6410-1005
0.18	20	1.00	-20 to 260/280	6418-2010
0.25	30	1.40	-20 to 260/280	6425-3014
0.25	60	1.40	-20 to 260/280	6425-6014



## Fast VOC analysis: GsBP-FVOC Ordering Info

ID (mm)	Length (m)	Film (µm)	Temperature Limit (°C)	P/N
0.1	10	0.18	-20 to 260/280	6510-1001
0.18	25	0.33	-20 to 260/280	6518-2503
0.25	30	0.47	-20 to 260/280	6525-3004
0.32	30	0.60	-20 to 260/280	6532-3006
0.53	30	1.00	-20 to 260	6553-3010

## GsBP-1301

Great column for VOC's, residue solvents, halogenatges, oxygenates, USP467, EPA methods

- 6% cyanopropyl phenyl and 94% dimethyl polysiloxane
- Solvent rinseable, highest temperature limit
- Low column bleed, inert and neutral surface, consistent column selectivity
- Wide range of column dimensions and stationary phase film thicknesses
- Mid-polar
- Equivalent to USP G43

**Similar Phases:** DB1301, DB-VRX, Rtx-1301, Rtx-VRX, CP-1301, VF-1301MS, SPB-1301, BP-624, ZB-1301, AT-624, Optima-624

### Typical Applications

1,4-Dioxane	Organic Volatile Impurities
EPA Method 551.1	Residual Solvents- European Pharmacopoeia Class I, II
EPA 8010	Spirit drinking, Rum, Scotch

## GsBP-1301 Ordering Info

id (mm)	Length (m)	Film (µm)	Temperature Limit (°C)	P/N
0.25	15	0.25	-20 to 280/300	6025-1502
	15	1.00	-20 to 280/300	6025-1510
	30	0.25	-20 to 280/300	6025-3002
	30	1.00	-20 to 280/300	6025-3010
	60	0.25	-20 to 280/300	6025-6002
	60	1.00	-20 to 280/300	6025-6010
0.32	15	0.25	-20 to 280/300	6032-1502
	15	1.00	-20 to 280/300	6032-1510
	30	0.25	-20 to 280/300	6032-3002
	30	1.00	-20 to 280/300	6032-3010
	60	0.25	-20 to 280/300	6032-6002
	60	1.00	-20 to 280/300	6032-6010
0.53	15	1.00	-20 to 260/280	6053-1510
	30	1.00	-20 to 260/280	6053-3010
	30	1.50	-20 to 260/280	6053-3015

## GsBP-1701

Great column for residue solvents, halogenates, acrylates, pesticides and herbicides, environmental, agriculture, pharmaceutical

- 14% cyanopropyl phenyl and 86% dimethyl polysiloxane
- Solvent rinseable, highest temperature limit
- Low column bleed, inert and neutral surface
- Wide range of column dimensions and stationary phase film thicknesses
- Mid-polar
- Equivalent to USP G46

**Similar Phases:** DB1701, Rtx-1701, VF-1701MS, CP-Sil 19 CB, SPB-1701, BP-10, ZB-1701, AT-1701, Optima-1701

### Typical Applications:

Acrylate Impurities II	Barbiturates (Acidic/Neutral Drugs- Underivatized)	Organochlorine Pesticides III	TMS derivatized Sugars
Antidepressants (Basic Drugs- Uncategorized)	Fentanyls	Phenoxy Acid Herbicides	Triazine Herbicides I
Antiepileptics (Uncategorized)	5% Fragrance Materials Association Mix	Styrene Impurities	VOCs in Packaging materials

### GsBP-1701 Ordering Info

ID (mm)	Length (m)	Film (µm)	Temperature Limit (°C)	P/N
0.20	25	0.20	-20 to 280/300	6120-2502
0.25	15	0.15	-20 to 280/300	6125-1501
	15	0.25	-20 to 280/300	6125-1502
	15	1.00	-20 to 280/300	6125-1510
	30	0.15	-20 to 280/300	6125-3001
	30	0.25	-20 to 280/300	6125-3002
	30	1.00	-20 to 280/300	6125-3010
	60	0.15	-20 to 280/300	6125-6001
	60	0.25	-20 to 280/300	6125-6002
	60	1.00	-20 to 280/300	6125-6010
0.32	15	0.15	-20 to 280/300	6132-1501
	15	0.25	-20 to 280/300	6132-1502
	15	1.00	-20 to 280/300	6132-1510
	30	0.15	-20 to 280/300	6132-3001
	30	0.25	-20 to 280/300	6132-3002
	30	1.00	-20 to 280/300	6132-3010
	50	1.00	-20 to 280/300	6132-5010
	60	0.15	-20 to 280/300	6132-6001
	60	0.25	-20 to 280/300	6132-6002
	60	1.00	-20 to 280/300	6132-6010
0.53	15	0.25	-20 to 260/280	6153-1502
	15	0.50	-20 to 260/280	6153-1505
	15	1.00	-20 to 260/280	6153-1510
	30	0.25	-20 to 260/280	6153-3002
	30	0.50	-20 to 260/280	6153-3005
	30	1.00	-20 to 260/280	6153-3010
	30	1.50	-20 to 260/280	6153-3015
	60	1.00	-20 to 260/280	6153-6010
	60	1.50	-20 to 260/280	6153-6015

# Polyethylene Glycol (PEG) Phases

GS-Tek offers three types of PEG columns: GsBP-INOWAX and its low bleed family GsBP-Inowax-MS, GsBP-FFAP, and GsBP-CarboWax 20M based on the characteristics of the PEG stationary phases, for wide ranges of applications across all over industries and researches

## GsBP-Inowax and Low Bleed GsBP-Inowax-MS

General columns for most popular applications, particularly chemical, pharmaceutical, agriculture, food, drinking, oil, cosmetics, flavor and fragrance, and others; ideal column for new method development

- Polyethylene Glycol, crosslinked and bonded
- Solvent rinseable with virtually all solvents, highest temperature limit
- Exceptionally low column bleed, inert and near neutral surface, high plate numbers
- Wide range of column dimensions and stationary phase film thicknesses for GC and GC/MS
- Polar Equivalent or close to USP G14, G15, G16, G20, G39

**Similar Phases:** DB-Wax, DB-WAXetr, DB-WaxFF, HP-Innowax, Supelco-wax 10, Omega-Wax, Rtx-Wax, Rxt-Stabilwax, CP-Wax 52 CB, BP-20, ZB-Wax, AT-Wax, Optimawax

### Typical Applications

Acrylamide (Potato Chip Extract)	EPA 602 Aromatics	Glycols, Glycols I	Peppermint Oil
Alcohols II and III	EPA-609 NitroAromatics	Hexamethylenediamine	Perfume
Aldehydes and Acids	Esters III	Impurities in Ethylbenzene	Phenols III
Amines (low MW)	Ethylene Oxide	Impurities in Mixed Xylenes	Polyunsaturated Fatty Acid Methyl Esters
Amines/Alcohols/Chlorides	FAME Standard I	Impurities in p-Xylene-ASTM D3798	Rapeseed oil
Aromatics Analysis: ASTM D16 Analytes	FAMEs (Cocoa Butter)	Impurities in Styrene	Rapid Analysis of Water in Organic Solvents
Aromatics II	Fast Styrene Analysis	Industrial Solvent	Solvents I, II
Blood Alcohol	Flavor Volatiles	Lavender Oil Spiked with Camphor	Spearmint oil
Bourbon	Formaldehyde Underivatized	Monomers in Latex Paint by Headspace	Strawberry Syrup
Branched alcohols	Fragrance Reference Standard II	Mushroom Aroma (Synthetic)	Sulfur and Selenium in Garlic by Headspace
BTEX	Frangnace Allergens	Nitrosamines	Tramanian Lavander Oil
Chlorinated Isooctane	Free Fatty Acids	Nutmeg Oil	Volatile Organics
Citronella Java Oil	Free Organic Acids/C4-C5 Isomers	Organic Acids	Volatile Sulfurs

### GsBP-Inowax Ordering Info

ID (mm)	Length (m)	Film (um)	Temperature Limit (°C)	P/N
0.20	25	0.20	40 to 260/280	2020-2502
	25	0.40	40 to 260/280	2020-2504
	50	0.20	40 to 260/280	2020-5002
	50	0.40	40 to 260/280	2020-5004
0.25	15	0.25	40 to 260/280	2025-1502
	15	0.50	40 to 260/280	2025-1505
	30	0.15	40 to 260/280	2025-3001
	30	0.25	40 to 260/280	2025-3002
	30	0.50	40 to 260/280	2025-3005
	60	0.15	40 to 260/280	2025-6001
	60	0.25	40 to 260/280	2025-6002
	60	0.50	40 to 260/280	2025-6005
0.32	15	0.25	40 to 260/280	2032-1502
	15	0.50	40 to 260/280	2032-1505
	30	0.15	40 to 260/280	2032-3001
	30	0.25	40 to 260/280	2032-3002
	30	0.50	40 to 260/280	2032-3005
	60	0.15	40 to 260/280	2032-6001

ID (mm)	Length (m)	Film (um)	Temperature Limit (°C)	P/N
	60	0.25	40 to 260/280	2032-6002
	60	0.50	40 to 260/280	2032-6005
0.53	15	1.00	40 to 240/250	2053-1510
	30	1.00	40 to 240/250	2053-3010
	60	1.00	40 to 240/250	2053-6010

## GsBP-Inowax-MS Ordering Info

ID (mm)	Length (m)	Film (um)	Temperature Limit (°C)	P/N
0.25	30	0.25	40 to 260/280	2425-3002
	60	0.25	40 to 260/280	2425-6002
	60	0.50	40 to 260/280	2425-6005
0.32	30	0.25	40 to 260/280	2432-3002
	30	0.50	40 to 260/280	2432-3005

**TIP:** Cut column ends with a ceramic wafer and check the cut edges with a magnifier.

## GsBP-FFAP

Ideal column for oxygenate solvents, volatile fatty acids or phenols in food, beverage, drugs, and others

- Polyethylene Glycol, nitroterephthalic acid modified, crosslinked and bonded
- Solvent rinseable with virtually all solvents, highest temperature limit
- Exceptionally low column bleed and high plate numbers
- Wide range of column dimensions and stationary phase film thicknesses for GC and GC/MS
- Polar. Equivalent to USP G25 and G35

**Similar Phases:** DB-FFAP, HP-FFAP, Rtx-Stabilwax-DA, OV-351, CP-Wax 58 CB, BP-21, AT-100

### Typical Applications:

Acrylates	Asprin and Ibuprofen in Methanol	Ethoxyethanol	Malt Whiskey
Alcoholic Beverage Standard: Acids & Esters	Cresylic Acids	Fatty Acids (Free)	Organic Acids

## GsBP-FFAP Ordering Info

ID (mm)	Length (m)	Film (um)	Temperature Limit (°C)	P/N
0.20	25	0.30	50 to 260	2120-2503
	50	0.30	50 to 260	2120-5003
0.25	15	0.25	50 to 260	2125-1502
	30	0.25	50 to 260	2125-3002
0.32	15	0.25	50 to 260	2132-1502
	25	0.50	50 to 260	2132-2505
	30	0.25	50 to 260	2132-3002
	30	0.50	50 to 260	2132-3005
	50	0.50	50 to 260	2132-5005
0.53	10	1.00	50 to 250	2153-1010
	15	1.00	50 to 250	2153-1510
	30	1.00	50 to 250	2153-3010

**TIP:** Use gas traps to improve gas quality.

## GsBP-CarboWax20M

General column for most popular applications, particularly chemical, pharmaceutical, agriculture, food, drinks, oil, cosmetics, flavor and fragrance, and others; ideal column for new method development

- Polyethylene Glycol
- True PEG selectivity
- Inert and near neutral surface, high plate numbers
- Polar, Equivalent to USP G14, G15, G16, G20, G39

**Similar Phases:** DB-CAM, HP-CarboWax 20M, Rtx-Wax

### Typical Applications:

Acids

Amines

Alcohols

Wine/Liqueur

### GsBP-CarboWax20M Ordering Info

ID (mm)	Length (m)	Film (um)	Temperature Limit (°C)	P/N
0.20	25	0.10	40 to 220	2220-2501
	50	0.10	40 to 220	2220-5001
0.25	30	0.25	40 to 220	2225-3002
0.32	30	0.25	40 to 220	2232-3002
	30	1.00	40 to 220	2232-3010
0.53	10	1.33	40 to 210	2253-1013
	30	1.33	40 to 210	2253-3013
	60	1.33	40 to 210	2253-6013

**TIP:** Before installing columns, cut 1-2 inches at both ends evenly.

## GsBP-PLOT Columns

- Porous Layer Open Tubular (PLOT) formed by various particle absorbents
- Truly immobilized particle coating on the capillary tubing wall. The use of a trap column is not necessary.
- Very high specific surface areas to provide high capacities needed for separations
- Different "polarities" (high column selectivity) leading to more specific separations
- Ideal columns for separating volatile and gaseous compounds
- A great replacement of packed columns
- Column customization – a similar column with an additional 75 USD and a 3 – 5 week lead time

### Common Practices and Tips:

- Avoid using the column at a temperature higher than the given temperature limit. This changes the selectivity.
- Avoid direct aqueous sample introduction to the Alumina and Molesieve PLOT columns.
- Avoid dirty sample introduction into all PLOT columns. With the introduction of dirty samples, the column takes a longer time to regain its peak performance. If a dirty sample is introduced, back flushing is the best method to clean the column.
- Performance regeneration can take a long time (10-24 hours) when the column is at its highest temperature in accordance with the temperature limits.

- Avoid rinsing the column to regenerate column performance. Instead, use higher temperature (but not higher than the temperature limit).
- Seal the column with a new septum when the column is stored outside of the GC oven.
- Cut the column gently and neatly to avoid particle dislodging. Do NOT tap or vibrate the column. Avoid too much tubing bending. These actions will destroy the coating binding and generate particles that can cause detector blockage or baseline spiking.
- Use helium as a carrier gas if possible. When hydrogen gas is used as a carrier, avoid using the instrument and high temperatures.
- Keep the column at 100°C -150°C when idling inside of a GC oven. Maintain the column gas flow.
- For a GC equipped with EPC, slowly ramp pressure for constant flow mode. Avoid pressure pulse injections.
- PLOT columns can be used in GC-MS instruments but great care must be used in order to avoid particle dislodging. In the case of the particles get into the ion source, clean them out as soon as possible to avoid the particles moving into the detector or the turbo pump.
- Use a shorter length column at first. Use a 50 or 60m column if the retention needs to be increased.
- Use a 0.53mm column for large sample loading capacity. Use a 0.32mm column for improving baseline separations or for use with a GC-MS application.
- The elution orders of working compounds are not completely defined. For this problem you should try to use your own knowledge, literature, expert consultation, or other resources to identify the peak(s). Internal Standards should be used for GC-MS as aid for peak identification.
- There is no totally "inert" PLOT column. Quantify your analysis result with care. Calibrate the result time by time because the column performance may decrease over time.
- Bare spots over the column length are normal for PLOT column. These spots do NOT affect column efficiency, retention time, or coating immobilization.

## GsBP-PLOT Column Selection

General Property	GsBP-PLOT Al <sub>2</sub> O <sub>3</sub> / "KCl", "S", "M"	AB-PLOT MoleSieves 5A	GsBP-PLOT Q	GsBP-PLOT U	GsBP-PLOT GasPro
<b>Stationary Phase</b>	Aluminum oxide, modified with KCl, Na <sub>2</sub> SO <sub>4</sub> , or Na <sub>2</sub> MoO <sub>4</sub>	Molecular Sieve, zeolite, 5A	Crosslinked Divinylbenzene polymer	Crosslinked divinylbenzene ethylene glycol Dimethacrylate copolymer	Modified porous silica layer
<b>Withstand Water</b>	No	No	Good to Excellent	Excellent	Modest
<b>Withstand acid/base</b>	No	No/Yes	Excellent	Excellent	Yes/No
<b>Withstand non-aqueous liquid</b>	Yes	No	Yes	Yes	Yes
<b>Thermal Stability</b>	200°C	300°C	280°C	190°C	260°C
<b>Rinse-able with solvent</b>	No	Yes, w/water	Yes	Yes	Yes, w/ acetone
<b>Fix gas separation at ambient temperature</b>	No	Yes	Air/CO, CO <sub>2</sub> , Water, sulfur gases, ammonia	Air/CO, CO <sub>2</sub> , water. Sulfur gases, ammonia	Air, CO <sub>2</sub> , inorganic gases
<b>C1 to C5 separation</b>	Excellent Baseline	No (C1 and C2)	Most, poor isomer baseline separation	Most, poor isomer baseline separation	Most
<b>Hydrocarbons</b>	C1 to C6 (C10 for short columns)	C1, C2	C1 to C12	C1 to C10	C1 to C12
<b>Separation of polar/oxygenated compounds</b>	Minimal	No	Good to excellent	Good to excellent	Good
<b>Known surface adsorption</b>	Oxygenated, acid/base, CO <sub>2</sub> , water	CO <sub>2</sub> , Water, Acid/base, hydrocarbons, halocarbons	Modest sulfur gases adsorption	Less adsorption of sulfur gases	N/A
<b>Elution Order</b>	Air, C1, Mostly carbon No. and aromatics	He/H <sub>2</sub> /Ne/Ar/O <sub>2</sub> /N <sub>2</sub> /C1/CO	Air, C1, C2, CO <sub>2</sub> , water, Mostly carbon No. or polarity aromatics	Air, C1, C2, CO <sub>2</sub> , C3, water. Mostly carbon No. or polarity and aromatics	Air, C1, CO <sub>2</sub> , Mostly carbon No.
<b>Known Applications</b>	Hydrocarbons, halocarbons, some chemical weapon gases (cynous gases), BTEX	Fixed gases and fixed gases from hydrocarbon stream, hydrogen isotopes at 80°C	Hydrocarbon stream oxygenated compounds, inorganic gases, halocarbons	Hydrocarbon stream, oxygenated compounds, inorganic gases	Impurities (sulfur compound) from hydrocarbon stream or air, halocarbons
<b>Similar Phases</b>	HP-PLOT Al <sub>2</sub> O <sub>3</sub> , "KCl", "S", "M", CP-Al <sub>2</sub> O <sub>3</sub> , PLOT KCl, Na <sub>2</sub> SO <sub>4</sub> , GS-Alumina, Rt-Alumina, ZB-Alumina	HP-PLOT Molsieve, CP-Molsieve, Rt-Molesieve, ZB-Molesieve	HP-PLOT Q, GS-Q, CP PoraPLOT Q, CP PoraPLOT Q, CP PoraPLOT Q HT, Rt-Q, Supel Q PLOT ZB-PLOT Q	HP-PLOT U, CP PoraPLOT U	GS-GasPro, CP-PLOT silica

Tek offers six types to PLOT columns: GsBP-PLOT Al<sub>2</sub>O<sub>3</sub>, GsBP-PLOT Molesieve, GsBP-PLOT GasPro, and GsBP-PLOT Q, GsBP-PLOT U, and GsBP-PLOT Carbon. These different stationary phase columns can be used for various small molecule applications in petrochemical, environment, and pharmaceutical industries.

## GsBP-PLOT Al<sub>2</sub>O<sub>3</sub> Columns

Ideal column for light hydrocarbons C1 to C5 separations, CFCs

- Porous Al<sub>2</sub>O<sub>3</sub>, modified with KCl, Sodium sulfate, or "M" salts
- Immobilized, rinseable with water or methanol
- Wide range of column dimensions and stationary phase film thicknesses, high plate numbers
- Complete separations of C1 to C5 isomers at above ambient temperatures
- Minimize column selectivity variety/retention time shift from moisture effect
- Higher retention than other commercial brand

### Typical Applications

Natural gas	LPG	Ethylene	MAPP
Refineral gas	Propane	Propylene	Butadienes
CFCs	C1 to C5	Extended C1 to C10	Nitrogen oxides

## GsBP-PLOT Al<sub>2</sub>O<sub>3</sub> "KCl"

Porous Al<sub>2</sub>O<sub>3</sub>, modified by KCl salt

- Good separations of olefins C2 to C5, least activity for propadiene
- Significant moisture effect on acetylene/propadiene retention time shifting

**Similar Phases:** HP-PLOT/Al<sub>2</sub>O<sub>3</sub> "KCL", CP-Al<sub>2</sub>O<sub>3</sub>/KCL-PLOT

### GsBP-PLOT Al<sub>2</sub>O<sub>3</sub> "KCl" Ordering Info

ID (mm)	Length (m)	Film (um)	Temperature Limit (°C)	P/N
0.25	25	5	-60 to 200/250	8125-2505
	30	5	-60 to 200/250	8125-3005
0.32	15	8	-60 to 200/250	8132-1508
	30	8	-60 to 200	8132-3008
	50	8	-60 to 200	8132-5008
0.53	15	15	-60 to 200/250	8153-1515
	30	15	-60 to 200	8153-3015
	50	15	-60 to 200	8153-5015
	60	15	-60 to 200	8153-6015

## GsBP-PLOT Al<sub>2</sub>O<sub>3</sub> "S"

- Porous Al<sub>2</sub>O<sub>3</sub>, modified by Na<sub>2</sub>SO<sub>4</sub> salt
- Excellent separations of olefins C2 to C5, slight absorption of propadiene
- Least moisture effect on acetylene/propadiene retention time shifting

**Similar Phases:** HP-PLOT/Al<sub>2</sub>O<sub>3</sub> "S", CP-Al<sub>2</sub>O<sub>3</sub>/Na<sub>2</sub>SO<sub>4</sub>-PLOT

### GsBP-PLOT Al<sub>2</sub>O<sub>3</sub> "S" Ordering Info

ID (mm)	Length (m)	Film (um)	Temperature Limit (°C)	P/N
0.25	25	5	-60 to 200/250	8225-2505
	30	5	-60 to 200/250	8225-3005
0.32	15	8	-60 to 200/250	8232-1508
	30	8	-60 to 200	8232-3008
	50	8	-60 to 200	8232-5008
0.53	15	15	-60 to 200/250	8253-1515
	30	15	-60 to 200	8253-3015
	50	15	-60 to 200	8253-5015
	60	15	-60 to 200	8253-6015



## GsBP-PLOT Al<sub>2</sub>O<sub>3</sub> "M"

Ideal column for complete separations of C1 to C5 light hydrocarbons, CFCs

- Porous Al<sub>2</sub>O<sub>3</sub>, modified by Na<sub>2</sub>MoO<sub>4</sub> salt
- Good separations of olefins C2 to C5, less absorption of propadiene
- Modest moisture effect on acetylene/propadiene retention time shifting

**Similar Phases:** HP-PLOT/Al<sub>2</sub>O<sub>3</sub> "M", GS-Alumina

### GsBP-PLOT Al<sub>2</sub>O<sub>3</sub> "M" Ordering Info

Id (mm)	Length (m)	Film (um)	Temperature Limit (°C)	P/N
0.25	25	5	-60 to 200/250	8325-2505
	30	5	-60 to 200/250	8325-3005
0.32	15	8	-60 to 200/250	8332-1508
	30	8	-60 to 200	8332-3008
	50	8	-60 to 200	8332-5008
0.53	15	15	-60 to 200/250	8353-1515
	30	15	-60 to 200	8353-3015
	50	15	-60 to 200	8353-5015
	60	15	-60 to 200	8353-6015

## GsBP-PLOT MoleSieve

Special columns for fixed gas separations.

- Molecular Sieves, zeolite, 5A
- Immobilized, rinseable with water or methanol
- Wide range of column dimensions and stationary phase film thicknesses
- High plate numbers
- Argon/Oxygen separation at ambient temperature

**Similar Phases:** HP-PLOT/Molesieve, CP-Molesieve PLOT, GS-Molesieve

### Typical Applications

Air	Hydrogen	Argon
Nobel gases	Nitrogen oxides	Natural gas
CO	SF <sub>6</sub>	Refinery gas

### GsBP-PLOT MoleSieve Ordering Info

ID (mm)	Length (m)	Film (um)	Temperature Limit (°C)	P/N
0.32	5	12	-80 to 300	8432-0512
	15	12	-80 to 300	8432-1512
	30	12	-80 to 300	8432-3012
	15	25	-80 to 300	8432-1525
	30	25	-80 to 300	8432-3025
	50	25	-80 to 300	8432-5025
0.53	60	25	-80 to 300	8432-6025
	5	25	-80 to 300	8453-0525
	15	25	-80 to 300	8453-1525
	30	25	-80 to 300	8453-3025
	15	50	-80 to 300	8453-1550
	30	50	-80 to 300	8453-3050
	50	50	-80 to 300	8453-5050
	60	50	-80 to 300	8453-6050

## GsBP-PLOT GasPro

Ideal column for sulfur analysis, CFCs, light hydrocarbons and solvents

- Proprietary porous silica layer

- Immobilized, rinseable with methanol, acetone, pentane
- 0.32mm ID column only
- High plate numbers
- Good separations of volatile sulfurs, CO<sub>2</sub>, solvents, light hydrocarbon C1 to C5

**Similar Phases:** GS-GasPro, CP-Silica PLOT

## Typical Applications

C1 and C2 Halocarbons (Freons)	Halothane	Residue Solvents
Extended Hydrocarbon Analysis	Inorganic Gases	Sulfur Compounds in Propylene (1 ppm)
Halocarbons	Mercaptans	Sulfur Gas Analysis in Light HydroCarbon Streams I

## GsBP-PLOT GasPro Ordering Info

ID (mm)	Length (m)	Film (um)	Temperature Limit (°C)	P/N
0.32	5	5	-80 to 260/300	8532-0505
	15	5	-80 to 260/300	8532-1505
	30	5	-80 to 260/300	8532-3005
	60	5	-80 to 260/300	8532-6005

## GsBP-PLOT Q

Good column for natural gas, refinery gases, chemical weapon gas, CFCs, sulfurs, amines

- Porous Divinylbenzene polymer
- Excellent immobilized, rinseable with volatile solvents
- Complete dimensions and film thicknesses
- Highest temperature limit and lowest column bleed
- Good separations of volatile sulfurs, CO<sub>2</sub>, oxygenate solvent vapors from light hydrocarbon C1 to C4 stream

**Similar Phases:** HP-PLOT Q, GS-Q, CP-PoraPLOT Q, Rtx-Q, Rtx-QS

## Typical Applications

Air, Carbon Monoxide, Methane, Carbon Dioxide	Hydrocarbon Gases	Oxygenates
Alcohols	N <sub>2</sub> OI	Refinery Gas I
Fatty Acids (Free)	Natural Gas	Solvents
Gases( Air, Carbon Monoxide, Methane, Carbon Dioxide)	Nitrogen, Oxygen, Argon	Sulfur Gas Analysis in Light HydroCarbon Streams

## GsBP-PLOT Q Ordering Info

id (mm)	Length (m)	Film (um)	Temperature Limit (°C)	P/N
0.32	15	15	-80 to 280/290	8632-1515
	30	15	-80 to 280/290	8632-3015
0.53	15	30	-80 to 280/290	8653-1530
	30	30	-80 to 280/290	8653-3030
	60	30	-80 to 260/280	8653-6030

## GsBP-PLOT U

Good column for natural gas, refinery gases, chemical weapon gas, CFCs, sulfurs, amines

- Porous Divinylbenzene, ethylene glycol dimethacrylate co-polymer
- Excellent immobilized, rinseable with volatile solvents
- Complete dimensions and film thicknesses
- Highest temperature limit and lowest column bleed
- Good separations of volatile sulfurs, amines, acids, CO<sub>2</sub>, oxygenate solvent vapors from light hydrocarbon C1 to C4 stream

**Similar Phases:** HP-PLOT U, CP-PoroPLOT U, Rtx-U

## Typical Applications

Amines in Water	Primary Amines	CO <sub>2</sub> in air	Moisture
Hydrocarbon Gases	Solvents	N <sub>2</sub> /CO	Sulfurs

## GsBP-PLOT U Ordering Info

id (mm)	Length (m)	Film (um)	Temperature Limit (°C)	P/N
0.32	15	10	-80 to 190/200	8732-1510
	30	10	-80 to 190	8732-3010
	30	20	-80 to 190	8732-3020
0.53	15	20	-80 to 190/200	8753-1520
	30	20	-80 to 190	8753-3020

**TIP:** Purge PLOT Column without connecting to the detector side to prevent baseline spiking and jet clogging.

# Specialty Columns

## GsBP-PONA

Excellent column for gasoline, natural gas, petroleum gases, sulfurs, amines, alcohols and other oxygenates

- 100% Poly(dimethylsiloxane), crosslinked and bonded
- Solvent rinseable, high temperature limit
- Low column bleed, inert and neutral surface, very high plate numbers
- 50m and 100m versions
- Non-polar

**Similar Phases:** HP-PONA, DB-Petro, Rtx-PONA

### Typical Applications

PONA Mix as Specified by AFNOR Method #2	Refinery gas III	Gasoline II	Residual Solvents
Propylene, Butene-1 and Ethylene	Sulfurs in Naphtha	FCC Gasoline	DHA

### GsBP-PONA Ordering Info

ID (mm)	Length (m)	Film (um)	Temperature Limit (°C)	P/N
0.2	50	0.50	-60 to 325/350	9002-PONA
0.25	100	0.50	-60 to 325/350	9006-PONA

## Micro-GC Applications

### GsBP-PLOT Q Ordering Info

ID (mm)	Length (m)	Film (um)	Temperature Limit (°C)	P/N
0.25	30	10	-60 to 280C	8625-3010
0.32	30	15	-60 to 280C	8632-3015

### GsBP-PLOT U Ordering Info

ID (mm)	Length (m)	Film (um)	Temperature Limit (°C)	P/N
0.25	30	10	-60 to 200C	8725-3010
0.32	30	20	-60 to 200C	8732-3020

### GsBP-PLOT Molesieve Ordering Info

ID (mm)	Length (m)	Film (um)	Temperature Limit (°C)	P/N
0.32	30	25	-60 to 300C	8432-3025

### GsBP-1 Ordering Info

ID (mm)	Length (m)	Film (um)	Temperature Limit (°C)	P/N
0.25	30	1.0	-60 to 325C	1125-3010

## GsBP-Low Bleed/MS Columns

Exceptionally low column bleed with high performances:

- Crosslinked and bonded, high temperature stable phases
- Resistant to virtually all solvents
- Total truly inert
- High efficiency
- Reproducible column selectivity
- Across most stationary phases

## GsBP-Low Bleed/MS Columns Ordering Info

Phase	ID (mm)	Length (m)	Film (um)	Temperature Limit (°C)	P/N
GsBP-1MS	0.20	17	0.33	-60 to 325/350	1120-1703
GsBP-1MS	0.25	30	0.10	-60 to 325/350	1125-3001
GsBP-1MS	0.25	30	0.25	-60 to 325/350	1125-3025
GsBP-1MS	0.25	30	1.00	-60 to 325/350	1125-3010
GsBP-5MS	0.20	17	0.33	-60 to 325/350	1520-1703
GsBP-5MS	0.25	30	0.10	-60 to 325/350	1525-3001
GsBP-5MS	0.25	30	0.25	-60 to 325/350	1525-3002
GsBP-5MS	0.25	30	1.00	-60 to 320/340	1525-3010
GsBP-5MS	0.25	60	0.25	-60 to 325/350	1525-6025
GsBP-5MS	0.25	60	1.0	-60 to 320/340	1525-6010
GsBP-35MS	0.25	30	0.25	-60 to 325/350	3525-3002
GsBP-XLB	0.25	30	0.25	-60 to 325/350	1625-3002
GsBP-50MS	0.25	30	0.25	-60 to 320/340	5025-3002
GsBP-1701MS	0.25	30	0.25	-20 to 280/300	6125-3002
GsBP-InowaxMS	0.25	30	0.25	40 to 260/280	2425-3002
GsBP-FFAPMS	0.20	50	0.33	40 to 260/280	2520-5003
GsBP-50MS	0.25	30	0.25	-60 to 320/340	5025-3002
GsBP-VMS	0.18	20	1.00	-20 to 260/280	6418-2010
GsBP-VMS	0.25	30	1.40	-20 to 260/280	6425-3014
GsBP-PLOT Al2O3, "S"	0.25	30	5.0	-60 to 200/250	8225-3005
GsBP-PLOT Q	0.25	30	10.0	-60 to 280/300	8625-3010
GsBP-PLOT U	0.25	30	10.0	-60 to 200/210	8725-3010

For customer-made MS columns, please inquiry with specifications of stationary phase, column ID, length and film thickness

## High Efficient and Fast Separation Columns

The columns utilizing narrow internal diameters to produce high plate numbers for critical separations

Phase	ID (mm)	Length (m)	Film (um)	Temperature Limit (°C)	P/N
GsBP-1MS	0.10	10	0.04	-60 to 325/350	1110-1004
GsBP-1MS	0.10	10	0.10	-60 to 325/350	1110-1010
GsBP-1MS	0.18	10	0.07	-60 to 325/350	1118-1007
GsBP-1MS	0.18	10	0.18	-60 to 325/350	1118-1018
GsBP-1MS	0.18	20	0.07	-60 to 325/350	1118-2007
GsBP-1MS	0.18	20	0.18	-60 to 325/350	1118-2018
GsBP-5MS	0.10	10	0.04	-60 to 325/350	1510-1004
GsBP-5MS	0.10	10	0.10	-60 to 325/350	1510-1010
GsBP-5MS	0.18	10	0.07	-60 to 325/350	1518-1007
GsBP-5MS	0.18	10	0.18	-60 to 325/350	1518-1018
GsBP-5MS	0.18	20	0.07	-60 to 325/350	1518-2007
GsBP-5MS	0.18	20	0.18	-60 to 325/350	1518-2018
GsBP-Inowax MS	0.10	10	0.04	40 to 260/280	2410-1004
GsBP-Inowax MS	0.10	10	0.10	40 to 260/280	2410-1010
GsBP-Inowax MS	0.18	10	0.07	40 to 260/280	2418-1007
GsBP-Inowax MS	0.18	10	0.18	40 to 260/280	2418-1018
GsBP-Inowax MS	0.18	20	0.07	40 to 260/280	2418-2007
GsBP-Inowax MS	0.18	20	0.18	40 to 260/280	2418-2018
GsBP-1701 MS	0.10	10	0.04	-20 to 280/300	6110-1004
GsBP-1701 MS	0.10	10	0.10	-20 to 280/300	6110-1010
GsBP-1701 MS	0.18	10	0.07	-20 to 280/300	6118-1007
GsBP-1701 MS	0.18	10	0.18	-20 to 280/300	6118-1018
GsBP-1701 MS	0.18	20	0.07	-20 to 280/300	6118-2007
GsBP-1701 MS	0.18	20	0.18	-20 to 280/300	6118-2018

## Deactivated Fused Silica Tubing

Deactivated fused silica tubing is commonly used as a retention gap and guard column or sample transfer line. They can prolong analytical column life, as they trap the most "dirty" or undesired compounds. We offer two types of deactivated tubing: non-polar with methylsilane and PEG. We can also offer other deactivation methods upon requesting.

- Modified surface with methylsilane or PEG
- Inert and near neutral surface
- Used for protecting analytical columns from dirty sample introduction

### MethylSilane Deactivated Tubing

ID (mm)	Length (m)	OD (mm)	Temperature Limit (°C)	P/N
0.2	1	0.34	350	9120-0100
	5	0.34	350	9120-0500
	10	0.34	350	9120-1000
0.25	1	0.35	350	9125-0100
	5	0.35	350	9125-0500
	10	0.35	350	9125-1000
0.32	1	0.43	350	9132-0100
	5	0.43	350	9132-0500
	10	0.43	350	9132-1000
0.53	1	0.67	325	9153-0100
	5	0.67	325	9153-0500
	10	0.67	325	9153-1000

### PEG Deactivated Tubing

ID (mm)	Length (m)	OD (mm)	Temperature Limit (°C)	P/N
0.2	1	0.34	300	9220-0100
	5	0.34	300	9220-0500
	10	0.34	300	9220-1000
0.25	1	0.35	300	9225-0100
	5	0.35	300	9225-0500
	10	0.35	300	9225-1000
0.32	1	0.43	300	9232-0100
	5	0.43	300	9232-0500
	10	0.43	300	9232-1000
0.53	1	0.67	300	9253-0100
	5	0.67	300	9253-0500
	10	0.67	300	9253-1000

# Packed Columns

Packed columns are traditional tools used for separation but are still prevailing in the industry. They are used in many gas chromatograph applications such as petroleum industries, food, chemicals, and others. GS-Tek offers packed columns in stainless steel tubing format, with complete well-known packing materials. GS-Tek also offers micropack columns for separation improvement and custom-made columns.

## HELPFUL TIPS:

- Most packed columns are not preconditioned. End user should precondition column at manufacturers specified maximum temperature prior to use
- Packed columns historically have different coil and connection configurations from various Gas Chromatograph brand.
- Packed columns are not manufacture-tested. Batch variation may exist

## To Order

Almost all packed columns are custom-made. A complete description of packed column configuration should be used to place an order.

## Packed Column Configuration Description

Tubing material	Length, foot or meter	OD inch/mm	Packing material	Instrument configuration	Connection
Stainless steel	Customer Specified	1/16 inch	Solid support	General	Brass nut fitting (standard)
Glass	Customer Specified	1/8 inch	Coating liquid phase and loading amount (if any) Support Mesh	HP/Agilent Varian P-E P-E auto system Shimadzu	Weldment VCR
Custom-specified	Customer Specified	1/4 inch			

For any other special custom-made configuration, please contact GS-Tek by email: [info@gs-tek.com](mailto:info@gs-tek.com) or phone: (302) 533-5646.

### TIP:

- 1) Thoroughly condition packed columns prior to use
- 2) Specify the loading amount of stationary phase (w/w) when ordering.

## Popular Packed Column Ordering Info

Stainless Steel (SS) Metal Packed Columns	
P/N	Description
9533-600	6' X 1/8" SS 10% Apiezon L Chrom W-HP 80/100
9533-602	6' X 1/8" SS 10% CWAX 400 Chrom W-HP 80/100
9533-604	6' X 1/8" SS 10% CWAX 1500 Chrom W-HP 80/100
9533-606	6' X 1/8" SS 10% CWAX 20M Chrom W-HP 80/100
9533-607	6' X 1/8" SS 10% CWAX 20M Chrom W-AW 80/100
9533-608	6' X 1/8" SS 10% CWAX 20M-TPA Chrom W-AW 80/100
9533-610	6' X 1/8" SS Chromosorb 101 80/100
9533-612	6' X 1/8" SS Chromosorb 102 80/100
9533-614	6' X 1/8" SS Chromosorb 103 80/100
9533-618	6' X 1/8" SS Chromosorb 105 80/100
9533-620	6' X 1/8" SS Chromosorb 106 80/100
9533-622	6' X 1/8" SS Chromosorb 107 80/100
9533-624	6' X 1/8" SS Chromosorb 108 80/100

## Stainless Steel (SS) Metal Packed Columns

9533-626	6' X 1/8" SS 10% DEGS Chrom W-AW 80/100
9533-628	6' X 1/8" SS 15% DEGS Chrom W-AW 80/100
9533-630	6' X 1/8" SS 5% FFAP Chrom W-HP 80/100
9533-632	6' X 1/8" SS 5% FFAP Chrom W-AW 80/100
9533-634	6' X 1/8" SS 3% OV-1 Chrom W-HP 80/100
9533-636	6' X 1/8" SS 3% OV-1 Chrom W-HP 100/120
9533-638	6' X 1/8" SS 10% OV-1 Chrom W-HP 80/100
9533-640	6' X 1/8" SS 3% OV-17 Chrom W-HP 80/100
9533-642	6' X 1/8" SS 3% OV-17 Chrom W-HP 100/120
9533-646	6' X 1/8" SS 10% OV-17 Chrom W-HP 80/100
9533-648	6' X 1/8" SS 10% OV-17 Chrom W-HP 100/120
9533-650	6' X 1/8" SS 3% OV-101 Chrom W-HP 80/100
9533-652	6' X 1/8" SS 3% OV-101 Chrom W-HP 100/120
9533-654	6' X 1/8" SS 10% OV-101 Chrom W-HP 80/100
9533-656	6' X 1/8" SS 3% OV-210 Chrom W-HP 80/100
9533-658	6' X 1/8" SS 3% OV-225 Chrom W-HP 100/120
9533-659	6' X 1/8" SS 3% OV-225 Chrom W-HP 80/100
9533-660	6' X 1/8" SS 3% OV-275 Chrom W-AW 80/100
9533-661	6' X 1/8" SS 3% SE-30GC Chrom W-HP 80/100
9533-680	6' X 1/8" SS 1.5% OV-17 + 1.95% QF-1 Chrom W-HP 80/100
9533-682	6' X 1/8" SS 4% SE-30GC + 6% OV-210 Chrom W-HP 80/100
9533-684	6' X 1/8" SS 10% OV-225 Chrom W-HP 80/100
9533-686	6' X 1/8" SS 10% TCEP on Chromosorb PAW, 80/100

## Molecular Sieves

P/N	Description
9533-690	6' X 1/8" SS Molesieve, 5A 80/100
9533-691	3' X 1/8" SS Molesieve, 5A 80/100
9533-692	12' X 1/8" SS Molesieve, 5A 80/100
9533-696	6' X 1/8" SS Molesieve, 13X 80/100
9533-697	3' X 1/8" SS Molesieve, 13X 80/100
9533-698	12' X 1/8" SS Molesieve, 13X 80/100

## Polymer Base

P/N	Description
9533-662	6' X 1/8" SS Porapak Q 80/100
9533-664	6' X 1/8" SS Porapak P 80/100
9533-666	6' X 1/8" SS Porapak R 80/100
9533-668	6' X 1/8" SS Porapak S 80/100
9533-670	6' X 1/8" SS Porapak T 80/100
9533-672	6' X 1/8" SS Porapak T 100/120
9533-674	6' X 1/8" SS Porapak N 80/100
9533-676	6' X 1/8" SS Porapak QS 80/100
9533-678	6' X 1/8" SS Porapak PS 80/100

**TIP:** Check the condition of liners, ferrules and septa on a regular basis to ensure optimum performance.



## Packing Media Solid Supports

Name	Description	Applications
Chromosorb PAW	C22 Firebrick acid washed mesh 80/100	Hydrocarbons
Chromosorb PAW DMCS	C22 Firebrick acid washed, treated with dimethyl-dichlorosilane mesh 80/100	Hydrocarbons/oxygenates
Chromosorb WAW	Diatomite support, acid washed, mesh 80/100	Oxygenates
Chromosorb WHP	Diatomite support, acid washed, silanized mesh 80/100	Steroids, bile acids, alkaloids, drugs

## Stationary Phases

Name	Description	Temperature Limit, (°C)
Squalane	Squalane	20/100
OV-1, SE-30	100% methyl silicone gum	50/300
OV-5, SE-52/54	5% phenyl 95% methyl silicone gum	50/300
UCW-982	100% methyl silicone gum, 1% vinyl	0/300
OV-101, SP-2100, DC-200	100% methyl silicone fluid	0/250
Dexsil 300, PS-300	Carbonate methyl silicone	50/450
OV-17, SP2250	50% methyl 50% phenyl silicone	0/375
OV-25	25% methyl 75% phenyl silicone	0/350
OV-210, SP2401	50% trifluoropropyl 50% methyl silicone	0/250
OV-225, XE-60	25% cyanopropyl silicone	0/265
Carbowax 20M	Polyethylene glycol	60/225
Carbowax 20M, TPA	Polyethylene glycol, acid modified	60/250
OV-351, SP-1000, FFAP-2	carbonwax, acid modified	50/250
DEGS	diethylene glycol succinate	40/200
EGS	ethylene glycol succinate	20/200
Silar 10C, SP2340	100% cyanopropyl silicone	0/250
TCEP	1,2,3-tris(2-cyanoethoxy)propane	0/125

## Solid Adsorbents

### Inorganic

Name	Description	Temperature Limit, (°C)
Molecular Sieve 5A	60/80, 80/100	350
Molecular Sieve 13X	60/80, 80/100	350
Tenax	35/60, 60/80, 80/100	350
Activated Charcoal	40/60	350
Activated Alumina	40/60, 80/100, 100/120	250
Silica Gel	40/60, 80/100, 100/120	200

## Porous Polymers

### Chromosorb™ “Century Series”

Name	Description	Temperature Limit, (°C)
Chromosorb 101	60/80, 80/100, 100/120	275
Chromosorb 102	60/80, 80/100, 100/120	250
Chromosorb 103	60/80, 80/100, 100/120	275
Chromosorb 105	60/80, 80/100, 100/120	250
Chromosorb 106	60/80, 80/100, 100/120	225
Chromosorb 107	60/80, 80/100, 100/120	225
Chromosorb 108	60/80, 80/100, 100/120	225
<b>Porapak®</b>		
Porapak-N	80/100	190
Porapak-P	80/100	250
Porapak-Q	80/100	250

Name	Description	Temperature Limit, (°C)
Porapak-QS	80/100	250
Porapak-R	80/100	250
Porapak-S	80/100	250
Porapak-T	80/100	190
<b>HayeSep®</b>		
HayeSep A	80/100	165
HayeSep B	80/100	195
HayeSep C	80/100	250
HayeSep D	80/100	290
HayeSep N	80/100	165
HayeSep P	80/100	250
HayeSep Q	80/100	275
HayeSep R	80/100	250
HayeSep S	80/100	250
HayeSep T	80/100	165
<b>Ohio Valley Specialty Chemical Porasil™</b>		
equivalent to durapak, poracil		
Carbowax 400/Porous-Sil C	80/100	200
N-Octane / Porous-Sil C	80/100	175
OPN/Porous-Sil C	80/100	150
C-18/Porous-Sil C	80/100	200
Phenyl Isocyanate / Porous-Sil C	80/100	60
Porous-Sil B 80/100	80/100	400
Porous-Sil C	80/100	400
Tenax	35/60, 60/80,80/100	350

## Stationary Phase Cross-References

GS-Tek	Phase Composition	Restek	Agilent	Supelco
GsBP-1 GsBP-1MS	100% dimethyl polysiloxane	Rxi-1ms, Rtx-1, Rtx-1MS	HP-1, HP-101, HP-1MS, Ultra-1, DB-1, DB-1MS, DB-1ht, SE-30	Equity-1, SPB-1, SP-2100, SPB-1 Sulfur, SE-30, MDN-1
GsBP-5 GsBP-5MS	95% dimethyl/ 5% diphenyl polysiloxane	Rxi-5ms, Rtx-5, Rtx-5MS	HP-5, HP-5MS, PAS-5, DB-5, DB-5.625, DB-5ht, SE-54	Equity-5, SPB-5, PTE-5, SE-54, SAC-5, PTE-5 QTM, MDN-5
GsBP-XLB	Proprietary phase	Rtx-XLB	DB-XLB	MDN-12
GsBP-35MS	65% dimethyl/ 35% diphenyl polysiloxane	Rtx-35, Rtx-35MS	HP-35, HP-35MS, DB-35	SPB-35, SPB-608, MDN-35
GsBP-50+MS	100% methyl phenyl polysiloxane	Rxi-50	HP-17, HP-50+	SPB-17
GsBP-1301	8% cyanopropylphenol/ 92% dimethyl polysiloxane	Rtx-1301	DB-1301	SPB-1301
GsBP-1701	14% cyanopropylphenol/ 86% dimethyl polysiloxane	Rtx-1701	HP-1701, PAS-1701, DB-1701	SPB-1701
GsBP-624, GsBP-VMS	Proprietary phase	Rtx-VRX Rtx-624, Rtx-VMS	HP-624, HP-VOC, DB-624, DB-502.2, DB-VRX	SPB-VOCCOL, SPB-624
GsBP-Inowax	Polyethylene glycol (PEG)	Stabilwax, Rtx-WAX	HP-20M, Inno Wax, DB-Wax, Carbowax 20M, HP Wax, DB-Waxetr	Supelcowax-10, Carbowax PEG 20M
GsBP-FFAP	Acid modified PEG	Stabilwax-DA	HP-FFAP, DB-FFAP, OV-351	Nukol, SP-1000
GsBP-PLOT Al2O3/ "KCI", "S", "M"	Aluminum oxide, modified with KCL, Na2SO4 or Na2MoO4	Rtx-Alumina	HP-PLOT Al2O3 "KCI", "S", "M"	Alumina Sulfate PLOT, Alumina Chloride PLOT
GsBP-PLOT MoleSieves 5A	Molecular Sieve zeolite, 5A	Rt-Msieve 5A	GS-Molesieve, HP-PLOT/Molesieve	Molesieve 5A
GsBP-PLOT Q	Crosslinked divinylbenzene polymer	Rt-QPLOT Rt-QSPLOT	HP-PLOT Q, GS-Q	Supel-Q PLOT
GsBP-PLOT U	Crosslinked divinylbenzene ethylene glycol dimethacrylate copolymer	Rt-UPLOT	HP-PLOT U	
GsBP-PLOT GasPro	Modified porous silica layer		GS-GasPro	
GsBP- PLOT Carbon	Activated Carbon		GS-Carbon PLOT	Carboxen-1006 PLOT



## United States Pharmacopoeia (USP) GC Phases

USP Code	USP Composition	Equivalent GsBP Column
G1	Dimethylpolysiloxane, oil	GsBP-1, GsBP-1MS
G2	Dimethylpolysiloxane gum	GsBP-1, GsBP-1MS
G3	50% phenyl, 50% methylpolysiloxane	GsBP-50+ MS
G5	3-cyanopropylmethylpolysiloxane	GsBP-23
G7	50% 3-cyanopropyl-50% phenylmethylsiloxane	GsBP-225
G8	80% Bis(3-cyanopropyl)20% 3-cyanopropylphenylpolysiloxane or 90% 3-cyanopropyl 10% phenylmethylsiloxane	Gsbp-FAME
G14	Polyethylene glycol, average MW 950--1,050	GsBP-InoWax
G15	Polyethylene glycol, average MW 3,000--3,700	GsBP-Inowax, GsBP-CarboWax20M
G16	Polyethylene glycol, average MW 15,000 GsBP-InoWax	GsBP-CarboWax20M
G17	75% phenyl 25% methylpolysiloxane	GsBP-50+ MS
G20	Polyethylene glycol, average MW 380-420	GsBP-InoWax
G25	Polyethylene glycol, TPA (Carbowax 20M, Terephthalic acid)	GsBP-FFAP
G27	5% phenyl 95% methylpolysiloxane	GsBP-5, GsBP-5MS
G28	25% phenyl 75% methylpolysiloxane	GsBP-35MS
G32	20% phenylmethyl 80% Dimethylpolysiloxane	GsBP-35MS
G35	Polyethylene glycol & diepoxide esterified with nitroterephthalic acid	GsBP-FFAP
G36	1% vinyl 5% phenylmethylpolysiloxane	GsBP-5, GsBP-5MS
G38	Phase G1 plus tailing inhibitor	GsBP-1, GsBP-1MS
G39	Polyethylene glycol average MW 1500	GsBP-InoWax
G41	Phenylmethyldimethylsilicone (10% phenyl substituted)	GsBP-5MS
G42	35% diphenyl 65% Dimethylvinylsiloxane	GsBP-35MS
G43	6% Cyanopropylphenyl-94% dimethylpolysiloxane	GsBP-1301
G45	Divinylbenzene ethylene glycol dimethacrylate	GsBP-PLOT U
G46	14% Cyanopropylphenyl-86% methylpolysiloxane	GsBP-1701

# Application Focus and Solution Provider

Based on its strength and expertise in gas chromatographic separations and column technologies, GS-Tek offers a variety of solution-base products to serve customers in specific industry applications.

## PONA Software Package

PONA Software Package is a DOS version software that work and is portable for any PC operation system. It has an interface with HP Chemstation to read Chemstation .D files. Based on internal calibration, standard retention data and the retention times from PONA columns (both 50m and 100m version), it automatically identifies 75-90% of 300 to 600 peaks from a gasoline sample. Once peaks are identified, the software calculates physical properties and Iso-octane values of a gasoline sample and generates printable reports as QC record. The following is an example of FCC gasoline sample results on a GsBP-PONA, 50m x 0.20mm x 0.5um (9002-PONA).

### Example of FCC Gasoline Sample on GsBP-PONA column

Column	GsBP-PONA
Number of peaks identified by the software	300
Calculated RON	87.26
Calculated MON	78.18
C:H	7.33
Specific density	0.8064

### Table 1 Overview of Phase

Types	Wt%	V%
P (Normal Paraffin)	3.29	3.68
I (Iso Paraffin)	25.81	28.37
O (Olefin)	9.14	10.08
N (Naphtha)	15.74	16.20
A (Aromatic)	46.02	41.67

### PONA Software Ordering Info

Description	P/N
PONA DOS version Software	9003-PONA-100m
	9001-PONA-50m
Column	9002-PONA, 50m x 0.20mm x 0.5um
	9006-PONA, 100m x 0.25mm x 0.5um
Gasoline standard	9005-PONA

## NGA Software Package

Similar to our PONA software, NGA software package is also a DOS version package for natural gas analysis. It reads HP-Chemstation data files from an analysis based on our configuration. It calculates all physical properties of a natural gas sample, such as BTU, dew point, specific density, and others.

### NGA Package Ordering Info

Description	P/N
NGA software	9005-NGA
Configuration of columns	9007-NGA-Col
Valves	9007-NGA-Valves



## High Temperature Sim-Dis Package

The HT Sim-Dis package includes software, calibration standard, and column and supply kit for Sim-Dis analysis. It analyzes compounds and generates boiling point plot up to 700C.

## HT Sim-Dis Package Ordering Info

Description	P/N
Sim-Dis package	9007-SIMDIS
Calibration standard	9007-SIMDIS-Std
One year supply kit	9007-SIMDIS-kit

## Analyzers

GS-Tek offers industry focused analyzers listed in the following:

- \* Natural gas analyzer (NGA, C1 to C12)
- \* Fast Refinery gas analyzer (FRGA, C1 to C6)
- \* Detail Hydrocarbon Analysis (DHA, C1 to C12)
- \* Trace level sulfur analyzer (TLSA)
- \* Gasoline analyzer (D2887, D2887X, D7169)
- \* Oxygenates in Gasoline

**Please contact GS-Tek for details and order info.**



## Instrument Components

GS-Tek offers spare/repair instrument components for various brand names, such as Agilent 6890, HP-5890 GCs, Thermo Focus and Trace, and others.

Common parts include: injector, detector and jet, sensor and heater, fan, electronics, valve, sampling valves, gas sampling system.

**Please contact GS-Tek for details and order info.**



## Separation Services

GS-Tek provides professional service for separation and analysis consultation on a project base. Such services include:

- Instrument configuration
- Sample preparation for analysis
- Columns and method
- Data analysis and software
- Contracting installation or maintenance on-site
- On-site training

**Please contact GS-Tek for details and order info.**

# Column Selection Guideline

A column is of course, the starting and central piece of a chromatograph. An appropriately selected column can produce a good chromatographic separation which provides an accurate and reliable analysis. An improperly used column can often generate confusing, inadequate, and poor separations which can lead to results that are invalid or complex to interpret.

There are over 10,000 compounds that can be analyzed by GC and over 400 GC capillary columns. It is a challenge for a column manufacturer to give detailed column selection guidelines to meet such a wide variety of applications. In spite of this challenge, we would like to offer our many years experience and expertise to help you choose the proper column for your application.

## Column Characteristics

A column is characterized by its stationary phase and dimensions: column ID, length, and film thickness (or more precisely, phase ratio). All of these variables directly affect separation to different degrees in elution order, retention time, peak resolution, and peak shape/height. Additionally, column performance is largely characterized by column inertness, plate numbers and column bleed in a chromatographic application. Therefore, indirectly or directly impacting how accurate and reliable the analysis performs. Among these variables, stationary phase is the most influential and effective variable that leads to a good separation on a properly maintained column.

## Stationary phase

When selecting a column, first determine the samples characteristics to match the columns stationary phase. Stationary phases are in general divided into 3 categories: 1) non-polar, 2) mid-polar and 3) polar. Stationary phases are further categorized by siloxane (non-polar and mid-polar) and polyethylene glycol (PEG or polar), based on the stationary chemical composition and WCOT (Gas-liquid partition chromatograph) and PLOT (Gas Solid absorption chromatograph) based on the separation mechanisms. Table I lists the common stationary phases.

	Separated compounds	Comment
<b>Non-Polar phases</b>		
GsBP-1, GsBP-5, GsBP-1MS, GsBP-5MS	Most compounds, elution order by boiling point order, primary C-C or C-H bonds compounds	Different elution orders of polar or polarized compounds, such as alcohol, from polar columns
<b>Mid-polar phase</b>		
GsBP-35, GsBP-50, GsBP-1301, GsBP-1701, GsBP-624	Most polar C-C or C-H bond compounds containing Br, Cl, F, N, O, P, S atoms.	Improved separation of polar compounds from non-polar compounds over non-polar columns
<b>Polar phase</b>		
GsBP-Inowax, GsBP-FFAP, GsBP-Carbowax	Most polar C-H or polarized compounds, such as aromatic rings	Different elution orders of polar compounds from non-polar/mid-polar columns
<b>PLOTs</b>		
Al <sub>2</sub> O <sub>3</sub>	Light hydrocarbons C1 to C6/C10, alkanes, alkenes, alkynes and benzene rings, or C-Halogenic bonded gases	Improved separations over non-polar columns
Molesieve	Fixed gas separation: H <sub>2</sub> , noble gases, sulfur gases, nitrous gases, oxygen, nitrogen, SF <sub>6</sub> , methane, ethane and ethylene, CO	Just gaseous state compounds below ambient temperatures
Porous Polymers	Light hydrocarbons C1 to C3/C6, CO <sub>2</sub> , CO, water, C1 to C4 alcohols, acids, amines, sulfurs, C1 to C3	Very versatile separations with not satisfactory resolution, inertness issues
PLOT Q, U, GasPro	Light sulfur compounds, CFCs, from light hydrocarbons	Elution order interference with hydrocarbons

The commonly used separation principle associated with stationary phases is: non-polar columns retain non-polar compounds and polar columns retain polar compounds. However, this principle can be improperly cited leading to the use of improper columns. Most complex and difficult samples to analyze contain non-polar and polar compounds for example gasoline blended with denatured ethanol.

Over the past few decades, statistics of GC applications shows a popularity of non-polar phase columns compared to polar or mid-polar phase columns. Typically, non-polar columns, such as the 5MS column, can capture over 50% of applications and analyses. While polar or mid-polar columns e.g. PEG phase columns may capture about 25% of applications. There is an increasing trend of non-polar columns to be used for volatile chemicals including solvents and drugs.

As a general rule, non-polar columns should be selected first, and polar columns should be used for less complicated samples (less varied in chemical structure). For separation confirmation purposes, polar and non-polar stationary phase columns should be used for the same sample.

## Table II lists the stationary phase recommendations for some compound separations

Sample Compounds of Interest	Recommended stationary phases	Comment
Air pollution	GsBP-1, GsBP-GasPro, GsBP-PLOT Q, GsBP-5	
Alcohol as major compounds	GsBP-1 or GsBP-5,	Good separation in C1 to C3 alcohols
Alcohols	GsBP-Inowax, Carbowax, FFAP	Limited separation of ethanol with isopropyl alcohol
Anesthetic gas or breath gas	GsBP-GasPro GsBP-5MS	

Sample Compounds of Interest	Recommended stationary phases	Comment
Aromatics	GsBP-Inowax / FFAP, GsBP-Al2O3 PLOT	
Biodiesel	GsBP-Inowax, GsBP-5MS, GsBP-624	
Dioxines	GsBP-5MS	Some critical separation issues
Drug abuse	GsBP-5, GsBP-Inowax, GsBP-1	
Drugs, natural product extract	GsBP-5, GsBP-1, GsBP-50MS	
FAMEs	GsBP-5MS, GsBP-Inowax, GsBP-624	Limited separations of isomers in C22-C24s. Lifetime issues
Food preserve additives	GsBP-5, GsBP-FFAP	
Gasoline	GsBP-1, GsBP-Inowax	DHA or oxygenates
Life science research	GsBP-5MS, GsBP-FFAP	Metabolism study
PCBs, PBDEs	GsBP-5MS	Some congeners separation resolution issue
Pesticides	GsBP-5MS	
Pesticides	GsBP-1701	
Petroleum streams	GsBP-AL2O3 PLOT, GsBP-5, GsBP-1	
Volatiles	GsBP-5, GsBP-1, GsBP-624	Co-elution or limited resolution issue for some volatiles
Water analysis, Volatiles	GsBP-624, GsBP-5	
Wine/Liquor	GsBP-FFAP, GsBP-Inowax, GsBP-1	

Stationary phase selection should also include the instrument/instrumentation conditions, such as the detector, carrier gas, and sample size. If both selection and detection are not main concerns, a stationary phase with low response to the detector should be used. For example, a cyano phase such as a 1301, 1701, 624, or fame column should not be used on a GC-NPD. A lower bleed column phase such as -1MS or -5MS should be used as much as possible to minimize the effect of a baseline rise on low detection limit. If the purity of the carrier gas is in question or the instrument has gas leaking issues, high temperature limit stationary phase should be considered first to minimize early phase damage. Finally, unless necessary, the bonded phase should always be used over non-bonded and non-crosslinked phases to avoid column performance degradation caused by the sample and the sample size.

When the separation or the peak identification is very complex, a non-polar phase column should be used as often as possible; the elution order on this type column is relatively simpler than the elution order on a polar phase column.

Finally, for applications that require validation, both polar and non-polar phase columns should be used to confirm peak identification or verify separation. Common pairs of columns are -5MS and -1701 or -35 for pesticides, --5MS and -624 or -VMS for residue solvents, PEG and Cyano phase for alcohol separations, and FAME analysis, -1, and PEG for oxygenates in gasoline.

## Column ID

Column Internal Diameters (ID) standard sizes are 0.20mm, 0.25mm, 0.32mm, and 0.53mm. Less popular IDs are 0.1mm and 0.8mm. 0.25mm. ID columns are often referred to as capillary columns and are able to separate many critical compounds, while 0.53mm columns are referred as replacements of packed columns for large sample size applications.

Column ID plays two contradicting roles in separation. With decreasing column ID, there are increased plate numbers (increased efficiency) and decreased sample loading capacities. When a column is overloaded with sample, the plate number is decreased greatly. Often times we have to make compromises. In most cases, there is no optimum column ID for an application.

As a general rule, a column with a larger column ID (e.g., 0.53mm ID) should be used for trace level impurity analysis or used with the Head Space (HS) application. If the separation needs to be improved or a critical separation needed, a column with a smaller column ID (0.25mm or 0.20mm) should be used. Each industry or demography has its own preference or internal standard of column ID. A column with a 0.32mm column ID is a popular choice because of its compromise in sample loading capacity and efficiency.

Columns with a 0.25mm column ID have become very popular in modern GC applications. The 0.25mm column ID has been estimated to account for over 50% of applications. It provides an excellent balance in separation efficiency and sample loading capacity. It is used widely in the environmental, food, and legal industries. In most cases, 0.25mm columns exhibit synergies of MS columns and are suitable for most GC-MS applications.

Columns with smaller column IDs such as 0.10mm and 0.20mm often are used for fast separations. Additionally, they can improve analysis by the column features relating to column inertness, efficiency, and column bleed. Relatively speaking, columns with 0.32mm and 0.53mm column IDs are more inert than columns with 0.20mm and 0.25mm column IDs. Whenever there is a need for column inertness, columns with larger column IDs should be considered. When the instrument is limited in inlet pressure control, columns with larger column IDs are the first choice. When the column carrier gas quality is in question or instrument condition is poorly kept, columns with larger column IDs (0.32mm or 0.53mm) should be considered to prolong the column lifetime. When the column bleed is a concern, columns with smaller column IDs along with columns that have thin film thicknesses should be used.

## Column Length

Column length increases retention times (analysis time) and, to a lesser degree, separation efficiency (by doubling plate number). Industry standardized lengths are 5m, 7.5m, 10m, 12.5m, 15m, 25m, 30m, 50m, 60m, 75, 100m, and 105m. The most popular column length is 30m.

For fast analysis, it is necessary that the column have a proper column ID and short column length (e.g. 5—15m x 0.25mm). With these specs, it is very possible to



generate excellent separation and results with adequate analysis times.

When there is a need to improve a separation by increasing resolution, longer length columns, such as 60m or 100m, can be used. The resolution is improved by the square root of the length; a 60m column only increases the resolution by 40% over a 30m column, while the analysis time is doubled.

Columns with longer lengths like 50m, 60m and 100m columns are often used for volatile applications in attempting to improve separations. This becomes prevailing in gaseous sample applications or detailed hydrocarbon analysis.

Columns with longer lengths often have issues with column inertness, column bleed, and column efficiency. These columns also require high carrier gas pressures or different carrier gases altogether (varying from nitrogen to hydrogen/helium).

## Film Thickness

Industry standardized film thicknesses are 0.1 $\mu$ m, 0.15 $\mu$ m, 0.25 $\mu$ m, 0.5 $\mu$ m, 1.0 $\mu$ m, 1.5 $\mu$ m, 3 $\mu$ m, 5 $\mu$ m. Some odd film thicknesses such as 0.33 $\mu$ m, 0.88 $\mu$ m, 2.65 $\mu$ m are historical convention. 0.25 $\mu$ m, 0.5 $\mu$ m and 1 $\mu$ m film thickness are the most popular ones.

Film thickness plays two roles, increasing the retention time, and increasing the sample loading capacity. Film thickness also affects the column operation temperature, analysis time, and result accuracy/reliability. A column with thin film thickness such as 0.25mm x 0.1 $\mu$ m gives a very fast separation, and sometimes may increase separation resolution, and decrease the column bleed at very high operation temperatures. Sometimes column inertness also becomes a noticeable issue. Column sample loading capacity can also be decreased greatly, weakening the benefits of a quicker and improved resolution.

0.25mm x 0.25mm ID, 0.5mm x 0.32mm ID, 1mm or 1.5mm x 0.53mm ID columns often give a better balance in separations and analyses requiring retention, resolution, separation, inertness, and column bleed.

Film thickness is related to column ID by the phase ratio ( $\beta$ ). On two columns of the same phase ratio and the same stationary phase, but different IDs, the separation or retentions would be the same or similar under the same temperature conditions. For an example, 0.25mm x 30m x 0.25 $\mu$ m GsBP-5MS ( $\beta$  =250) will have similar retention times and separations to a 0.53mm x 30m x 0.5 $\mu$ m column ( $\beta$ =265). Hence, this provides an alternate solution to a column that is not readily available.

## Customer-made columns

When you cannot find an existing column that meets your needs, you may inquire about a customer-made column. Except for the column's stationary phase, all column dimensions (column ID, length, and film thickness) can be specifically designed by you or with our collaboration. Additionally, two columns can be connected or a guard column to an analytical column. For details, please contact us.

## Sample Characteristics

The sample used for analysis is an important factor in column selections. A sample can be characterized in many ways. The following table lists a few general guidelines.

Physical property	ID (mm)	Length (M)	Film thickness, ( $\mu$ m)	Comment
Solid	0.53	30		
Liquid	Any			
Gas	0.53	30, 60	1.5 to 5	
Clean sample after preparation	0.25, 0.32	30	0.25	
Dirty sample or raw sample	0.53, 0.32	30	0.25 to 1.5	Guard column, 0.53mm ID
High boiling point compound	0.25, 0.32 and 0.53	15, 30	0.1, 0.25	Guard column, 0.53mm ID
Complicate sample, non-polar/polar compounds	0.20, 0.25	15 30, 60, 100	0.1, 0.25	
Unstable or reactive compounds, such as TNT	0.25, 0.53	5, 10, 15	0.1, 0.25, 1	
Aqueous sample	0.25, 0.53	15, 30, 60	1, 1.5, 3	Guard column

## Conventional Wisdom for Column Selection

- Make use of any available information on methods, regulations, and experimental results, that can be acquired from public domains and column manufacturers
- Know your sample and your application requirements
- Start with a simple column such as a non-polar phase 30m standard length and 0.25mm column ID
- Most known separations can be achieved, either completely or partially, with any popular columns
- If having trouble, use a trial and error approach and collaborate with the column manufacturer to save time and money
- Accumulate your experience and knowledge and share it with others.
- Optimization of separations including column separation is not an easy process, as variation from brand names and batches affect separation. So, keep in mind there is no perfect fit.
- There are differences between various GC name brands which yield varying results, such as elution order, separation/resolution, number of peaks, and often result accuracy.

## ASTM Methods

ASTM Designation	Testing Method	Method Title	GS-Tek Column Recommendations	P/N
D 1945	GC	Standard test method for the analysis of natural gas	GsBP-PLOT MoleSieve, 15m x 0.53mm x 50um GsBP-PLOT Q, 15m x 0.53mm x 30um	8453-1550 8653-1530
D 1946	GC	Standard test method for the analysis of reformed gas	GsBP-PLOT MoleSieve, 15m x 0.53mm x 50um GsBP-PLOT Q, 15m x 0.53mm x 30um	8453-1550 8653-1530
D 1983	GLC of methyl ether	Standard test method for the analysis of fatty acid compositions	GsBP-InoWax, 30m x 0.25mm x 0.25um	2025-3002
D 2163	GC	Standard test method for the analysis of liquified petroleum gases and propene concentration	GsBP-PLOT Al2O3 KCl, 30m x 0.53mm GsBP-PLOT Al2O3 Na2SO4, 30m x 0.53mm	8153-3015 8253-3015
D 2268	Capillary GC	Standard test method for the analysis of high purity n-heptane and iso-octane	GsBP-1, 60m x 0.25mm x 0.50um	0125-6005
D 2306	GC	Standard test method for C8 aromatic hydrocarbons	GsBP-InoWax, 60m x 0.25mm x 0.25um	2025-6002
D 2426	GC	Standard test method for the butadiene dimer and styrene in butadiene concentration	GsBP-1, 30m x 0.53mm x 5.0um	0153-3050
D 2427	GC	Standard test method for determination of C2 through C5 hydrocarbons in gasoline	GsBP-1, 30m x 0.53mm x 5.0um GsBP-PLOT Al2O3 M, 30m x 0.53mm	0153-3050 8353-3015
D 2504	GC	Standard test method for non-condensable gases in C2 and for lighter hydrocarbon products	GsBP-PLOT MoleSieve, 30m x 0.53mm x 50um	8453-3050
D 2505	GC	Standard test method for other hydrocarbons and carbon dioxide in high-purity ethylene	GsBP-PLOT GasPro, 60m x 0.32mm	8532-6005
D 2593	GC	Standard test method for butadiene purity and hydrocarbon impurities	GsBP-PLOT Al2O3 M, 30m x 0.53mm	8353-3015
D 2712	GC	Standard test method for hydrocarbon traces in concentrated propylene	GsBP-PLOT Al2O3 M, 50m x 0.53mm	8353-5015
D 2804	GC	Standard test method for the purity of methyl ethyl ketone	GsBP-InoWax, 30m x 0.53mm x 1.0um	2053-3010
Extended D 2887	GC	Standard test method for analysis of the boiling range distribution of petroleum fractions to C60	GsBP-1, 10m x 0.53mm x 0.88um GsBP-1, 5m x 0.53mm x 0.88um	0153-1008 0153-0508
D 2908	Aqueous-injection GC	Standard practice for measuring volatile organic matter in water	Contact GS-Tek for recommended VOC columns	
D 3054	GC	Standard test method for analysis of cyclohexane	GsBP-1, 60m x 0.32mm x 0.50um	0132-6005
D 3257	GC	Standard test method for the analysis of aromatics in mineral spirits	GsBP-624, 30m x 0.53mm x 3.0um	6253-3030
D 3329	GC	Standard test method for the purity of methyl isobutyl ketone	GsBP-InoWax, 30m x 0.53mm x 1.0um GsBP-624, 30m x 0.53mm x 3.0um	2053-3010 6253-3030
D 3432	GC	Standard test method for the analysis of unreacted toluene diisocyanates in urethane prepolymers and coating solutions	GsBP-1MS, 30m x 0.32mm x 1.00um	1132-3010
D 3447	GC	Standard test method for the purity of halogenated organic solvents	GsBP-624, 30m x 0.53mm x 3.0um	6253-3030
D 3534		Standard test method for the analysis of PCB's in water	GsBP-1MS, 30m x 0.32mm x 1.00um	1132-3010
D 3545	GC	Standard test method for the analysis of alcohol content and the purity of acetate esters	GsBP-624, 30m x 0.53mm x 3.0um	6253-3030
D 3687	The activated charcoal tube adsorption method	Standard practice for the analysis of collected organic vapors	GsBP-InoWax, 30m x 0.53mm x 1.0um	2053-3010
D 3695	Direct aqueous injection GC	Standard test method for the analysis of volatile alcohols in water	GsBP-InoWax, 30m x 0.53mm x 1.0um	2053-3010
D 3760	GC	Standard test method for the analysis of isopropylbenzene (Cumene)	GsBP-InoWax, 60m x 0.32mm x 0.25um (Column A) GsBP-1, 50m x 0.32mm x 0.52um (ColumnB)	2032-6002 0132-5005
D 3797	GC	Standard test method for the analysis of o-xylene	GsBP-InoWax, 60m x 0.32mm x 0.50um	2032-6005

ASTM Designation	Testing Method	Method Title	GS-Tek Column Recommendations	P/N
D 3798	GC	Standard test method for the analysis of p-xylene	GsBP-InoWax, 60m x 0.32mm x 0.50um	2032-6005
D 3871	Headspace sampling	Standard test method for the analysis of purgeable organic compounds in water	GsBP-624, 30m x 0.53mm x 3.0um	6253-3030
D 3893	GC	Standard test method for the purity of methyl amyl ketone and methyl isoamyl ketone	GsBP-624, 30m x 0.53mm x 3.0um	6253-3030
D 3973		Standard test method for the analysis of hydrocarbons with low molecular weights in water	GsBP-1, 30m x 0.53mm x 2.65um	0153-3026
D 4415		Standard test method for the determination of dimers in acrylic acid	GsBP-FFAP, 30m x 0.32mm x 0.25um	2132-3002
D 4424	GC	Standard test method for butylene analyses	GsBP-PLOT Al2O3 "S", 50m x 0.53mm	8253-5015
D 4443	Headspace GC	Standard test method for the residual vinyl chloride monomer content in PPB in vinyl chloride homo- and co-polymers	GsBP-1, 30m x 0.53mm x 2.65um	0153-3026
D 4864	GC	Standard test method for the determination of traces of methanol in propylene concentrates	GsBP-InoWax, 30m x 0.53mm x 1.0um GsBP-PLOT Q, 30m x 0.53mm x 30um	2053-3010 8653-3030
D 4947		Standard test method for the analysis of chlordane and heptachlor residues in indoor air	GsBP-5, 30m x 0.53mm x 1.5um	0553-3015
D 4961	GC	Standard test method for the analysis of major organic impurities in phenol produced by the cumene process	GsBP-PLOT Q, 15m x 0.53mm x 30um (Method B)	8653-1530
D 4983	Direct aqueous injection GC	Standard test method for the analysis of cyclohexylamine, morpholine, and diethylaminoethanol in water and condensed steam	GsBP-5MS, 30m x 0.32mm x 1.00um	1532-3010
D 5008	GC	Standard test method for ethyl methyl pentonal content and the purity value of 2-ethylhexanol	GsBP-1, 15m x 0.53mm x 5.0um GsBP-InoWax, 30m x 0.32mm x 0.25um	0153-1550 2032-3002
D 5060	GC	Standard test method for determining the impurities in high-purity ethylbenzene	GsBP-InoWax, 60m x 0.32mm x 0.5um	2032-6005
D 5075	GC	Standard test method for the analysis of nicotine in indoor air	GsBP-5, 30m x 0.53mm x 1.5um GsBP-5, 30m x 0.32mm x 1.0um	0553-3015 0532-3010
D 5135	Capillary GC	Standard test method for the analysis of sryreme	GsBP-InoWax, 60m x 0.32mm x 0.5um	2032-6005
D 5303	GC	Standard test method for the analysis of carbonyl sulfide in propylene	GsBP-PLOT GasPro, 30m x 0.32mm	8532-3005
D 5307	GC	Standard test method the determination of the boiling range distribution of crude petroleum	GsBP-1, 7.5m x 0.53mm x 5.0um	0153-0750
D 5310	Capillary GC	Standard test method for the analysis of tar acid composition	GsBP-5MS, 30m x 0.25mm x 0.25um	1525-3002
D 5316	Microextraction and GC	Standard test method for 1, 2-dibromoethane and 1,2-dibromo-3-chloropropane in water	GsBP-1MS, 30m x 0.32mm x 1.00um (Column B) GsBP-PLOT Q, 30m x 0.53mm x 30um	1132-3010 8653-3030
D 5317	GC with an electron capture detector	Standard test method for the determination of chlorinated organic acid compounds in water	GsBP-5MS, 30m x 0.25mm x 0.25um (Column 1) GsBP-1701, 30m x 0.25mm x 0.25um (Column 2) GsBP-35MS, 30m x 0.25mm x 0.25um	1525-3002 6125-3002 3525-3002
D 5320		Standard test method for the determination of 1,1-trichloroethane and methylene chloride in stabilized trichloroethylene and tetrachloroethylene	GsBP-1, 30m x 0.53mm x 3.0um GsBP-624, 30m x 0.32mm x 1.8um	0153-3030 6232-3018
D 5441	GC	Standard test method for the analysis of methyl tert-butyl ether (MTBE)	GsBP-PLOT Q, 30m x 0.53mm	8653-3030
D 5442	GC	Standard test method for the analysis of petroleum waxes	GsBP-5, 15m x 0.25mm x 0.25um	0525-1502

ASTM Designation	Testing Method	Method Title	GS-Tek Column Recommendations	P/N
D 5475	GC with a nitrogen phosphorus detector	Standard test method for the analysis of nitrogen and phosphorus-containing pesticides in water	GsBP-5MS, 30m x 0.25mm x 0.25um	1525-3002
			GsBP-35MS, 30m x 0.25mm x 0.25um	3525-3002
			GsBP-1701, 30m x 0.25mm x 0.25um	6125-3002
D 5501	GC	Standard test method for the determination of ethanol content in denatured fuel ethanol	GsBP-1, 100m x 0.25mm x 0.50um	0125-A005
D 5507	Capillary column/ multi-dimensional GC	Standard test method for the determination of trace organic impurities in monomer grade vinyl chloride	GsBP-PLOT Q, 15m x 0.53mm	8653-1530
			GsBP-PLOT U, 30m x 0.53mm	8753-3020
D 5508	Headspace-capillary GC	Standard test method for the determination of residual acrylonitrile monomers in styrene-acrylonitrile co-polymer resins and nitrile-butadiene rubbers	GsBP-PLOT Q, 30m x 0.53mm	8653-3030
D 5580	GC	Standard test method for the determination of benzene, toluene, ethylbenzene, p/m-xylene, C9, and heavier aromatics, and total aromatics in finished gasoline	GsBP-1, 30m x 0.53 mm x 5.0um	0153-3050
D 5599	GC and oxygen selective flame ionization detection	Standard test method for the determination of oxygenates in gasoline	GsBP-1, 60m x 0.25mm x 1.0um	0125-6010
D 5623	GC and sulfur selective detection	Standard test method for analysis of sulfur compounds in light petroleum liquids	GsBP-1, 30m x 0.32mm x 4.0um	0132-3040
D 5739	GC and positive ion electron impact low resolution mass spectrometry	Standard practice for oil spill source identification	GsBP-5, 30m x 0.25mm x 0.25um	0525-3002
D 5769	GC/MS	Standard test method for the determination of benzene, toluene, and total aromatics in finished gasoline	GsBP-1, 60m x 0.25mm x 1.0um	0125-6010
D 5790	Capillary column GC/ MS	Standard practice for the measurement of purgeable organic compounds in water		
D 5812	Capillary column GC	Standard test method the determination of organochlorine pesticides in water	GsBP-5MS, 30m x 0.25mm x 0.25um	1525-3002
			GsBP-35MS, 30m x 0.25mm x 0.25um	3525-3002
			GsBP-1701, 30m x 0.25mm x 0.25um	6125-3002
D 5917	GC and external calibration	Standard test method for the analysis of trace impurities in monocyclic aromatic hydrocarbons	GsBP-InoWax, 60m x 0.32mm x 0.25um	2032-6002
D 5986	GC/FTIR	Standard test method for the determination of oxygenates benzene, toluene, C8-C12 aromatics, and total aromatics in finished gasoline	GsBP-1, 60m x 0.53mm x 5.0um	0153-6050
D 6144	Capillary GC	Standard test method for the analysis of trace impurities in alpha-methylstyrene	GsBP-1, 60m x 0.25mm x 1.0um	0125-6010
D 6159	GC	Standard test method for the determination of hydrocarbon impurities in ethylene	GsBP-PLOT Al2O3/KCl, 50m x 0.53mm (Column 1)	8153-5015
			GsBP-PLOT Al2O3 M, 50m x 0.53mm (Column 1)	8353-5015
			GsBP-1, 30m x 0.53mm x 5.0um (Column 2)	0153-3050
D 6160	GC	Standard test method for the determination of PCB's in waste materials	GsBP-5MS, 30m x 0.32mm x 0.25um	1532-3002
D 2360	GC	Standard test method for the analysis of trace impurities in monocyclic aromatic hydrocarbons	GsBP-InoWax, 60m x 0.32mm x 0.25um	2032-6002
E 1616	GC	Standard test method for the analysis of acetic anhydride	GsBP-1, 50m x 0.32mm x 0.52um	0132-5005
E 1863	GC	Standard test method for the analysis of acrylonitrile	GsBP-InoWax, 30m x 0.32mm x 1.0um	2032-3010
			GsBP-PLOT Q, 30m x 0.32mm x 15.0um	8632-3015
E 202		Standard test method for the analysis of ethylene glycols and propylene glycols	GsBP-624, 30m x 0.53mm x 3.0um	6253-3030
E 475	GC	Standard test method for the assay of di-tert-butyl peroxide	GsBP-5, 30m x 0.53mm x 5.0um	0553-3050

## Environmental/EPA Methods

Analyte Type	Common Sample Preparation	Sample Matrix	Detector Type	EPA Method Reference	Gs-Tek Column Recommendations (P/N)
Semivolatiles					
Benzidines	Liquid extraction	Waste water	MSD	605, 8270	GsBP-5MS, 30m x 0.25mm x 0.25um (1525-3002) GsBP-5MS, 30m x 0.25mm x 0.5um (1525-3005) GsBP-5, 30m x 0.53mm x 1.5um (0553-3015)
Chlorinated Disinfection Byproducts	Liquid extraction derivatization	Drinking water	ECD	551, 551.1A	GsBP-5MS, 30m x 0.25mm x 1.0um (1525-3010) GsBP-1MS, 30m x 0.25mm x 1.0um (1125-3010)
Chlorinated Hydrocarbons	Liquid extraction sonication, solvent extraction, SPE	Waste water solid waste	ECD	612, 8120, 8121	GsBP-5MS, 30m x 0.32mm x 0.5um (1532-3005) GsBP-1MS, 30m x 0.32mm x 0.5um (1132-3005)
Halogenated Acetic Acids	Liquid extraction derivatization	Drinking water	ECD	552, 552.1, 552.2	GsBP-35MS, 30m x 0.32mm x 0.25um (3532-3002)
Nitroaromatics and Isophorone	Liquid extraction sonication, solvent extraction, SPE	Waste water, solid waste	ECD, FID	609, 8090	GsBP-5MS, 30m x 0.25mm x 0.25um (1525-3002) GsBP-5, 30m x 0.53mm x 1.5um (0553-3015)
Nitrosamines	Liquid extraction sonication, solvent extraction, SPE	Waste water, solid waste	NPD	607, 8070	GsBP-5MS, 30m x 0.25mm x 0.25um (1525-3002) GsBP-5, 30m x 0.53mm x 1.5um (0553-3015)
Phenols	Liquid extraction sonication, solvent extraction, derivatization	Waste water, solid waste	ECD, FID	528, 604, 8040, 8041	GsBP-5MS, 30m x 0.25mm x 0.25um (1525-3002) GsBP-5, 30m x 0.53mm x 1.5um (0553-3015)
Phthalate Esters	Liquid extraction sonication, solvent extraction, SPE	Drinking water, waste water, solid waste	ECD, FID	506, 606, 8060, 8061	GsBP-5MS, 30m x 0.25mm x 0.25um (1525-3002) GsBP-5, 30m x 0.53mm x 1.5um (0553-3015)
Polynuclear Aromatic Hydrocarbons (PAHs)	Liquid extraction sonication, solvent extraction, SPE	Waste water solid waste	FID	610, 8100	GsBP-5MS, 30m x 0.25mm x 0.25um (1525-3002) GsBP-5MS, 30m x 0.32mm x 0.25um (1532-3002) GsBP-1MS, 30m x 0.25mm x 0.25um (1125-3002)
Volatiles	Purge/Trap, SPE	Water, Air/ Solid wastes, Solid	MSD	EPA 8260	GsBP-VMS, 60m x 0.25mm x 1.4um (6425-6014) GsBP-1MS, 30m x 0.25mm x 1.0um (1125-3010)
Semivolatile Organic Compounds	Liquid extraction sonication, solvent extraction, SPE	Drinking water, waste water, solid waste	MSD	525, 625, 8270	GsBP-5MS, 30m x 0.25mm x 0.5um (1525-3005)
Volatiles					
Acrylonitrile and Acrolein	Purge and trap, liquid extraction, sonication	Waste water, solid waste	FID, NPD	603, 8015, 8031	GsBP-624, 30m x 0.53mm x 3um (6253-3030)
EDB and DBCP	Microextraction with Hexane	Drinking water, solid waste	ECD	504.1, 8011	GsBP-VMS, 60m x 0.25mm x 1.4um, (6425-6014) GsBP-624, 30m x 0.53mm x 3um (6253-3030)
Purgeable Aromatic Organics	Purge and headspace for screening	Drinking water, tap water, waste water, solid waste	PID	503 .1, 602, 8020	GsBP-624, 30m x 0.53mm x 3um (6253-3030) GsBP-624, 30m x 0.25mm x 1.4um( 6225-3014)
Purgeable Halogenated Organics	Purge and trap headspace for screening	waste water, solid waste	PID, ELCD	601, 8010	GsBP-VMS, 60m x 0.25mm x 1.4um (6425-6014) GsBP-624, 75m x 0.53mm x 3um (6253-7530)
Trihalomethanes	Purge and trap, direct injection, headspace	Drinking water	ELCD, ECD	501	GsBP-624, 30m x 0.53mm x 3um (6253-3030) GsBP-VMS, 60m x 0.25mm x 1.4um (6425-6014)
Volatile Organic Compounds (VOCs)	Purge and trap, direct injection, headspace	Drinking water, waste water, solid waste	PID, ELCD	502.2, 8021, CLP-Volatiles	GsBP-502.2 105m x 0.53mm x 3.0um (6353-A530) GsBP-624, 75m x 0.53mm x 3um (6253-7530)

Analyte Type	Common Sample Preparation	Sample Matrix	Detector Type	EPA Method Reference	GS-Tek Column Recommendations (P/N)
Volatile Organic Compounds (VOCs) using 5973 MSD	Purge and trap, direct injection, headspace	Drinking water, waste water, solid waste	MSD (5973)	524.2, 624, 82, 408, 260, CLP-VOCs	GsBP-VMS, 20m x 0.18mm x 1.0um (6418-2010) GsBP-624, 25m x 0.20mm x 1.12um (6220-2510)
Volatile Organic Compounds (VOCs) using MSD	Purge and trap, direct injection, headspace	Drinking water, waste water, solid waste	MSD	524.2, 624, 82, 408, 260, CLP-VOCs	GsBP-VMS, 60m x 0.25mm x 1.4um (6425-6014) GsBP-624, 60m x 0.32mm x 1.8um (6232-6018)
Pesticides, Herbicides and PCBs					
N- and P- Containing Pesticides and Herbicides	Liquid extraction sonication, solvent extraction, SPE	Drinking water, waste water, solid waste	NPD, ELCD, FPD	507, 614, 619, 622, 8140, 8141A	GsBP-35MS, 30m x 0.25mm x 0.25um (3525-3002) GsBP-5MS, 30m x 0.25mm x 0.25um (1525-3002)
Organochlorine Pesticides and PCBs	Liquid extraction sonication, solvent extraction, SPE	Drinking water, waste water, solid waste	ECD	508.0, 608 8081A, 8082, CLP-Pesticides	GsBP-35MS, 30m x 0.32mm x 0.25um (3532-3002)
Phenoxy Acid Herbicides	Liquid extraction sonication, solvent extraction, SPE	Drinking water, waste water, solid waste	ECD	515, 615, 8150, 8151	GsBP-35MS, 30m x 0.32mm x 0.25um (3532-3002)

# Column Care

GC column is the central piece for a successful analytical separation using GC instrumentation. A prolonged life and application success of column are often achieved by proper column care and use. Column care includes how to install it, maintenance including storage and regeneration of performance, in some cases.

## Column Installation

### Pre-Installation

A key element in care is understanding GC instrument basics and its usage history. Since most GC analysis problems are not caused by the column itself, knowledge of the instrument or instrumentation is emphasized. Some listed items that one should know are:

- GC condition: brand new or well used
- GC location change
- GC idling time
- Recent maintenance of GC system including gas line
- Abnormal GC column degradation
- Previous GC column performance record/logbook
- Carrier gas quality

This hints to instrument system performance for future use. Particularly, if previous GC columns exhibited shortened life due to high bleed, ghost peak, peaking tailing, no signal or high baseline signal, it more likely points to problems such as gas leakage, dirty inlet, gas flow or blockage of the detector jet.

If the GC exhibits some of the above symptoms, fix the problem following GC manufacturer's recommendations. Some of common recommendations are:

- Use high purity gases including carrier gas and makeup gas
- Change seals, septum and liner
- Change column ferrules
- Clear jet(s)
- Condition GC inlet and detector at high temperature for hours

### Installation

After checking out these practices, the GC instrument is ready for the installation of the GC column. It is vital to understand and know the history of the GC instrumentation since it is usually the cause of poor performance. Once the GC instrumentation parameters are reviewed, proper installation of the GC column is the next step. The recommended step-by-step GC column installation is as follows:

1. Carefully uncoil the column one half coil on both ends
2. Loosely hang the column inside the oven
3. Cut the column on each end 3-5cm with a column cutter as evenly and neatly as possible. Do not hand break column end tip without a cutter
4. Thoroughly examine the cut. Re-cut if the cut across appears uneven.
5. Use ferrules and column nuts that are in good condition
6. Install the column nuts and ferrules to both the column ends
7. Attach column end to the inlet or detector. Follow the instrument manufacturer's specification on column end tip length required, typically 2-3cm for split/split inlet or 1-2mm gap length for the FID jet. Ensure the column end does not touch the metal wall multiple times, as repetitive touching may damage the column tips which impacts sample introduction.
8. Finger-tighten the column nut with another hand holding the column end position for proper insertion, then use the proper size wrench to completely tighten the nuts. Do not over tighten as it may smash the column. Make sure the column tip insert length is within the range of the GC manufacturer's recommendation or specification.
9. Stepwise setup the column pressure to establish column flow
10. Repeat connection to the detector
11. Securely hang the column inside GC oven. Do not over uncoil GC column at each end as it may become broken after thermal cycling
12. Adjust the column flow to the manufacturer's specification. A general flow setting recommendation is as follows:

Column ID (mm)	Column flow range (ml/min)
0.53	5—8
0.32	1.0—2.5
0.25	0.8—1.5
0.2	0.4—1.0

13. Check for any leak signs, avoid bubble testing
  14. Set the proper inlet and detector temperatures
  15. Set the oven temperature around 50-100°C
  16. Turn on the detector
  17. Check for a stabilized signal level. If the signal is too low or too high, it may indicate a leaky column connection. Re-install the column and re-slice as needed.
- Note: Be careful of hot surfaces.

18. Condition columns at its upper temperature limit - (10-20°C) for minimum 30 min. Overnight conditioning is preferred.
19. Check for detector signal. If it is too high, there may be a leaking problem, dirty inlet/detector, or bad column. Find the source of leak, re-install the column, clean the inlet/detector or change another column.
20. Adjust column flow to analysis conditions

Proper column installation will produce consistent and successful analysis results. Taking careful steps in installing will enable the user to become familiar, as well as become effective in troubleshooting steps. However, column storage is also important and must not be overlooked to ensure storage conditions are not a factor in poor testing performance.

## Column Storage

### Idling inside GC oven

Maintain proper oven temperature, typically 100-150°C under column gas flow.

### Outside GC oven

Seal both ends of the column with septa, store the column in the original box. Avoid moisture, particulate/dust or chemical vapor invasion. Minimize any long term vibration from storage environment.

## Column Regeneration

### Recommended GC Column Conditioning

Condition or bake column at isothermal temperature close to the column upper temperature limit with 2x column working flow for 2 to 24 hours. This regeneration can be effective for sample contamination. Do not exceed the temperature limit because it may cause accelerated degradation of the column if oxygen is present in the carrier gas stream. The surfaces may become too active for many polar compounds.

### Multiple Solvent Injections

Injecting solvent multiple times at 50-100°C oven temperature may regenerate column performance. Avoid setting oven temperature below the solvent boiling point as solvent condensation will wash out the stationary phase. The column surface may become less inert after multiple injections.

### Trim Column Ends

Trim both ends of column by 0.1-1m is an easy and effective way to regenerate column performance. Trim longer lengths at the detector end than at inlet end. Adjust instrument conditions accordingly to maintain retention time locking. Condition the column for 30-120 mins after trimming. Be careful not to trim an excessive amount.

### Solvent Rinse

Offline solvent rinse is an old fashion to regenerate column performance. As column becomes commodity product, we do not recommend this technique. Instead, we recommend solvent injection as an alternative.

In extreme cases, use high grade solvents compatible to stationary phase, such as non-aqueous solvent for wax column or hexane/toluene solvents for polysiloxane column. Columns should only be rinsed with 2 to 3 the column volume solvent at low pressure. Avoid rapid pressure changes to minimize potential column breakage. Gas purge dry column for 30-60 min after rinse and follow up with proper column conditioning.

## Recommended MS Grade Column Conditioning

MS grade columns are specially made by manufacturer to minimize column bleed at its maximum isothermal temperature. Because of the time consuming MSD operation, column manufacturers usually do not test MS column by GC-MSD. Column bleeds are often measured by GC-FID. As MSD is operated at ultra-high vacuum pressures, new MS columns are more likely to exhibit high column bleed initially after installation. This requires that newly installed MS column be carefully conditioned prior to use.

1. Before installing new MS columns, check for the latest working condition of MSD, such as auto tune, background, noise, vacuum, ion source cleanliness, helium line trap, etc. For more details, refer to the MSD manufacturer's instruction.
2. Properly pump-down the MSD, power off the instrument as needed before column installation. If the instrument is equipped with a non-vent connector, maintain adequate helium flow at all times. Maintain MSD cleanliness as much as possible.
3. Install the MS column with ferrules and fittings that are in good condition. Cut column MSD end about 3 to 5cm to have a clean 10 to 15 cm section of the column. Insert the column to the GC-MSD transfer line to the manufacturer specified length.
4. Setup proper column gas flow
5. Set the oven temperature to 50-60°C
6. Power on the instrument and pump up the MSD



7. Wait for complete MSD pump up. Check for any signs of leak by following the manufacturer's guideline.
8. Setup the proper MSD parameters in accordance with the manufacturer's specification.  
Steps 9 to 12 can be substituted with MSD manufacturer's procedure.
9. Once MSD vacuum is established, increase the oven temperature to 100°C. Maintain this temperature for minimum 30min.
10. Manual Baking-out: (for 5MS column only) Program the GC oven temperature for column baking: 60°C (30min) 10°C/min to 280°C (10min) 10°C/min to 300°C (15min), 10°C/min to 325°C (30min). If it is an offline MSD, cut off one coil of the column at detector end and connect this end of the column to the MSD.
11. Manual Baking-out: (for other MS columns) Program the GC oven temperature: 60°C (30min) 10°C/min to the column upper temperature limit-20°C (30min), 10°C/min to the column upper temperature limit (30min).
12. Do not run the background check, noise check, autotune or other MSD methods during this manual baking-out period.
13. After completion of the manual baking out, run autotune to see check spectra readings: 18 (water), 28(nitrogen), 32 (oxygen), 79, 207 and 281 are high. If the air peak is high, check for gas leak signs.
14. If the spectrum 207 is less than 5% of the tune spectra (such as PFTBA), e.g. 219, run a background check. Otherwise, repeat column baking-out as described in step 10.
15. If a longer backing time is not possible or if column exhibits high bleed, repeat solvent injection. Solvents such as hexane, toluene, and dichloromethane can be used. Injection amount ranges from 2 to 5ul. Injection times should be 3-6mins. Time intervals between two solvent injections should be 5—10min. Oven temperature should be set around the column upper temperature limit.
16. If the high column bleed still persists, manually decrease the temperature of the transfer line from 320/280°C to 250°C to see if the column bleed decreases accordingly. If the column bleed decreases, use the 250°C transfer line temperature temporarily.
17. After solvent injection and the column bleed is still persistently high, the column may be defective or damaged by oxidation.
18. Occasionally check for gas line leaks from the gas supply to the injector, including septum leaks. Use new ferrules or ferrules in fairly good condition. Do not over tighten. Follow the instrument manufacturer's troubleshooting /maintenance guidance.

*MS columns do not require a long conditioning period prior to use. If high column bleed is persistent, it is recommended to change to a new MS column. Extensive periods of MS column conditioning time will result in contamination of the MSD and may damage column from leak in gas path or oxygen in carrier gas stream.*

### Practical Tips:

- Check carrier gas, supply pressure, trap, and gas valve
- Always run the carrier gas through the MS column
- Check leaks at septum or inlet. Use new septum if possible.
- Check for proper ferrule use for MSD
- Check for column breakage
- Do not over-tighten column nuts to MSD transfer line
- Make sure MSD is functioning properly
- Keep MSD ion source as clean as possible
- Run oven temperature at application maximum temperature, not the column maximum temperature to minimize column "bleed"

## PLOT Column Installation and Conditioning Recommendations

1. Carefully loosen a comfortable working length of column from cage at each end. Avoid excessive vibration at column tips.
2. Cut 1 to 5cm from each column end
3. Install column to the GC inlet per GC manufacturer's suggestion
4. Do not connect the PLOT column to GC detector
5. Setup proper column flow, check for any breakage during column flow buildup. Use bubbling technique for a quick flow check.
  - a. Recommended column flow of 6 - 10ml/min for 0.53mm ID column and 2-4ml/min for 0.32mm ID column. Measure flow with a flowmeter as needed
6. Recommended column flow of 6 - 10ml/min for 0.53mm ID column and 2-4ml/min for 0.32mm ID column. Measure flow with a flowmeter as needed
7. Leave the column detector end either inside oven or outside oven
8. Program a brief condition temperature profile. Lower temperatures for 2-5 mins, 150°C for 10min, higher temperatures for 10-30 mins.
9. Decrease oven temperature, recheck column flow as necessary, install the column to the GC detector while avoiding excessive vibration.
10. Light the detector and check for unusually high signal noise. If noise appears too high, cutoff 1 - 5cm of the column tip and reconnect the column detector side connection.
11. Repeat the brief column condition temperature profile to establish a stable baseline with less noise
12. Condition column as needed to activate PLOT column and decrease signal level

## Troubleshooting

GC is a complicated system and basic knowledge of troubleshooting technique in the following areas is deemed useful: method, sample, instrument, column and software. These components are closely correlated and affect each others performance. When a problem is arises, there is often is no single root-cause. Hurrying to solve problems may be a temporary fix due to time constraints such as changing a column, but often leads to overlooking the real root-cause and the problem may manifest itself again. However, a planned and systematic approach to troubleshooting tends to yield a faster and more accurate way to solve an issue.

## Causes of Column Degradation

There are various root causes for column performance degradation. Most root causes are related to oxygen present in the carrier gas stream (oxidation), thermal damage, and sample contamination. Check for obvious instrumentation issues as dictated above before attempting more time-consuming troubleshooting actions. The following table gives lays out general troubleshooting process and some remedies. It is important to follow proper column installation step and to maintain

decent maintenance of instrument to prevent column performance degradation.

**Table 1 – Troubleshooting General Guide for Column Degradation**

Degradation Symptoms	Root cause	From	Recommended Corrective Actions
-High column bleed -Column selectivity change/ shift -Retention time shift -Chopping baseline profile -Peak tailing -Blockage of detector jet and abnormal signal level	-Oxygen in carrier gas flow path -Bad column	- Low grade carrier gas used - Leak in gas line connection - Instrument leak: inlet, pressure regulator, valve - Home gas plumb connection with dead/void volume in the flow path	-Change carrier gas grade -Use traps -Properly plumbing -Fix instrument leaks -Purge column for a long period of time at low temperatures -Avoid high temperature chromatography -Change column
-Peak tailing -Unstable or noisy detector signal - Retention time shift	-Moisture present in gas stream line -Sample contamination -Thermal damage at temperature over column upper limit	-System off for long time -Low grade carrier gas -Large dirty sample introduction	-Use trap in carrier gas line -Bake instrument -Do not turn off instrument unless necessary -Good sample preparation -Trim contaminated column ends by 0.1-0.5m
-Accelerated column bleed -Significant column selectivity change -Severely peak tailing -Peak broadening	-Thermal damage	-Oven temperature exceeding the column upper temperature limit -Too high inlet/detector temperatures -Combination of oxidation, duration time and column temperature	-Almost irreversible degradation -Trim column each end by 0.5-1m -Reduce used temperatures -Switch high grade carrier gas
-Column breakage	-Human error -Instrumentation error -Bad column	-Bad column -Gas pressure pulse -Fast temperature ramping up/down - Over tightening column nut	-Slowly setup carrier gas pressure with EPC -Reduce temperature ramping -Butt-connect the broken column -Re-install column

Troubleshooting problems is a vast subject and covering every possible problem and its solution is challenging. However, we offer some basic troubleshooting techniques based on our column expertise.

1. Define and clearly state the problem
2. Check for obvious mistakes and avoid overlooking simple steps

Document logs of events will provide internal guidance and will help maintain a good working condition for your GC system and prolonged column lifetime. The following list covers simple and easy related causes:

- Instrument conditions: any power outage, temperature setting of injector, detector, oven and aux, EPC/EFC setting, valve on/off, cable connection, oven heater/sensor, etc.
- Instrument maintaining and repair log. Is it a time to maintain instrument?
- Software: Does software function properly and correctly?
- Sample: sample shelf time, sample drain from solvent evaporation thru the punched cap, inlet septum leak
- Gases: Supply gas drain or insufficient pressure, valve on/off, gas line leak, log grade gas used, gas cylinder changeover, wrong gas connection, etc

**3. Troubleshooting based on Performance**

- Baseline
  - a. Wandering: inlet leaking, loose connections at inlet or detector side, carrier gas contamination, detector contamination, column contamination, inlet/detector heating zone temperature varying
  - b. Drafting: downward: column not thoroughly conditioned, instrument not stabilized; upward: column bleed from oxidation, instrument contamination
  - c. Spiking: dirty detector: dust inside inlet/detector/column, electrical noise
  - d. Noise: dust in detector, detector gas and gas flow, column contamination or oxidation, PCB issue
  - e. Offset: chip in inlet, column installation at detector side, unstable carrier gas flow (clogging or inconsistent leaking)
- Peak
  - a. No peak at all: column broken, column not properly installed, non carrier gas, detector off, syringe needle clogged, no sample introduction, valve off/on, wrong signal channel
  - b. Missing peak: column improper installation at inlet/detector, column contamination, inlet contamination, column selectivity change over time, column oxidized, solvent effect, aged sample, improper syringe/liner used
  - c. Peak shape broadening: too much sample loading, very low split flow, split valve off, sample becomes concentrated over time, column is oxidized, low oven temperature, part of column outside oven, heating zone is not properly setup
  - d. Peak(s) is too small: inlet septum leak, syringe needle clogging, improper column installation including loose connection, split flow change, liner contamination (for active compounds), column contamination, column inertness, vial/syringe quality issue, gold seal contamination, lower oven temperature
  - e. Peak tailing: column inertness or column contamination, improper column installation (mostly at inlet), dirty inlet/detector, active butt-connector

for column-column connection, effect of solvent-stationary phase match, increased column activity from high temperature run, unknown active compounds, sample overloading, column performance decreased, column oxidized

- f. Peak fronting: too much sample loading, sample is too concentrated, column performance decreased, split flow decreased from error or clogging
- g. Split peak: poor sample injection technique, dual sample injections, cool inlet, improper column installation, column not neat cut, dirty liner, column selectivity change over time, oven temperature changed

- Elution and retention time

- a. Elution order change: column selectivity change over time, solvent effect, mismatch of column (stationary phase and solutes), oven temperature change, carrier gas flow change, ghost peak from contaminations or carry over contamination, wrong peak identifications
- b. Retention time shifting: leak in inlet, carrier gas flow shifting/change, oven temperature shifting, column contamination, solvent effect, column performance decreased ( phase stripping by solvent, phase oxidizing)

- Separation

- a. Resolution decreased: improper column installation, column selectivity change overtime, column contamination, oven temperature change, too much sample introduction, carrier gas flow change, column performance decreased

#### 4. Practical Tips

- a. Good column installation techniques and periodic checks for proper installation should be practiced
- b. Identify problem, state and analyze problem logically and systematically
- c. Check and fix obvious errors or mistakes
- d. Look for available expertise to fix problem efficiently and effectively
- e. Perform corrective and preventative maintenance on instrumentation
- f. Develop your troubleshooting skills from educational sources and from knowledgeable peers
- g. Quick fixes: re-install column, cut column both ends off, baking column at high temperatures, solvent injection and changing to a different solvent

#### 5. Column Performance Degradation

Columns from a manufacturer should have good performance initially. Under careful control and minimal error conditions, column should perform well for a long time. But in reality, many columns lose their performance earlier than their typical lifetime. Column performance loss is usually caused by:

- Oxidation from leaking, impurity in carrier gas
- Improper instrumentation conditions
  - \* temperature is higher than column upper temperature limit
  - \* too fast temperature program run for fast analysis
  - \* installation
  - \* improper precondition and post run
  - \* too much sample loading
- Column contamination
  - \* sample containing high boiling point compounds
  - \* reaction of active compounds to stationary phase
  - \* carry-over contamination from instrument and sample
  - \* accumulating moisture effect
- Incompatible /mismatched solvent to column stationary phase

Symptoms of column performance degradation:

- Loss or decrease retention
- Loss of sample loading capacity
- Peak tailing
- Peak size reduced
- Peak broadening
- Peak missing
- Resolution decreased

Take care of the column, because it is critical tool that determines the analysis success.

# General Chromatography Supplies

GS-Tek offers a variety of ferrules for many GC brands. Ferrule materials include graphite, vespel and PTFE. Graphite ferrules are commonly used in GC instrumentation. Vespel/graphite ferrules are typically used for GC-MSD. PTFE ferrules are typically used for gas connections at ambient temperatures.

## Ferrules

Short Ferrule for Agilent Inlet Systems	
P/N	Description
C022001	0.4mm ID Graphite Ferrule (10/pk)
C022002	0.5mm ID Graphite Ferrule (10/pk)
C022003	0.8mm ID Graphite Ferrule (10/pk)
C022004	1.0mm ID Graphite Ferrule (10/pk)



For 1/16" Standard Swagelok® /Parker® Type Fittings	
P/N	Description
C022102	1/16"to 0.4mm ID Graphite Ferrule (10/pk)
C022103	1/16"to 0.5mm ID Graphite Ferrule (10/pk)
C022104	1/16"to 0.8mm ID Graphite Ferrule (10/pk)
C022105	1/16"to 1.0mm ID Graphite Ferrule (10/pk)
C022106	1/16"to 1.2mm ID Graphite Ferrule (10/pk)

Quick Conversion Table	
Inches	mm
1/16	1.6
1/8	3.2
1/4	6.2

For Standard Swagelok® /Parker® Type Fittings	
P/N	Description
C022101	1/16" ID Graphite Ferrule (10/pk)
C022109	1/8" ID Graphite Ferrule (10/pk)
C022116	1/4" ID Graphite Ferrule (10/pk)

Reducing Ferrule For Standard Swagelok® /Parker® Type Fittings	
P/N	Description
C022111	1/8" to 0.5 mm ID Graphite Ferrule (10/pk)
C022112	1/8" to 0.8 mm ID Graphite Ferrule (10/pk)
C022113	1/8" to 1/16" Graphite Ferrule (10/pk)
C022118	1/4" to 0.4 mm ID Graphite Ferrule (10/pk)
C022119	1/4" to 0.5 mm ID Graphite Ferrule (10/pk)
C022120	1/4" to 0.8 mm ID Graphite Ferrule (10/pk)
C022117	1/4" to 1.0 mm ID Graphite Ferrule (10/pk)
C022121	1/4" to 1/16" ID Graphite Ferrule (10/pk)
C022122	1/4" to 1/8" ID Graphite Ferrule (10/pk)

## 60% Vespel/40%Graphite Ferrule (V/G) Temperature Limit 400°C

Short Ferrule for Agilent Inlet Systems	
P/N	Description
C022006	0.5mm ID V/G Ferrule (10/pk)
C022007	0.8mm ID V/G Ferrule (10/pk)



Capillary Column Ferrule for Standard 1/16" Swagelok® /Parker® Type Fittings	
P/N	Description
C022147	1/16" to 0.5mm V/G Ferrule (10/pk)
C022148	1/16" to 0.8mm V/G Ferrule (10/pk)
C022149	1/16" to 1.0mm V/G Ferrule (10/pk)

For Standard Swagelok® /Parker® Type Fittings	
P/N	Description
C022153	1/8" ID V/G Ferrule (10/pk)
C022160	1/4" ID V/G Ferrule (10/pk)

Reducing Ferrule for Standard Swagelok® /Parker® Type Fittings

P/N	Description
C022155	1/8" to 0.5mm ID V/G Ferrule (10/pk)
C022156	1/8" to 0.8mm ID V/G Ferrule (10/pk)
C022157	1/8" to 1/16" ID V/G Ferrule (10/pk)
C022161	1/4" to 0.4mm ID V/G Ferrule (10/pk)
C022162	1/4" to 0.5mm ID V/G Ferrule (10/pk)
C022164	1/4" to 0.8mm ID V/G Ferrule (10/pk)
C022166	1/4" to 1/16" V/G Ferrule (10/pk)
C022167	1/4" to 1/8" V/G Ferrule (10/pk)

VespeL Ferrule Temperature Limit 350°C

Short Ferrule for Agilent Inlet Systems

P/N	Description
C022013	1/16" to 0.5mm ID -Agilent style (10/pk)
C022014	1/16" to 0.8mm ID -Agilent style (10/pk)

Capillary Column Ferrule for Standard 1/16" Swagelok® /Parker® Fittings

P/N	Description
C022127	1/16" to 0.4mm ID VespeL Ferrule (10/pk)
C022128	1/16" to 0.5mm ID VespeL Ferrule (10/pk)
C022129	1/16" to 0.8mm ID VespeL Ferrule (10/pk)
C022130	1/16" to 1.0mm ID VespeL Ferrule (10/pk)
C022131	1/16" to 1.2mm ID VespeL Ferrule (10/pk)

Straight Ferrule for tubing with ODs for Standard Swagelok® /Parker® Type Fittings

P/N	Description
C022133	1/8" VespeL Ferrule (10/pk)
C022141	1/4" VespeL Ferrule (10/pk)

Reducing Ferrule for Standard Swagelok® /Parker® Type Fittings

P/N	Description
C022136	1/8" to 0.5mm ID VespeL Ferrule (10/pk)
C022137	1/8" to 0.8mm ID VespeL Ferrule (10/pk)
C022138	1/8" to 1/16" ID VespeL Ferrule (10/pk)
C022143	1/4" to 1/16" ID VespeL Ferrule (10/pk)
C022144	1/4" To 1/8" ID VespeL Ferrule (10/pk)

Capillary Column Ferrule for Standard 1/16" Swagelok® /Parker® Type Fittings

P/N	Description
C022171	1/16" to 0.4mm ID PTFE Ferrule (10/pk)
C022172	1/16" to 0.5mm ID PTFE Ferrule (10/pk)
C022173	1/16" to 0.8mm ID PTFE Ferrule (10/pk)
C022174	1/16" to 1.0mm ID PTFE Ferrule (10/pk)
C022175	1/16" to 1.2mm ID PTFE Ferrule (10/pk)

Straight Ferrules for Tubing ODs for Standard Swagelok® /Parker® Type Fittings

P/N	Description
C022176	1/8" ID PTFE Ferrule (10/pk)
C022182	1/4" ID PTFE Ferrule (10/pk)

Reducing Ferrule for Standard Swagelok® /Parker® Type Fittings

P/N	Description
C022178	1/8" to 0.5mm ID PTFE Ferrule (10/pk)
C022179	1/8" to 0.8mm ID PTFE Ferrule (10/pk)



General Recommendations for Ferrule ID

Column ID	Ferrule ID	Column OD
0.1 mm	0.4 mm	0.25 mm
0.2 mm	0.4 mm	0.36 mm
0.25 mm	0.4 mm	0.36 mm
0.32 mm	0.5 mm	0.44 mm
0.45 mm	0.8 mm	0.67 mm
0.53 mm	0.8 mm	0.68 mm

Reducing Ferrule for Standard Swagelok®/Parker® Type Fittings	
C022180	1/8" to 1/16" ID PTFE Ferrule (10/pk)
C022185	1/4" to 1/16" ID PTFE Ferrule (10/pk)
C022186	1/4" To 1/8" ID PTFE Ferrule (10/pk)

## Septa

Silicone-based septa are typically used for both GC inlet seals and sample introduction. They have a centered hole for guiding the syringe needle. Quality and performance of septa have a direct effect on application results (reliability and accuracy), column lifetime and instrument condition. A good practice is to check and change septa as often as needed. Packaged in a glass jar.

- Septa are made of two different processed silicone material: Advance Green (AG) and Bleed and Temperature Optimized (BTO). BTO temperature limit is 400°C, and AG temperature limit is 350°C. Both are preconditioned and ready to use.
- Septa are offered in different sizes depending on the GC instrument configurations. Check the GC instrumentation specifications for details.



P/N	Description
<b>5mm Diameter for on-column injection</b>	
C0239587	Septa Marathon 5mm CenterGuide (25/pk)
C0239597	Septa Marathon 5mm CenterGuide (50/pk)
C0246525	Septa AG3 5mm CenterGuide (50/pk)
C0298787	Septa BTO 5mm CenterGuide (50/pk)
<b>9mm Diameter</b>	
C0239778	Septa Marathon 9mm CenterGuide (25/pk)
C0239779	Septa Marathon 9mm CenterGuide (50/pk)
C0246713	Septa AG3 9mm CenterGuide (50/pk)
C0298713	Septa BTO 9mm CenterGuide (50/pk)
<b>9.5mm (3/8") Diameter</b>	
C0239188	Septa Marathon 3/8" (9.5mm) (25/pk)
C0239198	Septa Marathon 3/8" (9.5mm) (50/pk)
C0246124	Septa AG3 3/8" (9.5mm) (50/pk)
C0298705	Septa BTO 3/8" (9.5mm) (50/pk)
<b>11mm (7/16") Diameter (Popular for Agilent/HP GCs)</b>	
C0239287	Septa Marathon 11mm (7/16") CenterGuide (25/pk)
C0239297	Septa Marathon 11mm (7/16") CenterGuide (50/pk)
C0246225	Septa AG3 11mm (7/16") Centerguide (50/pk)
C0298717	Septa BTO 11mm (7/16") Centerguide (50/pk)
<b>11.5mm Diameter</b>	
C0239787	Septa Marathon 11.5mm CenterGuide (25/pk)
C0239798	Septa Marathon 11.5mm CenterGuide (50/pk)
C0246725	Septa AG3 11.5mm CenterGuide (50/pk)
C0298777	Septa BTO 11.5mm CenterGuide (50/pk)
<b>12.7mm (1/2") Diameter</b>	
C0220120	Microsep F-138 Septa 1/2", 12.7mm (50/pk)
C0230125	Microsep F-174 Septa 1/2" (12.7mm) (50/pk)
C0230660	Septa Puresep P 1/2" (12.7mm) (50/pk)
<b>Description</b>	
C0230695	Septa Puresep T 1/2" (12.7mm) (50/pk)
C0230698	Septa Puresep T 13 mm (50/pk)
C0234125	Economy Blue Septa 1/2" 12.7 mm (100/pk)
C0236125	Ultrasep R Septa 1/2", (12.7mm) (50/pk)
<b>17mm Diameter</b>	
C0239688	Septa Marathon 17mm (25/pk)
C0239698	Septa Marathon 17mm (50/pk)
C0246624	Septa AG3 17mm (50/pk)
C0298817	Septa BTO 17mm CenterGuide (50/pk)
<b>Septa for Shimadzu GC</b>	
C0239488	Septa Marathon for Shimadzu (25/pk)
C0239498	Septa Marathon for Shimadzu (50/pk)

P/N	Description
C0246424	Septa AG3 for Shimadzu (50/pk)
C0298735	Septa BTO Shimadzu (50/pk)
<b>Septa for cylinder gas sample seal</b>	
C0236524	Cylindrical Septa Half-Hole (25/pk)
C0236526	Cylinder Septa Half-Hole (100/pk)
C0296027	Microsep F-145 Cylindrical Septa Half-Hole (50/pk)

## Liners

Liners provide chambers sample evaporizing and sample introduction into the column. Liners are the center pieces of the inlet system and have direct impact on application reliability and accuracy. It is recommended to change liner as often as needed.

Liners come in different lengths, diameters(OD/IDs), shapes, and surface deactivation for different instruments, sampling and applications. Choose your liner carefully to fitting both your instrument and application. In most cases, liners with silanized glass wool insert should be used as much as possible to improve application result.

Sample Injection Volume (ul)	Recommended Liner ID (mm)
More (>) than 1 ul	4 mm (vol~800ul)
Less (<) than 1 ul	2 mm (vol~200ul)



Agilent Instruments Capillary GCs	
P/N	Description
C0208112-10	Liner, 4 mm ID Glass for Agilent GC (10/pk)
C0208112-5	Liner, 4 mm ID Glass for Agilent GC (5/pk)
C0208113	Liner, 4mm with Silanized Wool for Agilent GC (ea)
C0208113-10	Liner, 4mm with Silanized Wool for Agilent GC (10/pk)
C0208113-5	Liner, 4mm with Silanized Wool for Agilent GC (5/pk)
P/N	Description
C0208114	Liner, 4mm with Cup for Agilent GC (ea)
C0208114-10	Liner, 4mm with Cup for Agilent GC (10/pk)
C0208114-5	Liner, 4mm with Cup for Agilent GC (5/pk)
C0208116	Liner, 4 mm Double Taper for Agilent GC (ea)
C0208116-10	Liner, 4 mm Double Taper for Agilent GC (10/pk)
C0208116-5	Liner, 4 mm Double Taper for Agilent GC (5/pk)
C0208119	Liner, 4 mm Single Taper for Agilent GC (ea)
C0208119-10	Liner, 4 mm Single Taper for Agilent GC (10/pk)
C0208119-5	Liner, 4 mm Single Taper for Agilent GC (5/pk)
C0208120	Liner, 4 mm Single Taper w/ Sil Wool For Agilent GC (ea)
C0208120-10	Liner, 4 mm Single Taper w/ Sil Wool For Agilent GC(10/pk)
C0208120-5	Liner, 4 mm Single Taper w/ Sil Wool For Agilent GC(5/pk)
C0208122	Liner, 4 mm Quartz for Agilent GC (ea)
C0208122-10	Liner, 4 mm Quartz for Agilent GC (10/pk)
C0208122-5	Liner, 4 mm Quartz for Agilent GC (5/pk)
C0208124	Liner, 4mm w/ Cup & Sil Wool for Agilent GC (ea)
C0208124-10	Liner, 4mm w/ Cup & Sil Wool for Agilent GC (10/pk)
C0208124-5	Liner, 4mm w/ Cup & Sil Wool for Agilent GC (5/pk)
C0208110	Liner, 2 mm Splitless, Glass for Agilent GC (ea)
C0208110-10	Liner, 2 mm Splitless, Glass for Agilent GC (10/pk)
C0208110-5	Liner, 2 mm Splitless, Glass for Agilent GC (5/pk)
C0208111	Liner, 2 mm Splitless, Quartz for Agilent GC (ea)
C0208111-10	Liner, 2 mm Splitless, Quartz for Agilent GC (10/pk)
C0208111-5	Liner, 2 mm Splitless, Quartz for Agilent GC (5/pk)
C0208129	Liner, 2mm Single Taper for Agilent GC (ea)
C0208129-10	Liner, 2mm Single Taper for Agilent GC (10/pk)
C0208129-5	Liner, 2mm Single Taper for Agilent GC (5/pk)
C0208130	Liner, Packed Columns Deact. for Agilent GC (ea)
C0208130-25	Liner, Packed Columns Deact. for Agilent GC (25/pk)
C0208132	Liner, Packed Col. Not Deact. for Agilent GC (ea)
C0208132-25	Liner, Packed Col. Not Deact. for Agilent GC (25/pk)

The liner is packed into a plastic tube holder. A volume pack of 5 or more are packed into a carton box. Liner-seal O-ring sold separately.

Agilent Parts	
P/N	Description
C05181-3316	Splitless liner, single taper, deactivated, 4mm ID, 1/pk
C05183-4695	Splitless liner, single taper, deactivated, 4mm ID, 5/pk
C05183-4696	Splitless liner, single taper, deactivated, 4mm ID, 25/pk
C05062-3587	Splitless liner, single taper, glass wool insert, deactivated, 4mm ID, 1/pk
C05183-4693	Splitless liner, single taper, deactivated, 4mm ID, 5/pk
C05183-4694	Splitless liner, single taper, deactivated, 4mm ID, 25/pk
C05181-8818	Splitless Liner, straight, deactivated, 2mm ID, 1/pk
C05183-4703	Splitless Liner, straight, deactivated, 2mm ID, 5/pk
C05183-4704	Splitless Liner, straight, deactivated, 2mm ID, 25/pk
C05183-4711	Split liner, single taper, deactivated, glass wool insert, 4mm ID, 1/pk
C05183-4712	Split liner, single taper, deactivated, glass wool insert, 4mm ID, 5/pk
C05183-4713	Split liner, single taper, deactivated, glass wool insert, 4mm ID, 25/pk
C019251-60540	Split Liner, straight, non-deactivated, 4mm ID, 1/pk
C05183-4691	Split Liner, straight, non-deactivated, 4mm ID, 5/pk
C05183-4692	Split Liner, straight, non-deactivated, 4mm ID, 25/pk

PerkinElmer Capillary GCs	
P/N	Description
C0208212-10	Liner, Dimple Splitter for PerkinElmer GC (10/pk)
C0208212-5	Liner, Dimple Splitter for PerkinElmer GC (5/pk)
C0208214	Liner, Splitless for PerkinElmer GC (ea)
C0208214-10	Liner, Splitless for PerkinElmer GC (10/pk)
C0208214-5	Liner, Splitless for PerkinElmer GC (5/pk)
C0208232	Liner, 4 mm Split, Autosystem for PerkinElmer GC (ea)
C0208232-10	Liner, 4 mm Split, Autosystem for PerkinElmer GC (10/pk)
C0208232-5	Liner, 4 mm Split, Autosystem for PerkinElmer GC (5/pk)
C0208233	Liner, 4 mm Split, Autosystem w/ Wool for PerkinElmer (ea)
C0208233-10	Liner, 4 mm Split, Autosystem w/ Wool for PerkinElmer(10/pk)
C0208233-5	Liner, 4 mm Split, Autosystem w/ Wool for PerkinElmer (5/pk)
C0208234	Liner, 2mm Splitless Autosystem for PerkinElmer GC (ea)
C0208234-10	Liner, 2mm Splitless Autosystem for PerkinElmer GC (10/pk)
C0208234-5	Liner, 2mm Splitless Autosystem for PerkinElmer GC (5/pk)
C0208240	Liner, Packed Col., Autosystem for PerkinElmer GC (ea)
C0208240-10	Liner, Packed Col., Autosystem for PerkinElmer GC (10/pk)
C0208240-5	Liner, Packed Col., Autosystem for PerkinElmer GC (5/pk)
C0208242	Liner, Packed Col., Sigma C02000 8000 for PerkinElmer GC (ea)
C0208242-10	Liner, Packed Col., Sigma C02000 8000 for PerkinElmer GC(10/pk)
C0208242-5	Liner, Packed Col., Sigma C02000 8000 for PerkinElmer GC (5/pk)

Varian Capillary GCs	
P/N	Description
C0208311-10	Liner, 4 mm Open Split for Varian 1075/1077 (10/pk)
C0208311-5	Liner, 4 mm Open Split for Varian 1075/1077 (5/pk)
C0208312	Liner, Frit Split for Varian 1075/1077 (ea)
C0208312-10	Liner, Frit Split for Varian 1075/1077 (10/pk)
C0208312-5	Liner, Frit Split for Varian 1075/1077 (5/pk)
C0208313	Liner, 4 mm Open Split w/ Sil. Wool for Varian 1075/1077 (ea)
C0208313-10	Liner, 4 mm Open Split w/ Sil. Wool for Varian 1075/77(10/pk)
C0208313-5	Liner, 4 mm Open Split w/ Sil. Wool for Varian 1075/77 (5/pk)
C0208314	Liner, Splitless, Glass for Varian 1075/1077 (ea)
C0208314-10	Liner, Splitless, Glass for Varian 1075/1077 (10/pk)
C0208314-5	Liner, Splitless, Glass for Varian 1075/1077 (5/pk)
C0208315	Liner, Splitless, Quartz for Varian 1075/1077 (ea)
C0208315-10	Liner, Splitless, Quartz for Varian 1075/1077 (10/pk)
C0208315-5	Liner, Splitless, Quartz for Varian 1075/1077 (5/pk)
C0208316	Liner, 0.5mm SPI for Varian 1093/1094 (ea)



PerkinElmer Capillary GCs	
P/N	Description
C0208316-10	Liner, 0.5mm SPI for Varian 1093/1094 (10/pk)
C0208316-5	Liner, 0.5mm SPI for Varian 1093/1094 (5/pk)
C0208318	Liner, 0.8mm SPI for Varian 1093/1094 (ea)
C0208318-10	Liner, 0.8mm SPI for Varian 1093/1094 (10/pk)
C0208318-5	Liner, 0.8mm SPI for Varian 1093/1094 (5/pk)
C0208346	Liner, 3.4 mm Double Taper for Varian 1078/1079 (ea)
C0208346-10	Liner, 3.4 mm Double Taper for Varian 1078/1079 (10/pk)
C0208346-5	Liner, 3.4 mm Double Taper for Varian 1078/1079 (5/pk)

Shimadzu GCs	
P/N	Description
C0208414-10	Liner, Split 14a for Shimadzu GC (10/pk)
C0208414-5	Liner, Split 14a for Shimadzu GC (5/pk)
C0208416	Liner, Splitless 14a for Shimadzu GC (ea)
C0208416-10	Liner, Splitless 14a for Shimadzu GC (10/pk)
C0208416-5	Liner, Splitless 14a for Shimadzu GC (5/pk)

Thermo Trace/Focus GCs	
P/N	Description
C0208612	Liner, Split 5mm ID for Thermo-Finnigan GC (ea)
C0208612-10	Liner, Split 5mm for Thermo-Finnigan GC (10/pk)
C0208612-5	Liner, Split 5mm for Thermo-Finnigan GC (5/pk)
C020809-R	Liner, 4mm(ID) x 5.4mm(OD) x 79.5mm for Thermo GCs IP Deact., ea
C020810-R	Liner, 4mm(ID) x 5.4mm(OD) x 79.5mm for Thermo GCs IP Deact., 5pk
C020948-R	Liner, 4mm(ID) x 8.0mm(OD) x 105mm for Thermo GCs IP Deact., ea
C020948-214.1-R	Liner, 4mm(ID)x 8.0mm (OD) x 105mm for Thermo GCs Siltek Deact., ea
C020949-R	Liner, 4mm(ID) x 8.0mm(OD) x 105mm for Thermo GCs IP Deact., 5pk
C020949-214.5-R	Liner, 4mm(ID) x 8.0mm(OD) x 105mm for Thermo GCs Siltek Deact., 5pk

O-Ring Seal	
P/N	Description
C05188-5365	Fluorocarbon O-ring, for Agilent liner, 10/pk
C05180-4168	Graphite O-ring, for split liner, Agilent 10/pk
C05180-4173	Graphite O-ring, for splitless liner, Agilent 10/pk
Graphite O-ring L temperature limit > 350°C	
Fluorocarbon O-ring: temperature limit < 350°C	

## Syringes

### HP/Agilent

These autosamplers use standard size 10µL syringes with cemented needle syringes. Needles are cemented into the glass syringe barrel at a point corresponding to the zero graduation mark. Syringes are not autoclavable. Removable needle syringes. These are autoclaveable when disassembled.



P/N	Description
C080000	Hamilton 10 ul 1701N Syringe 26s Gauge Cemented Needle
C080011	Hamilton 10 ul 1701RN Syringe 26s Gauge Removable Needle
C080135	Hamilton 1 ul 7001KH Syringe 26s Gauge Knurled Hub Needle
C080300	Hamilton 10 ul 701N Syringe 26s Gauge Cemented Needle
C080338	Hamilton 10 ul 701RN Syringe 26s Gauge Removable Needle
C080366	Hamilton 10 ul 701N Syringe Cemented Needle (6/pk)

### Agilent / HP 7673 and 7683 Autosampler

These syringes are designed for the Agilent / HP 7673 and 7683 autosampler. The 700 series is the standard Microliter® syringe, with an all-metal plunger. N-style syringes have a cemented needle.



P/N	Description
C080387	Hamilton 10 ul 701ASN Syringe 23s Gauge Point Style
C080388	Hamilton 10 ul 701ASN Syringe 26s Gauge Point Style
C080389	Hamilton 10 ul 701ASN Syringe (26S/1.71"/HP) (6/pk)
C080390	Hamilton 10 ul 701ASN Syringe (23S/1.71"/HP) (6/pk)
C087987	Hamilton 5 ul 75ASN Syringe 23s Gauge Point Style
C087988	Hamilton 5 ul 75ASN Syringe 26s Gauge Point Style
C087989	Hamilton 5 ul 75ASN Syringe (26s/1.71"/HP) (6/pk)
C087990	Hamilton 5 ul 75ASN Syringe (23s/1.71"/HP) (6/pk)

## 700 Series Replaceable Needle

These syringes are designed for the Agilent / HP 7673 and 7683 autosampler. The 700 series is the standard Microliter® syringe, with an all-metal plunger. RN-style syringes use the Hamilton-standard RN-type removable needles.



P/N	Description
C087957	Hamilton 5 ul 75ASRN Syringe 23s Gauge Point Style
C087958	Hamilton 5 ul 75ASRN Syringe 26s Gauge Point Style
C080357	Hamilton 10 ul 701ASRN Syringe 23s Gauge Point Style
C080358	Hamilton 10 ul 701ASRN Syringe 26s Gauge Point Style

The Type N series Microliter® syringes have a metal plunger with no PTFE tip. Cemented needle syringes are needles cemented into the glass syringe barrel at a point corresponding to the zero graduation mark. Syringes are not autoclavable.

P/N	Description
C080300	Hamilton 10 ul 701N Syringe 26s Gauge Cemented Needle
C080366	Hamilton 10 ul 701N Syringe Cemented Needle (6/pk)
C080400	Hamilton 25 ul 702N Syringe
C080500	Hamilton 50 ul 705N Syringe
C080600	Hamilton 100 ul 710N Syringe
C080700	Hamilton 250 ul 725N Syringe
C080800	Hamilton 500 ul 750N Syringe
C087900	Hamilton 5 ul 75N Syringe

The RN type Microliter® syringes has a metal plunger with no PTFE tip. Removable needle syringes. These are autoclavable when disassembled

P/N	Description
C087930	Hamilton 5 ul 75RN Syringe
C080830	Hamilton 500 ul 750RN Syringe
C080730	Hamilton 250 ul 725RN Syringe
C080630	Hamilton 100 ul 710RN Syringe
C080530	Hamilton 50 ul 705RN Syringe
C080430	Hamilton 25 ul 702RN Syringe
C080330	Hamilton 10 ul 701RN Syringe
C080336	Hamilton 10 ul 701RN Syringe Removable Needle (6/pk)

## 800 Series Needle

The 800 N series features Microliter® syringes with a handle and replaceable parts. Cemented needle syringes: Needles are cemented into the glass syringe barrel at a point corresponding to the zero graduation mark. Syringes are not autoclavable.

P/N	Description
C084850	Hamilton 5 ul 85N Syringe 26s w/ Handle Point Style
C084852	Hamilton 10 ul 801N Syringe 26s w/ Handle Point Style
C084854	Hamilton 25 ul 802N Syringe 22s w/ Handle Point Style
C084856	Hamilton 50 ul 805N Syringe 22s w/ Handle Point Style
C084858	Hamilton 100 ul 810N Syringe 22s w/ Handle Point Style

The 800 RN series features Microliter® syringes with a handle and replaceable parts. RN - removable needle syringes. These are autoclaveable when disassembled

P/N	Description
C084859	Hamilton 100 ul 810RN Syringe 22s w/ Handle Point
C084861	Hamilton 250 ul 825RN Syringe 22s Point Style 2
C084857	Hamilton 50 ul 805RN Syringe 22s w/ Handle Point Style
C084855	Hamilton 25 ul 802RN Syringe 22s w/ Handle Point Style
C084853	Hamilton 10 ul 801RN Syringe 26s w/ Handle Point Style
C084851	Hamilton 5 ul 85RN Syringe 26s w/ Handle Point Style

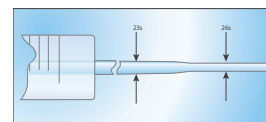
## 1700 Series Removable Needle

These syringes are designed for the Agilent / HP 7673 and 7683 autosampler. The plungers have a PTFE tip to seal both liquids and gases.

P/N	Description
C080087	Hamilton 10 ul 1701ASRN Syr. 23s Gauge Point Style
C080088	Hamilton 10 ul 1701ASRN Syr. 26s Gauge Point Style

## Cemented Needle

Syringes have a unique dual-gauge design. The needle provides the durability of a 23s gauge needle with the ability of a 26s gauge needle to perform split/splitless and on-column injections. Needles are cemented into the glass syringe barrel at a point corresponding to the zero graduation mark. Syringes are not autoclavable.



P/N	Description
C087993	Hamilton 5 ul 75ASN Syringe 23s-26s Gauge Point Style
C087994	Hamilton 5 ul 75ASN Syringe 23s-26s Point Style HP
C080391	Hamilton 10 ul 701ASN Syringe 23s-26s Point Style
C080393	Hamilton 701ASN Syringe 10 ul 23s-26s Gauge Point
C080076	Hamilton 5 ul 175ASN Syringe 23s-26s Gauge Point S
C080079	Hamilton 10 ul 1701ASN Syringe 23s-26s Gauge Point
C080092	Hamilton 5 ul 175ASN Syringe 23s-26s Point Style H
C080096	Hamilton 10 ul 1701ASN Syringe 23s-26s Point Style

## Gastight® Syringe

### RN

Gastight® syringes have a large capacity of 1mL and above. The plungers have a PTFE tip to seal both liquids and gases. RN-style syringes use the Hamilton-standard removable needle.

P/N	Description
C081330	Hamilton 1 ml 1001RN Syringe
C081430	Hamilton 2.5 ml 1002RN Syringe
C081530	Hamilton 5 ml 1005RN Syringe
C081630	Hamilton 10 ml 1010RN Syringe

### LT

These are large Gastight® syringes with capacities of 1mL and above. The plungers have a PTFE tip to seal both liquids and gases. LT - Luer tip syringes have a ground-glass barrel with a male luer taper, to accept most hypodermic needles. Syringes are autoclavable when disassembled.

P/N	Description
C081601	Hamilton 10 ml 1010 LT Syringe
C081501	Hamilton 5 ml 1005 LT Syringe
C081401	Hamilton 2.5 ml 1002 LT Syringe
C081301	Hamilton 1 ml 1001 LT Syringe
C082001	Hamilton 1.25 ml 1001.25 LT Syringe

### LTN

These are larger Gastight® syringes, with capacities of 1mL and above. The plungers have a PTFE tip to seal both liquids and gases. LTN - Luer tip / cemented needle syringes have a needle cemented into the barrel to a point corresponding to the zero graduation. Not autoclavable.

P/N	Description
C082017	Hamilton 1.25 ml 1001.25 LTN Syringe
C081317	Hamilton 1 ml 1001 LTN Syringe
C081417	Hamilton 2.5 ml 1002 LTN Syringe
C081517	Hamilton 5 ml 1005 LTN Syringe
C081617	Hamilton 10 ml 1010 LTN Syringe

## TLL

These are larger Gastight® syringes, with capacities of 1mL and above. The plungers have a PTFE tip to seal both liquids and gases. TLL syringes have a PTFE luer lock. The male luer taper accepts all luer-hub needles and connectors and locks luer hubs in place. Syringes are autoclaveable when disassembled.

P/N	Description
C081620	Hamilton 10 ml 1010TLL Syringe
C081520	Hamilton 5 ml 1005TLL Syringe
C081420	Hamilton 2.5 ml 1002TLL Syringe
C081320	Hamilton 1 ml 1001TLL Syringe
C082520	Hamilton 25 ml 1025TLL Syringe
C085020	Hamilton 50 ml 1050TLL Syringe
C086020	Hamilton 100 ml 1100TLL Syringe

## Gas Sampling Syringe

The Gastight® Sampling Syringe incorporates an on/off valve that is threaded into a Gastight housing. RN - Removable needle syringe uses the Hamilton-standard removable needle design. GS-Tek also carries other brand syringes including VICI, SGE and Agilent. Please contact us for availability.

P/N	Description
C081556	5 ml Sample Lock Syringe
C081656	10 ml Sample Lock Syringe

### Economic buy of 6/pk

P/N	Description
C080092	Hamilton 5 ul 175ASN Syringe 23s-26s Point Style HP (6/pk)
C080094	Hamilton 10 ul 1701 ASN HP Syringe 6/PK, 23S GA
C080096	Hamilton 10 ul 1701ASN Syringe 23s-26s Point Style HP (6/pk)
C080336	Hamilton 10 ul 701RN Syringe Removable Needle (6/pk)
C080366	Hamilton 10 ul 701N Syringe Cemented Needle (6/pk)
C080389	Hamilton 10 ul 701ASN Syringe (26S/1.71"/HP) (6/pk)
C080390	Hamilton 10 ul 701ASN Syringe (23S/1.71"/HP) (6/pk)
C080391	Hamilton 10 ul 701ASN Syringe 23s-26s Point Style HP (6/pk)
C087989	Hamilton 5 ul 75ASN Syringe (26s/1.71"/HP) (6/pk)
C087990	Hamilton 5 ul 75ASN Syringe (23s/1.71"/HP) (6/pk)
C087994	Hamilton 5 ul 75ASN Syringe 23s-26s Point Style HP (6/pk)

## Vials, Caps and Septa

GS-Tek offers a wide selection of vials, caps, and septa for many GC sampling introduction. All vials, caps and septa are precleaned to minimize any sample contamination and to ensure reliable analysis result. 2ml vial are compatible with many instrument autosamplers.



Vials	
P/N	Description
COV30010	100ul Glass Snap-Lock Vials (12/pk)
C0123344	250ul Clr Snap Top Vial 12x32 Pre-inserted w/ Label (100/pk)
C084261	1 ml PP Tapered Vial For Waters 96 Tray w/ Cap (100/pk)
C084051	1.0 ml 8 X 40 mm Tapered Crimp Top Vial (100/pk)
C084071	1.0 ml 8 X 40 mm Crimp Top Vial, Seal Combo-Pack (100/pk)
C084091	1.0 ml 8 X 40 mm Vial w/ Poly Plug Combo-Pack (100/pk)
C084001	1.2 ml 8 X 40 mm Crimp Top Vial (100/pk)
C084021	1.2 ml 8 X 40 mm Crimp Top Vial, Seal Combo-Pack (100/pk)
C084041	1.2 ml 8 X 40 mm Vial w/ Plug Cap Combo-Pack P (100/pk)
C084201	1.2 ml Insert For 15 X 45 Vial 8X42 mm (100/pk)

Vials	
C084242	1.2 ml Waters 96 Shell Vial Combo Pack (100/pk)
C0123340	1.8 ml/2ml Clear Screw w/Graduated Marking Spot Std Mth (100/pk)
C0123341	1.8 ml/2ml Clear Snap/Crimp Top Vial (100/pk)
C0123342	1.8 ml/2ml Amber Screw Graduated Vial Std. Mouth (100/pk)
C0123343	1.8 ml/2ml Amber Snap/Crimp Top Vial (100/pk)
C0123385	1.8 ml/2ml Screw Top Vial w/ Label Combo-Pack L (100/pk)
C0123405	1.8 ml/2ml Wide Mouth Screw Vial 12 X 32 mm (100/pk)
C0123406	1.8 ml/2ml Amber Wide Mouth Screw Vial (100/pk)
C0123408	1.8 ml/2ml Clear Screw Graduated Wide Mouth Vial (100/pk)
C0123409	1.8 ml/2ml Amber Screw Graduated Vial Wide Mouth ( 100/pk)
C0123411	1.8 ml/2ml Labeled Crimp Top Std. Mouth Vial (100/pk)
C0123415	1.8 ml/2ml Wide Mouth Screw Vial Combo-Pack (100/pk)
C0123425	1.8 ml/2ml Preassembled Vial Cap w/ Seal ST (100/pk)
C0223801	6 ml Flat Bottom, Beveled Top Headspace Vial (100/pk)
C0223821	6 ml Headspace Vial Combo- Pack (100/pk)
C0223821A	6 ml Headspace Vial Combo Pack, Pre-cleaned w/press release seals
C0224601	10 ml Round Bottom, Beveled Top Headspace Vial (100/pk)
C0224604	10 ml Flat Bottom, Beveled Top Headspace Vial (100/pk)
C0224608	10ml Headspace Vial Clear Screw Top (100/pk)
C0224609	10ml Headspace Vial Amber Screw Top (100/pk)
C0224621	10 ml Headspace Vial Combo- Pack (100/pk)
C0237501	20 ml Round Bottom, Beveled Top Headspace Vial (100/pk)
C0237504	20 ml Headspace Vial Flat Bottom, Beveled Top(100/pk)
C0237506	20 ml Headspace Vial Flat Top/Flat Bottom (100/pk)
C0237508	20ml Headspace Vial Clear Screw Top (100/pk)
C0237509	20ml Headspace Vial Amber Screw Top (100/pk)
C0237511	20ml Headspace Screw Vial Combo-Pack (100/pk)
C0237521	20 ml Headspace Vial Combo- Pack (100/pk)
C0237531	20ml Headspace Vial Septum 2 Combo-Pack (100/pk)
C0275705	24 ml Clear EPA Vials (100/pk)
C0275725	24 ml EPA Vial Combo-Pack (100/pk)
C0275745	Pre-Assembled 24 ml EPA Vials (100/pk)
C0275805	24ml Amber EPA Vial (100/pk)
C0275825	Precleaned Clear 24 MI EPA Vials (72/pk)
C0275835	Precleaned Amber 24 ml EPA Vials (72/pk)
C0275905	24 ml Amber EPA Vial Combo- Pack (100/pk)
C0306001	27 ml Headspace Vial For Shimadzu (100/pk)
C0279505	40 ml Clear EPA Vial (100/pk)
C0279515	40 ml Amber EPA Vial (100/pk)
C0279525	40 ml EPA Vial Combo-Pack (100/pk)
C0279535	40 ml EPA Amber Vial Combo- Pack (100/pk)
C0279545	Pre-Assembled 40 ml EPA Vial (100/pk)
C0279555	40 ml EPA Combo-Pack (100/pk) Preassembled / Clr,Cap,PTFE
C0279575	40 ml EPA Vial Combo-Pack White Cap/PTFE/Sil (100/pk)
C0279577	40 ml EPA Vial Combo-Pack White Cap/Economy PTFE/Sil (100/pk)
C0279578	40 ml EPA Vial w/Economy PTFE/Sil Septa(100/pk)
C0279580	40ml Clear EPA Vial Combo Pack with Bonded Level 3 Cap (100/pk)
C0279585	40ml EPA Vial Combo-Pack White Cap/PTFE/Sil (100/pk)
C0279590	40ml Clear EPA Vial Combo-Pack Black Cap/PTFE/Sil (100/pk)
C0279815	Precleaned 40 ml EPA Vial (72/pk) w/ Level 3 Certificate
C0279825	Precleaned 40 ml EPA Vial (72/pk)
C0279825A	40 ml Precleaned EPA Vial w/ QC Analysis (72/pk)
C0279835	Precleaned Amber 40 ml EPA Vials (72/pk)
C0279836	40mL Amber Precleaned EPA Vial with Solid Cap 72/pk
C0271406	60 ml Clear EPA Vial (144/pk)
C0271425	Clear 60 ml EPA Vials, Precleaned (72/pk)
C0271435	Amber 60 mL EPA Vials, Precleaned (72/pk)

## Vial Insert, Glass or PP

P/N	Description
C053101	250 ul Insert For 1.8 ml Std. Vial Flat Bottom (100/pk)
C053151	100 ul Tapered Insert(Mandrel) For 1.8 ml Std. Vial (100/pk)
C053159	100 ul Tapered Insert (Pulled) For 1.8 ml Std. Vial (100/pk)
C053161	100 ul Trispring Insert For 1.8 ml Std. Vial (100/pk)
C053171	100 ul PP Trispring Insert For 1.8 ml Std. Vial (100/pk)
C053852	200 ul Tapered Insert for Waters New Style Vial (200/pk)
C063011	250 ul Tapered Insert (Pulled) For 1.8 ml Wide Vial (100/pk)
C063101	350 ul Insert For 1.8 ml Wide Mth. Vial Flat Bottom (100/pk)
C063151	250 ul Tapered Insert(Mandrel) For 1.8 ml Wide Vial (100/pk)
C063161	250 ul Trispring Insert For 1.8 ml Wide Vial (100/pk)
C063171	250 ul PP Trispring Insert For 1.8 ml Wide Vial (100/pk)
C063181	250 ul Hanging Insert For 1.8 ml Wide Vial (100/pk)
C063551	250 ul Polyethylene Inserts (100/pk)
C063951	300 ul Tapered Insert(Mandrel) For 4 ml Waters Vial (100/pk)
C063961	300 ul 6x39 mm Spring Insert For 4 ml Vial (100/pk)
C063971	300 ul PP Trispring Insert For WISP Vials (100/pk)
C084201	1.2 ml Insert For 15 X 45 Vial 8X42 mm (100/pk)



## Headspace Vials

P/N	Description
C0223801	6 ml Flat Bottom, Beveled Top Headspace Vial (100/pk)
C0223821	6 ml Headspace Vial Combo- Pack (100/pk)
C0223821A	6 ml Headspace Vial Combo Pack, Pre-cleaned w/press release seals
C0224601	10 ml Round Bottom, Beveled Top Headspace Vial (100/pk)
C0224604	10 ml Flat Bottom, Beveled Top Headspace Vial (100/pk)
C0224608	10ml Headspace Vial Clear Screw Top (100/pk)
C0224609	10ml Headspace Vial Amber Screw Top (100/pk)
C0224621	10 ml Headspace Vial Combo- Pack (100/pk)
C0237501	20 ml Round Bottom, Beveled Top Headspace Vial (100/pk)
C0237504	20 ml Headspace Vial Flat Bottom, Beveled Top(100/pk)
C0237506	20 ml Headspace Vial Flat Top/Flat Bottom (100/pk)
C0237508	20ml Headspace Vial Clear Screw Top (100/pk)
C0237509	20ml Headspace Vial Amber Screw Top (100/pk)
C0237511	20ml Headspace Screw Vial Combo-Pack (100/pk)
C0237521	20 ml Headspace Vial Combo- Pack (100/pk)
C0237531	20ml Headspace Vial Septum 2 Combo-Pack (100/pk)
C0306001	27 ml Headspace Vial For Shimadzu (100/pk)



## Derivatization/Reaction Vials

GS-Tek also supplies brand name vials, such as Microanalytical, Agilent, and others. Please inquiry for product availability.

P/N	Description
C099400	0.1 ml Mini Reaction Vials Caps and Liners (12/pk)
C099410	0.3 ml Mini Reaction Vials w/ Caps and Liners (12/pk)
C099420	1.0 ml Mini Reaction Vials w/ Caps and Liners (12/pk)
C099430	3.0 ml Mini Reaction Vials w/ Caps and Liners (12/pk)
C099440	5.0 ml Mini Reaction Vials w/ Caps and Liners (12/pk)
C099450	10.0 ml Mini Reaction Vials w/ Caps and Liners (12/pk)
C099451	10.0 ml Kimble Mini Reaction Vial W/Cap & Liner (12/pk)

## Caps and Septa

Crimping Cap	
P/N	Description
C0308201	8 mm Crimp Cap & Seal S (100/pk)
C0308231	8 mm Crimp Cap & TruSeal (100/pk)
C0308401	8 mm Crimp Cap & Seal TT (100/pk)
C0308501	8 mm Blank Crimp Cap Open-hole .156 (100/pk)
C0311001Y	11 mm Yellow Crimp Cap & Standard Seal (100/pk)
C0311001	11 mm Crimp Cap & Standard Seal (100/pk)
C0311001B	11 mm Blue Crimp Cap & Standard Seal (100/pk)
C0311001G	11 mm ID Green Crimp Cap and Standard Seal (100/pk)
C0311001GO	11 mm ID Gold Crimp Cap and Standard Seal (100/pk)
C0311001O	11 mm Orange Crimp Cap & Standard Seal (100/pk)
C0311001PU	11 mm Purple Crimp Cap & Standard Seal (100/pk)
C0311001R	11 mm Red Crimp Cap and Standard Seal (100/pk)
C0311001Y	11 mm Yellow Crimp Cap & Standard Seal (100/pk)
C0311201	11 mm Crimp Cap & Seal S (100/pk)
C0311231	11 mm Crimp Cap & TruSeal (100/pk)
C0311231L	11mm Crimp Cap & TruSeal Long (100/pk)
C0311401	11 mm Crimp Cap & Seal TT (100/pk)
C0311501	11 mm Blank Crimp Cap Open-hole .220 (100/pk)
C0313001	13 mm Crimp Cap & Standard Seal (100/pk)
C0320001	20 mm Crimp Cap (100/pk)
C0320121	20 mm Aluminum Crimp Cap and Septum 3 (100/pk)
C0320122	20 mm Safety Crimp Cap w/ Septum 3 (100/pk)
C0320130	20 mm Aluminum Crimp Cap with Blue/White Silicone Septa (100/pk)
C0320221	20 mm Aluminum Crimp Cap w/ Septum 2 (100/pk)
C0320222	20 mm Safety Crimp Cap w/ Septum 2 (100/pk)
C0320301	20 mm Safety Crimp Caps For Headspace Vials (100/pk)
C0320321	20 mm Safety Crimp Cap With Silicone/PTFE Seal (100/pk)
C0320421	20 mm Aluminum Crimp Cap & Black Butyl Septum (100/pk)
C0320521	20 mm Aluminum Crimp Cap & Bellows Seal (100/pk)
C0320545	20 mm ID GC Grade Soil Septum For Headspace (100/pk)

## Screw Caps

Cap by mouth diameter	
P/N	Description
C0308115	8 mm Black Screw Cap (100/pk)
C0309115	8 mm Wide-Lip Black Screw Cap (100/pk)
C0309415	8 mm White Wide-Lip Screw Cap (100/pk)
C0309525	8 mm Preassembled Screwcap w/ PTFE/Silicone Seal (100/pk)
C0309585	8 mm Preassembled Screw Cap w/ Seal TT (100/pk)
C0309915	8 mm Pierceable Screw Cap w/ Seal (100/pk)
C0309925	8 mm Solid Screw Cap w/ PTFE Liner (100/pk)
C0309425	9mm Yellow Screw Cap PTFE/Silicone 9-425 (100/pk)
C0310115	10 mm Wide Mouth Black Screw Cap (100/pk)
C0309935	12 mm Solid Screw Cap w/ PTFE Liner (100/pk)
C0312115	12 mm Black Screw Cap (100/pk)
C0312415	12 mm White Screw Cap (100/pk)
C0312815	12mm Pierceable Screw Cap w/ Seal (100/pk)
C0313115	13mm Poly/Pro Rubber Lined Screw Cap (100/pk)
C0320124	18mm Pre-Assm Silver Screw Cap W/Sil White/PTFE Red Septa (100/pk)
C0320125	18mm Pre-Assm Silver Screw Cap W/Sil Blue/PTFE White Septa (100/pk)
C0320126	18mm Pre-Assm Silver Screw Cap W/Sil White/PTFE Blue Septa (100/pk)

Cap by mouth diameter	
C0320128	18mm Pre-Assm Silver Screw Cap W/Butyl Red/PTFE Gray Septa (100/pk)
C0324115	24 mm Screw Cap 24-400 (100/pk)
C0324115B	24 mm Screw Cap 24-400 Blue (1000/pk)
C0324415	24mm Pre-Assembled White Screw (24-414) Cap w/ PTFE/Sil Septa

Cap by thread	
P/N	Description
C0312585	13-425 Open Hole Black Caps Pre-Stuffed W/ Seal TT
C0520110	15-425 Solid Screw Cap w/ PTFE Liner (100/pk)
C0520310	18-400 Solid Screw Cap w/ PTFE Liner (100/pk)
C0520210	20-400 (20mm) Solid Screw Cap w/ TFE Liner (100/pk)
C0520410	22-400 Green Screw Cap PTFE Liner (100/pk)
C0520510	24-400 Solid Screw Cap w/ PTFE Liner (100/pk)
C0324114	24-414 Open Hole Screw Cap Black (100/pk)
C0324425	24-414 Cap with Bonded Teflon/Silicone Seal, Level 3 (100/pk)
C0520810	38-400 Solid Screw Cap w/ PTFE Liner (100/pk)

## Snapping Caps

P/N	Description
C0308051	8 mm Snap Plug Cap for Waters 96 Vial (100/pk)
C0311251	Snap Cap For Snap/Crimp Top Vial w/ PTFE Seal (100/pk)
C0311261	Snap Cap For Snap/Crimp Top Vial PTFE/Rubber Seal (100/pk)
C0311271	Snap Cap For Snap/Crimp Top Vial w/ PTFE/Sil. Seal(100/pk)
C0311281	Snap Cap For Snap/Crimp Top Vial w/ Poly. Seal (100/pk)

## Magnetic Caps

P/N	Description
C0311002	11 mm Magnetic Crimp Cap (100/pk)
C0311603	11 mm Magnetic Crimp Cap and Seal TT (100/pk)
C0320123	20 mm Magnetic Crimp Cap w/ Septum 3 (100/pk)
C0320223	20 mm Magnetic Crimp Cap w/ Septum 2 (100/pk)
C0320605	20mm Magnetic Crimp Caps For Headspace Vials(100/pk) (Gold)
C0320607	20mm Magnetic Ring Crimp Cap 100/pk
C0320608	20mm Magnetic. Crimp Caps(8mm hole) for Headspace Vials (100/pk)
C0320610	20mm Magnetic Ring Crimp Cap w/Septum 3 (100/pk)

## Vial Racks

P/N	Description
C0868804	Vial Rack 48 Position (5)
C0868805	Wheaton 36 Position Vial Rack For Headspace Vials (5/pk)
C0868806	Wheaton 50 Position Vial Rack For EPA Vials (5/pk)
C0868850	50 Position Vial Rack For 1.8 ml Vials PE (5/pk)
C0868880	Autosampler Vial Rack Lid, Transparent (10/pk)
C0868880AS	Autosampler Vial Rack, Assorted (10/pk) (Blue, Green, Orange, Pin)
C0868880B	Autosampler Vial Rack, Blue (10/pk)
C0868880G	Autosampler Vial Rack, Green (10/pk)
C0868880O	Autosampler Vial Rack, Orange (10/pk)
C0868880P	Autosampler Vial Rack, Pink (10/pk)
C0868880R	Autosampler Vial Rack, Red (10/pk)
C0868880Y	Autosampler Vial Rack, Yellow (10/pk)





## Crimper/Decapper

P/N	Description
C0328040	28 mm Precision Decapper
C0320010	20 mm Plier Decapper
C0320000	20 mm Crimper
C0320040	20 mm Precision Decapper
C0313000	13 mm Crimper
C0313010	13 mm Plier Decapper
C0313040	13 mm Precision Decapper
C0311010	11 mm Plier Decapper
C0311040	11 mm Precision Decapper
C0308010	8 mm Plier Decapper
C0308040	8 mm Precision Decapper

## Electronic Decapper

P/N	Description
C0308950	CRS Electronic Crimper 8mm
C0311950	CRS Electronic Crimper 11mm
C0311960	CRS Electronic Decapper 11mm
C0313950	CRS Electronic Crimper 13mm
C0313960	CRS Electronic Decapper 13mm
C0320950	CRS Electronic Crimper 20mm
C0320960	CRS Electronic Decapper 20mm



## Derivatization Vials

GS-Tek offers common silanes in closed vial for sample derivatization suitable for GC analysis. Some shipping restriction may apply for international shipping.

P/N	Description
C0140-100V	Trimethylsilylimidazole (TMSI-Vial) *UN1993*
C0140-10V	Trimethylsilylimidazole (TMSI-Vial) *UN1993*
C0140-1V	Trimethylsilylimidazole (TMSI-Vial), 10 x 1ml *UN1993*
C0140-25V	Trimethylsilylimidazole (TMSI-Vial) *UN1993*
C0203-100V	N,O-Bis(trimethylsilyl) acetamide (BSA-Vial) *RESTRICTED* UN2920
C0203-10V	N,O-Bis(trimethylsilyl) acetamide (BSA-Vial) *RESTRICTED* UN2920
C0203-1V	N,O-Bis(trimethylsilyl) acetamide (BSA-Vial), 10 X 1ml *RESTRICTED* UN2920
C0203-25V	N,O-Bis(trimethylsilyl) acetamide (BSA-Vial) *RESTRICTED* UN2920
C0257-100V	N,O-Bis(trimethylsilyl) trifluoroacetamide (BSTFA-Vial) UN1993
C0257-10V	N,O-Bis(trimethylsilyl) trifluoroacetamide (BSTFA-Vial) UN1993
C0257-1V	N,O-Bis(trimethylsilyl) trifluoroacetamide (BSTFA-Vial), 10 X 1 ml UN1993
C0257-25V	N,O-Bis(trimethylsilyl) trifluoroacetamide (BSTFA-Vial) UN1993

## Tubing

GS-Tek offers a variety of pre-cleaned tubing for gas line connections. Tubing materials are aluminum, copper, stainless steel and PTFE.

P/N	Description
C0430001	1/16" 316 SS Tubing .010" ID (per ft, continuous)
C0430002	1/16" 316 SS Tubing .010" ID (50 ft/roll)
C0430003	1/16" 316 SS Tubing .010" ID (200 ft/roll)
C0430004	1/16" 316 SS Tubing .020" ID (per ft, continuous)
C0430005	1/16" 316 SS Tubing .020" ID (50 ft/roll)
C0430006	1/16" 316 SS Tubing .020" ID (200 ft/roll)
C0430008	1/16" 316 SS Tubing .030" ID (per ft, continuous)
C0430010	1/16" 316 SS Tubing .030" ID (50 ft/roll)
C0430011	1/16" 316 SS Tubing .030" ID (200 ft/roll)
C0430012	1/16" 316 SS Tubing .040" ID (per ft, continuous)

P/N	Description
C0430013	1/16" 316 SS Tubing .040" ID (50 ft/roll)
C0430014	1/8" 304 SS Tubing .085" ID (per ft, continuous)
C0430015	1/8" 304 SS Tubing .085" ID (50 ft/roll)
C0430016	1/4" 304 SS Tubing .210" ID (per ft, continuous)
C0430018	1/4" 304 SS Tubing .210" ID (50 ft/roll)
C0430020	1/8" 316 SS Tubing .085" ID (per ft, continuous)
C0430021	1/8" 316 SS Tubing .085" ID (50 ft/roll)
C0430022	1/4" 316 SS Tubing .210" ID (per ft, continuous)
C0430023	1/4" 316 SS Tubing .210" ID (50 ft/roll)
C0430025	1/16" X 1/32" PTFE Tubing (10 ft/roll)
C0430026	1/16" X 1/32" PTFE Tubing (50 ft/roll)
C0430027	1/16" X 1/32" PTFE Tubing (100 Ft/roll) /10 roll minimum
C0430035	1/8" X 1/16" PTFE Tubing (10 ft/roll)
C0430036	1/8" X 1/16" PTFE Tubing (50 ft/roll)
C0430045	1/4" X 3/16" PTFE Tubing (10 ft/roll)
C0430046	1/4" X 3/16" PTFE Tubing (50 ft/roll)
C0431001	1/8" Aluminum Tubing .075" ID (50 ft/roll)
C0431002	3/16" Aluminum Tubing (50 ft/roll)
C0431003	1/4" Aluminum Tubing .190" ID (50 ft/roll)
C0432001	1/8" Copper Tubing .065" ID (50 ft/roll)
C0432002	1/8" Copper Tubing .065" ID Precleaned (50 ft/roll)
C0432003	1/4" Copper Tubing 0.190" ID (50 ft/roll)
C0432005	1/4" Copper Tubing .190" ID Precleaned (50 ft/roll)
C0433001	1/8" Aluminum Tubing .063" ID PTFE Lined (per ft, cont.)
C0433002	1/8" Aluminum Tubing .075" ID PTFE Lined (50 ft/roll)
C0433003	1/4" Aluminum Tubing .188" ID PTFE Lined (per ft, cont.)
C0433004	1/4" Aluminum Tubing .188" ID PTFE Lined (50 ft/roll)

## Tubing Miscellaneous

P/N	Description
C0436003	Tubing Cutter, Heavy Duty
C0436011	Cutting Jig File
C0436020	Tubing Bender - 1/4"
C0436021	Tubing Bender - 1/8"
C0436022	Tubing Bender - 3/16"

## Fittings

Union	
P/N	Description
B100-61	Brass Swagelok Tube Fitting, Bulkhead Union, 1/16 in. Tube OD
SS100-6	SS Swagelok Tube Fitting, Union, 1/16 in. Tube OD
SS100-61	SS Swagelok Tube Fitting, Bulkhead Union, 1/16 in. Tube OD
B200-6	Brass Swagelok Tube Fitting, Union, 1/8 in. Tube OD
B200-61	Brass Swagelok Tube Fitting, Bulkhead Union, 1/8 in. Tube OD
SS200-6	SS Swagelok Tube Fitting, Union, 1/8 in. Tube OD
SS200-61	SS Swagelok Tube Fitting, Bulkhead Union, 1/8 in. Tube OD
B400-6	Brass Swagelok Tube Fitting, Union, 1/4 in. Tube OD
B400-61	Brass Swagelok Tube Fitting, Bulkhead Union, 1/4 in. Tube OD
SS400-6	SS Swagelok Tube Fitting, Union, 1/4 in. Tube OD
SS400-61	SS Swagelok Tube Fitting, Bulkhead Union, 1/4 in. Tube OD
Tee	
P/N	Description
SS100-3	SS Swagelok Tube Fitting, Union Tee, 1/16 in. Tube OD
B200-3	Brass Swagelok Tube Fitting, Union Tee, 1/8 in. Tube OD



SS200-3	SS Swagelok Tube Fitting, Union Tee, 1/8 in. Tube OD
B400-3	Brass Swagelok Tube Fitting, Union Tee, 1/4 in. Tube OD
SS400-3	SS Swagelok Tube Fitting, Union Tee, 1/4 in. Tube OD
<b>Cross</b>	
P/N	Description
B200-4	Brass Swagelok Tube Fitting, Union Cross, 1/8 in. Tube OD
SS200-4	SS Swagelok Tube Fitting, Union Cross, 1/8 in. Tube OD
B400-4	Brass Swagelok Tube Fitting, Union Cross, 1/4 in. Tube OD
SS400-4	SS Swagelok Tube Fitting, Union Cross, 1/4 in. Tube OD



## Swagelok Tubing Adaptors

P/N	Description
SS100-R-2BT	SS Swagelok Tube Fitting, Bored-Through Reducer, 1/16 in. x 1/8 in. Tube OD
B100-R-4	Brass Swagelok Tube Fitting, Reducer, 1/16 in. x 1/4 in. Tube OD
SS100-R-4	SS Swagelok Tube Fitting, Reducer, 1/16 in. x 1/4 in. Tube OD
B200-R-2	Brass Swagelok Tube Fitting, Reducer, 1/8 in. Tube OD x 1/8 in.
SS200-R-4BT	SS Swagelok Tube Fitting, Bored-Through Reducer, 1/8 in. x 1/4 in. Tube OD
B200-R-4	Brass Swagelok Tube Fitting, Reducer, 1/8 in. x 1/4 in. Tube OD
SS200-R-1	1/8 Tubing adaptor to 1/16 Swagelok reduce union, 316 SS
SS200-R-4	SS Swagelok Tube Fitting, Reducer, 1/8 in. x 1/4 in. Tube OD
B100-1-2	Brass Swagelok Tube Fitting, Male Connector, 1/16 in. Tube OD x 1/8 in. Male NPT
B100-1-2BT	Brass Swagelok Tube Fitting, Bored-Through Male Connector, 1/16 in. Tube OD x 1/8 in. Male NPT
B100-1-4	Brass Swagelok Tube Fitting, Male Connector, 1/16 in. Tube OD x 1/4 in. Male NPT
B200-1-2	Brass Swagelok Tube Fitting, Male Connector, 1/8 in. Tube OD x 1/8 in. Male NPT
B200-1-2BT	Brass Swagelok Tube Fitting, Bored-Through Male Connector, 1/8 in. Tube OD x 1/8 in. Male NPT
B200-1-4	Brass Swagelok Tube Fitting, Male Connector, 1/8 in. Tube OD x 1/4 in. Male NPT
B200-1-4BT	Brass Swagelok Tube Fitting, Bored-Through Male Connector, 1/8 in. Tube OD x 1/4 in. Male NPT
B200-1-8	Brass Swagelok Tube Fitting, Male Connector, 1/8 in. Tube OD x 1/2 in. Male NPT
B200-6-1	Brass Swagelok Tube Fitting, Reducing Union, 1/8 in. x 1/16 in. Tube OD
B200-7-2	Brass Swagelok Tube Fitting, Female Connector, 1/8 in. Tube OD x 1/8 in. Female NPT
B200-7-4	Brass Swagelok Tube Fitting, Female Connector, 1/8 in. Tube OD x 1/4 in. Female NPT



P/N	Description
B2-TA-1-2	Brass Swagelok Tube Fitting, Male Tube Adapter, 1/8 in. Tube OD x 1/8 in. Male NPT
B2-TA-1-4	Brass Swagelok Tube Fitting, Male Tube Adapter, 1/8 in. Tube OD x 1/4 in. Male NPT
B2-TA-7-2	Brass Swagelok Tube Fitting, Female Tube Adapter, 1/8 in. Tube OD x 1/8 in. Female NPT
B2-TA-7-4	Brass Swagelok Tube Fitting, Female Tube Adapter, 1/8 in. Tube OD x 1/4 in. Female NPT
B400-1-2	Brass Swagelok Tube Fitting, Male Connector, 1/4 in. Tube OD x 1/8 in. Male NPT
B400-1-2BT	Brass Swagelok Tube Fitting, Bored-Through Male Connector, 1/4 in. Tube OD x 1/8 in. Male NP
B400-1-4	Brass Swagelok Tube Fitting, Male Connector, 1/4 in. Tube OD x 1/4 in. Male NPT
B400-1-4BT	Brass Swagelok Tube Fitting, Bored-Through Male Connector, 1/4 in. Tube OD x 1/4 in. Male NPT



P/N	Description
B400-6-1	Brass Swagelok Tube Fitting, Reducing Union, 1/4 in. x 1/16 in. Tube OD
B400-6-2	Brass Swagelok Tube Fitting, Reducing Union, 1/4 in. x 1/8 in. Tube OD
B400-7-2	Brass Swagelok Tube Fitting, Female Connector, 1/4 in. Tube OD x 1/8 in. Female NPT
B400-7-4	Brass Swagelok Tube Fitting, Female Connector, 1/4 in. Tube OD x 1/4 in. Female NPT
B400-R-2	Brass Swagelok Tube Fitting, Reducer, 1/4 in. x 1/8 in. Tube OD
B400-R-4	Brass Swagelok Tube Fitting, Reducer, 1/4 in. x 1/4 in. Tube OD

P/N	Description
B4-TA-1-2	Brass Swagelok Tube Fitting, Male Tube Adapter, 1/4 in. Tube OD x 1/8 in. Male NPT
B4-TA-1-4	Brass Swagelok Tube Fitting, Male Tube Adapter, 1/4 in. Tube OD x 1/4 in. Male NPT
B4-TA-7-2	Brass Swagelok Tube Fitting, Female Tube Adapter, 1/4 in. Tube OD x 1/8 in. Female NPT
B4-TA-7-4	Brass Swagelok Tube Fitting, Female Tube Adapter, 1/4 in. Tube OD x 1/4 in. Female NPT
SS-1F0-3GC	SS Swagelok Tube Fitting, Low Dead Volume Union Tee, 1/16 in. Tube OD
SS-1F0-6GC	SS Swagelok Tube Fitting, Low Dead Volume Union, 1/16 in. Tube OD
SS-200-6-1ZV	SS Swagelok Tube Fitting, Zero Volume Reducing Union, 1/8 x 1/16 in. Tube OD
SS-400-6-1FGC	SS Swagelok Tube Fitting, Female Swagelok Union, 1/4 in. Tube OD x 1/16 in. Female Swagelok Tube Fitting
SS-400-6-1ZV	SS Swagelok Tube Fitting, Zero Volume Reducing Union, 1/4 x 1/16 in. Tube OD
SS100-1-2BT	SS Swagelok Tube Fitting, Bored-Through Male Connector, 1/16 in. Tube OD x 1/8 in. Male NPT
SS100-1-4	SS Swagelok Tube Fitting, Male Connector, 1/16 in. Tube OD x 1/4 in. Male NPT
SS100-1-4BT	SS Swagelok Tube Fitting, Bored-Through Male Connector, 1/16 in. Tube OD x 1/4 in. Male NPT
SS100-4	SS Swagelok Tube Fitting, Union Cross, 1/16 in. Tube OD

P/N	Description
SS100-R-2BT	SS Swagelok Tube Fitting, Bored-Through Reducer, 1/16 in. x 1/8 in. Tube OD
SS100-R-4BT	SS Swagelok Tube Fitting, Bored-Through Reducer, 1/16 in. x 1/4 in. Tube OD
SS200-1-4BT	SS Swagelok Tube Fitting, Bored-Through Male Connector, 1/8 in. Tube OD x 1/4 in. Male NPT
SS200-6-1	SS Swagelok Tube Fitting, Reducing Union, 1/8 in. x 1/16 in. Tube OD
SS200-7-4	SS Swagelok Tube Fitting, Female Connector, 1/8 in. Tube OD x 1/4 in. Female NPT
SS2-TA-1-4	SS Swagelok Tube Fitting, Male Tube Adapter, 1/8 in. Tube OD x 1/4 in. Male NPT
SS400-1-2	SS Swagelok Tube Fitting, Male Connector, 1/4 in. Tube OD x 1/8 in. Male NPT
SS400-1-2BT	SS Swagelok Tube Fitting, Bored-Through Male Connector, 1/4 in. Tube OD x 1/8 in. Male NPT
SS400-1-4	SS Swagelok Tube Fitting, Male Connector, 1/4 in. Tube OD x 1/4 in. Male NPT
SS400-6-1	SS Swagelok Tube Fitting, Reducing Union, 1/4 in. x 1/16 in. Tube OD
SS400-6-2	SS Swagelok Tube Fitting, Reducing Union, 1/4 in. x 1/8 in. Tube OD
SS400-6-2BT	SS Swagelok Tube Fitting, Bored-Through Reducing Union, 1/4 in. x 1/8 in. Tube OD
SS400-6BT	SS Swagelok Tube Fitting, Bored-Through Union, 1/4 in. Tube OD
SS400-7-2	SS Swagelok Tube Fitting, Female Connector, 1/4 in. Tube OD x 1/8 in. Female NPT
SS400-7-4	SS Swagelok Tube Fitting, Female Connector, 1/4 in. Tube OD x 1/4 in. Female NPT
SS400-R-2	SS Swagelok Tube Fitting, Reducer, 1/4 in. x 1/8 in. Tube OD
SS400-R-4	SS Swagelok Tube Fitting, Reducer, 1/4 in. x 1/4 in. Tube OD
SS4-TA-1-2	SS Swagelok Tube Fitting, Male Tube Adapter, 1/4 in. Tube OD x 1/8 in. Male NPT
SS4-TA-1-4	SS Swagelok Tube Fitting, Male Tube Adapter, 1/4 in. Tube OD x 1/4 in. Male NPT
SS4-TA-7-2	SS Swagelok Tube Fitting, Female Tube Adapter, 1/4 in. Tube OD x 1/8 in. Female NPT
SS4-TA-7-2RP	SS Swagelok Tube Fitting, Female Tube Adapter, 1/4 in. Tube OD x 1/8 in. Female ISO Parallel Thread
SS4-TA-7-2RT	SS Swagelok Tube Fitting, Female Tube Adapter, 1/4 in. Tube OD x 1/8 in. Female ISO Tapered
SS4-TA-7-4	SS Swagelok Tube Fitting, Female Tube Adapter, 1/4 in. Tube OD x 1/4 in. Female NPT
SS4-TA-7-8	SS Swagelok Tube Fitting, Female Tube Adapter, 1/4 in. Tube OD x 1/2 in. Female NPT
SS600-1-2	SS Swagelok Tube Fitting, Male Connector, 3/8 in. Tube OD x 1/8 in. Male NPT

## Gas Management

One of important parts in GC instrument is gas management. Good gas management will ensure application result correct, accurate, repeatable and reproducibility. Good gas management will also prolong column lifetime and improve analysis limits. Gas management consists of tubing, fitting, valve, regulator, and traps. AirGas smart indicating brass single-stage regulator start kit is one example of integrated gas management system. It minimizes gas leak with factory connection, indicating gas trap will help when the trap needs to be replaced.



## Ordering Information

Product Number	Material	Block and Purge Assembly	Max Inlet Pressure (psig)	Max Outlet Pressure (psig)	Capacity (lpm @ Max Del. Pressure)	Inlet Gauge Range (psig)	Delivery Gauge Range (psig)
CY11-SR145A(CGA)	Brass	Yes	3,500	25	12	0-4,000	30" Hg-0-30
CY11-SR145B(CGA)	Brass	Yes	3,500	50	12	0-4,000	0-60
CY11-SR145D(CGA)	Brass	Yes	3,500	100	12	0-4,000	0-200

## Cylinder Gas Pressure Regulator

P/N	Description
CG5183-4641	CGA 346, 125 psig max air
CG5183-4642	CGA 350, 125 psig max, H <sub>2</sub> , Ar/Me
CG5183-4643	CGA 540, 125 psig max, O <sub>2</sub>
CG5183-4644	CGA 580, 125 psig max, He, AR, N <sub>2</sub>
CG5183-4645	CGA 590, 125 psig max, Air



## Valves

P/N	Description
B-2JN	Brass Screwed-Bonnet Needle Valve, 1/8 in. Swagelok Tube Fitting
B-2/4JN1	Brass Screwed-Bonnet Needle Valve, 1/8 in. MNPT x 1/4 in. Swagelok Tube Fitting
B-2/4JNA1	Brass Screwed-Bonnet Angle-Pattern Needle Valve, 1/8 in. MNPT x 1/4 in. Swagelok Tube Fitting
B-2/4JNAR1	Brass Screwed-Bonnet Angle-Pattern Needle Valve, 1/8 in. MNPT x 1/4 in. Swagelok Tube Fitting, Regulating Stem



## Fittings

P/N	Description
B200-6	Brass Swagelok Tube Fitting, Union, 1/8 in. Tube OD
SS200-6	SS Swagelok Tube Fitting, Union, 1/8 in. Tube OD
B400-R-2	Brass Swagelok Tube Fitting, Reducer, 1/4 in. x 1/8 in. Tube OD
B400-6	Brass Swagelok Tube Fitting, Union, 1/4 in. Tube OD
B200-7-2	Brass Swagelok Tube Fitting, Female Connector, 1/8 in. Tube OD x 1/8 in. Female NPT
B200-7-4	Brass Swagelok Tube Fitting, Female Connector, 1/8 in. Tube OD x 1/4 in. Female NPT
B200-1-2	Brass Swagelok Tube Fitting, Male Connector, 1/8 in. Tube OD x 1/8 in. Male NPT
B200-1-4	Brass Swagelok Tube Fitting, Male Connector, 1/8 in. Tube OD x 1/4 in. Male NPT

## Tubing

P/N	Description
C0432002	Copper tubing, 1/8in 50ft roll
C0430036	1/8" X 1/16" PTFE Tubing (50 ft/roll)
C0436003	Pro Tubing cutter

## Flow Meter

P/N	Description
CAADM1000	ADM 1000 flow meter 0.5 to 1000ml/min digital display, 9V battery NIST traceable
CFM261239	GFM Flowmeter for Helium 0 - 500 ml/min

## Leak Detector

P/N	Description
C021-070	Gow-Mac mini gas leak detector, 10 <sup>-5</sup> cc/sec helium, 10 <sup>-4</sup> cc/s argon

## Traps

P/N	Description
CARMSH-2	Big universal trap, RMS series 1/8 inch connector Helium
CARMSN-2	Big universal trap, RMS series 1/8 inch connector N2
CABOT-2	Big Oxygen Trap, BOT series, 1/8 inch connector, 750 cc, 250psig max
CABMT-2	Big Moisture Trap, BMT series, 1/8 inch connector, 750 cc, 250psig max
C0202200	1/8" Model 1000 Oxygen Trap
C0202202	1/4" Model 1000 Oxygen Trap
C0202204	Regenerate 1/8" Model 1000 Oxygen Trap
C0202205	Regenerate 1/4" Model 1000 Oxygen Trap
C0202220	1/8" Indicating Oxygen Trap
C0202223	1/4" Indicating Oxygen Trap
C0202224	Regenerate 1/8" Indicating Oxygen Trap
C0202225	Regenerate 1/4" Indicating Oxygen Trap
C0202240	1/8" 120cc Gas Dry Filter Trap
C0202242	1/4" 120cc Gas Dry Filter Trap
C0202244	Refill Kit-Gas Dry Trap // 500cc Mol Sieve & 500 Drierite
C0202248	1/8" 120cc Gas-Dry Filter Trap Bench Mount
C0202249	1/4" 120cc Gas-Dry Filter Trap Bench Mount
C0202258	1/8" 400cc Bench Mount Big Trap
C0202259	1/4" 400cc Bench Mount Big Trap
C0202260	1/8" 400cc Big Trap
C0202262	1/4" 400cc Big Trap
C0202266	1/8" Safe Glass Moisture Trap
C0202268	1/4" Safe Glass Moisture Trap
C0202270	1/8" Model 500 Mol. Sieve Drying Trap
C0202272	1/4" Model 500 Mol. Sieve Drying Trap
C0202280	1/8" 120cc Gas Dry Filter Trap with CoFree Indicator
C0202282	1/4" 120cc Gas Dry Filter Trap with CoFree Indicator
C0202290	1/8" 400cc Big Trap with CoFree Indicator
C0202292	1/4" 400cc Big Trap with CoFree Indicator
C0202294	1/8" 400cc Bench Mount Big Trap with CoFree Indicator
C0202296	1/4" 400cc Bench Mount Big Trap with CoFree Indicator
C0202330	1/8" Model 300 Hydrocarbon Trap
C0202332	1/4" Model 300 Hydrocarbon Trap
C0202340	1/8" Model 100 Safe Glass Hydrocarbon Trap
C0202342	1/4" Model 100 Safe Glass Hydrocarbon Trap

## Gas Sampling Bags

P/N	Description
C0410306-4	Metal Film Bag w/ Halkey Robts & Septa/Tube 20.3 L 18" x 18"
C0410308-4	Metal Film Bag w/ Halkey Robts & Septa/Tube 37.7 L 24" x 24"
C0410309-4	Metal Film Bag w/ Halkey Robts & Septa/Tube 53 L 18" x 34"
C0410310-4	Metal Film Bag w/ Halkey Robts & Septa/Tube 24" x 34"

## Shut Off Valves

P/N	Description
B-OGS2	Brass Toggle Valve, 1/8 in. Swagelok Tube Fitting
B-2JN	Brass Screwed-Bonnet Needle Valve, 1/8 in. Swagelok Tube Fitting

## Wrenches

P/N	Description
CW916508	9/16 and 5/8 inch open
CW716916	7/16 and 9/16 open

## Column Supplies Miscellaneous

### Column nut

P/N	Description
CA5181-8830	Column nut, 1/16in hex 2/pk, Agilent style
CA05988-20066	MS Interface column nut, female
CA5188-4732	High temp SimDis PTV Inlet 4mm hex

### Column scribe

P/N	Description
C021006	Column Scribe,10/pk

### Column cage and Metal Tag

P/N	Description
CO50001	Column metal tag
CO50001-10	Column metal tag, 10/pk
CO50002	Column cage, 17.5cm diameter x 4cm height
CO50002-10	Column cage, 17.5cm diameter x 4cm height, 10/pk

### Wrench

P/N	Description
CA8710-0510	Column nut wrench, 1/4 and 5/16 open end

### Column butt-connector, fused silica/quartz

P/N	Description
CA705-0905	Fused Silica union, press fit, universal, 2-way, 5/pk
CA705-0903	Fused Silica union, press fit, universal, 3-way
CA5181-3398	Quartz Deactivated splitter
C0204002	Polyimide Sealing Resin (10g)

# Syringe Filters and Supplies

Syringe Filters are used for processing small amount (< 1000ml) samples. Typical applications include HPLC mobile phase filtration and desalting, solution filtration in synthesis, particulate filtration of analytical sample, biological sample filtration and quick separation (DNA, plasma, protein, cell cultures, and others). Syringe filters are made of inert plastic house, membrane, and luer lock fit. It is used with disposal syringes or filtration device with luer fit. Syringe filters are often one-time use only.



## Features:

- Polypropylene syringe filter house with Luer lock
- 13mm, 25mm and 30mm filtration diameter
- Variety of membrane media and pore sizes
- Plastic box package to prevent from contamination
- Extremely competitive price

## Ordering Info

P/N	Description	Qty
SN01322	13mm 0.22um Nylon Syringe filters with Luer lock ( Color Coded: Yellow )	100/pk
SN01345	13mm 0.45um Nylon Syringe filters with Luer lock ( Color Coded: Pink )	100/pk
SN02522	25mm 0.22um Nylon Syringe filters with Luer lock ( Color Coded: Yellow )	100/pk
SN02545	25mm 0.45um Nylon Syringe filters with Luer lock ( Color Coded: Pink )	100/pk
SN03045	30mm 0.45um Nylon Syringe filters with Luer lock ( Color Coded: Pink )	100/pk
SM01322	13mm 0.22um Mixed cellulose(CA-CN) Syringe filters with Luer lock (Color Coded: Green)	100/pk
SM01345	13mm 0.45um Mixed cellulose(CA-CN) Syringe filters with Luer lock ( Color Coded:Blue )	100/pk
SM02522	25mm 0.22um Mixed cellulose(CA-CN) Syringe filters with Luer lock (Color Coded :Green )	100/pk
SM02545	25mm 0.45um Mixed cellulose(CA-CN) Syringe filters with Luer lock ( Color Coded:Blue )	100/pk
SM03045	30mm 0.45um Mixed cellulose(CA-CN) Syringe filters with Luer lock ( Color Coded:Blue )	100/pk
SP01322	13mm 0.22um PTFE Syringe filters with Luer lock ( Color Coded: Purple )	100/pk
SP01345	13mm 0.45um PTFE Syringe filters with Luer lock ( Color Coded: Orange )	100/pk
SP02522	25mm 0.22um PTFE Syringe filters with Luer lock ( Color Coded: Purple )	100/pk
SP02545	25mm 0.45um PTFE Syringe filters with Luer lock ( Color Coded: Orange )	100/pk
SP03045	30mm 0.45um PTFE Syringe filters with Luer lock ( Color Coded: Orange )	100/pk
SP03010	30mm 1.0um PTFE Syringe filters with Luer lock ( Color Coded: Purple )	100/pk
SPV1322	13mm 0.22um PVDF Syringe filters with Luer lock ( Color Coded: Coffee )	100/pk
SPV1345	13mm 0.45um PVDF Syringe filters with Luer lock ( Color Coded: Red )	100/pk
SPV2522	25mm 0.22um PVDF Syringe filters with Luer lock ( Color Coded: Coffee )	100/pk
SPV2545	25mm 0.45um PVDF Syringe filters with Luer lock ( Color Coded: Red )	100/pk
SPE1322	13mm 0.22um PES Syringe filters with Luer lock ( Color Coded: White )	100/pk
SPE1345	13mm 0.45um PES Syringe filters with Luer lock ( Color Coded: Azury )	100/pk
SPE2522	25mm 0.22um PES Syringe filters with Luer lock ( Color Coded: White )	100/pk
SPE2545	25mm 0.45um PES Syringe filters with Luer lock ( Color Coded: Azury)	100/pk
SPE3045	30mm 0.45um PES Syringe filters with Luer lock ( Color Coded: Azury)	100/pk
SGF1310	13mm 1.0um Glassfiber Syringe filters with Luer lock ( Color Coded: TBD)	100/pk
SGF2510	25mm 1.0um Glassfiber Syringe filters with Luer lock ( Color Coded: TBD)	100/pk
SGF3010	30mm 1.0um Glassfiber Syringe filters with Luer lock ( Color Coded: Darkgreen)	100/pk
<b>Economy Packs</b>		
SN01322-1K	13mm 0.22um Nylon Syringe filters with Luer lock ( Color Coded: Yellow )	1000/pk
SN01345-1K	13mm 0.45um Nylon Syringe filters with Luer lock ( Color Coded: Pink )	1000/pk
SN02522-0.5K	25mm 0.22um Nylon Syringe filters with Luer lock ( Color Coded: Yellow )	500/pk
SN02545-0.5K	25mm 0.45um Nylon Syringe filters with Luer lock ( Color Coded: Pink )	500/pk
SN03045-0.5K	30mm 0.45um Nylon Syringe filters with Luer lock ( Color Coded: Pink )	500/pk
SM01322-1K	13mm 0.22um Mixed cellulose (CA-CN) Syringe filters with Luer lock (Color Coded:Green)	1000/pk
SM01345-1K	13mm 0.45um Mixed cellulose (CA-CN) Syringe filters with Luer lock ( Color Coded:Blue )	1000/pk
SM02522-0.5K	25mm 0.22um Mixed cellulose (CA-CN) Syringe filters with Luer lock (Color Coded:Green )	500/pk
SM02545-0.5K	25mm 0.45um Mixed cellulose (CA-CN) Syringe filters with Luer lock ( Color Coded:Blue )	500/pk



P/N	Description	Qty
SM03045-0.5K	30mm 0.45um Mixed cellulose(CA-CN) Syringe filters with Luer lock ( Color Coded:Blue )	500/pk
SP01322-1K	13mm 0.22um PTFE Syringe filters with Luer lock ( Color Coded: Purple )	1000/pk
SP01345-1K	13mm 0.45um PTFE Syringe filters with Luer lock ( Color Coded: Orange )	1000/pk
SP02522-0.5K	25mm 0.22um PTFE Syringe filters with Luer lock ( Color Coded: Purple )	500/pk
SP02545-0.5K	25mm 0.45um PTFE Syringe filters with Luer lock ( Color Coded: Orange )	500/pk
SP03045-0.5K	30mm 0.45um PTFE Syringe filters with Luer lock ( Color Coded: Orange )	500/pk
SP03010-0.5K	30mm 1.0um PTFE Syringe filters with Luer lock ( Color Coded: Purple )	500/pk
SPV1322-1K	13mm 0.22um PVDF Syringe filters with Luer lock ( Color Coded: Coffee )	1000/pk
SPV1345-1K	13mm 0.45um PVDF Syringe filters with Luer lock ( Color Coded: Red )	1000/pk
SPV2522-0.5K	25mm 0.22um PVDF Syringe filters with Luer lock ( Color Coded: Coffee )	500/pk
SPV2545-0.5K	25mm 0.45um PVDF Syringe filters with Luer lock ( Color Coded: Red )	500/pk
SPE1322-1K	13mm 0.22um PES Syringe filters with Luer lock ( Color Coded: White )	1000/pk
SPE1345-1K	13mm 0.45um PES Syringe filters with Luer lock ( Color Coded: Azury )	1000/pk
SPE2522-0.5K	25mm 0.22um PES Syringe filters with Luer lock ( Color Coded: White )	500/pk
SPE2545-0.5K	25mm 0.45um PES Syringe filters with Luer lock ( Color Coded: Azury )	500/pk
SPE3045-0.5K	30mm 0.45um PES Syringe filters with Luer lock ( Color Coded: Azury )	500/pk
SGF1310-1K	13mm 1.0um Glassfiber Syringe filters with Luer lock ( Color Coded: TBD)	1000/pk
SGF2510-0.5K	25mm 1.0um Glassfiber Syringe filters with Luer lock ( Color Coded: TBD)	500/pk
SGF3010-0.5K	30mm 1.0um Glassfiber Syringe filters with Luer lock ( Color Coded: Darkgreen)	500/pk

## Membrane Discs

Typically used in sample preparation processes including GC and HPLC analysis to separate salts, cell tissues, peptides, DNA and other proteinoeous matter.



P/N	Description	Qty
G14710	47mm 1.0um Glass fiber Membrane Disc	100/PK
M14722	47mm 0.22um Mixed cellulose(CA-CN) Membrane Disc	100/PK
M14745	47mm 0.45um Mixed cellulose(CA-CN) Membrane Disc	100/PK
N14722	47mm 0.22um Nylon Membrane Disc	100/PK
N14745	47mm 0.45um Nylon Membrane Disc	100/PK
P14722	47mm 0.22um PTFE Membrane Disc	100/PK
P14745	47mm 0.45um PTFE Membrane Disc	100/PK
P24722	47mm 0.22um PVDF Membrane Disc	100/PK
P24745	47mm 0.45um PVDF Membrane Disc	100/PK
G11310	13mm 1.0um Glass fiber Membrane Disc	100/PK
M11322	13mm 0.22um Mixed cellulose(CA-CN) Membrane Disc	100/PK
M11345	13mm 0.45um Mixed cellulose(CA-CN) Membrane Disc	100/PK
N11322	13mm 0.22um Nylon Membrane Disc	100/PK
N11345	13mm 0.45um Nylon Membrane Disc	100/PK
P11322	13mm 0.22um PTFE Membrane Disc	100/PK
P11345	13mm 0.45um PTFE Membrane Disc	100/PK
P21322	13mm 0.22um PVDF Membrane Disc	100/PK
P21345	13mm 0.45um PVDF Membrane Disc	100/PK
G12510	25mm 1.0um Glass fiber Membrane Disc	100/PK
M12522	25mm 0.22um Mixed cellulose(CA-CN) Membrane Disc	100/PK
M12545	25mm 0.45um Mixed cellulose(CA-CN) Membrane Disc	100/PK
N12522	25mm 0.22um Nylon Membrane Disc	100/PK
N12545	25mm 0.45um Nylon Membrane Disc	100/PK
P12522	25mm 0.22um PTFE Membrane Disc	100/PK
P12545	25mm 0.45um PTFE Membrane Disc	100/PK
P22522	25mm 0.22um PVDF Membrane Disc	100/PK
P22545	25mm 0.45um PVDF Membrane Disc	100/PK
Others	Please contact us at <a href="mailto:info@gs-tek.com">info@gs-tek.com</a> for more information.	
	Fritz, HDPE, PTFE, cut to specified diameter	100/pk
	Filtration tube with fritz	50/pk

## Chemical Resistance Guide for Membranes

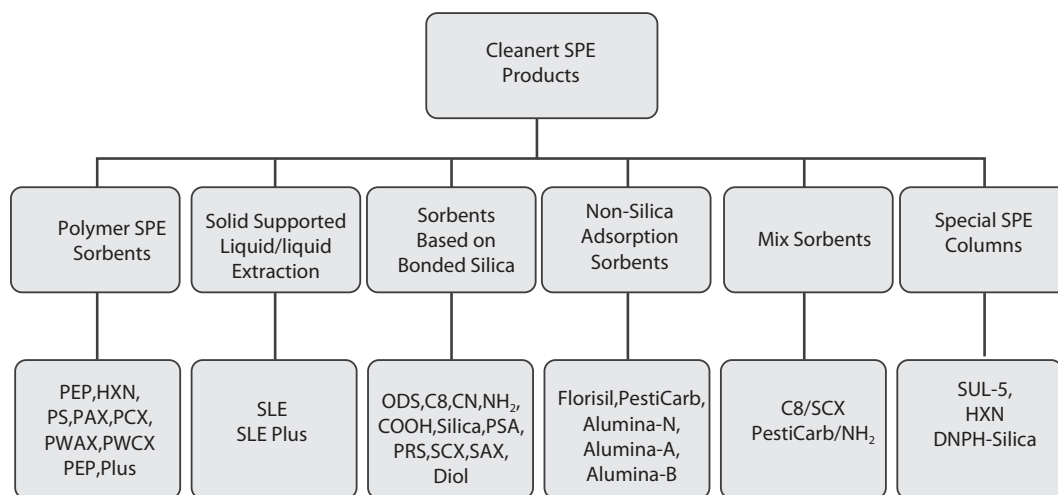
Chemical	Mixed Cellulose Acetate/Nitrate	Regenerate Cellulose	Nylon	PTFE
1-hexanol	+	+	+	+
Acetic acid,10%&25%	0	+	-	+
Acetone	-	+	+	+
Acetonitrile	-	+	+	-
Aliphatic hydrocarbon	+	+	+	+
Ammonia,1M	+	+	+	+
Aromatic hydrocarbon	+	+	N/A	+
Benzene	+	+	+	+
Boric acid	+	+	0	+
CTC	0	+	-	+
Carboxylic acid	+	+	-	+
Chloroacetic acid	-	0	-	+
Chloroform	-	+	+	0
Cyclohexane	0	+	+	+
Cyclohexanol	+	+	+	+
Diethyl ether	0	+	+	0
Dimethyl formamide	-	0	+	+
DMSO	-	0	N/A	+
Alcohol =< 98%	+	+	+	+
Acetic ether	-	+	+	+
Vinyl chloride	0	+	+	+
Ethylene glycol	+	+	+	+
Formic acid, 25%	0	+	-	+
N-hexane	+	+	+	+
Hydrochloric acid,25%	-	+	-	+
Isopropyl alcohol	+	+	+	+
Methanol	+	+	0	+
Nitrous acid,25%	0	+	-	+
Pentane	+	+	+	+
Phosphoric acid,25%	+	+	0	+
Phosphoric acid,45%	0	0	0	+
KOH,1M	-	0	-	+
Water solution of inorganic salt	+	+	+	+
NaOH,1M	0	-	-	+
Acetylene tetrachloride	0	+	0	+
THF	-	+	+	0
Toluene	+	+	+	+
TCA,10%	-	-	0	+
Trichloro ethane	0	+	0	+
Trichloroethylene	0	+	0	+
Dimethyl benzene	+	+	+	+

The mark represent: "+" = chemical resistance; "0" = limited chemical resistance; "-" = no chemical resistance; N/A= no data.

# Solid Phase Extraction (SPE)

## Cleanert SPE Columns, Wellplates and Media

GS-Tek has expanded our offerings to a full line of SPE sorbents, columns and wellplates for your sampling preparation needs. Preparation of samples is an integral part of a successful analysis. Thus, the more efficient, reproducible and selective the sample prep step, the more reliable results you can trust.



## Cross Reference Table

	GS-Tek	Waters	Supelco	Agilent	Varian
ODS C18	Cleanert C18	Sep-pak C18	ENVI-18 LC-C18	—	Bond Elut C18
ODS C18-N(Non-encapped)	Cleanert C18-N	—	—	AccuBOND C18	Bond Elut C18-OH
C8	Cleanert C8	Sep-pak C8	ENVI-8	AccuBOND C8	Bond Elut C8
CN Cyanopropyl	Cleanert CN	Sep-pak CN	LC-CN	AccuBOND CN	Bond Elut CN
NH2 Aminopropyl	Cleanert NH2	Sep-pak NH2	LC-NH2	AccuBOND NH2	Bond Elut NH2
PSA(N-aminoethyl Aminopropyl)	Cleanert PSA	—	—	—	Bond Elut PSA
SAX(Strong anion exchanger)	Cleanert SAX	—	LC-SAX	AccuBOND SAX	Bond Elut SAX
COOH(Weak cation exchanger)	Cleanert COOH	—	LC-WCX	—	Bond Elut CBA
PRS(Propane sulfonic acid)	Cleanert PRS	—	—	—	Bond Elut PRS
SCX(Strong cation exchanger)	Cleanert SCX	—	LC-SCX	AccuBOND SCX	Bond Elut SCX
Silica	Cleanert Silica	Sep-pak Silica	LC-Silica	AccuBOND Silica	Bond Elut Silica
Diol	Cleanert Diol	Sep-pak Diol	LC-Diol	AccuBOND Diol	Bond Elut Diol
PS	Cleanert PS	—	ENVI-Chrom P	AccuBOND ENV PS-DVB	—
PEP(Polar polymers)	Cleanert PEP	Oasis HLB	—	—	Bond Elut Plexa
PAX	Cleanert PAX	Oasis MAX	—	—	—
PCX	Cleanert PCX	Oasis MCX	—	—	—
HXN	Cleanert HXN	—	—	—	—

## Cleanert Plus SPE Columns and 96 Wellplates

Cleanert Plus SPE products use the particles with narrowly controlled size distribution, a novel frit material & design, unique pre-activation process on reverse phase, and a pre-drying on normal phase columns.

### Benefits

- Stable flow rate, clog free
- No activation step is needed, saving 1/3 of work load and time
- More consistent performance from normal phase by pre-drying
- Faster and reliable alternative to liquid/liquid extraction

**Application Example:** SPE-HPLC Analysis of Terramycin in Serum of Mouse using Cleanert PEP Plus

Method and the Result of Cleanert PEP 60mg/3mL	Method and the Result of Cleanert PEP Plus 60 mg/3mL
Wash with 2mL methanol, 2mL water 12 mins by gravity	Preconditioned 0 mins
Load 2mL sample solution(the mouse serum which contains 10ppm terramycin); 15 mins by gravity	Load 2mL sample solution(the mouse serum which contains 10ppm terramycin); 4 mins by gravity
Wash with 3mL water, then drying the column fully	Wash with 3mL water, then drying the column fully
Elute terramycin with 3mL methanol	Elute terramycin with 3mL methanol
Evaporate the elution by nitrogen at room temperature; dissolve the residue with 2mL mobile phase	Evaporate the elution by nitrogen at room temperature; dissolve the residue with 2mL mobile phase
Recovery: 83.2%	Recovery: 81.4%

## Cleanert PEP Plus

### Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
A hydrophilic and lipophilic balanced material, made of polydivinyl benzene functionalized with a polar group	30mg	1mL	100	PE0301-P
	50mg	1mL	100	PE0501-P
	60mg	3mL	50	PE0603-P
	100mg	3mL	50	PE1003-P
	200mg	6mL	30	PE2006-P
	500mg	6mL	30	PE5006-P
	15mg/well	2mL	96-wellplate	PE0152-WP
	30mg/well	2mL	96-wellplate	PE0302-WP
	50mg/well	2mL	96-wellplate	PE0502-WP

## Cleanert Florisil Plus

The new Cleanert Florisil Plus SPE products feature a special frit design making the columns clog-free. The SPE columns also offer a unique “pre-drying” function by removing water that is contained in the samples. These columns have unprecedented consist and reliable performance.

### Characteristics

**Average particle diameter:** 80-100µm; **Pore size:** 80Å; **Specific surface area:** 250-300m<sup>2</sup>/g

### Cleanert Florisil Plus Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
Sodium sulfate/Florisil	100mg	1mL	100	FS1001-P
	200mg	3mL	100	FS2003-P
	500mg	3mL	50	FS5003-P
	500mg	6mL	50	FS5006-P
	1g	6mL	30	FS0003-P
	2g	10mL	15	FS2000-P
	100mg/well	2mL	96-wellplate	FS1002-WP

## Cleanert Silica Plus

The new Cleanert Silical Plus SPE products feature a special frit design making the columns clog-free. The SPE columns also offer a unique “pre-drying” function by removing water that is contained in the samples. These columns have unprecedented consist and reliable performance.

### Characteristics

**Average particle diameter:** 40-60µm; **Pore size:** 60Å; **Specific surface area:** 480m<sup>2</sup>/g

## Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
Sodium sulfate/Silica	100mg	1mL	100	SI1001-P
	200mg	3mL	100	SI2003-P
	500mg	3mL	50	SI5003-P
	500mg	6mL	50	SI5006-P
	1g	6mL	30	SI0006-P
	50mg/well	2mL	96-wellplate	SI0502-WP
	100mg/well	2mL	96-wellplate	SI1002-WP

## PEP (Polar Polymers) Alternative to Oasis HLB

PEP is made of polydivinylbenzene functionalized with vinyl prolidone. The material has a balanced hydrophilic and hydrophobic property and can be used in the entire pH range of 1-14.

PEP can be used to extract a variety of polar and non-polar compounds. Some highly hydrophilic compounds which have little retention on C18 columns, such as chlorinated phenols, phosphate esters and drug metabolites, can be effectively retained on PEP.

## Particle Characteristics

Functionalized polymer sorbents; Average particle size: 35µm. Average pore size: 80Å; Surface area: 600m<sup>2</sup>/g

## Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
Cleanert PEP	30mg	1mL	100	PE0301
	60mg	3mL	50	PE0603
	100mg	3mL	50	PE1003
	200mg	6mL	30	PE2006
	500mg	6mL	30	PE5006
	30mg/well	2mL	96-wellplate	PE0302-W
	50mg/well	2mL	96-wellplate	PE0502-W
	10g			PE0010
	100g			PE0100

## PEP Plus (Pre-conditioned and Clog Resistant)

The PEP Plus columns are packed with high quality PEP sorbents. The sorbents contain high surface area polydivinylbenzene spherical particles that are modified with polar groups to offer a balanced hydrophilicity and hydrophobicity. The characteristics of the sorbent are water-wettable (undesirable drying effects are minimized), wide pH range (1-14), optimized retention for polar compounds and high capacity.

PEP Plus has a novel frit material & design and it has undergone a pre-activation process step during manufacturing. The pre-activation step during manufacturing eliminates the end user's need for an activation step prior to use thus reducing working load by ~30% which is more than 1/3 saved work load!

## Particle Characteristics

Polar and spherical particles: Average particle size: 40µm; Average pore size: 70Å; Special surface area: 600m<sup>2</sup>/g

## Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
Cleanert PEP Plus	30mg	1mL	100	PE0301-P
	60mg	3mL	50	PE0603-P
	100mg	3mL	50	PE1003-P
	200mg	6mL	30	PE2006-P
	500mg	6mL	30	PE5006-P
	30mg/well	2mL	96-wellplate	PE0302-WP
	50mg/well	2mL	96-wellplate	PE0502-WP
	10g			PE0010-P
	100g			PE0100-P

## PAX (RP/Strong Anion Exchange)

It is designed to overcome the limitations of traditional silica based mixed-mode SPE sorbents such as C18/SAX. It is a RP/strong anion exchange mixed mode polystyrene/divinylbenzene sorbent, stable from pH 0-14.

### Particle Characteristics

Based on functionalized polystyrene/divinylbenzene

Average particle diameter: 40µm; Average pore size: 70Å; Volume of pore: 1.2cm<sup>2</sup>/g; Specific surface area: 600m<sup>2</sup>/g.

### Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
Cleanert PAX	30mg	1mL	100	AX0301
	60mg	3mL	50	AX0603
	100mg	3mL	50	AX1003
	200mg	6mL	30	AX2006
	500mg	6mL	30	AX5006
	30mg/well	2mL	96-wellplate	AX0302-W
	50mg/well	2mL	96-wellplate	AX0502-W
	10g			AX0010
	100g			AX0100

## PCX (RP/Strong Cation Exchange)

PCX is a mixed-mode, strong cation exchange sorbent. It has reverse-phase and anion-exchange dual functionality. Its high surface area has wide usable pH range of 0-14.

### Particle Characteristics

Based on Functionalized polystyrene/divinylbenzene

Average particle diameter: 40µm; Average pore size: 70Å; Volume of pore: 1.2cm<sup>2</sup>/g; Specific surface area: 600m<sup>2</sup>/g.

### Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
Cleanert PCX	30mg	1mL	100	CX0301
	60mg	3mL	50	CX0603
	100mg	3mL	50	CX1003
	200mg	6mL	30	CX2006
	500mg	6mL	30	CX5006
	30mg/well	2mL	96-wellplate	CX0302-W
	50mg/well	2mL	96-wellplate	CX0502-W
	10g			CX0010
	100g			CX0100

## PWAX (RP/Weak Anion Exchange)

Cleanert PWAX provides the dual modes of retention, weak anion exchange and reverse phase on a stable polymer sorbent, which improves the retention for acidic analytes.

### Particle Characteristics

Based on partially functionalized aminopolystyrene/divinylbenzene; Average particle diameter: 40µm; Average pore size: 70Å; Volume of pore: 1.2cm<sup>2</sup>/g; Specific surface area: 600m<sup>2</sup>/g.

## Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
Cleanert PWAX	30mg	1mL	100	WAX0301
	60mg	3mL	50	WAX0603
	100mg	3mL	50	WAX1003
	200mg	6mL	30	WAX2006
	500mg	6mL	30	WAX5006
	30mg/well	2mL	96-wellplate	WAX0302-W
	50mg/well	2mL	96-wellplate	WAX0502-W
	10g			WAX0010
	100g			WAX0100

## PWCX (RP/Weak Cation Exchange)

Cleanert PWCX provides the dual modes of retention, weak cation exchange and reverse phase on a stable polymer sorbent, which improves the retention for basic analytes.

### Particle Characteristics

Based on partially functionalized polystyrene/divinylbenzene; Average particle diameter: 40µm; Average pore size: 70Å; Volume of pore: 1.2cm<sup>2</sup>/g; Specific surface area: 600m<sup>2</sup>/g.

## Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
Cleanert PWCX	30mg	1mL	100	WCX0301
	60mg	3mL	50	WCX0603
	100mg	3mL	50	WCX1003
	200mg	6mL	30	WCX2006
	500mg	6mL	30	WCX5006
	30mg/well	2mL	96-wellplate	WCX0302-W
	50mg/well	2mL	96-wellplate	WCX0502-W
	10g			WCX0010
	100g			WCX0100

## PEP-ED

PEP-ED is made of the polydivinylbenzene having a surface functionalized with an electron donating group. They can be used in the entire pH 1-14. The surface has a balanced hydrophilic and hydrophobic property and can extract a variety of polar and non-polar compounds, especially with electron-deficient structures.

### Particle Characteristics

Adsorption sorbents; Average particle size: 35µm. Average pore size: 80Å; Surface area: 600m<sup>2</sup>/g

## Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
Cleanert PEP ED	30mg	1mL	100	PE0301-E
	60mg	3mL	50	PE0603-E
	100mg	3mL	50	PE1003-E
	200mg	6mL	30	PE2006-E
	500mg	6mL	30	PE5006-E
	30mg/well	2mL	96-wellplate	PE0302-WE
	50mg/well	2mL	96-wellplate	PE0502-WE
	10g			PE0010-E
	100g			PE0100-E

## PEP-ER

PEP-ER is made of the polydivinylbenzene having a surface functionalized with an electron withdrawing group. They can be used in the entire pH 1-14. The surface has a balanced hydrophilic and hydrophobic property and can extract a variety of polar and non-polar compounds, especially having an electron-rich structure

## Particle Characteristics

Adsorption sorbents; Average particle size: 35µm. Average pore size: 80Å; Surface area: 600m<sup>2</sup>/g

### Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
Cleanert PEP ER	30mg	1mL	100	PE0301-R
	60mg	3mL	50	PE0603-R
	100mg	3mL	50	PE1003-R
	200mg	6mL	30	PE2006-R
	500mg	6mL	30	PE5006-R
	30mg/well	2mL	96-wellplate	PE0302-WR
	50mg/well	2mL	96-wellplate	PE0502-WR
	10g			PE0010-R
	100g			PE0100-R

## PS

PS is made of non-substituted polydivinylbenzene. It has larger surface areas (>600m<sup>2</sup>/g.) and thus greater capacity than reverse phase bonded silica. PS can be used for the extraction of non-polar and polar compounds.

## Particle Characteristics

Based on polystyrene/divinylbenzene; Average particle diameter: 40µm;

Average pore size: 70Å; Volume of pore: 1.2cm<sup>3</sup>/g; Specific surface area: 600m<sup>2</sup>/g.

### Ordering Info

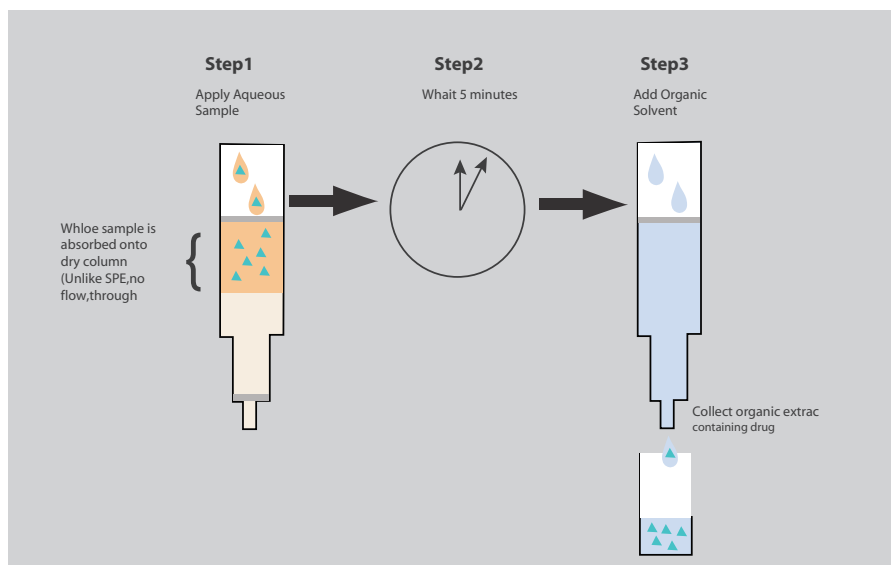
Material	Sorbent	Vol	Tubes/box	P/N
Cleanert PS	30mg	1mL	100	PS0301
	60mg	3mL	50	PS0603
	100mg	3mL	50	PS1003
	200mg	6mL	30	PS2006
	500mg	6mL	30	PS5006
	30mg/well	2mL	96-wellplate	PS0302-W
	50mg/well	2mL	96-wellplate	PS0502-W
	10g			PS0010
	100g			PS0100

## SLE (Solid Supported Liquid/Liquid Extraction) Technique

### Procedure

- A modified form of diatomaceous earth is packed in a cartridge.
- Biological fluid can be applied to the cartridge using gravity flow.
- The aqueous sample is deposited as a thin film on the hydrophilic surface.
- The analytes are extracted with a water immiscible organic solvent





## SLE

Solid supported liquid/liquid Extraction columns and plates use specially treated diatomiteous materials as a solid support for liquid/liquid extractions. The SPE procedures can be easily automated.

### The General Method Includes:

1. Load an aqueous sample into the column by gravity or a soft vacuum
2. Apply one or a multiple organic solvents by gravity or well-controlled vacuum
3. Vacuum the organic solution which contains the analyte out from bottom of the columns or plates, collect the solution
4. Concentrate the collected solution

### Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
Special treated diatomite	200mg	3mL	100	SL2003
	500mg	3mL	50	SL5003
	500mg	6mL	50	SL5006
	1g	6mL	30	SL0006
	14g	40mL	10	SL1400
	300mg/well	2mL	96-wellplate	SL3002-W
	500mg/well	2mL	96-wellplate	SL5002-W

## SLE Plus

Solid Supported Liquid/Liquid Extraction columns and plates use the specially treated diatomite materials to run liquid/liquid extractions on the solid supports, which are easily automated in parallel to save significant time.

Compared with SLE, the SLE Plus has a special frit design which keeps the columns clog-free for very nasty samples.

### The General Method Includes:

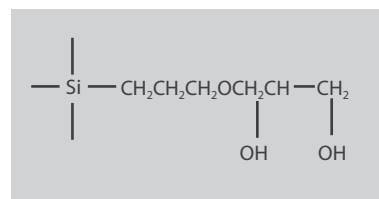
1. Load an aqueous sample into the column by gravity or a soft vacuum
2. Apply one or a multiple organic solvents by gravity or well-controlled vacuum
3. Vacuum the organic solution which contains the analyte out from bottom of the columns or plates, collect the solution
4. Concentrate the collected solution

## Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
Special treated diatomite	200mg	3mL	100	SL2003-P
	500mg	3mL	50	SL5003-P
	500mg	3mL	50	SL5006-P
	1g	6mL	30	SL0006-P
	14g	40mL	10	SL1400-P
	300mg/well	2mL	96-wellplate	SL3002-WP
	500mg/well	2mL	96-wellplate	SL5002-WP

## Bonded Silica SPE ODS C18 (End-capped)

ODS C18 products columns and plates are packed with reverse phase, octadecylsilane bonded silica sorbents. The sorbent is double endcapped and has a high bonding density (%C>17). These columns can be used as a replacement for BondElute C18 and Super clean ENVI C18. These products can be used for desalting biomolecules, such as proteins and DNAs.



## Particle Characteristics

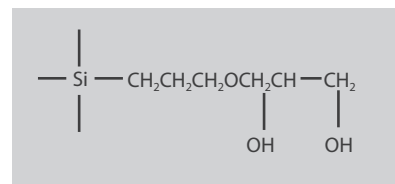
Based on silica; C%: 18-19%; Average particle diameter: 50µm  
Average pore size: 60Å; Volume of pore: 0.8cm<sup>2</sup>/g; Specific surface area: 4802/g

## Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
Cleanert ODS(C18,end-capped)	100mg	1mL	100	181001
	200mg	3mL	50	182003
	500mg	3mL	50	185003
	500mg	6mL	30	185006
	1g	6mL	30	180006
	50mg/well	2mL	96-wellplate	180502-W
	100mg/well	2mL	96-wellplate	181002-W
	10g			180010
	100g			18010

## ODS C18-N (Non-end-capped)

ODS C18-N products have silica based reverse phase sorbents bonded with octadecylsilane without endcapping. The extra silanol residue of the sorbent provides additional polar interactions associated with surface silanol groups which enhance the retention of basic compounds. These columns are similar to Agilent AccuBond C18 and BondElute C18 OH.



## Particle Characteristics

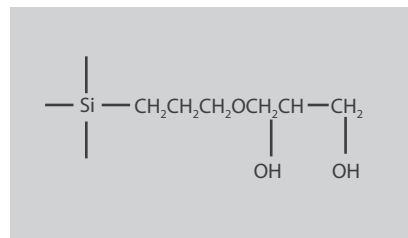
Based on silica; C%: 17-18%; Average particle diameter: 50µm;  
Average pore size: 60Å; Volume of pore: 0.8cm<sup>2</sup>/g; Specific surface area: 480m<sup>2</sup>/g

## Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
Cleanert (C18, Non-end-capped)	100mg	1mL	100	181001-N
	200mg	3mL	50	182003-N
	500mg	3mL	50	185003-N
	500mg	6mL	30	185006-N
	1g	6mL	30	180006-N
	50mg/well	2mL	96-wellplate	180502-N-W
	100mg/well	2mL	96-wellplate	181002-N-W
	10g			180010-N
	100g			180100-N

## C8 (Octyl)

The property of C8 products is similar to ODS C18 products. However, this sorbent is slightly less retentive than C18, which facilitates the elution of more hydrophobic substance. C8 is successfully used for the extraction of both water-soluble and fat-soluble vitamins from serum, as well as the desalting of biological macromolecules.



### Particle Characteristics

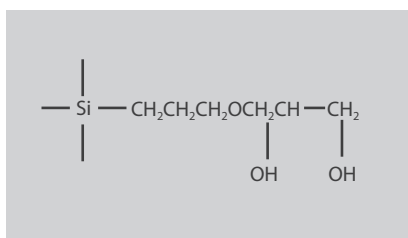
Based on silica; C%: 9-10%; Average particle diameter: 50µm;  
 Average pore size: 60Å; Volume of pore: 0.8cm<sup>2</sup>/g; Specific surface area: 480m<sup>2</sup>/g

### Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
Cleanert C8	100mg	1mL	100	81001
	200mg	3mL	50	82003
	500mg	3mL	50	85003
	500mg	6mL	30	85006
	1g	6mL	30	80006
	50mg/well	2mL	96-wellplate	080502-W
	100mg/well	2mL	96-wellplate	081002-W
	10g			80010
	100g			80100

## CN (Cyanopropyl)

Cyano(CN) SPE have silica based sorbents bonded with cyanopropyl functional group. This polar sorbent exhibits both polar and non-polar interactions. It can be used for extraction of both polar and non-polar molecules in either normal phase reverse phase mode.



### Particle Characteristics

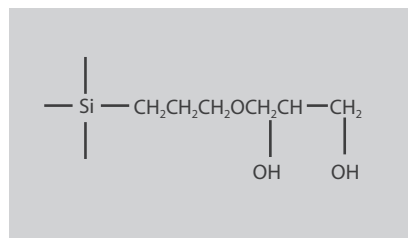
Based on silica; C%: 5-6%; Average particle diameter: 50µm;  
 Average pore size: 60Å; Volume of pore: 0.8cm<sup>2</sup>/g; Specific surface area: 480m<sup>2</sup>/g

### Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
Cleanert CN	100mg	1mL	100	CN1001
	200mg	3mL	50	CN2003
	500mg	3mL	50	CN5003
	500mg	6mL	30	CN5006
	1g	6mL	30	CN0006
	50mg/well	2mL	96-wellplate	CN0502-W
	100mg/well	2mL	96-wellplate	CN1002-W
	10g			CN0010
	100g			CN0100

## NH2 (Aminopropyl)

NH<sub>2</sub> SPE products have silica based sorbents bonded with aminopropyl functional group. This sorbent can be used in either normal phase or reverse phase mode. It retains the analytes either by a polar adsorption (from non-polar solution) or by weak anion exchange (from aqueous solution). pKa=9.8.



### Particle Characteristics

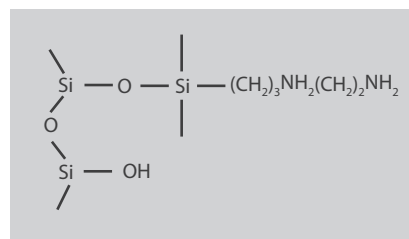
Based on silica; Average particle diameter: 50µm;  
 Average pore size: 60Å; Volume of pore: 0.8cm<sup>2</sup>/g; Specific surface area: 480m<sup>2</sup>/g

## Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
Cleanert NH2	100mg	1mL	100	NH1001
	200mg	3mL	50	NH2003
	500mg	3mL	50	NH5003
	500mg	6mL	30	NH5006
	1g	6mL	30	NH0006
	50mg/well	2mL	96-wellplate	NH0502-W
	100mg/well	2mL	96-wellplate	NH1002-W
	10g			NH0010
	100g			NH0100

## PSA ((N-aminoethyl) Aminopropyl)

PSA SPE is similar to Cleanert-NH2. PSA has two amino groups with pKa=10.1 and 10.9 respectively. This sorbent is an anion exchanger slightly stronger than NH2. It can be used for the extraction of metal ions by chelating interactions. It is also commonly used to remove organic acids, pigments and metal ions from organic samples such as vegetables and fruits.



## Particle Characteristics

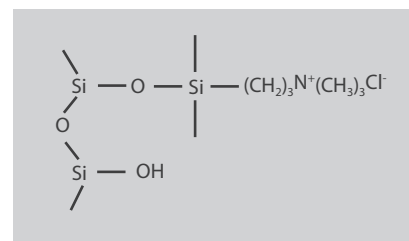
Based on silica; Average particle diameter: 50µm;  
Average pore size: 60Å; Volume of pore: 0.8cm<sup>2</sup>/g; Specific surface area: 480m<sup>2</sup>/g

## Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
Cleanert PSA	100mg	1mL	100	PA1001
	200mg	3mL	50	PA2003
	500mg	3mL	50	PA5003
	500mg	6mL	30	PA5006
	1g	6mL	30	PA0006
	50mg/well	2mL	96-wellplate	PA0502-W
	100mg/well	2mL	96-wellplate	PA1002-W
	10g			PA0010
	100g			PA0100

## SAX (Strong Anion Exchanger)

SAX SPE products have silica based sorbents bonded with a quaternary amine. This strong anion exchanger is used to extract compounds capable of carrying a negative charge from both aqueous and non-aqueous solutions. They are ideally suit to extraction of weak acids and desalting of biological macromolecules, like BondElute-SAX.



## Particle Characteristics

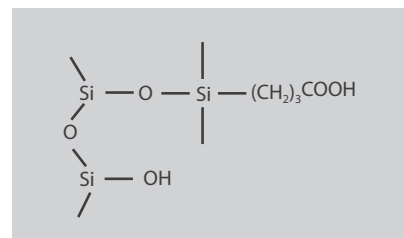
Based on silica; C%: 9-10%; Average particle diameter: 50µm; Average pore size: 60Å;  
Volume of pore: 0.8cm<sup>2</sup>/g Specific surface area: 480m<sup>2</sup>/g The ion exchange degree: 0.5meq/g.

## Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
Cleanert SAX	100mg	1mL	100	SA1001
	200mg	3mL	50	SA2003
	500mg	3mL	50	SA5003
	500mg	6mL	30	SA5006
	1g	6mL	30	SA0006
	50mg/well	2mL	96-wellplate	SA0502-W
	100mg/well	2mL	96-wellplate	SA1002-W
	10g			SA0010
	100g			SA0100

## COOH (Weak Cation Exchanger)

COOH SPE products consist of a propane carboxylic acid on the inner silica surface. The pKa of the carboxylic acid group is approximately 3.8. It is a useful sorbent for quaternary ammonium salt and other strong cations.



### Particle Characteristics

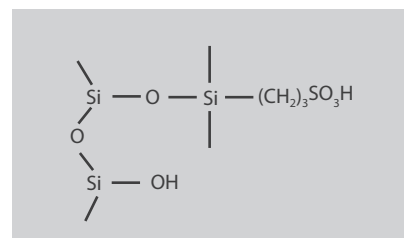
Based on silica; C%: 5-6%; Average particle diameter: 50 $\mu$ m; Average pore size: 60 $\text{\AA}$ ; Volume of pore: 0.8cm<sup>2</sup>/g; Specific surface area: 480m<sup>2</sup>/g

### Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
Cleanert COOH	100mg	1mL	100	CH1001
	200mg	3mL	50	CH2003
	500mg	3mL	50	CH5003
	500mg	6mL	30	CH5006
	1g	6mL	30	CH0006
	50mg/well	2mL	96-wellplate	CH0502-W
	100mg/well	2mL	96-wellplate	CH1002-W
	10g			CH0010
	100g			CH0100

## PRS (Propane Sulfonic Acid)

RS SPE sorbent is a silica gel based strong cation exchanger. This sorbent, consisting of a propane sulfonic acid, has slightly less exchange capability than SCX. It can be applied to the extraction of weak cations, such as pyridine, with high recovery.



### Particle Characteristics

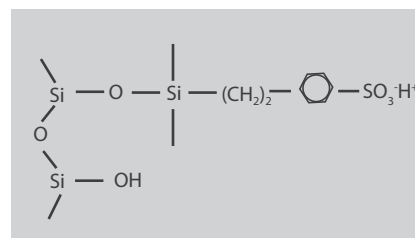
Based on silica; Average particle diameter: 50 $\mu$ m; Average pore size: 60 $\text{\AA}$ ; Volume of pore: 0.8cm<sup>2</sup>/g; Specific surface area: 480m<sup>2</sup>/g The ion exchange degree: 0.3meq/g.

### Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
Cleanert PRS	100mg	1mL	100	PR1001
	200mg	3mL	50	PR2003
	500mg	3mL	50	PR5003
	500mg	6mL	30	PR5006
	1g	6mL	30	PR0006
	50mg/well	2mL	96-wellplate	PR0502-W
	100mg/well	2mL	96-wellplate	PR1002-W
	10g			PR0010
	100g			PR0100

## SCX (Strong Cation Exchanger)

SCX products are strong cation exchangers based on silica gel, with benzene sulfonic acid. The sorbent is used to extract positively charged basic compounds or remove the salt from biological samples. It can also be mixed with C18 sorbent to extract the organic bases.



### Particle Characteristics

Based on silica; Average particle diameter: 50 $\mu$ m; Average pore size: 60 $\text{\AA}$ ; Volume of pore: 0.8cm<sup>2</sup>/g; Specific surface area: 480m<sup>2</sup>/g The ion exchange degree: 0.5meq/g.

## Ordering Info

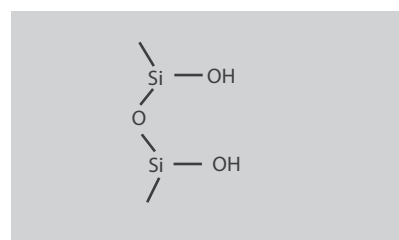
Material	Sorbent	Vol	Tubes/box	P/N
Cleanert SCX	100mg	1mL	100	SC1001
	200mg	3mL	50	SC2003
	500mg	3mL	50	SC5003
	500mg	6mL	30	SC5006
	1g	6mL	30	SC0006
	50mg/well	2mL	96-wellplate	SC0502-W
	100mg/well	2mL	96-wellplate	SC1002-W
	10g			SC0010
	100g			SC0100

## Silica

Silica SPE product has unbonded, activated irregular silica as the sorbent. This sorbent exhibits high polar interaction and is used for the extraction of weak-polar or non-polar compound, such as oil. In addition, the silanol groups are ionizable at intermediate pH, so it can be used as a weak cation exchanger.

### Particle Characteristics

Based on silica; Average particle diameter: 50µm; Average pore size: 60Å; Volume of pore: 0.8cm<sup>2</sup>/g; Specific surface area: 480m<sup>2</sup>/g



## Ordering Info

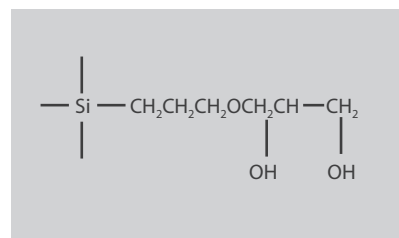
Material	Sorbent	Vol	Tubes/box	P/N
Cleanert Silica	100mg	1mL	100	SI1001
	200mg	3mL	50	SI2003
	500mg	3mL	50	SI5003
	500mg	6mL	30	SI5006
	1g	6mL	30	SI0006
	50mg/well	2mL	96-wellplate	SI0502-W
	100mg/well	2mL	96-wellplate	SI1002-W
	10g			SI0010
	100g			SI0100

## Diol

Silica based dihydroxy SPE. It is used to extract polar analytes from non-polar solutions. It is a neutral sorbent and extracts compounds by forming hydrogen bonding or polar-polar interaction. As an example, it can be used to extract THC.

### Particle Characteristics

Based on silica; C%: 5-6%; Average particle diameter: 50µm; Average pore size: 60Å; Volume of pore: 0.8cm<sup>2</sup>/g; Specific surface area: 480m<sup>2</sup>/g



## Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
Cleanert Diol	100mg	1mL	100	DI1001
	200mg	3mL	50	DI2003
	500mg	3mL	50	DI5003
	500mg	6mL	30	DI5006
	1g	6mL	30	DI0006
	50mg/well	2mL	96-wellplate	DI0502-W
	100mg/well	2mL	96-wellplate	DI1002-W
	10g			DI0010
	100g			DI0100

## Non-Silica Adsorption Sorbent Florisil (Magnesia Silica)

PestiCarb is made of graphitized carbon by a distinct surface modification process and has been used for sample cleanup in pesticide residues in plant or animal tissues. This sorbent can effectively reduce the background noise and increase the sensitivity, the functions of which are similar to Supelco Envicarb.

### Particle Characteristics

Adsorption sorbents; Average particle diameter: 80-100µm (40-60µm optional);  
 Average pore size: 80Å; Specific surface area: 291m<sup>2</sup>/g

### Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
Cleanert Florisil	100mg	1mL	100	FS1001
	200mg	3mL	50	FS2003
	500mg	3mL	50	FS5003
	500mg	6mL	30	FS5006
	1g	6mL	30	FS0006
	50mg/well	2mL	96-wellplate	FS0502-W
	100mg/well	2mL	96-wellplate	FS1002-W
	10g			FS0010
	100g			FS0100

## PestiCarb (Graphitized Carbon)

PestiCarb is made of graphitized carbon by a distinct surface modification process, and has been used for sample cleanup in pesticide residues in plants or animal tissues. This sorbent can effectively reduce the background noise and increase the sensitivity, the functions of which are similar to Supelco Envicarb.

### Particle Characteristics

Adsorption sorbents; Average particle size: 120-400 mesh.

### Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
Cleanert PestiCarb	100mg	1mL	100	PC1001
	200mg	3mL	50	PC2003
	500mg	3mL	50	PC5003
	500mg	6mL	30	PC5006
	1g	6mL	30	PC0006
	50mg/well	2mL	96-wellplate	PC0502-W
	100mg/well	2mL	96-wellplate	PC1002-W
	10g			PC0010
	100g			PC0100

## Alumina N (Aluminium Oxide;Neutral)

Alumina N sorbents(pH=7.5) can adsorb molecules by interaction with the aluminum metal center. The neutralized surface allows interaction with compounds whose heteroatoms are electronegative (e.g.N,S,P) or with an electron-rich ,highly aromatic structure.

### Particle Characteristics

Adsorption sorbents;  
 Average particle size: 150 mesh; Average pore size: 58Å

## Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
Cleanert Alumina N	100mg	1mL	100	AL1001-N
	200mg	3mL	50	AL2003-N
	500mg	3mL	50	AL5003-N
	500mg	6mL	30	AL5006-N
	1g	6mL	30	AL0006-N
	50mg/well	2mL	96-wellplate	AL0502-N-W
	100mg/well	2mL	96-wellplate	AL1002-N-W
	10g			AL0010-N
	100g			AL0100-N

## Alumina A (Aluminium Oxide; Acidic)

Alumina A sorbents(pH=4.5) can be used as strong polar absorbents or mild cation exchangers. This sorbent is processed with a special deactivation procedure which ensures high analyte recovery.

### Particle Characteristics

Adsorption sorbents; Average particle size: 150 mesh; Average pore size: 58Å

## Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
Cleanert Alumina A	100mg	1mL	100	AL1001-A
	200mg	3mL	50	AL2003-A
	500mg	3mL	50	AL5003-A
	500mg	6mL	30	AL5006-A
	1g	6mL	30	AL0006-A
	50mg/well	2mL	96-wellplate	AL0502-A-W
	100mg/well	2mL	96-wellplate	AL1002-A-W
	10g			AL0010-A
	100g			AL0100-A

## Alumina B (Aluminium Oxide; Basic)

Alumina B products(pH=10) can be used to remove organic acids and phenols in the sample matrix. They have been pre-treated by special deactivation to ensure high analyte recovery.

### Particle Characteristics

Adsorption sorbents; Average particle size: 150 mesh; Average pore size: 58Å.

## Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
Cleanert Alumina B	100mg	1mL	100	AL1001-B
	200mg	3mL	50	AL2003-B
	500mg	3mL	50	AL5003-B
	500mg	6mL	30	AL5006-B
	1g	6mL	30	AL0006-B
	50mg/well	2mL	96-wellplate	AL0502-B-W
	100mg/well	2mL	96-wellplate	AL1002-B-W
	10g			AL0010-B
	100g			AL0100-B

## Mixed and Layered Phases PestiCarb/NH2

PestiCarb/NH2 SPE column is packed with 500mg PestiCarb and 500mg NH2. It has been widely used in analysis of pesticides residue, especially for the Japanese Positive List System. It can be used in pesticide residue analysis, coloring matter, fatty acid and hydroxybenzene.



## Particle Characteristics

See Pesticarb and Cleanert NH2

### Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
Cleanert PestiCarb/NH2	500mg/500mg	6ml	30	PN0006

## C8/SCX

Mixed mode SPE based on silica of C8 and strong cation-exchange. It is usually used for the extraction of basic drugs from urine or blood

## Particle Characteristics

See C8 and SCX

### Ordering Info

Material	Sorbent	Vol	Tubes/box	P/N
Cleanert C8/SCX	50mg	3mL	50	CS0503
	130mg	3mL	50	CS1303
	300mg	3mL	50	CS3003
	500mg	6mL	30	CS5006
	1g	6mL	30	CS0006
	50mg/well	2mL	96-wellplate	CS0502-W
	100mg/well	2mL	96-wellplate	CS1002-W
	10g			CS0010
	100g			CS0100

## Cleanert Pre-IC:

### Sample Clean-up Cartridges for Ion Chromatography

The sample preparation is necessary not only for HPLC but also for IC. The demands for sample preparation of IC led to a development of a new SPE product family, which was named "Cleanert Pre-IC". Cleaner Pre-IC can perform superior sample preparation for IC analysis thanks to their high capacity sorbent and a excellent flow characteristics.

Part No.	Resin Type	Average particle size	Capacity	Application
IC-RP	divinylbenzene resin	40µm	300mg/ 1cc cartridge	To remove substances such as aromatic dyes, some aromatic carboxylic acids, hydrocarbons, and surfactants from sample matrices
IC-P	polyvinylpyrrolidone(PVP) polymer resin	40µm	350mg/ 1cc cartridge	To remove the phenolic fraction of humic acids, tannic acids, lignins, anthocyanins, and azodyes from samples.
IC-A	16% cross-linked,styrene-based,anion-exchangeresin in thebicarbonate form.	40µm	0.7meq/ 1cc cartridge	To remove anion contaminant and neutralize the strongly acidic sample solution.
IC-H	16% cross-linked,sulfonic acid ,sulfonic acid ,styrene-based,sulfonic acid ,cation-exchangeresin in thehydrogen form	40µm	2.0-2.2meq/ 1cc cartridge	To remove high levels of alkaline earths and transition metals from sample matrices and in the neutralization of highly alkaline samples such as sodium hydroxide or sodium carbonate.
IC-Na	16% cross-linked,sulfonic acid ,sulfonic acid ,styrene-based,sulfonic acid ,cation-exchangeresin in the sodium form.	40µm	2.0-2.2meq/1cc cartridge	To remove high levels of alkaline earths and transition metals from sample matrices without acidifying the sample. This ensures good recovery of acid labile analytes such as nitrite.
IC-Ag	16% cross-linked,styrene-based,sulfonic acid,cation-exchangeresin in the silverstyrene-based,styrene-based,form.	40µm	2.0-2.2meq/ 1cc cartridge	To remove chloride, bromide, and iodide from sample matrices. An IC- H cartridge should be used after the IC- Ag cartridge to remove dissolved Ag.
IC-Ba	styrene-based,sulfonic acid ,cation-exchangeresin in thebarium form.	40µm	2.0-2.2meq/ 1cc cartridge	To remove SO42- For reproducible, quantitative determinations in low-ionic-strength samples, these cartridges should be activated with a chloride-based activating solution. Then the added chloride need to be removed.

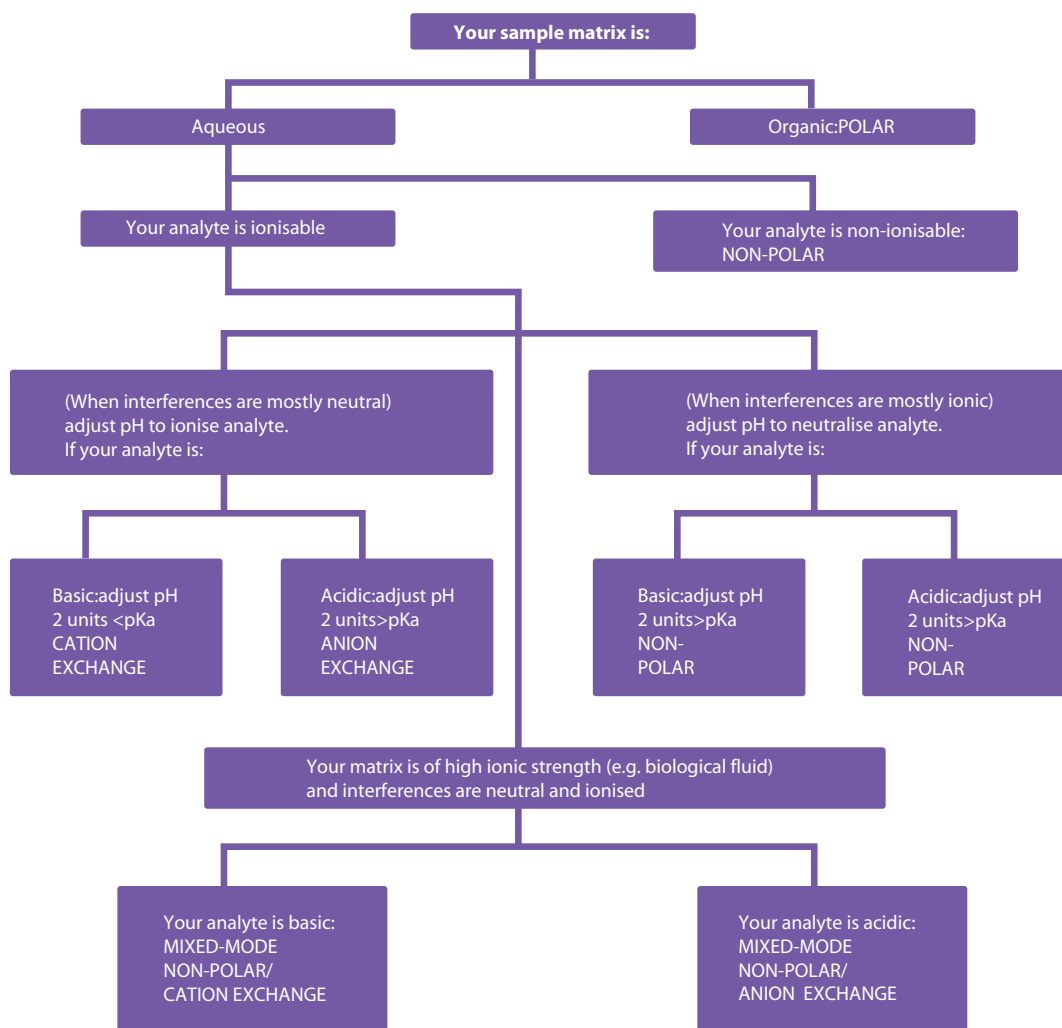
Part No.	Resin Type	Average particle size	Capacity	Application
IC-M	iminodiacetateresin in the ammonium form	40µm	0.4meqmg/1cc cartridge	To remove transition metals and matrix elimination of alkali and alkaline earth metals.
IC-Ag/H	It is a layered cartridge that contains IC- Ag resin and IC- H resin.			
IC-Ba/Ag/H	It is a layered cartridge that contains IC-Ba resin, IC- Ag resin and IC- H resin.			

## SPE Method Guideline

There are many factors influencing the method for SPE, and the following are the four main ones which must be considered:

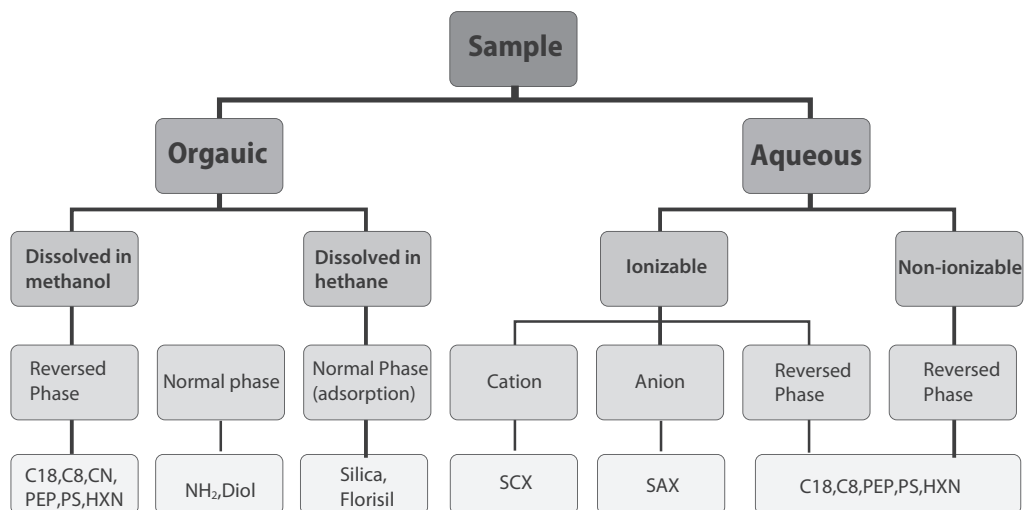
### 1. The Selection of Sorbent Retention Mechanism

The guide briefly outlines the decision making process required to choose a suitable extraction mechanism starting with understanding the sample matrix properties.



## 2. The Selection of SPE Columns

The guide page briefly outlines the decision making process required to choose a suitable sorbent.



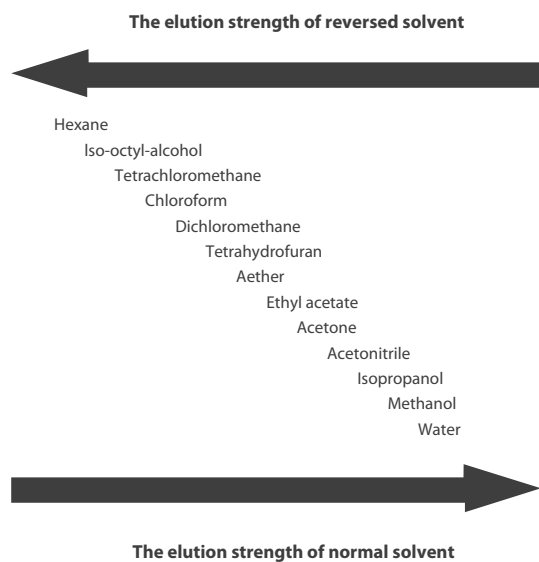
### The selection of column packaging and the parameter of sample loading and elution

For the normal phase and reversed phase SPE cartridges, the weight of the sample can not exceed 5% of cartridges load capacity. For the ion-exchange mode, the capacity of the ion-exchange must be considered.

Table below shows the capacity and elution parameters of SPE:

Specification	Loading Sample	The Minimum Volume of Elution
50mg/1mL	2.5mg	125µL
100mg/1mL	5mg	250µL
200mg/3mL	10mg	500µL
500mg/6mL	25mg	1.2mL
1g/6mL	50mg	2.4mL

## 3. The Selection of Ideal Elution Solvent



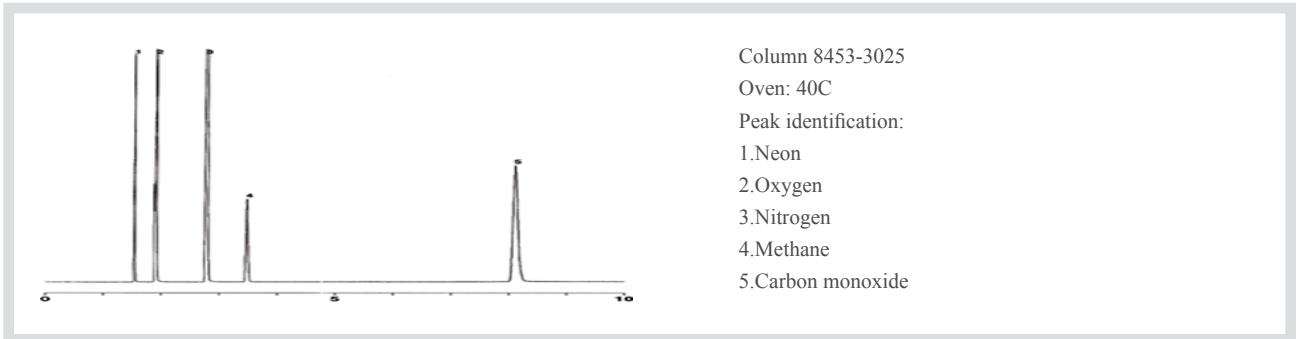
## Applications

Application*	Recommended SPE	Instrument
Oleic Acid in Human Plasma	Cleanert PAX, 30mg/mL	HPLC-MS
Pseudoephedrine Hydrochloride in Human Plasma	Cleanert PCX, 100mg/mL	HPLC-MS
Evodiamine and Rutecarpine in Human Serum	Cleanert C18, 200mg/3mL	LC-MS
Malachite Green in Salmon	Cleanert Alumina B; Cleanert SCX	HPLC
Clenbuterol in Urine	Mixed Phase SPE Cleanert C18/SCX 500mg/3mL	LC-MS
Chloramphenicol	Cleanert Florisil 1000mg/6mL	LC-MS
Seven Hydroxybenzenes in Water	Cleanert PEP, 4 nitrophenol	HPLC
Nitroanilines	Cleanert PEP	HPLC (Venusil AQ-C18)
Aniline	Cleanert PEP	HPLC (Venusil AQ-C18)
N,N-dimethylaniline	Cleanert PEP	HPLC (Venusil AQ-C18)
Praziquantel	Cleanert PEP	HPLC (Venusil AQ C18)
Gliclazide	Cleanert PEP	HPLC (Promosil C18)

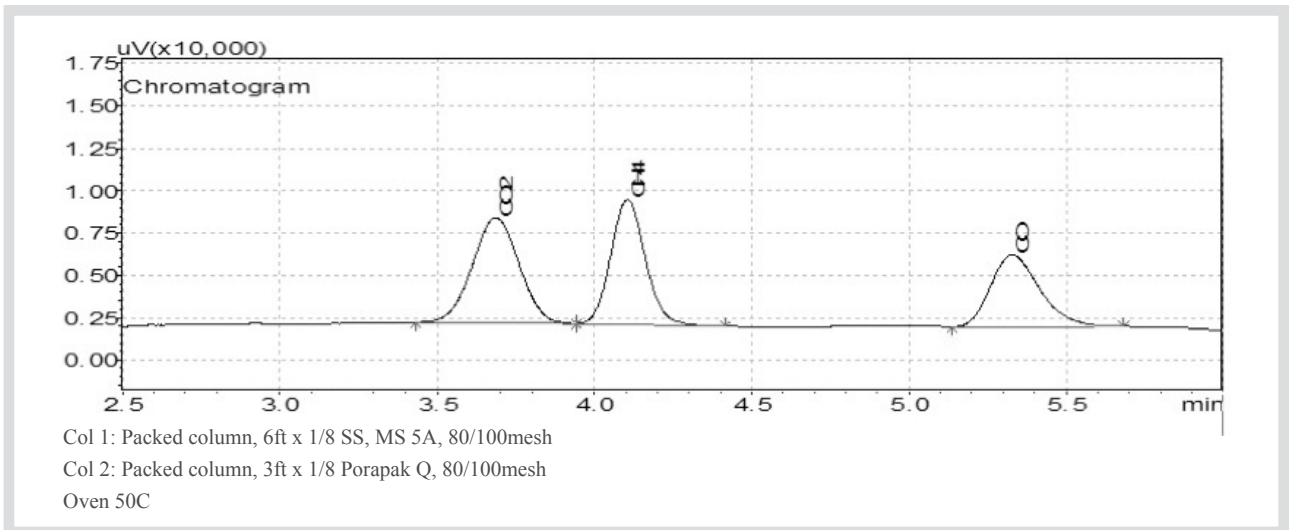
\*Please contact GS-Tek for specifics

# Petroleum and petrochemicals

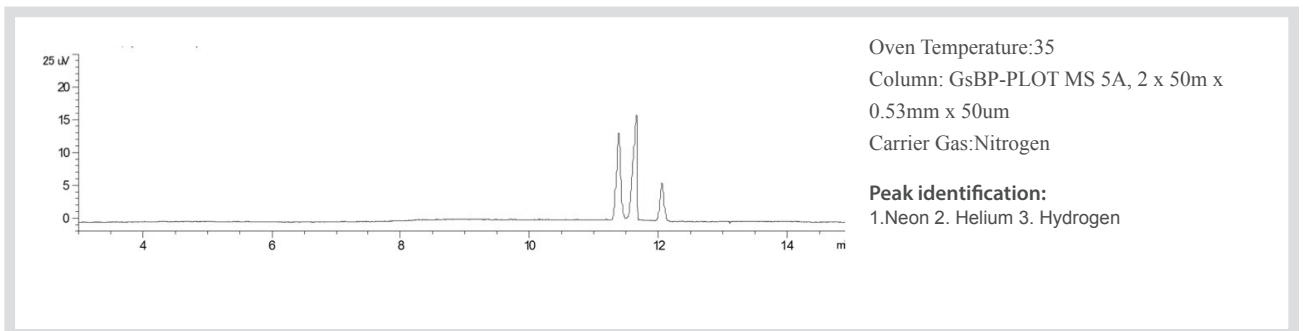
## 1. Gases \* Fixed gases



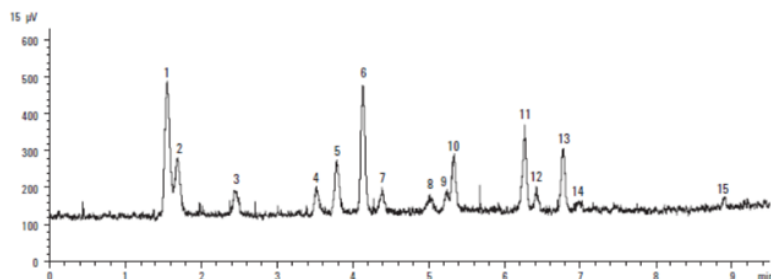
## • CO/CO2 Separations



## • Nobel gas separations



## •Sulfurs (a)Low level Sulfurs in Helium

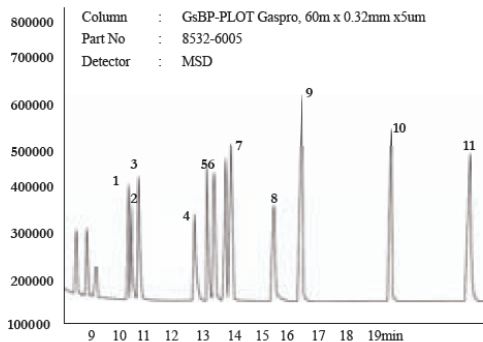


Column: 0153-6050, GsBP-1,  
60m x 0.53mm x 5um  
Oven: 30C 1.5min, 15C/min to  
200C  
Detector: SCD  
Sample: 1ml loop

### Peak identification:

- |   |  |   |
|---|--|---|
| 1. Hydrogen sulfide H <sub>2</sub> S                  | 7. 2-propanethiol CH <sub>3</sub> SHC <sub>2</sub> H <sub>5</sub>                    | 13. Methyl ethyl sulfide CH <sub>3</sub> SCH <sub>2</sub> CH <sub>3</sub>           |
| 2. Carbonyl sulfide COS                               | 8. Tert-butyl mercaptan (CH <sub>3</sub> ) <sub>3</sub> CSH                          | 14. 2-methyl-1-propanethiol<br>(CH <sub>3</sub> ) <sub>2</sub> CHCH <sub>2</sub> SH |
| 3. Methyl mercaptan CH <sub>3</sub> SH                | 9. 1-propanethiol CH <sub>3</sub> (CH <sub>2</sub> ) <sub>2</sub> SH                 | 15. 1-methyl-1-propanethiol<br>CH <sub>3</sub> CH <sub>2</sub> CHSHCH <sub>3</sub>  |
| 4. Ethyl mercaptan CH <sub>4</sub> CH <sub>3</sub> SH | 10. Thiophene C <sub>4</sub> H <sub>4</sub> S  |   |
| 5. Dimethyl sulfide CH <sub>3</sub> SCH <sub>3</sub>  | 11. n-butanethiol CH <sub>3</sub> (CH <sub>2</sub> ) <sub>3</sub> SH                 |   |
| 6. Carbon disulfide CS <sub>2</sub>                   | 12. Diethyl sulfide CH <sub>3</sub> CH <sub>2</sub> SCH <sub>2</sub> CH <sub>3</sub> |   |

## (b) Sulfur separations

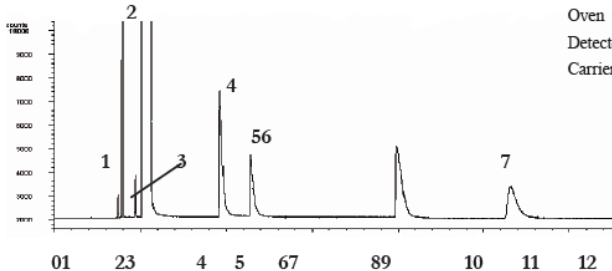


Column : GsBP-PLOT Gaspro, 60m x 0.32mm x 5um  
Part No : 8532-6005  
Detector : MSD

### Peak identification

- |                            |                           |
|----------------------------|---------------------------|
| 1. Thiobis-methane         | 7. Dimethylbisulfide      |
| 2. 2-Propanethiol          | 8. 2-Methyl-2-butanethiol |
| 3. 1-Propanethiol          | 9. 1-Pentanethiol         |
| 4. 2-Methyl-2-propanethiol | 10. Diethyl disulfide     |
| 5. 2-Methyl-propanethiol   | 11. 1-Heptanethiol        |
| 6. 2-Butanethiol           |                           |

## • Amines



Column : GsBP-PLOT U, 30m x 0.53mm x 20um,  
Part No : 8753-3020  
Injection : 1.0ul injection, 250°C  
Oven : 150C(1min) 10C/min to 190C(5min)  
Detector : TCD 200C  
Carrier : Hydrogen at 40cm/sec constant pressure

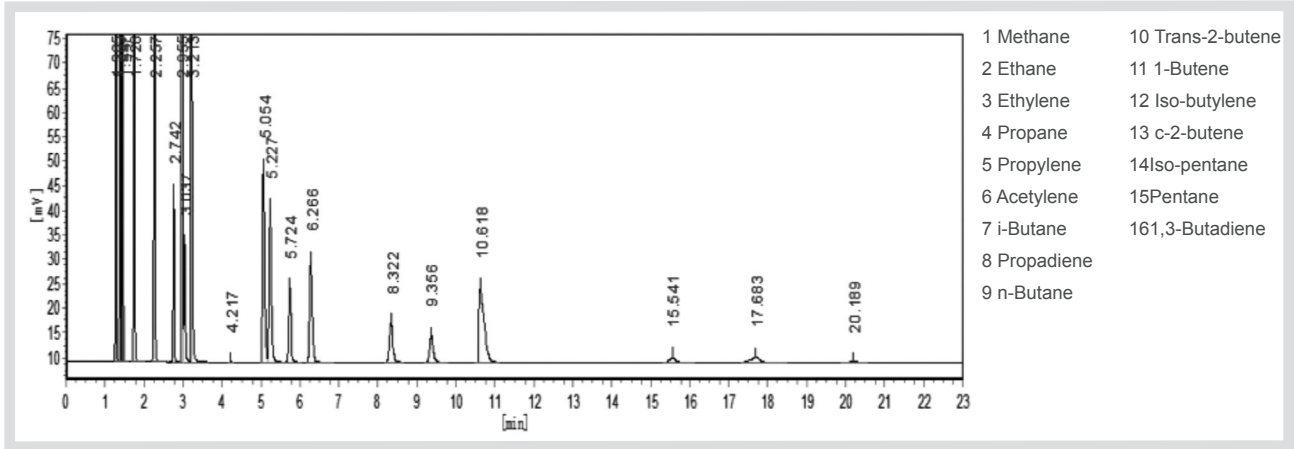
### Peak identification

- |                    |
|--------------------|
| 1. Air             |
| 2. Ammonia         |
| 3. Water           |
| 4. Isopropyl amine |
| 5. Triethyl amine  |
| 6. Propylamine     |
| 7. Butylamine      |

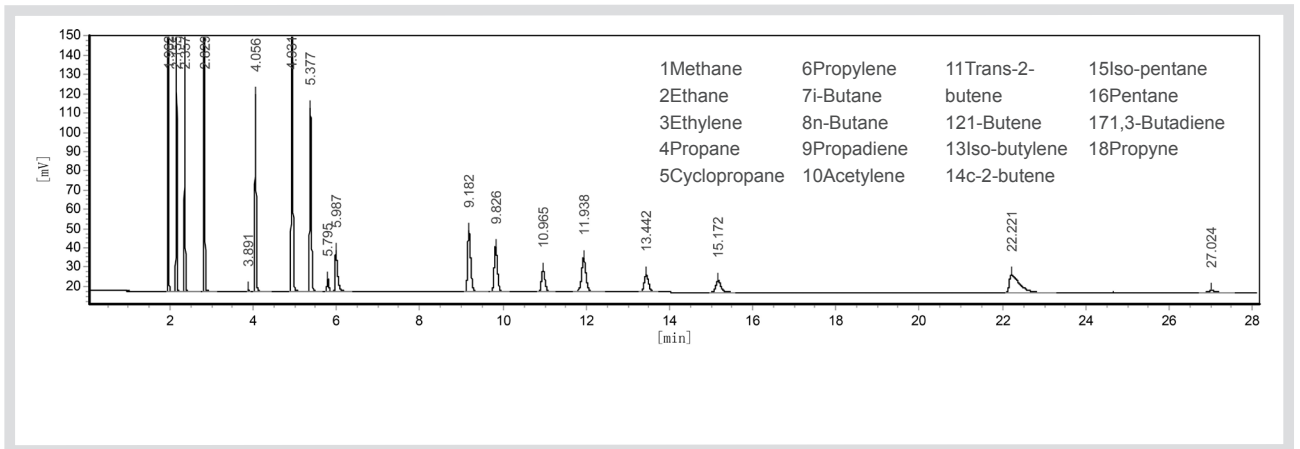
## 2. Light Hydrocarbons

### (a) C1 to C6 Separations on Al<sub>2</sub>O<sub>3</sub> PLOT Columns:

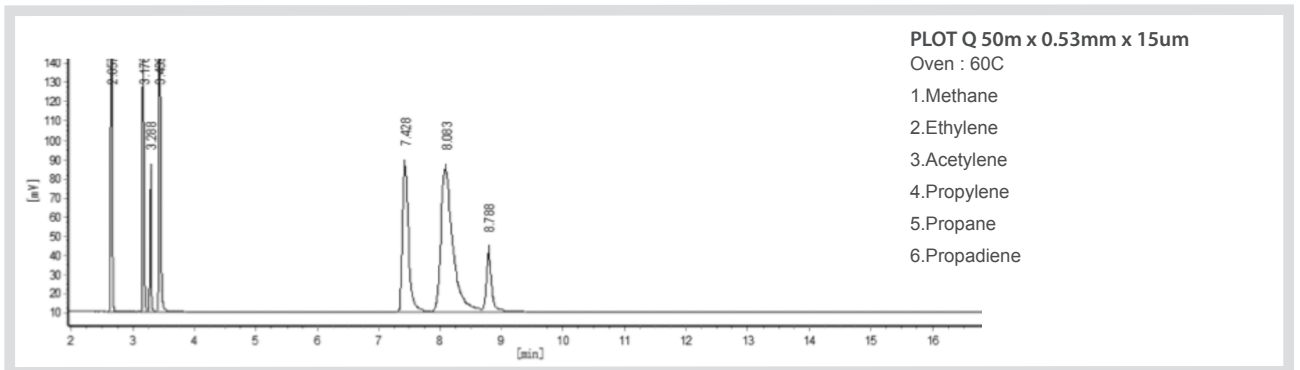
#### (i) KCL column



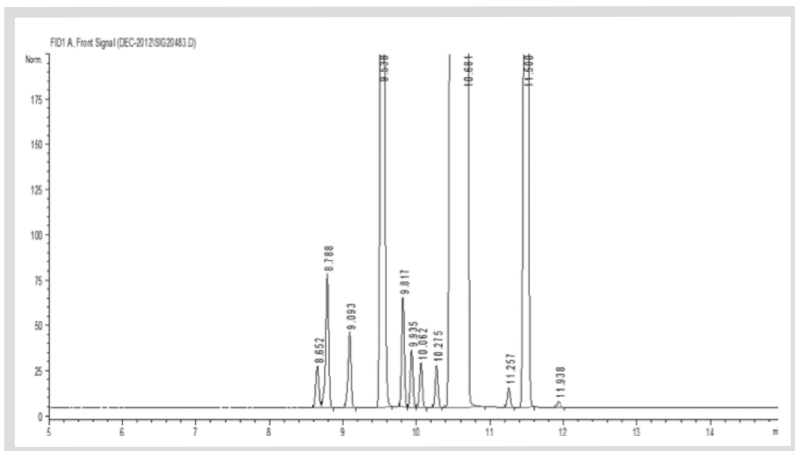
#### (ii) "S" Column



#### (iii) PLOT Q column



## (iv) GsBP-1 type column

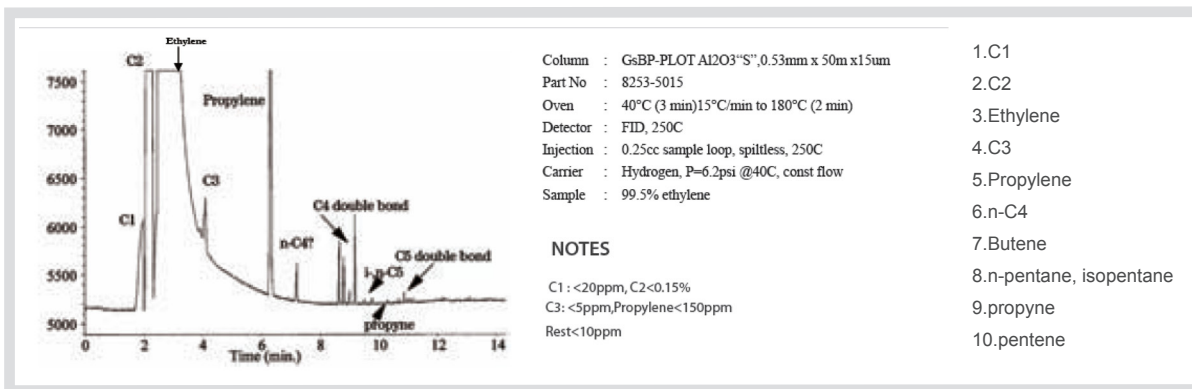


9006-PONA GsBP-PONA, 100m x 0.25mm x 0.5um  
Oven: 38C

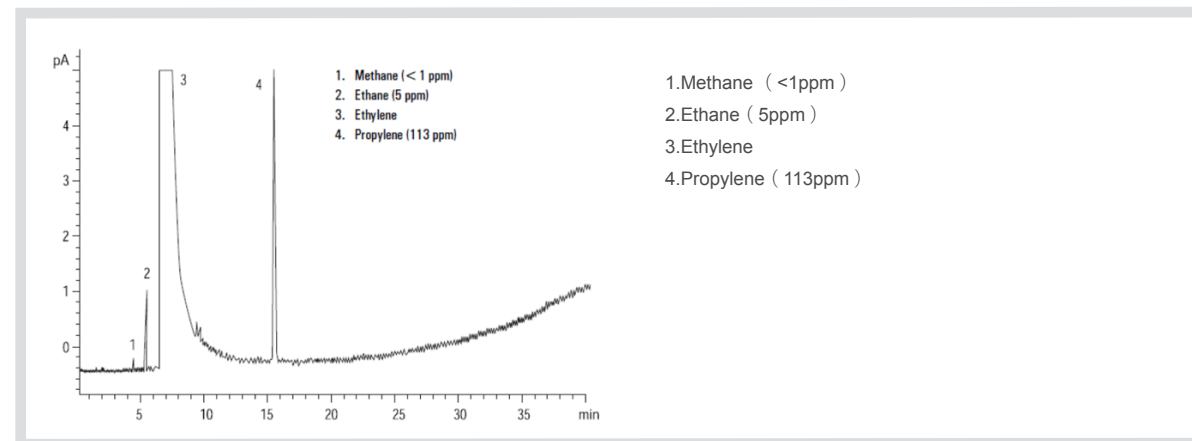
Peak No.	Compound	Retention Time (min)
1	Methane	8.652
2	Ethane	8.788
3	Propane	9.093
4	Methanol	9.538
5	i-Butane	9.817
6	n-Butane	9.935
7	t-Butene/Butene-1	10.062
8	cis-2-Butene	10.275
9	Ethanol	10.681
10	Iso-Pentane	11.257
11	iso-Propyl alcohol	11.500
12	N-pentane	11.938

## (b) Ethylene:

### (i) Blending sample

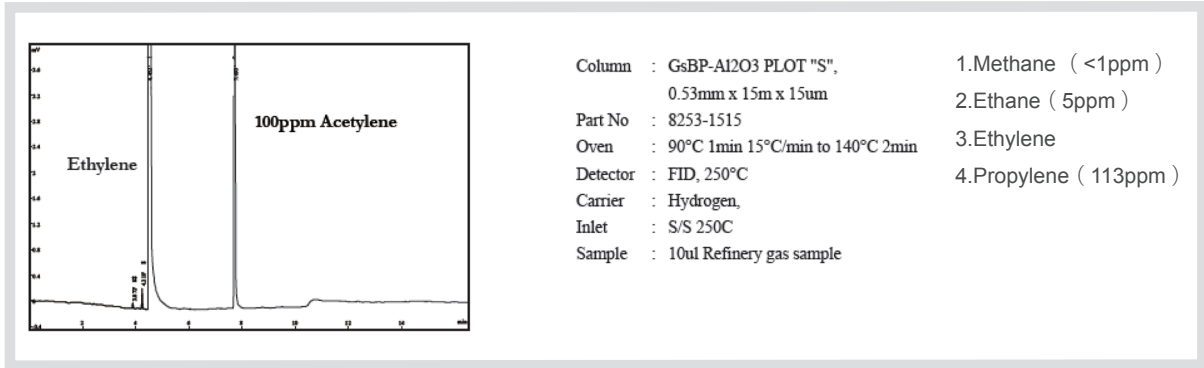


### (II) Crude sample

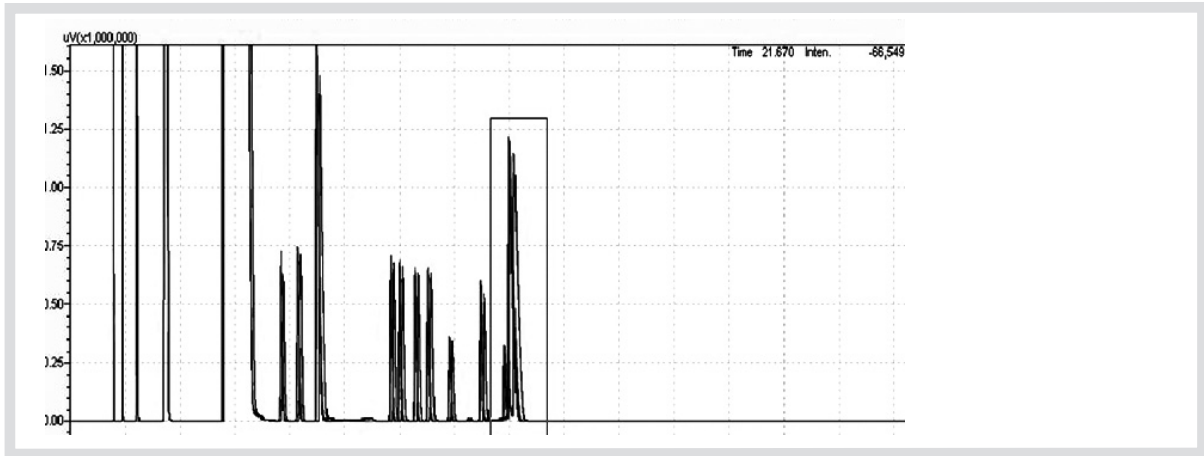




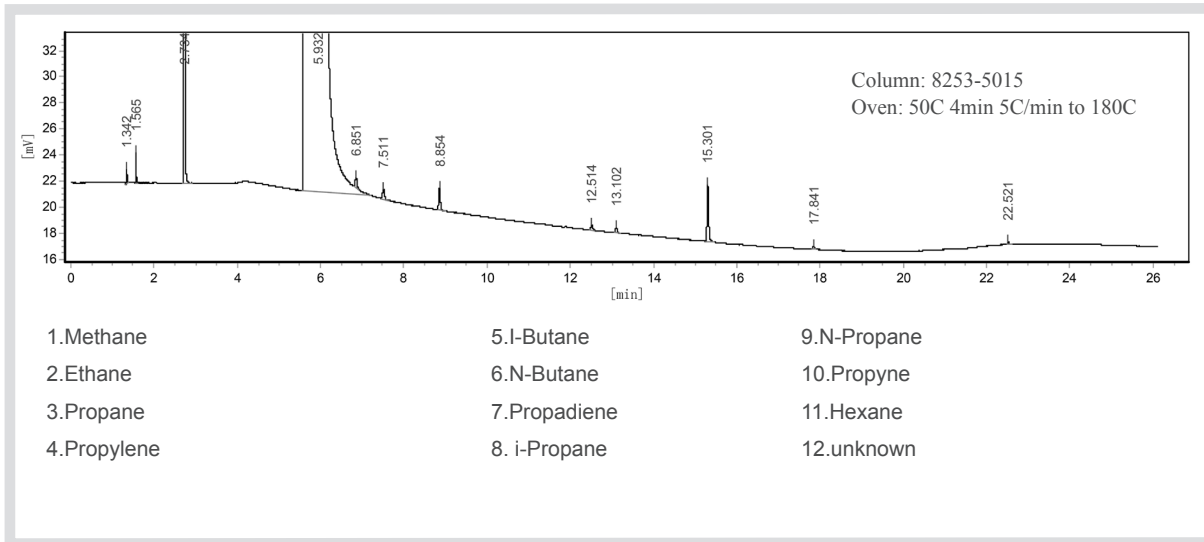
(ii) 1000ppm acetylene in Ethylene



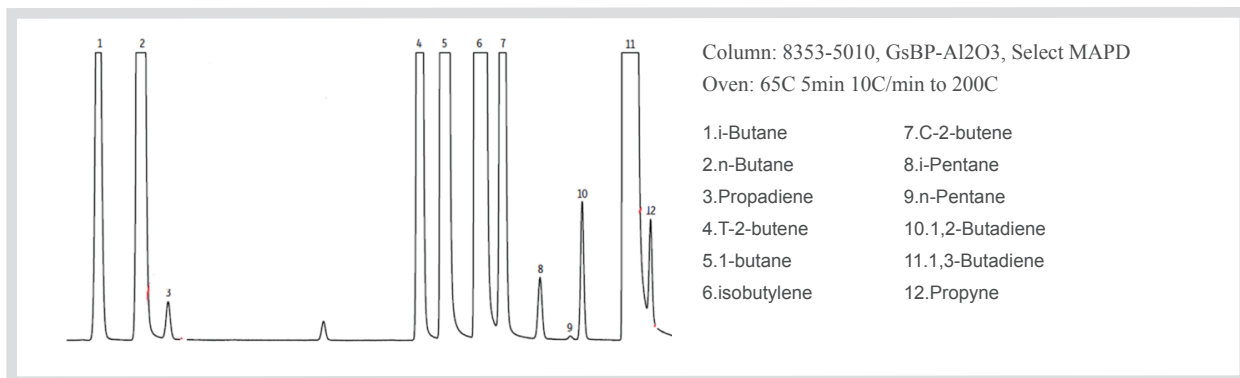
(c) Propylene



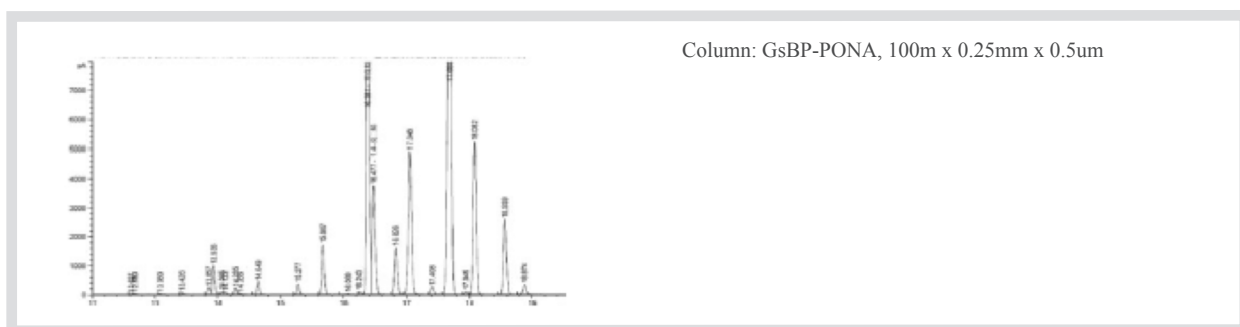
(d) MPS (crude propylene)



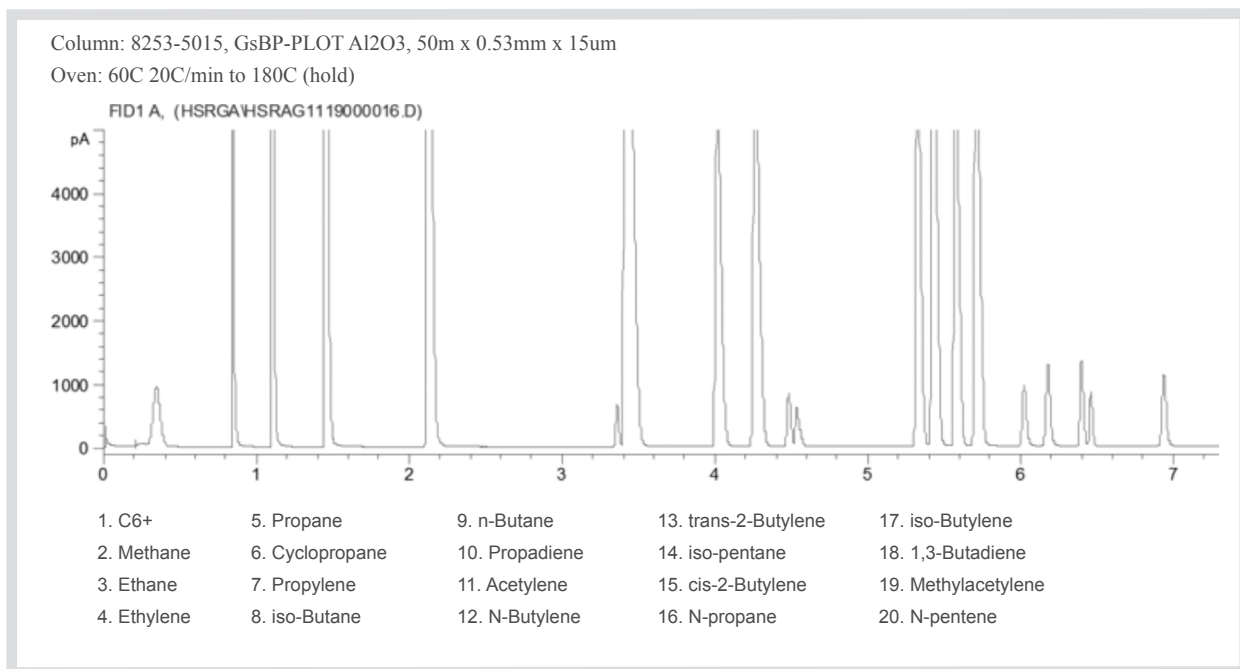
## (e) 1,3-Butadiene



## (f) Pentenes

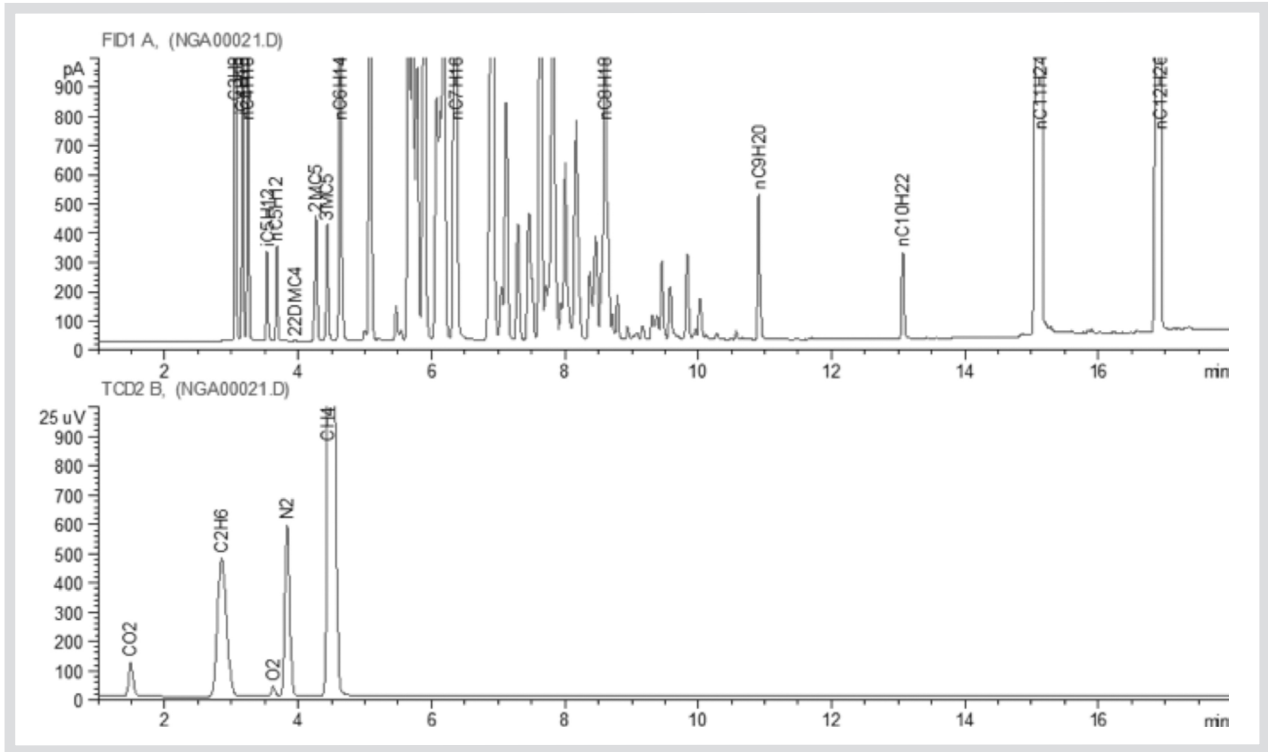


## (g) Fast RGA: (7.5min)



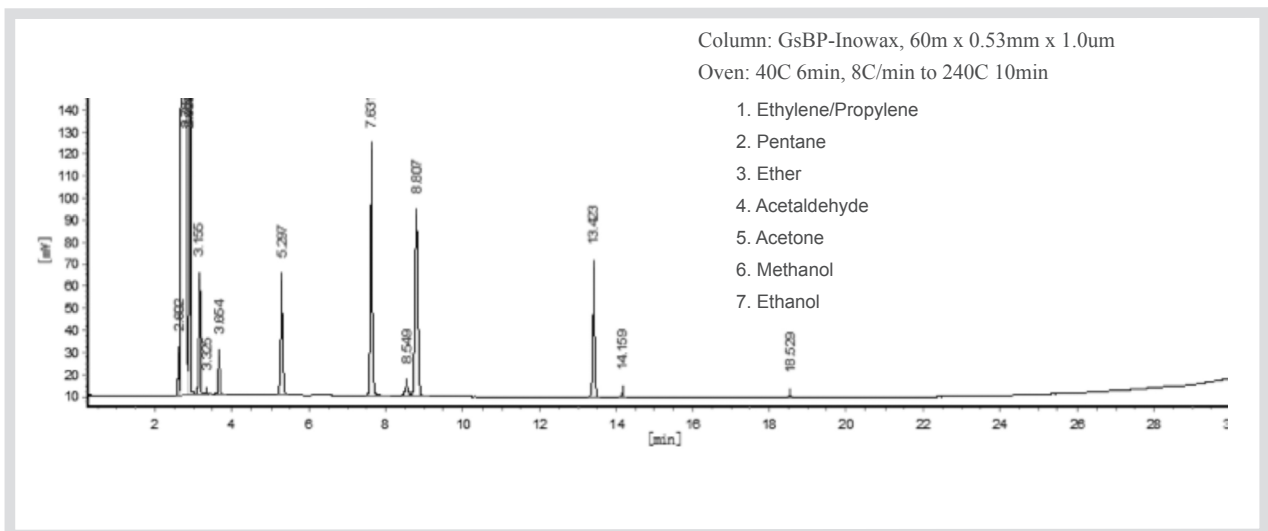
(i) Extended Natural Gas:

GsBP-PONA 100m x 0.25mm x 0.5um

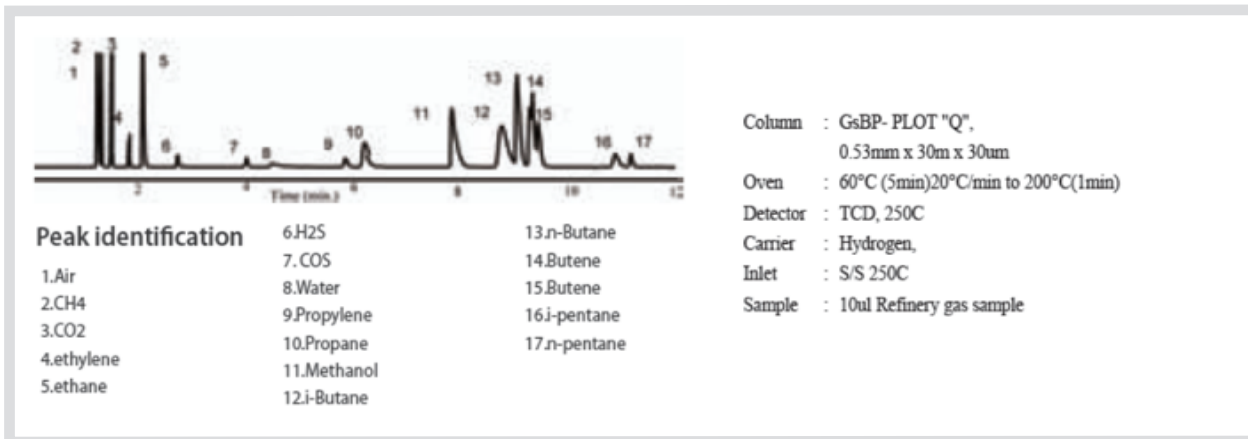


(j) Oxygenates in Hydrocarbon Stream:

(a) Alcohols



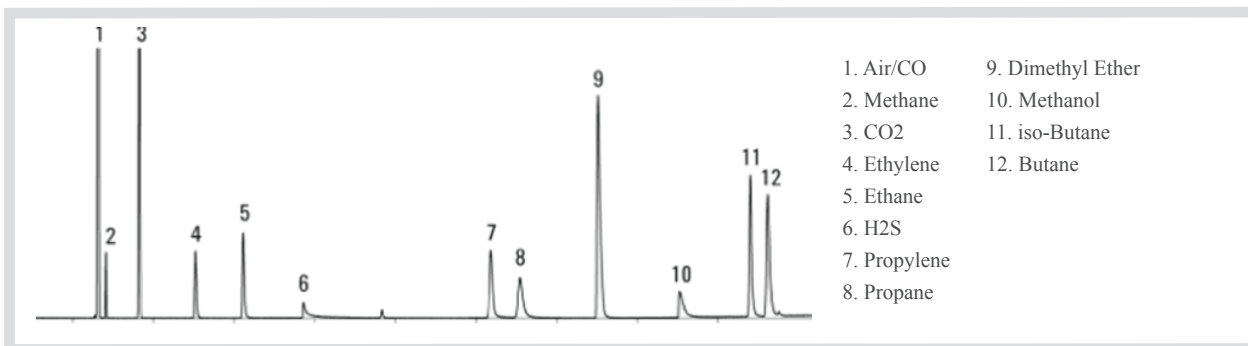
## (b) Sulfurs/Water



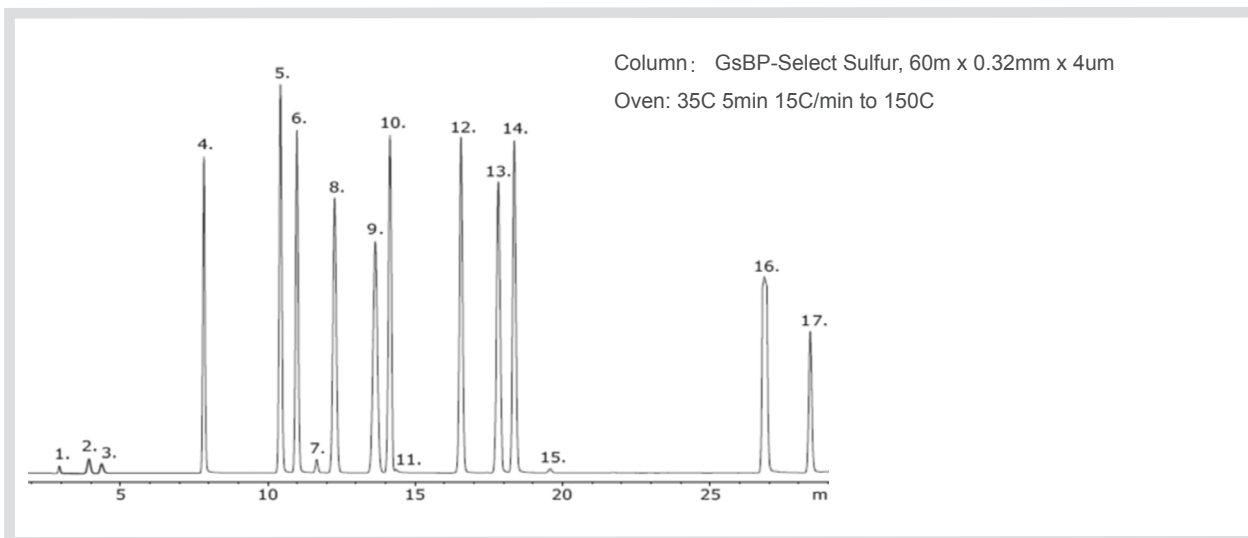
## (c) Dimethyl ether

Column, GsBP-PLOT Q, 30m x 0.53mm x 30um

Oven: 30C, 5min 30C/min to 75C (4min) 10C/min to 180C.

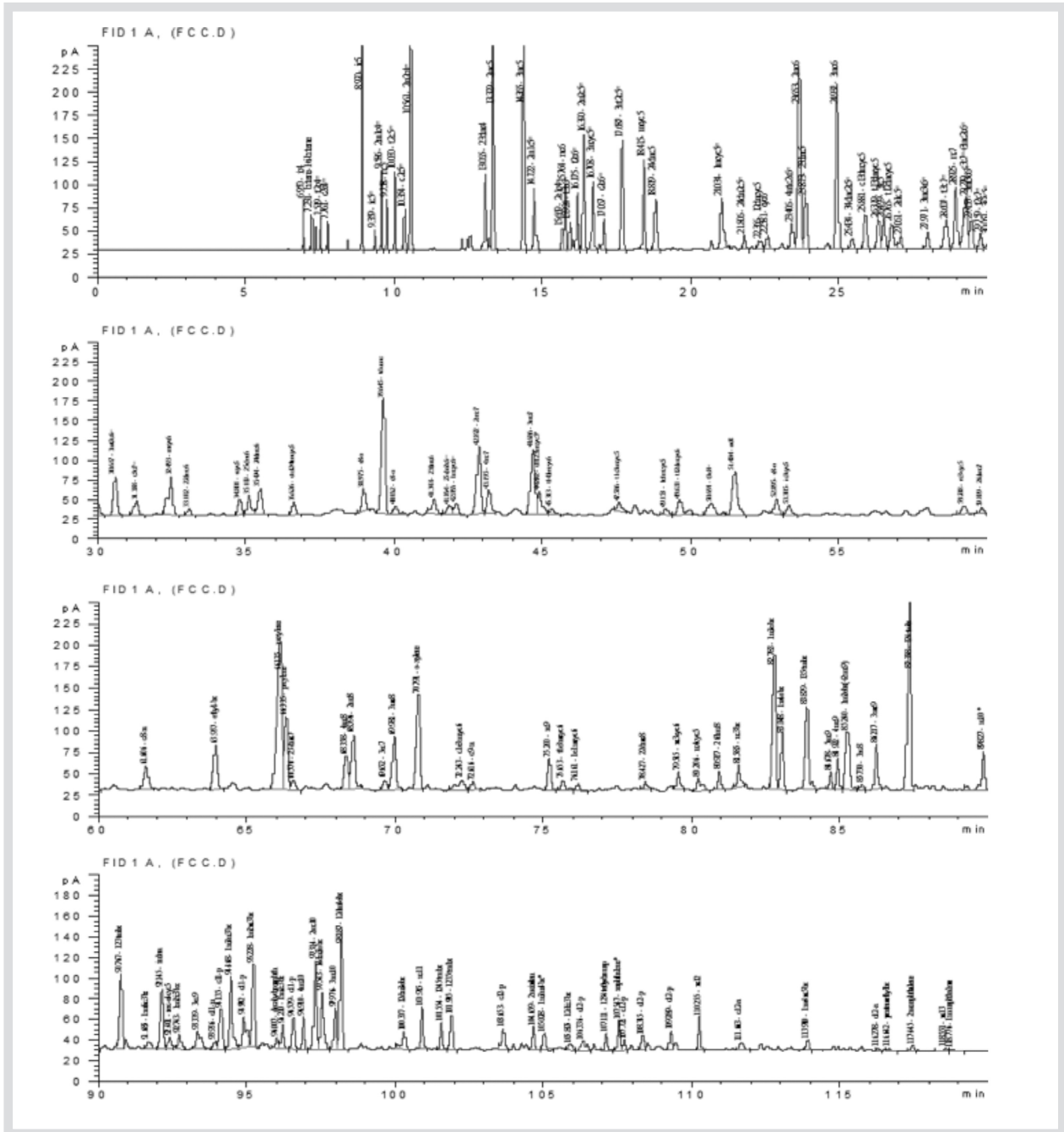


## (d) Sulfurs

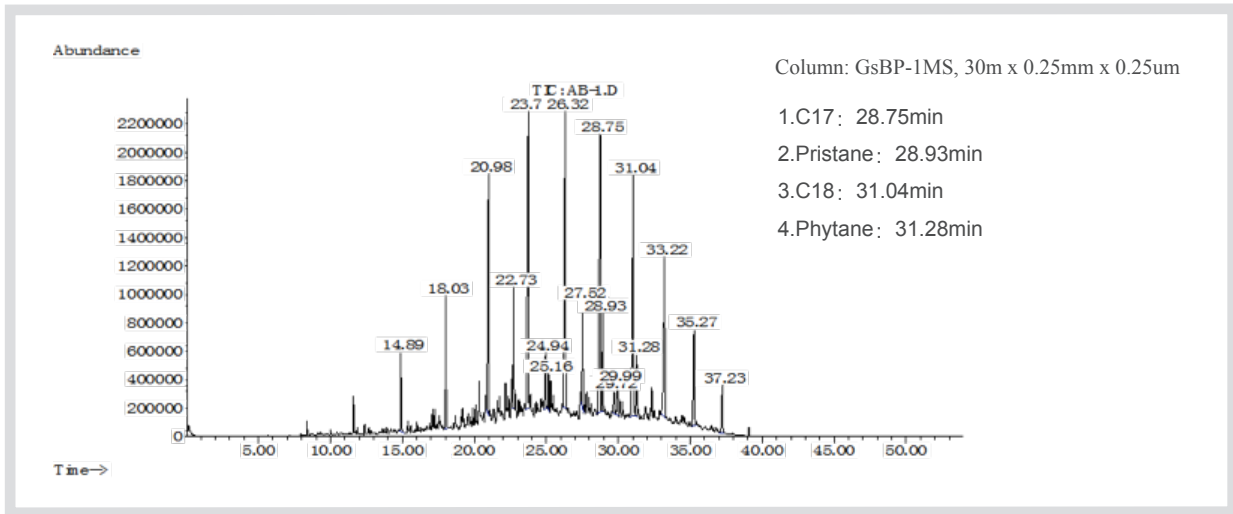


### 3. Oils:

#### (a) Gasoline:



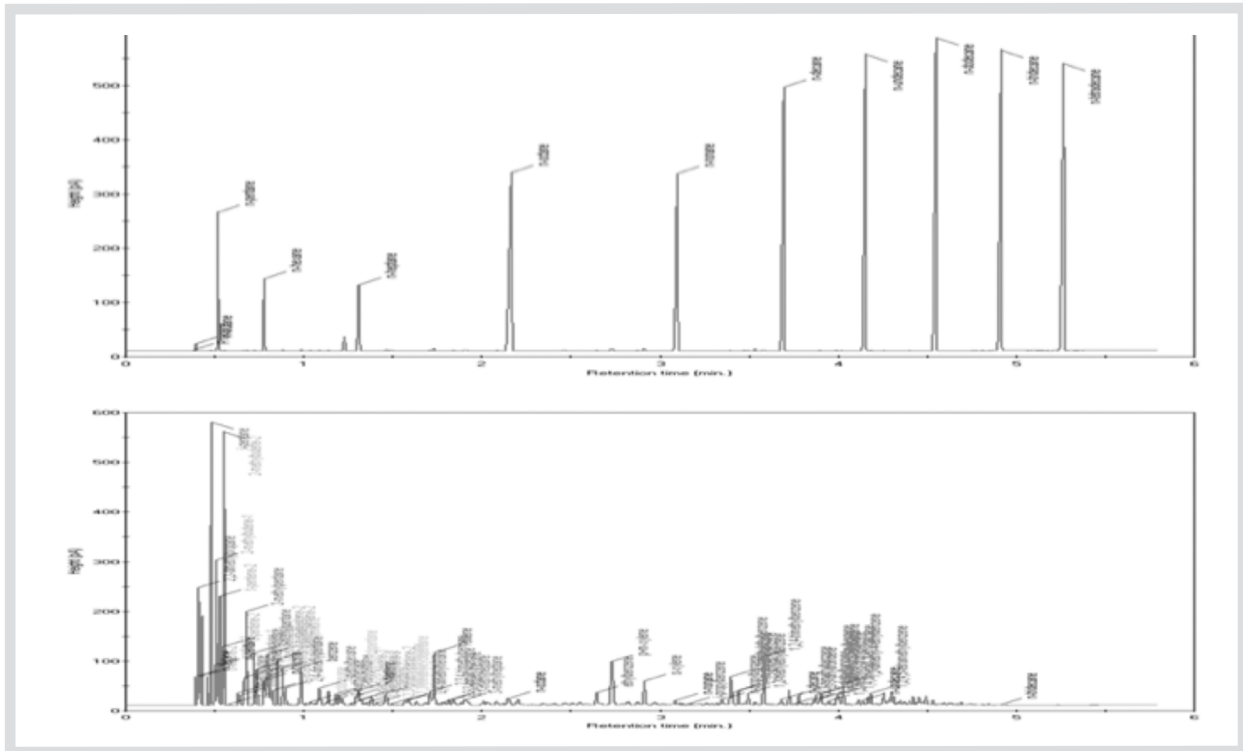
(b) Diesel:



(c) Fast DHA with 100um ID column

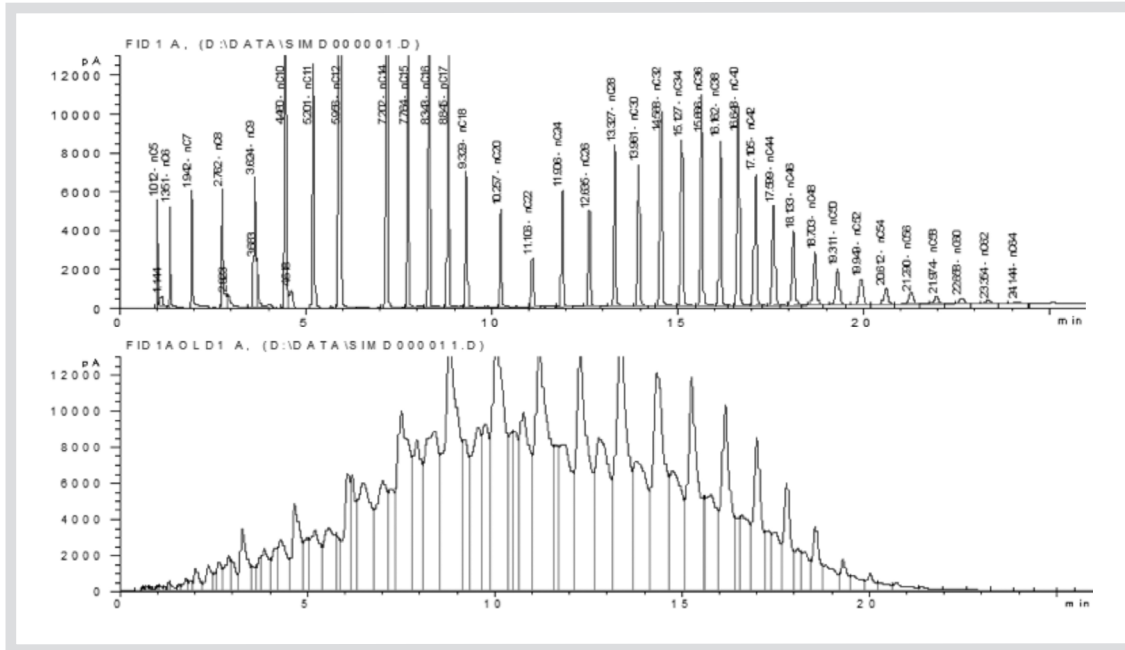
Column: GsBP-Sim-Dis, 10m x 0.10mm x 0.2um

Oven: 35C 0.65min 100C/min to 45C 0.75min 100C/min to 60C 0.75min 50C/min to 230C 0.5min. Total time: 6.3min

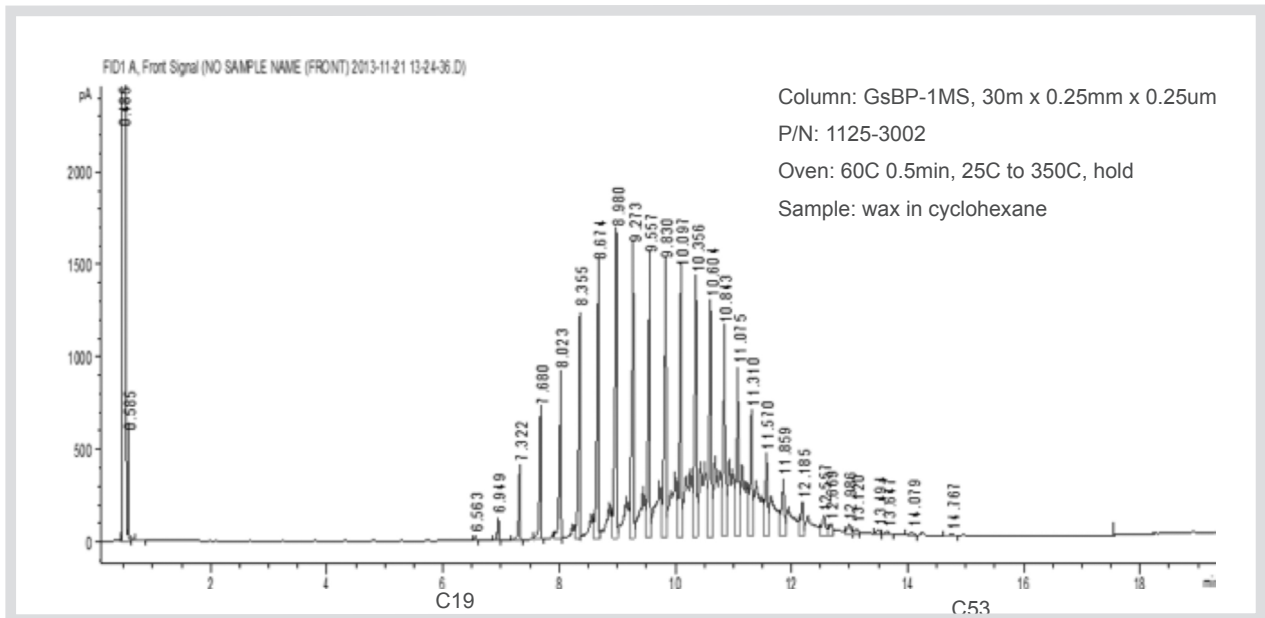


© Sim\_dis  
 (k) High temp Sim-Dis

Column: GsBP-Sim-Dis, 10m x 0.53mm x 0.5um, Metal column,  
 Oven: 35C 1min 10C/min to 350C 5min 5C/min to 400C 5min.

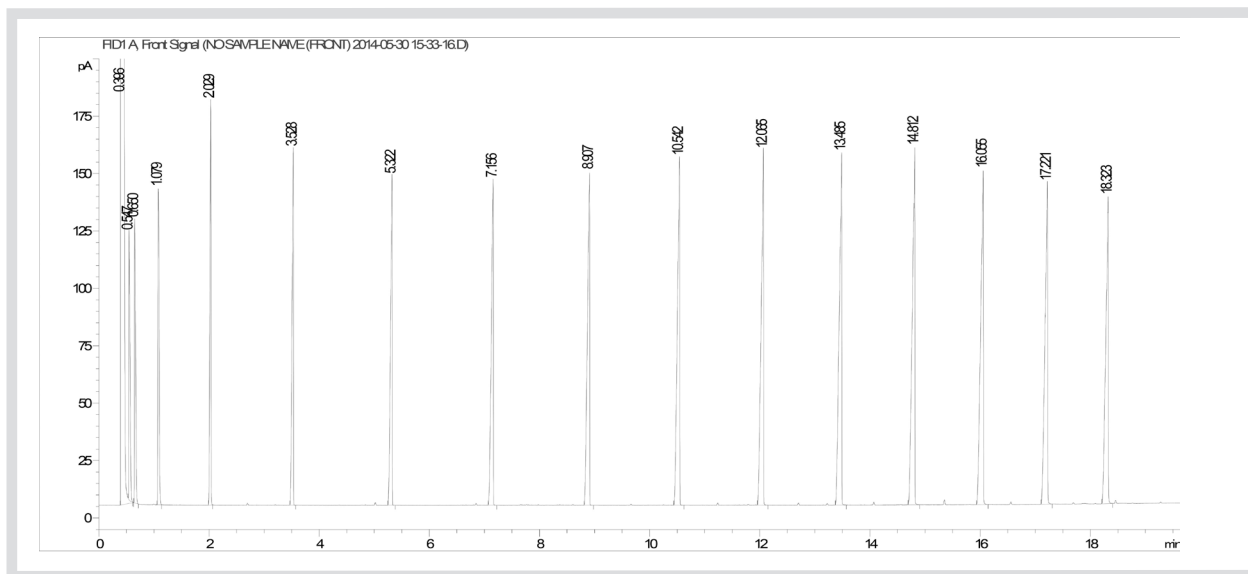


(ii) Paraffin Wax:



## (I) Extended: C9 to C36 with 100um ID column

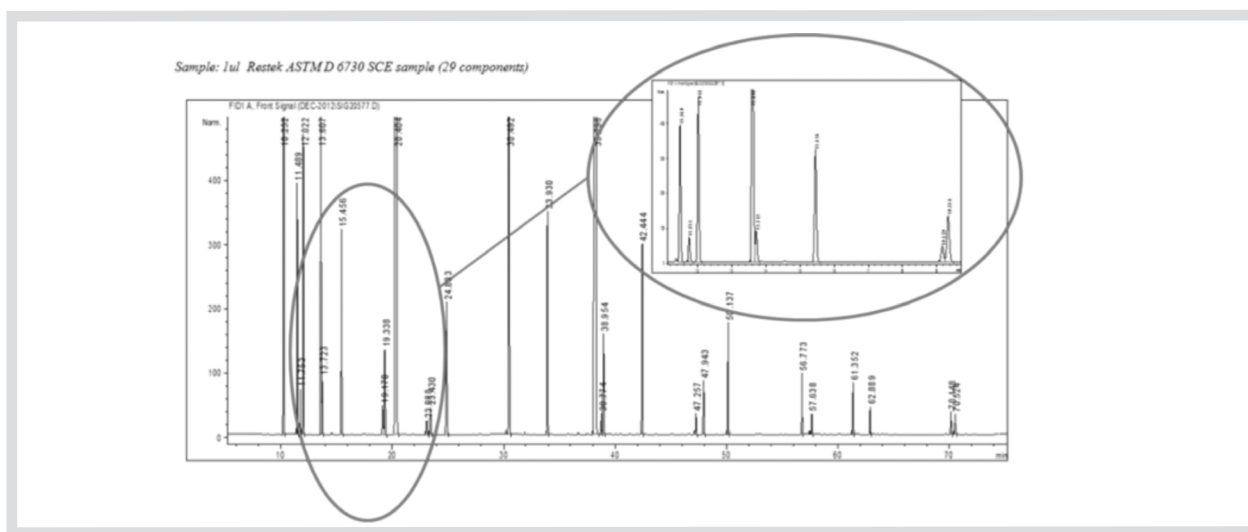
• Oven: 150 ° C (hold 1 min) to 340 ° C 15min



## Spark Engine fuel (ASTM D6730-1)

Column: GsBP-PONA, 100m x 0.25mm x 0.5um

Oven: 50°C (hold 27 minutes) to 100°C at 22°C/min (hold 27 minutes) to 160°C at 3°C/min (hold 10 minutes) to 320°C at 5°C/min (hold 10 minutes)



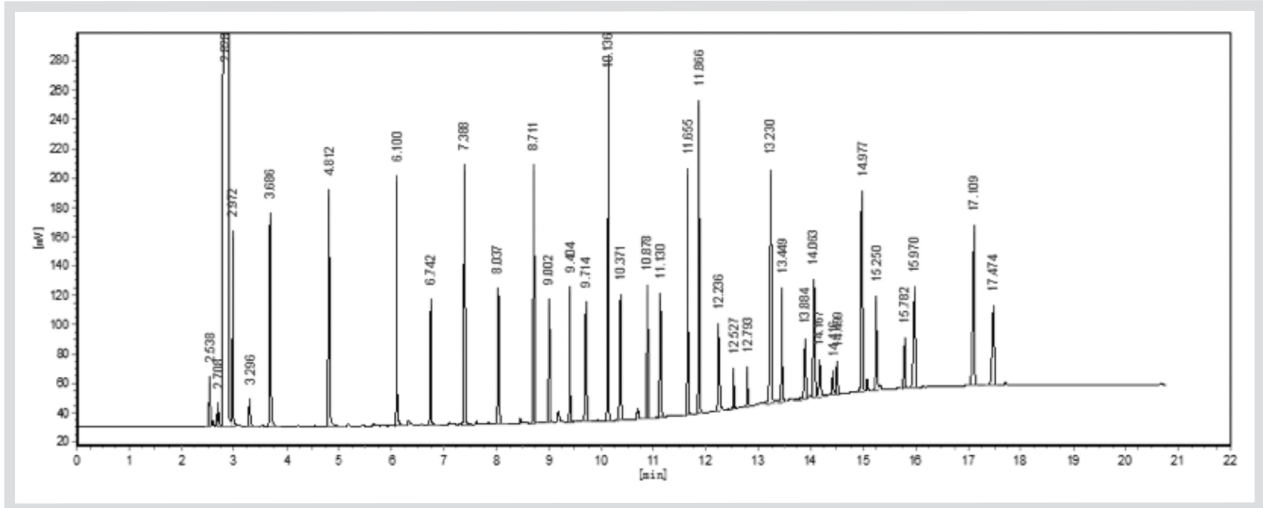
- |                                  |                                   |                           |                           |                               |
|----------------------------------|-----------------------------------|---------------------------|---------------------------|-------------------------------|
| 1.Ethanol                        | 7.n-Hexane                        | 13.n-Heptane              | 19.p-Xylene               | 25.1,2,3,5-Tetramethylbenzene |
| 2.n-Pentane                      | 8.1-Methylcyclopentene            | 14.2,2,3-Trimethylpentane | 20.n-Nonane               | 26.Naphthalene                |
| 3.Tert-butanol                   | 9.Benzene                         | 15.Toluene                | 21.5-Methylnonane         | 27.Dodecane                   |
| 4.2-methylbutene-2               | 10.Cyclohexane                    | 16.n-Octane               | 22.1-Methyl-2-ethylbenzen | 28.1-Methylnaphthalene        |
| 5.Methyl Tert Butyl Ether (MTBE) | 11.3-Ethylpentane                 | 17.Ethylbenzene           | 23.n-Decane               | 29.Tridecane                  |
| 6.2,3-Dimethylbutane             | 12.trans-1,2-Dimethylcyclopentane | 18.2,3-Dimethylheptane    | 24.Undecane               |                               |



## FAMES

Column: GsBP-FAMEWax 60m x 0.25mm x 0.25um

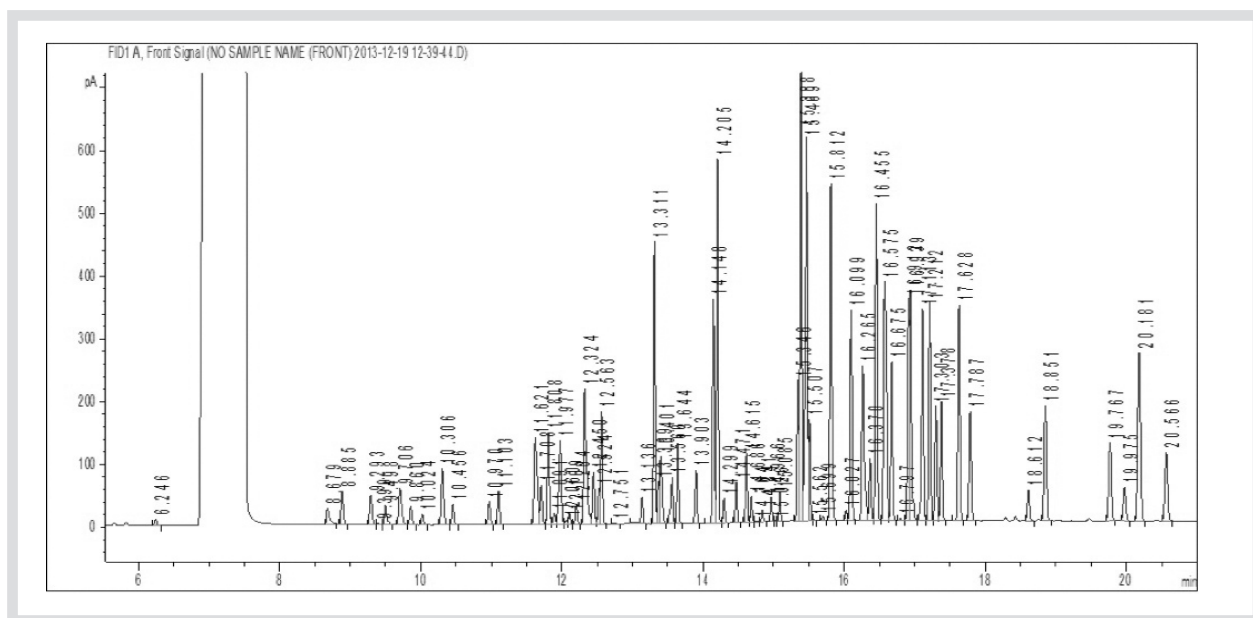
Oven: 100 ° C (1min) 25° C/min to 200° C 10Cmin to 280C hold



1C4:0	9C14:1(cis-9)	17C18:1(trans-9)	25C20:2(all-cis-11,14,)	33C22:2(all-cis-13,16)
2C6:0	10C15:0	18C18:1(cis-9)	26C20:3(all-cis-8,11,14)	34C22:6 (all-
3C8:0	11C15:1(cis-10)	19C18:2(all-trans-9,12)	27C20:3(all-cis-11,14,17)	cis-4,7,10,13,16,19)
4C10:0	12C16:0	20C18:2(all-cis-9,12)	28C20:4(all-cis-5,8,11,14)	35C23:0
5C11:0	13C16;1(cis-9)	21C18:3(all-cis-6,9,12)	29C20:5(all-cis-5,8,11,14,17)	36C24:0
6C12:0	14C17:0	22C18:3(all-cis-9,12,15)	30C21:0	37C24:1(cis-15)
7C13:0	15C17:1(cis-10)	23C20:0	31C22:0	
8C14:0	16C18:0	24C20:1(cis-11)	32C22:1(cis-13)	

# Environmental

## 1. 8260 Analysis



- |   |  |                                   |  |
|---|--|-----------------------------------|--|
| 1. Vinyl chloride                           | 22. 1,1,1-Trichloroethane                  | 43. 1,1,2-Trichloroethane         | 64. 2-Chlorotoluene                    |
| 2. Diethyl ether (ethyl ether)              | 23. Dibromofluoromethane                   | 44. Tetrachloroethene             | 65. 1,3,5-Trimethylbenzene             |
| 3. 1,1-Dichloroethene                       | 24. Carbon tetrachloride                   | 45. 1,3-Dichloropropane           | 66. 4-Chlorotoluene                    |
| 4. 1,1,2-Trichlorotrifluoroethane (CFC-113) | 25. 1,1-Dichloropropene                    | 46. Dibromochloromethane          | 67. tert-Butylbenzene                  |
| 5. Iodomethane (methyl iodide)              | 26. 1,2-Dichloroethane-d4                  | 47. 1,2-Dibromoethane (EDB)       | 68. Pentachloroethane                  |
| 6. Carbon disulfide                         | 27. Benzene                                | 48. Chlorobenzene                 | 69. 1,2,4-Trimethylbenzene             |
| 7. Acetonitrile                             | 28. 1,2-Dichloroethane                     | 49. Ethylbenzene                  | 70. sec-Butylbenzene                   |
| 8. Allyl chloride (3-chloropropene)         | 29. Isobutyl alcohol (2-methyl-1-propanol) | 50. 1,1,1,2-Tetrachloroethane     | 71. 4-Isopropyl toluene (p-Cymene)     |
| 9. Methylene chloride (dichloromethane)     | 30. Trichloroethene                        | 51. m-Xylene                      | 72. 1,3-Dichlorobenzene                |
| 10. Acrylonitrile                           | 31. 1,2-Dichloropropane                    | 52. p-Xylene                      | 73. 1,4-Dichlorobenzene                |
| 11. trans-1,2-Dichloroethene                | 32. Methyl methacrylate                    | 53. o-Xylene                      | 74. n-Butylbenzene                     |
| 12. 1,1-Dichloroethane                      | 33. 1,4-Dioxane                            | 54. Styrene                       | 75. 1,2-Dichlorobenzene                |
| 13. Chloroprene (2-chloro-1,3-butadiene)    | 34. Dibromomethane                         | 55. Bromoform                     | 76. 1,2-Dibromo-3-chloropropane (DBCP) |
| 14. cis-1,2-Dichloroethene                  | 35. 2-Chloroethanol                        | 56. Isopropylbenzene (cumene)     | 77. Nitrobenzene                       |
| 15. 2,2-Dichloropropane                     | 36. Bromodichloromethane                   | 57. cis-1,4-Dichloro-2-butene     | 78. 1,2,4-Trichlorobenzene             |
| 16. Propionitrile                           | 37. 2-Nitropropane                         | 58. 1-Bromo-4-fluorobenzene (BFB) | 79. Hexachloro-1,3-butadiene           |
| 17. Methyl acrylate                         | 38. cis-1,3-Dichloropropene                | 59. 1,1,2,2-Tetrachloroethane     | 80. Naphthalene                        |
| 18. Methacrylonitrile                       | 39. Toluene-d8                             | 60. trans-1,4-Dichloro-2-butene   | 81. 1,2,3-Trichlorobenzene             |
| 19. Bromochloromethane                      | 40. Toluene                                | 61. Bromobenzene                  |  |
| 20. Tetrahydrofuran                         | 41. trans-1,3-Dichloropropene              | 62. 1,2,3-Trichloropropane        |  |
| 21. Chloroform                              | 42. Ethyl methacrylate                     | 63. n-Propylbenzene               |  |

## 2. 8270Analysis

GC: Agilent 7890 w/ FID

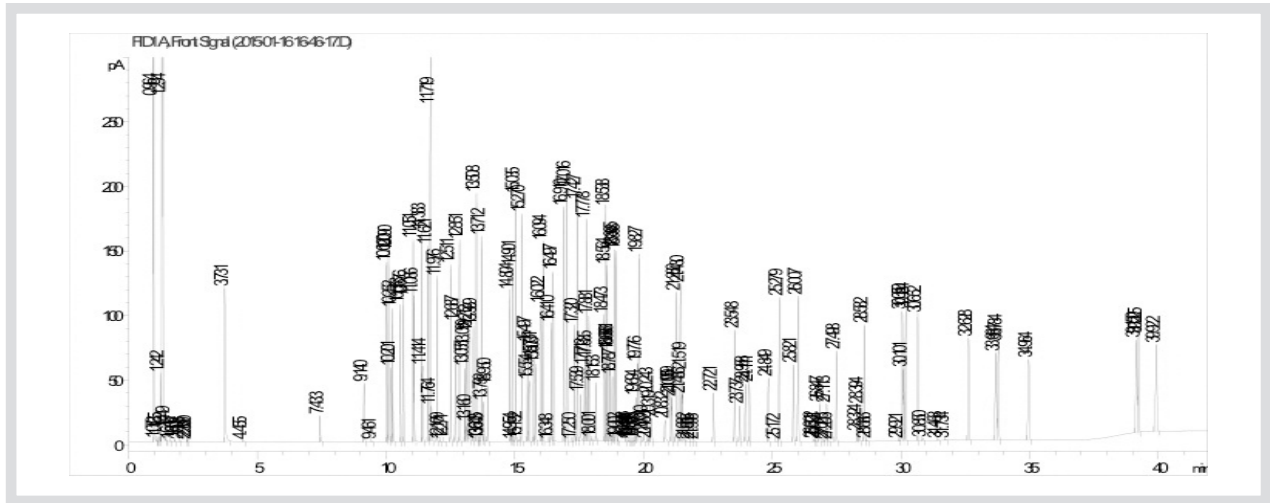
Column: GsBP-5Ms, 30 m x 0.25 mm I.D., 0.5 µm(cat.# 1525-3005)

Oven: 40°C (hold 5 minutes) to 200°C at 12°C/min( hold 2min )to 290°C at 8°C/min (hold 5 minutes) to 325°C at 20°C/min (hold 5 minutes)

Carrier: Hydrogen, 1.3ml/min constant flow mode

Inlet: Split, 275°C , split flow 60ml/min, 1 µL of 200 µg/mL, AccuStandard EPA Method 8270 standard

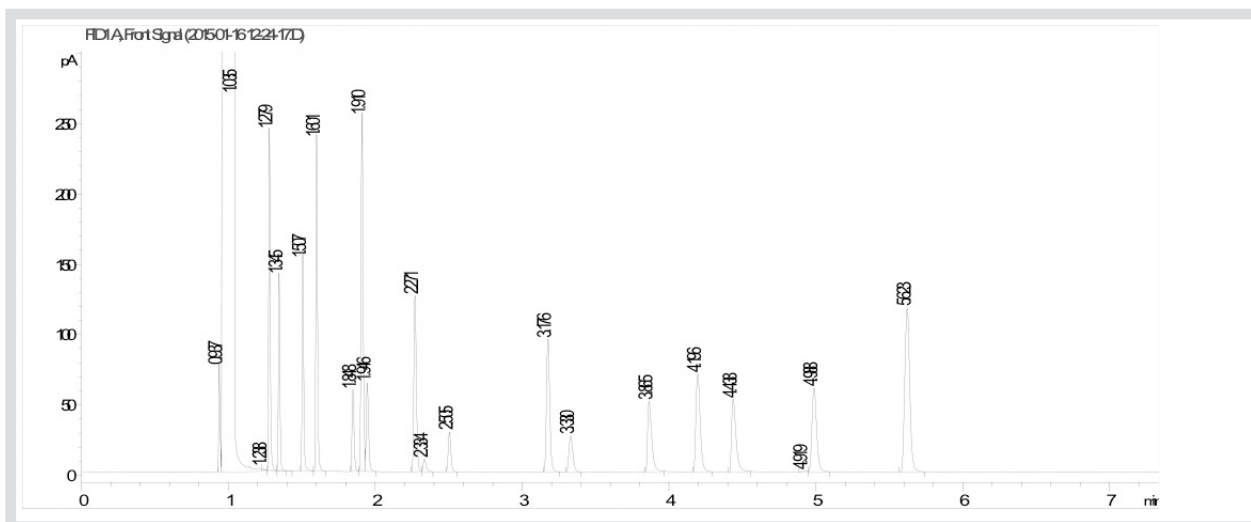
Detector: FID, 325°C



1. Pyridine	3.731	32. Hexachlorobutadiene	13.950	63. Diphenylamine	18.865
2. Methyl methanesulfonate	7.433	33. N-Nitrosodimethylamine	14.804	64. Azobenzene	18.938
3. Ethyl methanesulfonate	9.140	34. 4-Chloro-3-methylphenol	14.901	65. 2,4,6-Trichlorophenol	19.002
4. Phenol	10.020	35. Isosafrole (cis & trans)	15.035	66. Diallate (cis & trans)	19.694
5. Aniline	10.090	36. 2-Methylnaphthalene	15.270	67. 1,3,5-Trinitrobenzene	19.776
6. Bis(2-chloroethyl)ether	10.201	37. 1-Methylnaphthalene	15.497	68. Phorate	19.827
7. 2-Chlorophenol	10.252	38. Hexachlorocyclopentadiene	15.554	69. 4-Bromophenyl phenyl ether	20.010
8. 1,3-Dichlorobenzene	10.553	39. 1,2,4,5-Tetrachlorobenzene	15.554	70. Phenacetin	20.243
9. 1,4-Dichlorobenzene	10.676	40. Safrole	15.731	71. Diallate (cis & trans)	20.319
10. 2-Methylphenol (o-cresol)	11.051	41. 2,4,5-Trichlorophenol	15.805	72. Hexachlorobenzene	20.832
11. 1,2-Dichlorobenzene	11.051	42. 2-Chloronaphthalene	16.022	73. Dimethoate	21.059
12. Benzyl alcohol	11.086	43. 2-Nitroaniline	16.094	74. Pentachlorophenol	21.099
13. 4-Methylphenol (p-cresol)	11.383	44. 1,4-Naphthoquinone	16.410	75. Pentachloronitrobenzene	21.280
14. 3-Methylphenol (m-cresol)	11.383	45. 1,3-Dinitrobenzene	16.497	76. Pronamide (Propyzamide)	21.430
15. 2,2'-Oxybis(1-chloropropane)	11.414	46. Dimethylphthalate	16.497	77. Dinoseb	21.486
16. Acetophenone	11.621	47. 2,6-Dinitrotoluene	16.910	78. Phenanthrene	21.519
17. N-Nitrosodi-n-propylamine	11.719	48. Acenaphthylene	17.016	79. Disulfoton	21.682
18. Hexachloroethane	11.764	49. 3-Nitroaniline	17.320	80. Anthracene	21.682
19. Nitrobenzene	11.976	50. Acenaphthene	17.427	81. Methyl parathion	23.548
20. Isophorone	12.511	51. 2,4-Dinitrophenol	17.539	82. Di-n-butyl phthalate	23.737
21. 2-Nitrophenol	12.687	52. Pentachlorobenzene	17.713	83. 4-Nitroquinoline-1-oxide	23.958
22. 2,4-Dimethylphenol	12.851	53. 4-Nitrophenol	17.778	84. Parathion (ethyl parathion)	24.111
23. O,O,O-Triethyl phosphorothioate	13.055	54. Dibenzofuran	17.835	85. Isodrin	24.849
24. Bis(2-chloroethoxy)methane	13.099	55. 2,4-Dinitrotoluene	17.881	86. Fluoranthene	25.279
25. Benzoic acid	13.160	56. 2,3,4,6-Tetrachlorophenol	18.153	87. Benzidine	25.821
26. 2,4-Dichlorophenol	13.212	57. Diethylphthalate	18.473	88. Pyrene	26.007
27. 2,6-Dichlorophenol	13.212	58. Fluorene	18.538	89. Aramite	26.847
28. 1,2,4-Trichlorobenzene	13.389	59. 4-Chlorophenyl phenyl ether	18.564	90. Aramite isomer	27.113
29. Naphthalene	13.508	60. Zinphos (Thionazine)	18.661	91. Chlorobenzilate	27.498
30. 4-Chloroaniline	13.712	61. 4-Nitroaniline	18.686	92. Famphur	28.324
31. Hexachloropropene	13.792	62. 4,6-Dinitro-2-methylphenol	18.787	93. Kepone	28.394

94. Benzyl butyl phthalate	28.582	98. Bis(2-ethylhexyl)phthalate	30.652	102. Benzo(a)pyrene	34.964
95. Benz(a)anthracene	30.050	99. Di-n-octyl phthalate	32.628	103. Indeno(1,2,3-cd)pyrene	39.150
96. 3,3'-Dichlorobenzidine	30.101	100. Benzo(b)fluoranthene	33.684	104. Dibenzo[a,h]anthracene	39.225
97. Chrysene	30.184	101. Benzo(k)fluoranthene	33.784	105. Benzo(ghi)perylene	39.922

### 3. 502.2

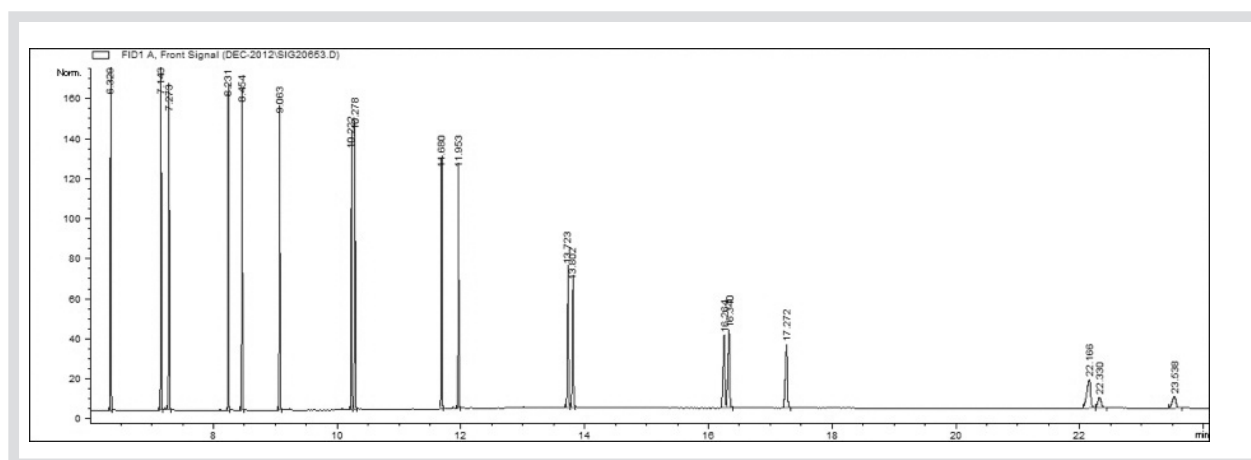


1. 1,1-dichloroethene	1.279	6. chloroform	1.910	11. cis-1,3-Dichloropropene	4.196
2. Methylene chloride (dichloromethane)	1.345	7. 1,1,1-trichloroethane	1.946	12. trans-1,3-Dichloropropene	4.438
3. trans-1,2-Dichloroethene	1.507	8. carbon tetrachloride	2.271	13. 1,3-Dichloropropane	4.988
4. 1,1-Dichloroethane	1.601	9. Trichloroethene	3.176	14. bromoform	5.623
5. 2,2-Dichloropropane	1.848	10. bromodichloromethane	3.865		

### 4. PAHs, 17+1 and 25

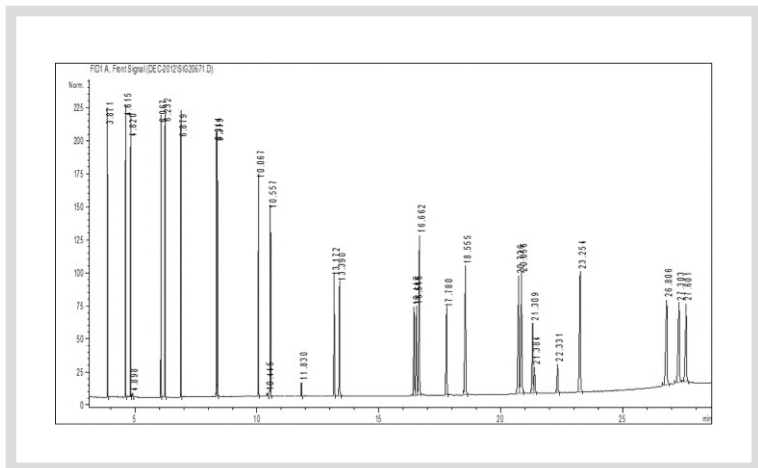
Cat no: 1518-4001 GsBP-PAH 40m x 0.18mm  
 Oven: 60 °C (1min) 20 °C /min 280 °C (20min)  
 Carrier: Hydrogen, column flow 1.2ml/min  
 Inlet: Split, 275 °C, split ratio 50:1  
 Detector: FID 325 °C  
 Samples: EPA Method 8310 PAH Mixture (18 components)  
 Inject volume: 1ul

1. Naphthalene	6.33	10. Pyrene	11.95
2. 1-Methylnaphthalene	7.14	11. Benzo[a]anthracene	13.72
3. 2-Methylnaphthalene	7.27	12. Chrysene	13.80
4. Acenaphthylene	8.23	13. Benzo[b]fluoranthene	16.26
5. Acenaphthene	8.45	14. Benzo[k]fluoranthene	16.34
6. Fluorene	9.06	15. Benzo[a]pyrene	17.27
7. Phenanthrene	10.22	16. Dibenzo[a,h]anthracene	22.17
8. Anthracene	10.28	17. Benzo[ghi]perylene	22.33
9. Fluoranthene	11.68	18. Indeno[1,2,3-cd]pyrene	23.54



Phone (302)533-5646  
Fax (302)737-4547

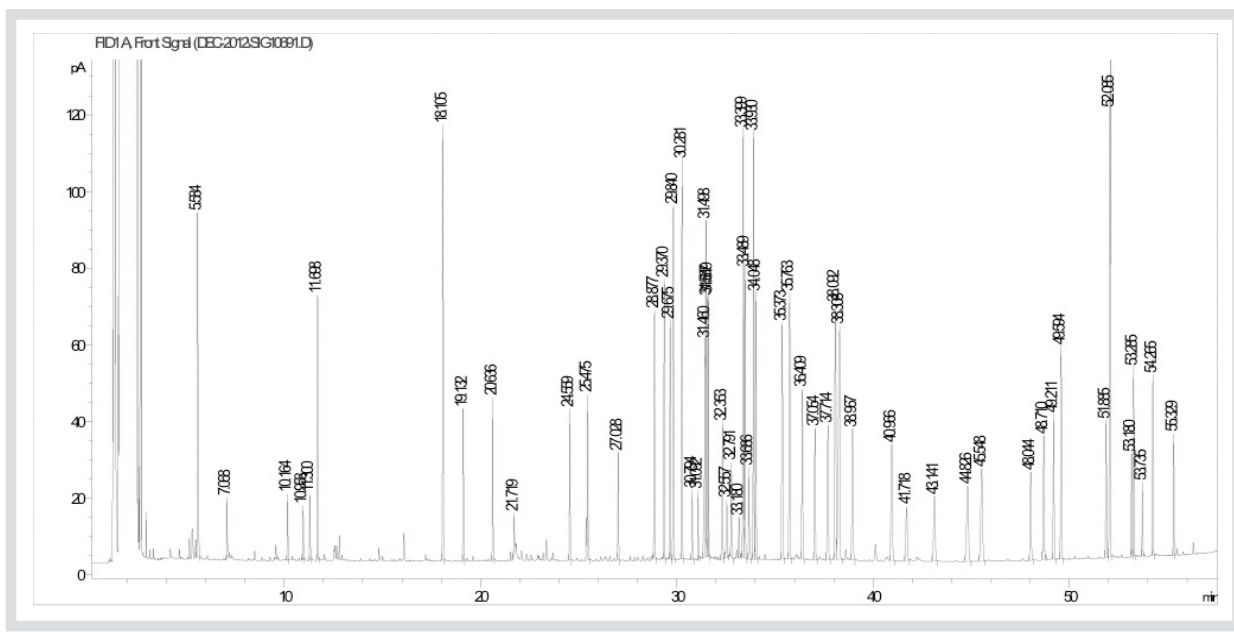
- Cat no: 7125-3002, 30m x 0.25mm x 0.25um
- Oven: 100 °C (1min) 15°C /min to 280 °C 5°C /min 340 °C 10min
- Carrier: Hydrogen, column flow 1.2ml/min
- Inlet: Split, 275 °C, split 50ml/min
- Detector: FID 350 °C
- Inject volume: 1ul



1.Naphthalene	3.87
2.1-Methylnaphthalene	4.61
3.2-Methylnaphthalene	4.82
4.Acenaphthylene	6.07
5.Acenaphthene	6.23
6.Flourene	6.88
7.Phenanthrene	8.34
8.Anthracene	8.38
9.Fluoranthene	10.07
10.Pyrene	10.56
11.Benzo[a]anthracene	13.17
12.Chrysene	13.39
13.Benzo[b]fluoranthene	16.45
14.Benzo[k]fluoranthene	16.55
15.Benzo[j]fluoranthene	16.66
16.Benzo[a]pyrene	17.78
17.3-Methylcholanthrene	18.56
18.Dibenzo[a,h]acridine	20.74
19.Dibenzo[a,i]acridine	20.86
20.Indeno[1,2,3-cd]pyrene	21.31
21.Dibenz[a,h]anthracene	21.38
22.Benzo[ghi]perylene	22.33
23.7H-Dibenzo[c,g]carbazole	23.25
24.Dibenzo[a,e]pyrene	26.81
25.Dibenzo[a,i]pyrene	27.30
26.Dibenzo[a,h]pyrene	27.60

### 5. Pesticide, 508

(1) 50C 5min 5C/min 150C 5C/min 200C 10min 8C/min 300C 20min  
GsBP-5MS, 30m x 0.25mm x 0.5um



1.4-Cl-3-nitrobenzotrifluoride	5.584
2. Dichlorvos	7.068
3. Hexamethylphosphoramide	10.164
4. Mevinphos	10.958
5. Trichlorfon	11.3
6. TEPP	11.698
7. Demeton-O	18.105
8. Thionazin	19.132
9. Ethoprop	20.636
10. Simazine	24.559
11. Atrazine	25.475
12. Naled	27.029
13. Sulfotepp	28.877
14. Phorate	29.37
15. Dicrotophos	29.675
16. Demeton-S	29.84
17. Monocrotophos	30.281
18. Terbufos	30.794
19. Dimethoate	31.092
20. Dioxathion	31.498
21. Fonophos	31.588
22. Diazinon	31.619
23. Disulfoton	32.353
24. Phosphamidon isomer	32.557
25. Dichlorofenthion	32.791
26. Chlorpyrifos methyl	33.399
27. Phosphamidon	33.489

28. Parathion-methyl	33.686
29. Ronnel	33.93
30. Fenitrothion	34.048
31. Aspon	35.373
32. Malathion	35.762
33. Chlorpyrifos	36.409
34. Trichloronate	37.054
35. Parathion-ethyl	37.714
36. Fenthion	38.092
37. Merphos	38.308
38. Chlorfenvinphos	38.967
39. Crotoxyphos	40.966
40. Stirofos	41.718
41. Tokuthion	43.141
42. Merphos oxone	44.826
43. Ethion	45.548
44. Fensulfothion	48.044
45. Bolstar	48.709
46. Carbophenothion	49.212
47. Famphur	49.595
48. EPN	51.886
49. Phosmet	52.086
50. Leptophos	53.18
51. Tri-o-cresyl phosphate	53.286
52. Azinphos-methyl	53.735
53. Azinphos-ethyl	54.265
54. Coumaphos	55.33

## (2) 35mS

Carrier: Helium at 45 cm/sec (EPC in constant flow mode)

Oven: 110° C for 0.5 min

110-320° C at 15° C/min

320° C for 2 min

Inlet: Splitless, 250° C

30 sec purge activation time

50 pg per component

Detector:  $\mu$ ECD, 350° C

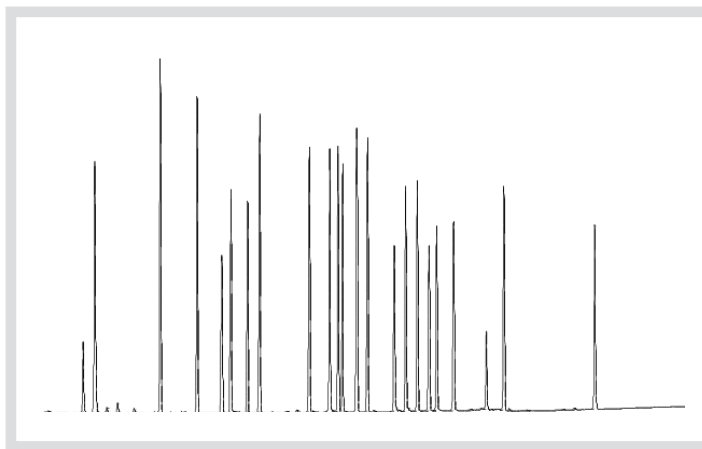
Nitrogen makeup gas

(column + makeup flow = 30 mL/min

constant flow

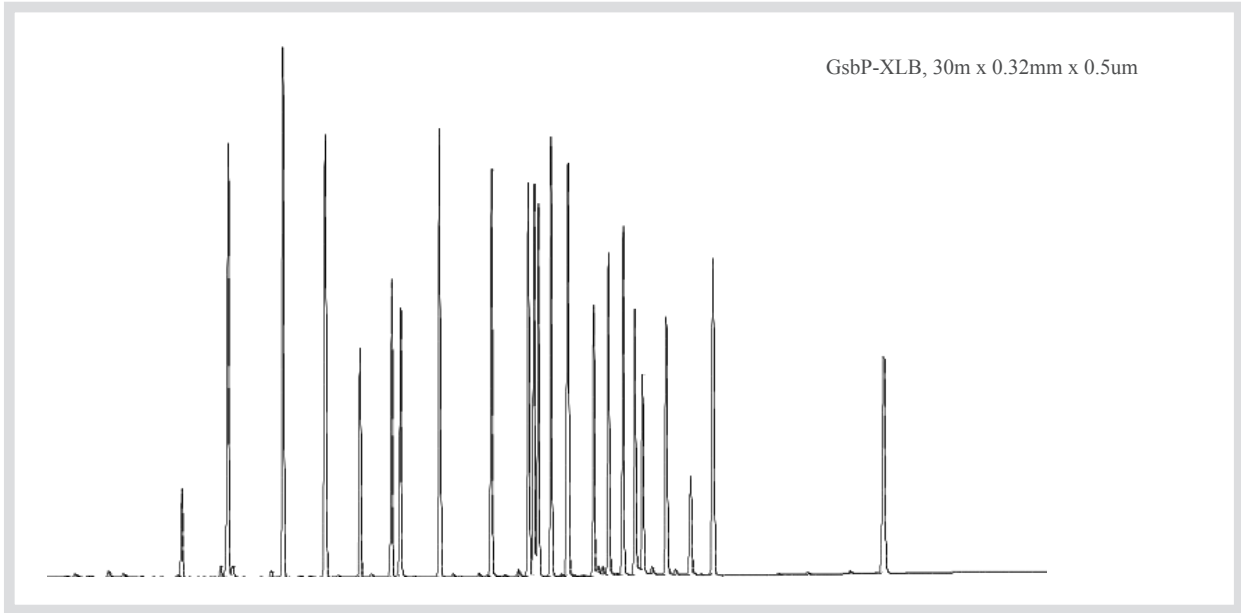
Column: GSbP-35MS 30m x 0.32mm x

0.5um



1. Tetrachloro-m-xylene(ss)	9. $\gamma$ -Chlordane	17. 4,4' -DDT
2. $\alpha$ -BHC	10. $\alpha$ -Chlordane	18. Endrin aldehyde
3. $\gamma$ -BHC	11. Endosulfan I	19. Endosulfan sulfate
4. $\beta$ -BHC	12. 4,4' -DDE	20. Methoxychlor
5. Heptachlor	13. Dieldrin	21. Endrin ketone
6. $\delta$ -BHC	14. Endrin	22. Decachlorobiphenyl(SS)
7. Aldri	15. 4,4' -DDD	
8. Heptachlor eepoxide	16. Endosulfan II	

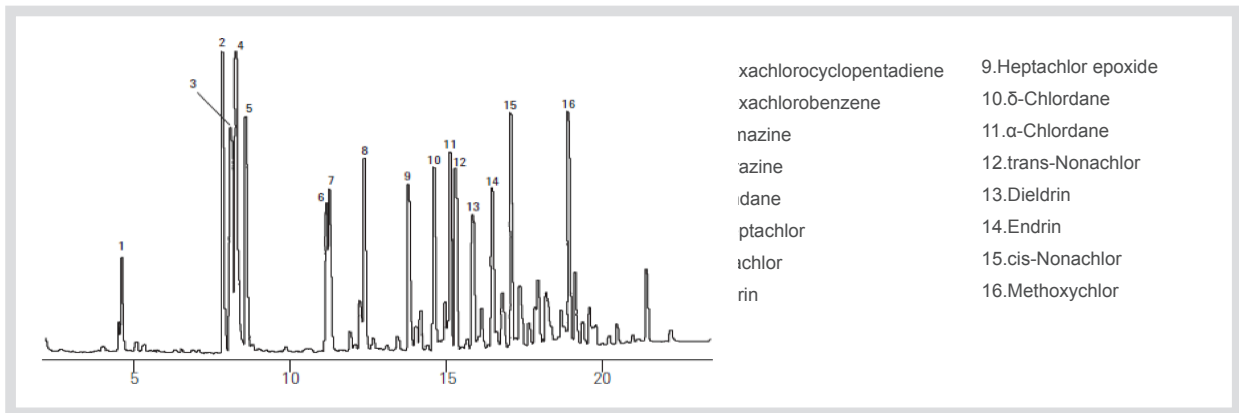
### (3) XLB Columns



### Pesticide in water, EPA 505.

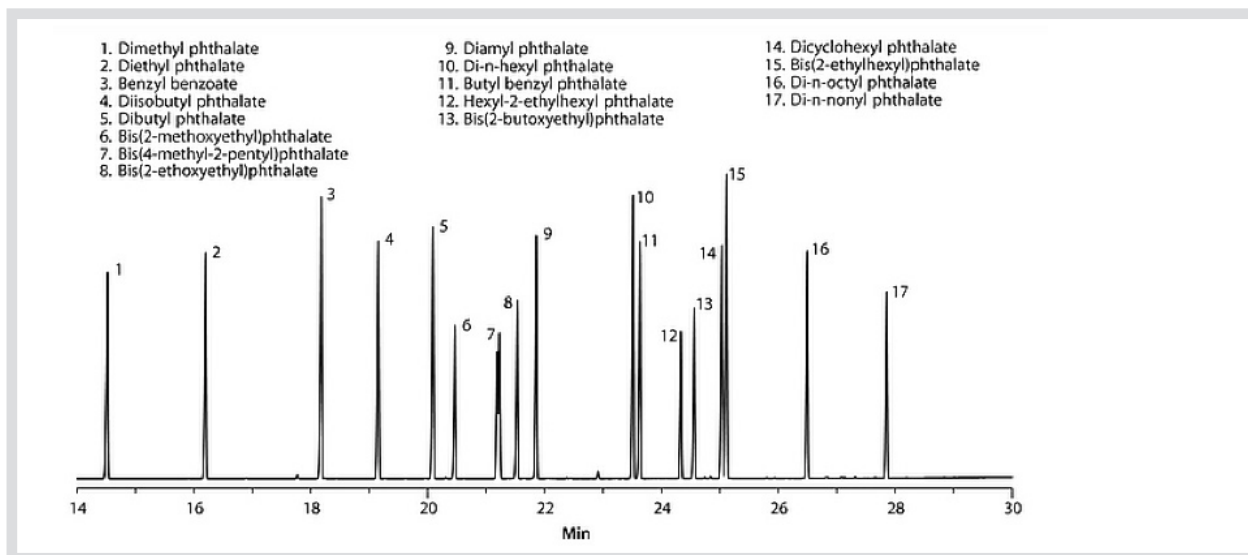
Column: GsbP5MS, 30m x 0.25mm x 0.25um

Oven: 80°C for 1min  
80-175°C at 30°C/min  
175°C for 4 min  
175-215°C at 6°C/min  
215°C for 2 min  
215-290°C at 15°C/min  
290°C for 5 min

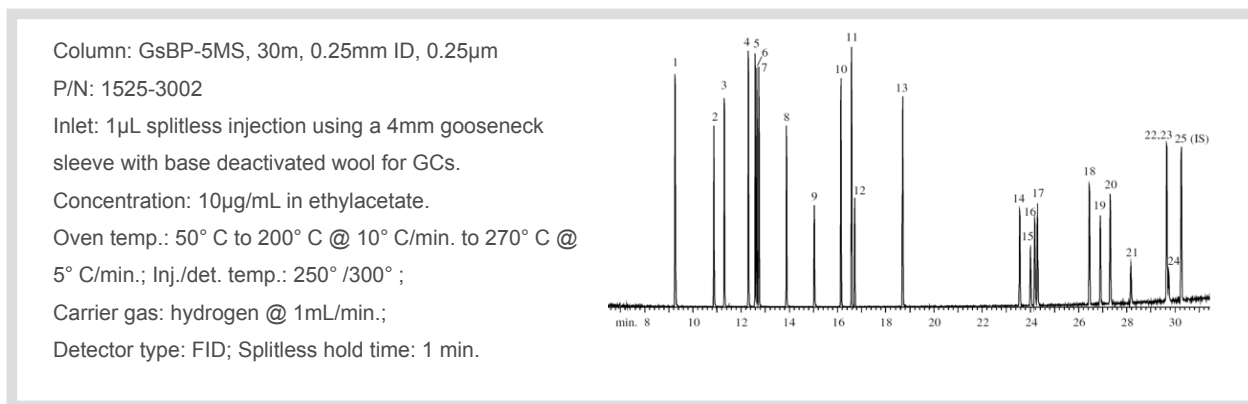


## 6. 17MS, XLB, 5MS, 1701, 35MS

### 7. plasticizer



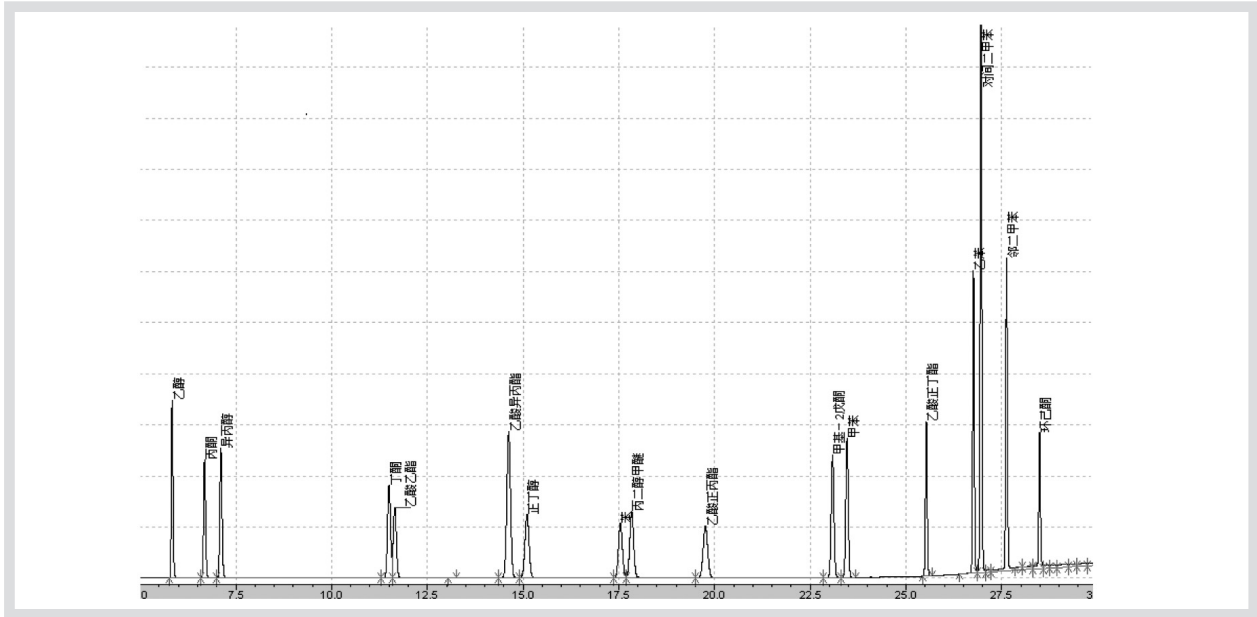
### 8. Azo





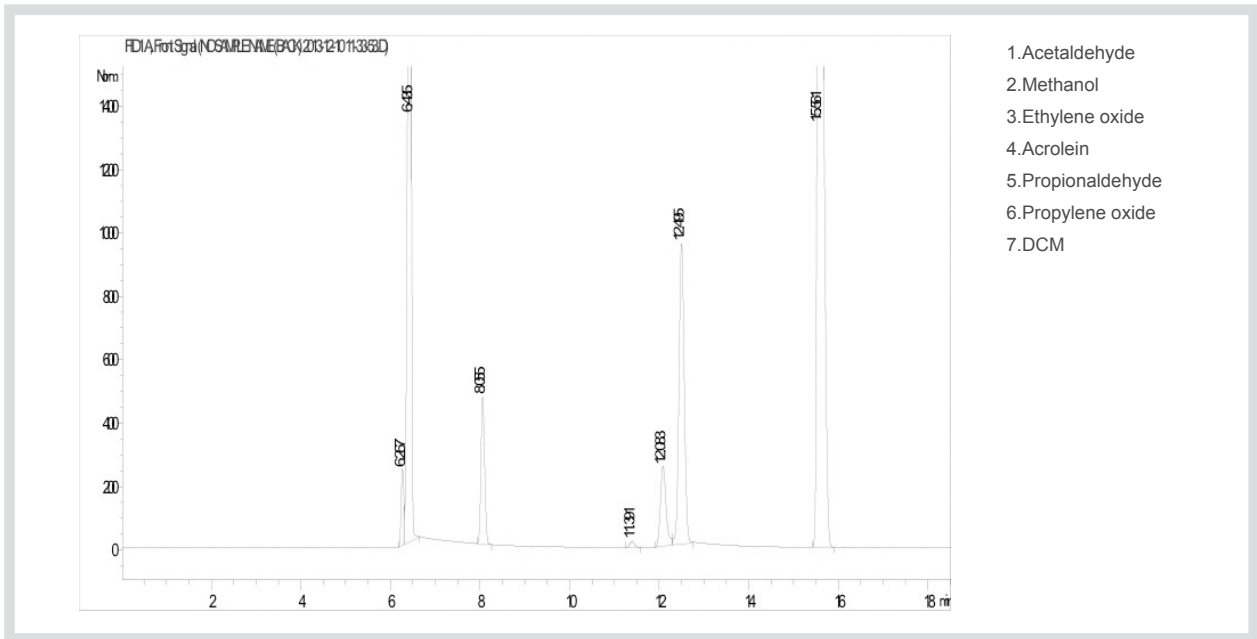
### 9. BTEX

Column: GsBP-624, 60m x 0.25mm x 1.4um  
Oven: 40C 4min 10C/Min to 240C hold

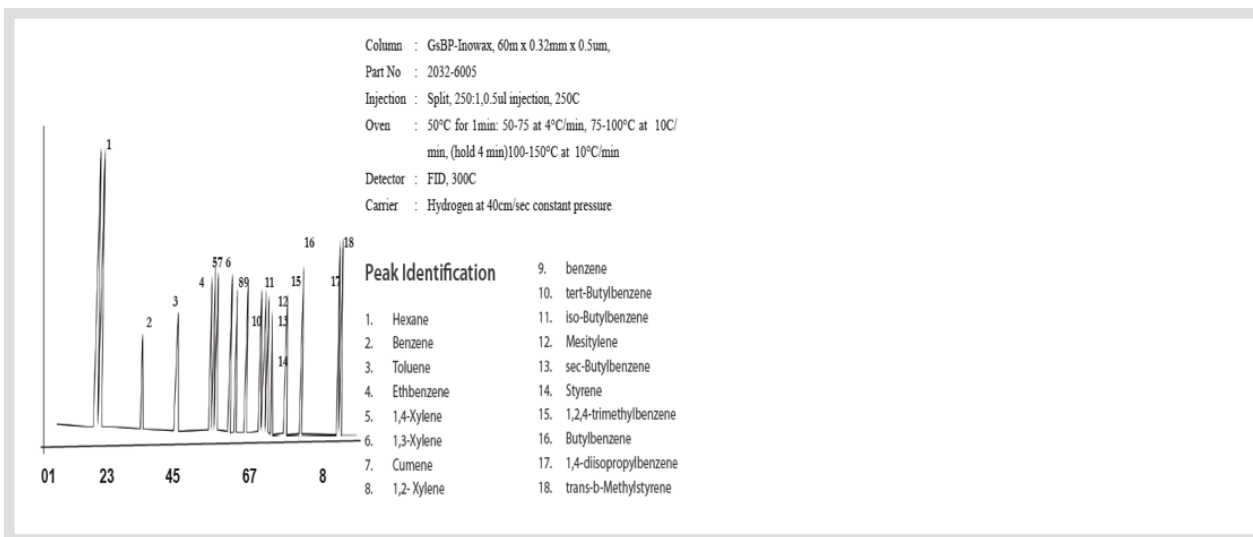


### 10. Ethylene oxide

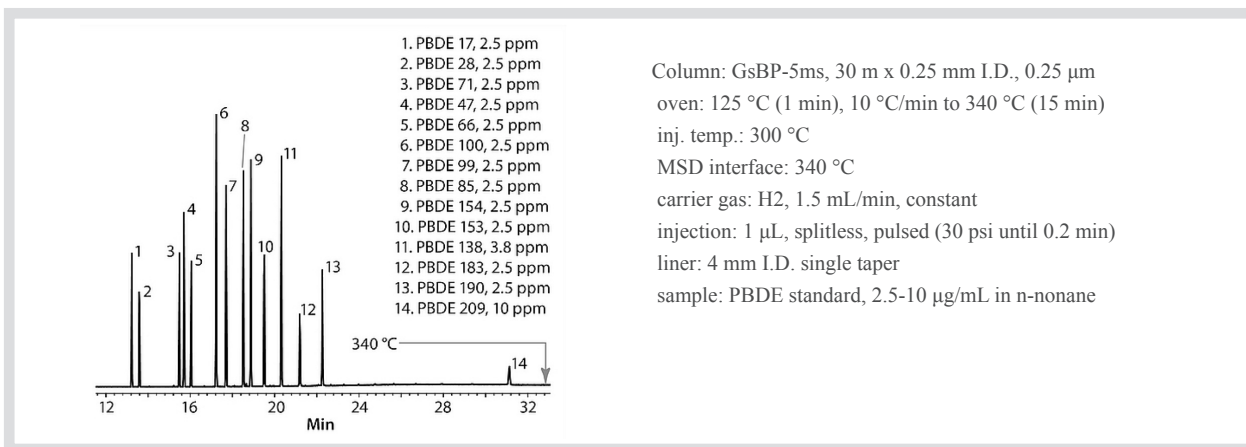
Column: 7332-5000, GsBP-EPOx, 50m x 0.32mm  
Oven: 35 °C (8min) 2 °C /min 100 °C 10 °C/min 210 °C 10min



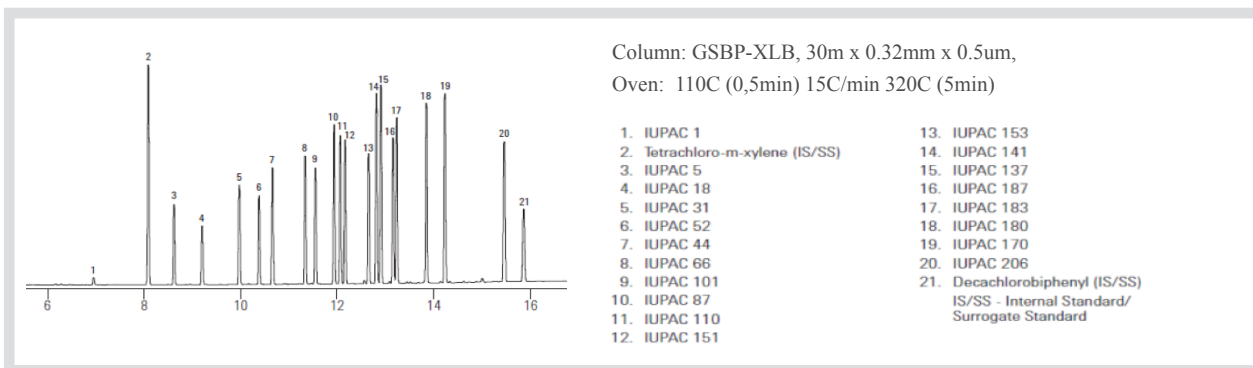
## 11. Benzene derivatives



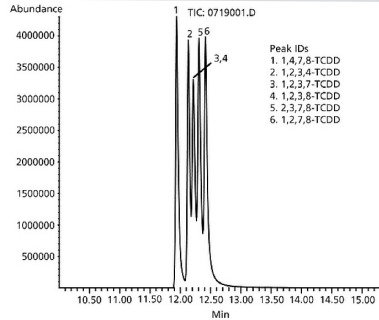
## 12. pBDEs



## 13. PCBs congeners

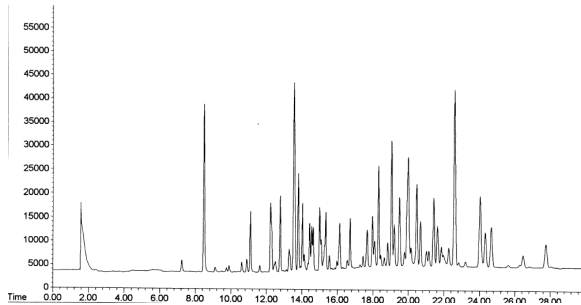


## 14. Dioxins

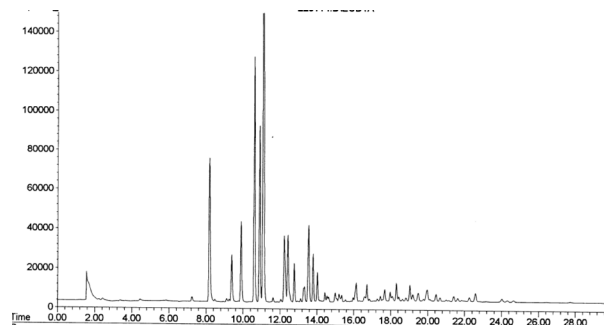


Column: GsBP-5ms, 30 m x 0.25 mm I.D., 0.25  $\mu$ m  
oven: 170 ° C (1 min.), 8 ° C/min to 270 ° C (10 min.)  
inj: 250 ° C  
detector: FID 325 ° C  
carrier gas: hydrogen, 1.5ml/min, constant  
injection: 1  $\mu$ L, splitless (1 min.)  
sample: TCDD standard, 1500 ppb in n-dodecane

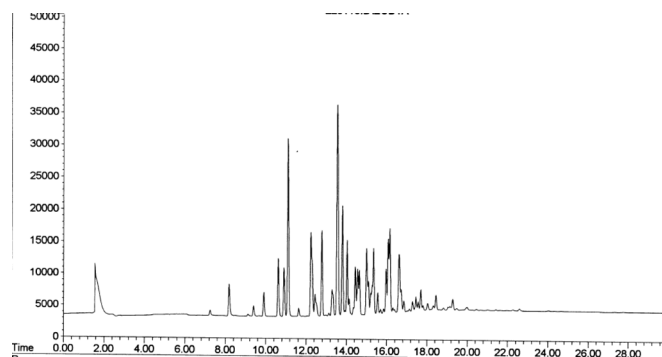
## 15. Aroclor



GC chromatogram of the Aroclor 1016/1260 mixture analyzed on a GsBP-5 column(30-m x 0.53-mm ID, 1.5-:m film thickness). Temperature program: 150 ° C (1.0 min hold) to 280 ° C (17 min hold) at 8 ° C/min.



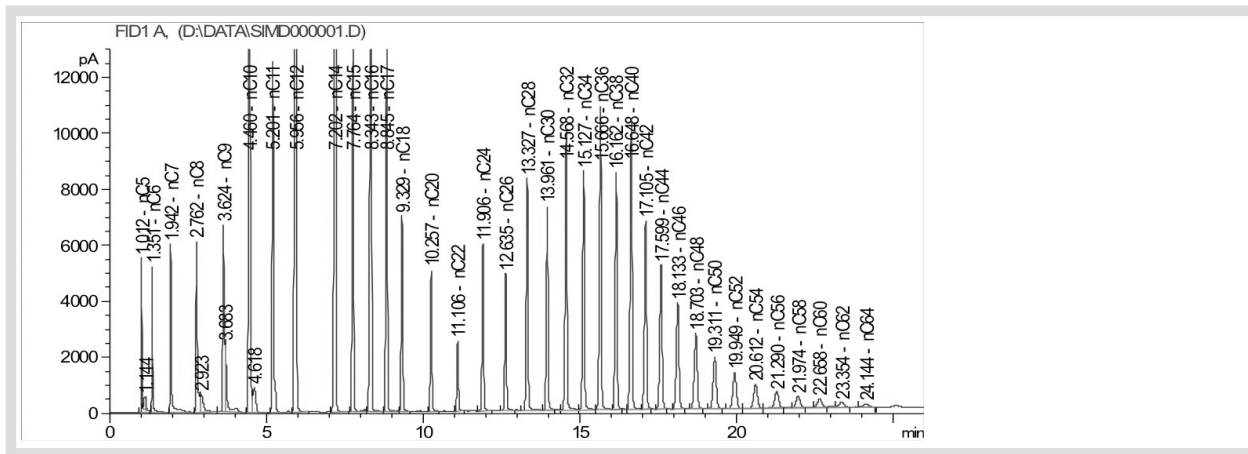
GC chromatogram of Aroclor 1221 analyzed on a GsBP-5 column (30-m x 0.53-mm ID, 1.5-:m film thickness). Temperature program: 150 ° C (1.0 min hold) to 280 ° C (17 min hold) at 8 ° C/min.



GC chromatogram of Aroclor 1232 analyzed on a GsBP-5 (30-m x 0.53-mm ID, 0.5-:m film thickness). Temperature program: 150 ° C (1.0 min hold) to 280 ° C (17 min hold) at 8 ° C/min.

## 16. Diesel

Environmental monitoring: Analysis of Diesel Components C5-C64



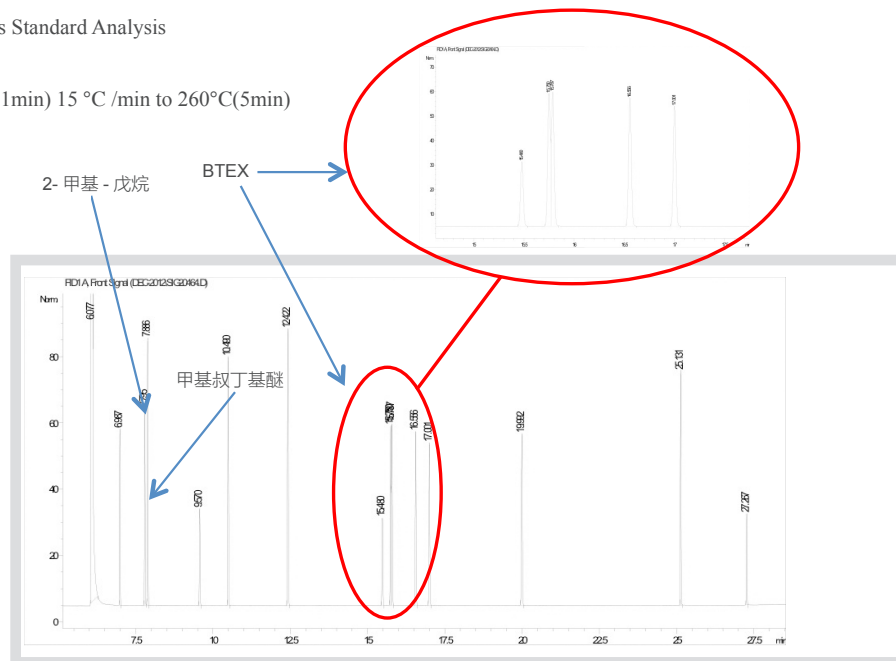
## 17. VPH

Government EPA Regulation: MA VPHs Standard Analysis

Column: 9006-pona

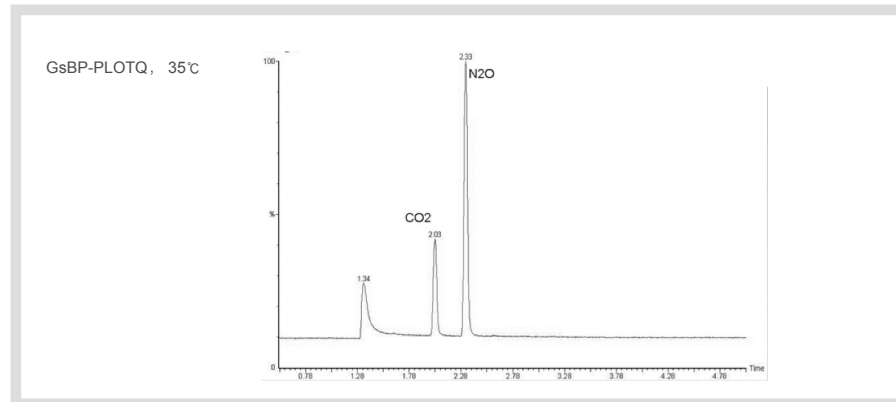
Oven: 50°C(1min) 5 °C /min to 150°C (1min) 15 °C /min to 260°C(5min)

- 1.Methanol
- 2.Pentane
- 3.MTBE
- 4.2-Methylpentane
- 5.Benzene
- 6.Isooctane
7. Toluene
8. Ethylbenzene
9. m-Xylene
10. p-Xylene
11. o-Xylene
12. Nonane



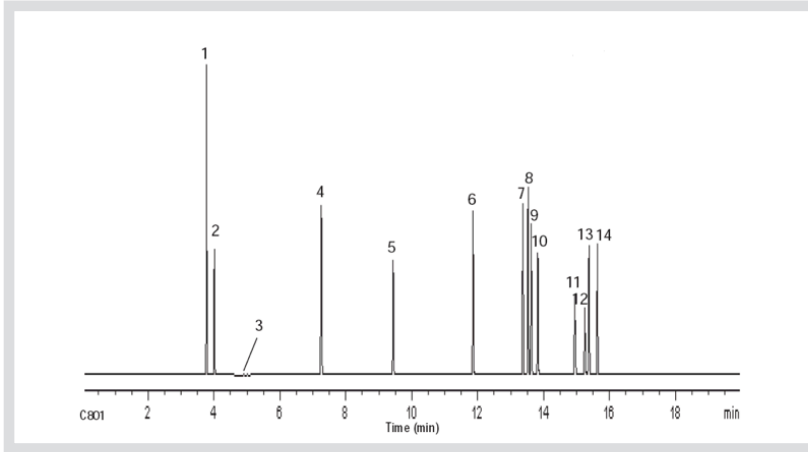
## 18. Nox

GsBP-PLOTQ, 35



## 19. Sulfide

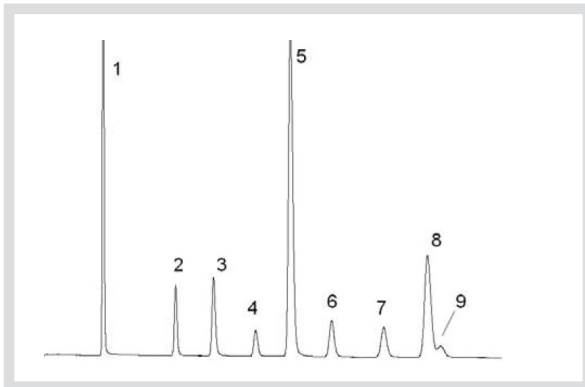
Col: GsBP-GasPro, 60m x 0.32mm



- 1.COS
2. Hydrogen Sulfide
- 3.Propylene
4. Carbon Sulfide
- 5.Methyl mercaptan
- 6.Ethyl mercaptan
- 7.Thiofuran
- 8.Dimethyl sulfide
- 9.2-Propyl mercaptan
- 10.1- Propyl mercaptan
- 11.2-Methyl-2-propyl mercaptan
- 12.2-Methyl-1-propyl mercaptan
- 13.1-Methyl-1-propyl mercaptan
- 14.1- Butyl mercaptan

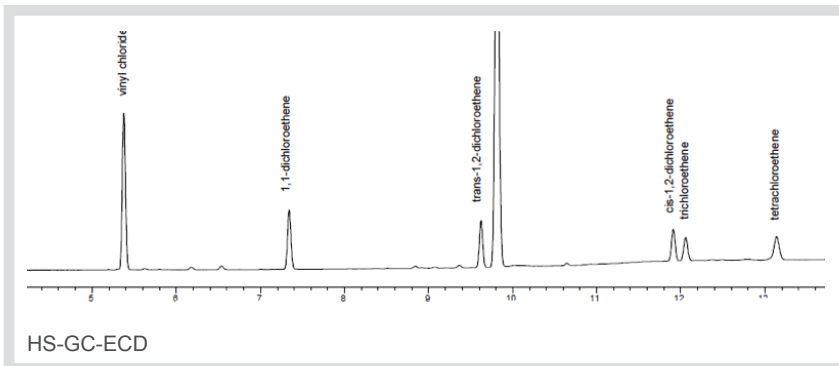
## 20.CFCs

Column: GsBP-PLOT Al<sub>2</sub>O<sub>3</sub>, KCL, 30m x 0.53mm x 10um  
 Oven: 135C



### Peak:

- 1.1,1-dichloroethylene
- 2.Methylene Chlorides
- 3.1, 2-Dichloroethylene
- 4.TetraChloromethane
- 5.Unknown
- 6.Cis-1,2-Dichloroethylene
- 7.Trichloroethylene
- 8.1,1,2-trichloroethylene
- 9.Chloroform



Column: GsbP-PLOT Al<sub>2</sub>O<sub>3</sub>, KCL, 50m x 0.53mm x 15um\  
 Oven: 35C 4min 10C/min to 150C  
 HS-GC-ECD

- 1.Vinyl chloride
- 2.1,1' -dichloroethene
- 3.Trans-1,2-dichloroethene
- 4.Cis-1,2-dichloroethene
- 5.Trichloroethene
- 6.Terachloroethene

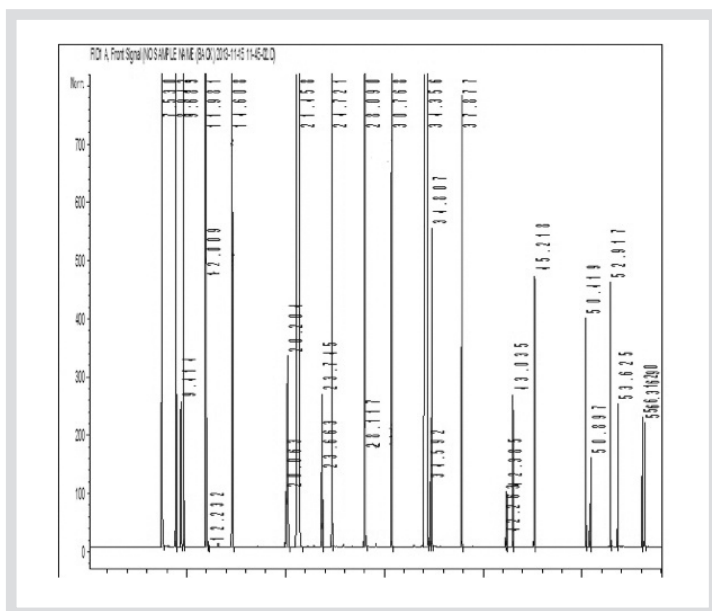
## 21. DHA

Column: GsBP-DHA5, 105 m x 0.25 mm I.D., 0.5 µm

Oven: 30° C 23min 10° C/min 90° C 10min 3° C/min 120° C 10° C/min 200° C 10min

Detector: FID 325 ° C

Carrier gas: hydrogen, 1.5ml/min, constant



Peak No.	Compound	Retention Time (min)
1	Ethanol	7.530
2	Pentane	8.942
3	Tert-butanol	9.414
4	2-methylbutene-2	9.683
5	Methyl tert-butyl ether(MTBE)	11.980
6	2,3-dimethylbutane	12.009
7	Hexane	14.608
8	1-methylcyclopentene	20.063
9	Benzene	20.204
10	Cyclohexane	21.458
11	3-ethylpentane	23.663
12	trans-1,2-Dimethylcyclopentane	23.745
13	Heptane	24.721
14	2,2,3-trimethylpentane	28.090
15	Toluene	28.117
16	Octane	30.768
17	ethyl benzene	34.356
18	2,3-dimethylheptane	34.592
19	p-Xylene	34.807
20	Nonane	37.877
21	5-Methylnonane	42.385
22	1-Methyl-2-ethylbenzene	43.035
23	Decane	45.218
24	Undecane	50.419
25	1,2,3,5-tetramethylbenzene	50.897
26	Naphthalene	52.917
27	Dodecane	53.625
28	1-Methylnaphthalene	56.120
29	Tridecane	56.369

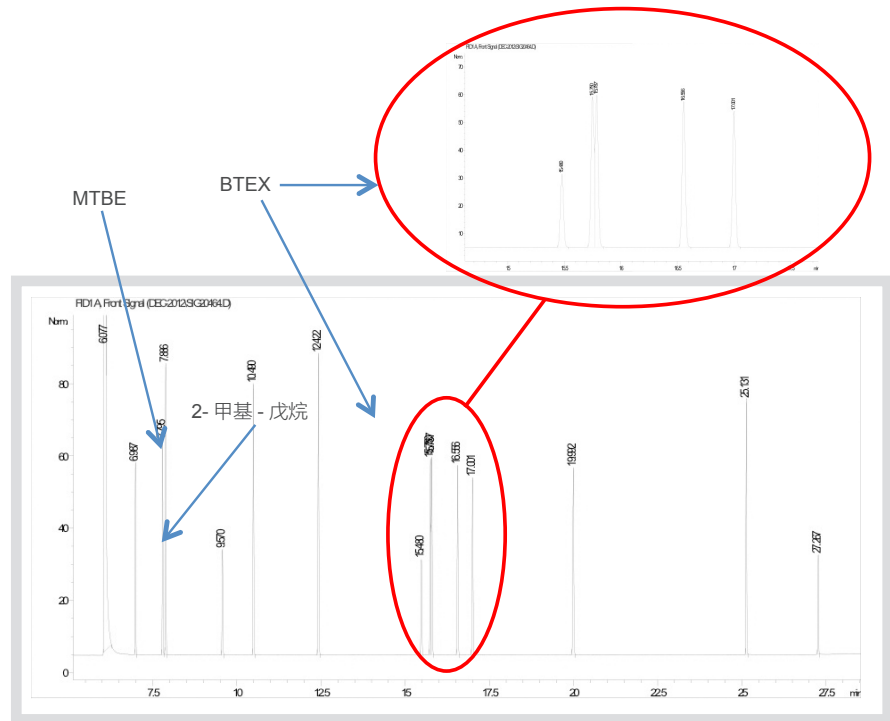
# Chemicals

## 1. Aromatics

### (a) BTEX, 9006-pona

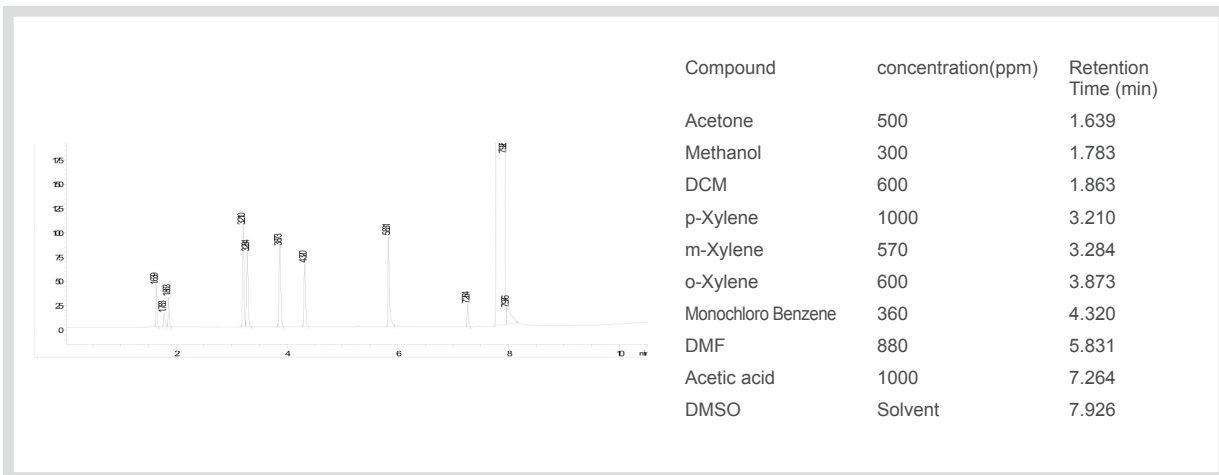
Oven: 50°C(1min) 5°C /min to 150°C  
 (1min) 15 °C /min to 260°C(5min)

1. Methanol
2. Pentane
3. Methyl tert-butyl ether
4. 2-methyl pentane
5. Benzene
6. isooctane
8. Toluene
9. Ethylbenzene
10. m-xylene
11. p-xylene
12. o-xylene
13. Nonane



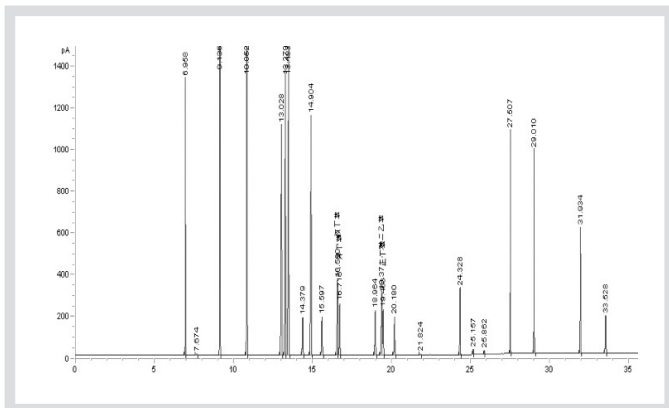
### (b) Xylenes

2125-3002 80° C 4min 25° C/min 240° C 5min



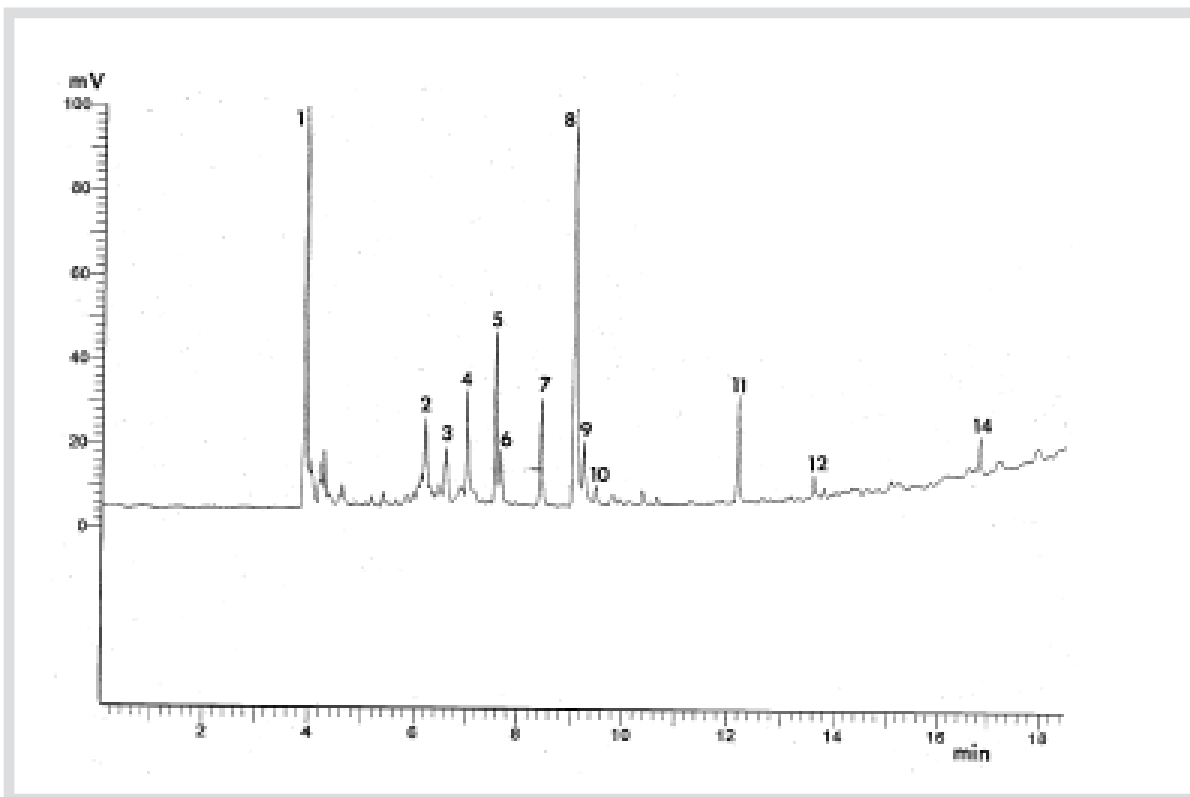
## (c) Butyl benzene

7324-6002, 80C (5min) 3.5C/min to 132C, 10C/  
min to 200C (10min)



Peak #	Name	Retention Time(min)
1	Octane	6.958
2	Benzene	9.198
3	Toluene	10.052
4	Ethylbenzene	13.028
5	p-Xylene	13.279
6	m-Xylene	13.488
7	Isopropyl benzene	14.379
8	o-Xylene	14.904
9	n-Propyl benzene	15.597
10	Tert-butylbenzene	16.580
11	Isobutylbenzene	16.716
12	m-Diethylbenzene	18.964
13	p-Diethylbenzene	19.370
14	n-butylbenzene	19.468
15	o-Diethylbenzene	20.180
16	1,3,5-Triethylbenzene	24.328
17	Triethylbenzene-2	25.157
18	Triethylbenzene-3	25.862
19	ACP	27.507
20	MBA	29.010
21	Diphenylmethane	31.934
22	1,2-Diphenyl ethane	33.528

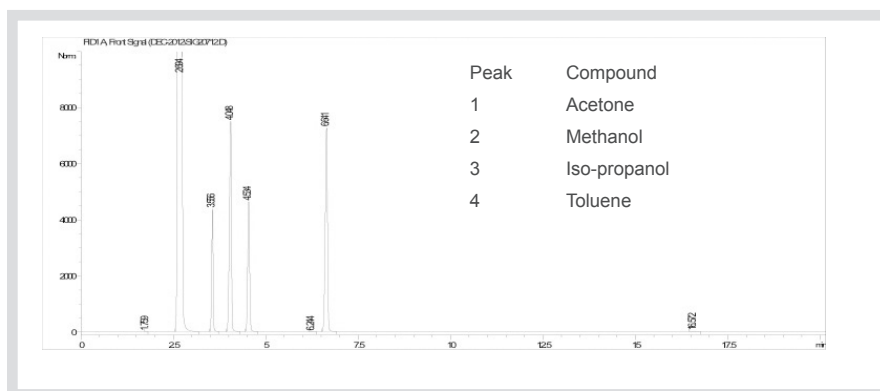
## (d) Styrene





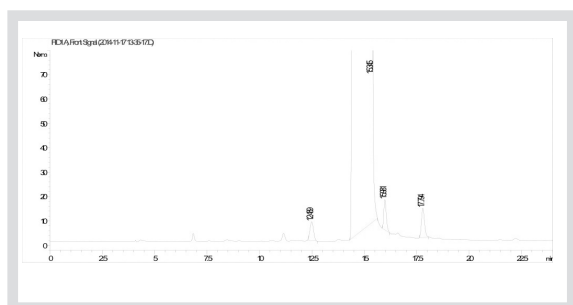
## 2. Acetone

- GC: Agilent 7890 w/ FID
- Cat no: 2232-5010 GsBP-Carbonwax 50m x 0.32mm x 1.0um
- Oven: 45°C-100°C 0-11min; 100 °C 11-20min
- Carrier: Hydrogen, column flow 2.3ml/min
- Inlet: Split, 150 °C
- Detector: FID 250 °C
- Inject volume: 1ul



## 3. Acetonitrile

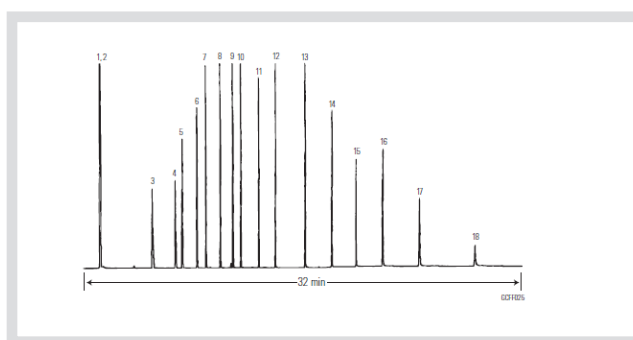
2153-6010°C 60°C 25min 10°C/min°C90°C 1min



Peak No.	Compound	Retention Time (min)
1	Acrylonitrile	15.315
2	Acetonitrile	15.981
3	Propionitrile	17.791

## 4. Acetic Acid and formic acid

Column: 2125-3002, GsBP-FFAP, 30m x 0.25mm x 0.25um  
 Oven: 100C (5min) 10C/min to 250C (10min)

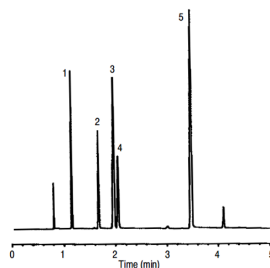


1. Acetone	7. Isovaleric acid	13. Decanoic acid
2. Formic acid	8. Valeric acid (pentanoic acid)	14. Dodecanoic acid
3. Acetic acid	9. Isocaproic acid	15. Tetradecanoic acid
4. Propionic acid	10. Caproic acid (hexanoic acid)	16. Hexadecanoic acid
5. Isobutyric acid	11. Heptanoic acid	17. Octadecanoic acid
6. Butyric acid	12. Octanoic acid	18. Arachidic acid (eicosanoic acid)

## 5. Alcohols

### (I) Methanol

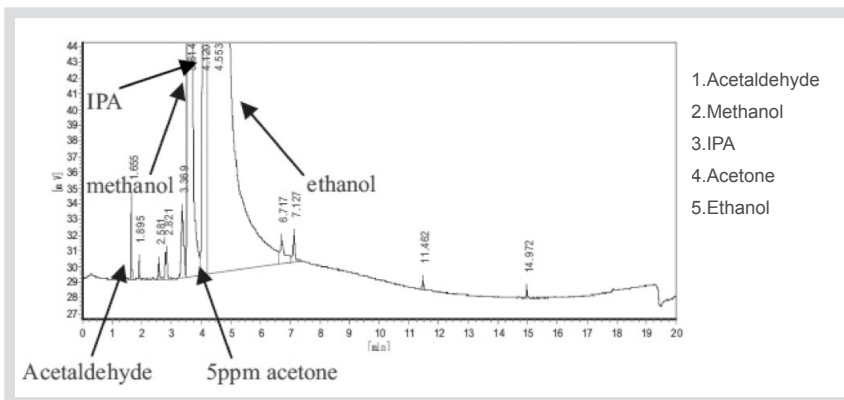
Carrier: Hydrogen, 1.0 ml/min constant flow  
 Column: GsBP-INNOWax, 15 m x 0.25 mm x 0.5 um  
 Injection: Split (300:1), 250° C  
 Oven: 45° C 2.5min 20° C/min 110° C  
 Detector: FID 275° C



1. Acetone
2. Methanol
3. isopropanol
4. Ethanol
5. n-Propanol

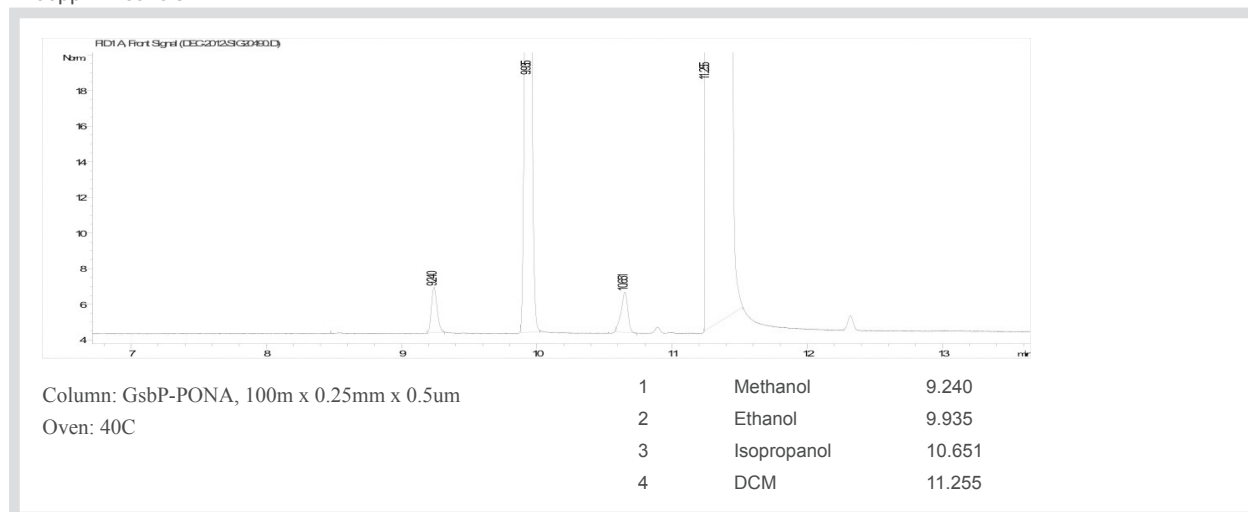
## (II) Denaturated ethanol

Column : GsBP-Inowax, 30m x 0.53mm x 1.0um,  
 Part No : 2053-3010  
 Injection : 250°C, split/splitless  
 Oven : 50C(5min) 10C/min to 200C  
 Detector : FID 260  
 Carrier : Helium  
 Sample : 2µL denaturated alcohol spiking with 5ppm acetone

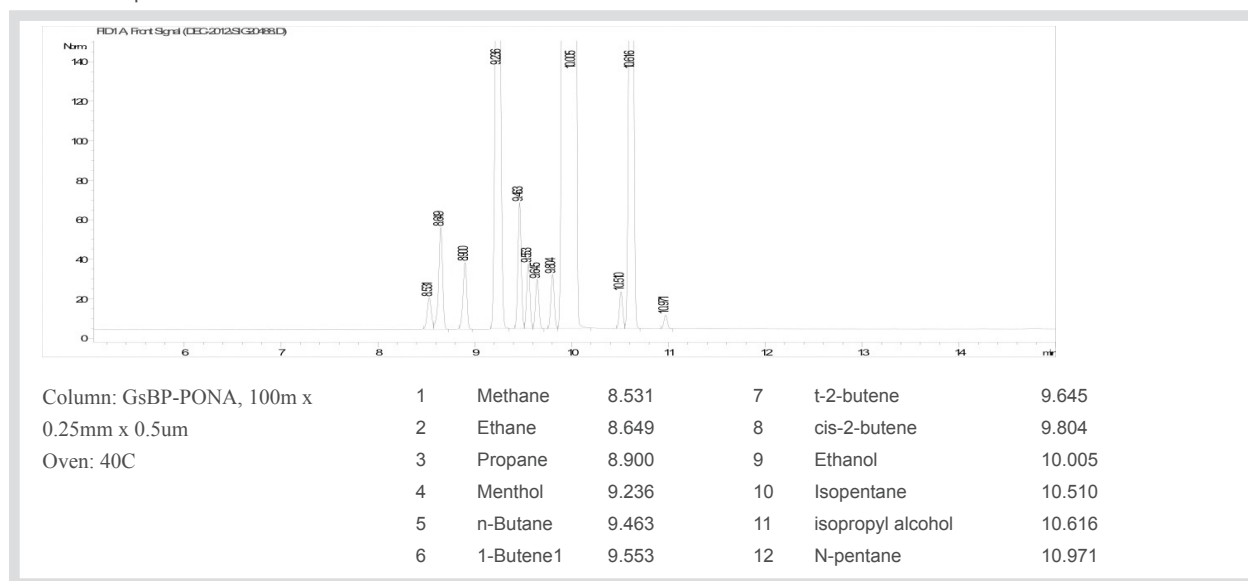


## (III) Alcohols

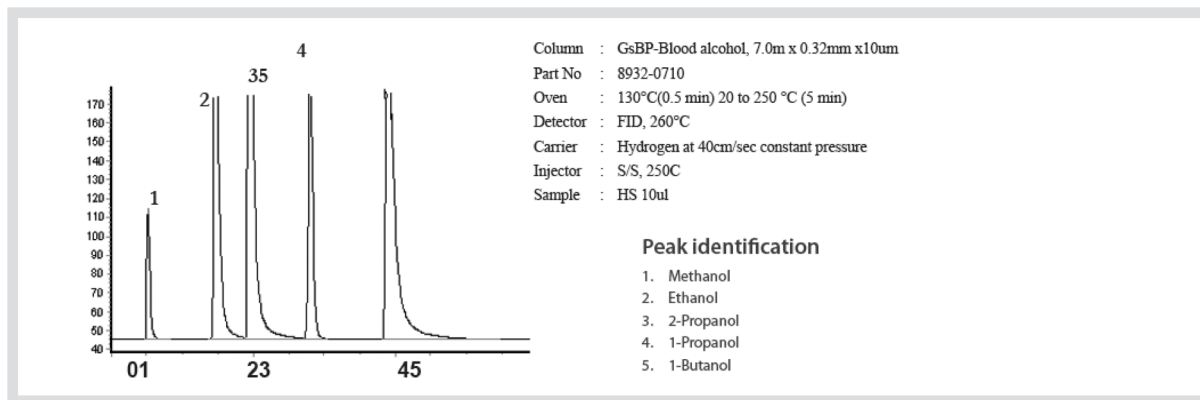
• 100ppm Alcohols



• Alcohols Separation from C1 to C5



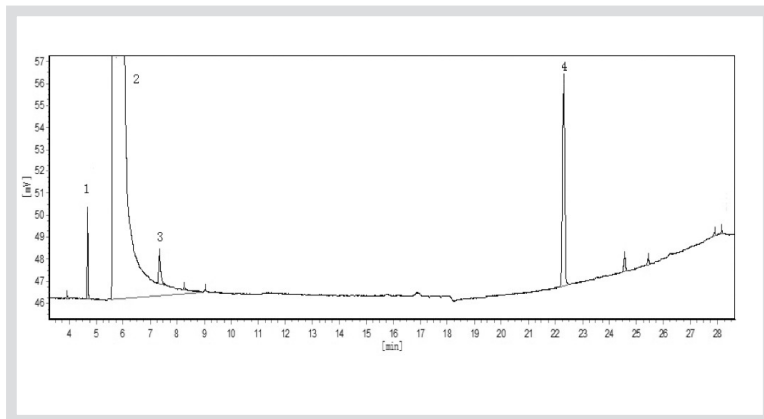
Phone (302)533-5646  
Fax (302)737-4547



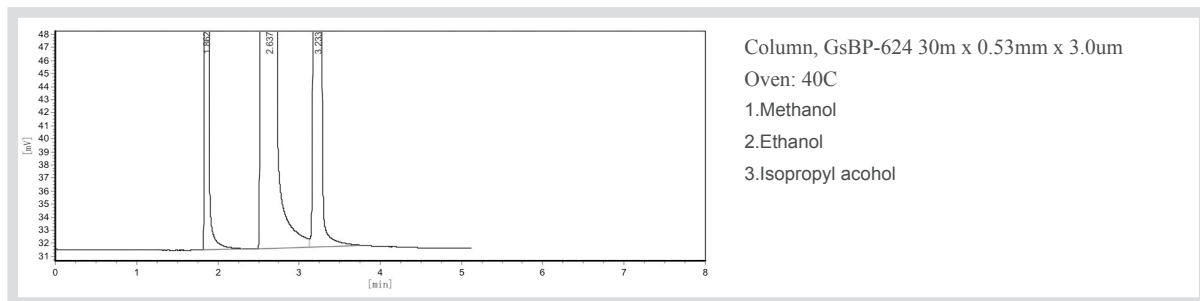
Catalog No.:7132-A500  
Serial No.: 11081964  
Stationary Phase:GsBP-Methanol  
Column Length: 105m  
Column ID: 0.32mm  
Film Thickness:N/A  
Oven Temp.:TP Carrier GasHydrogen  
Head Pressure:10psi  
Split Flow:80ml/min  
TP: 50 °C (18min) 10C/min to 150C (3min)

Peak No. Compound

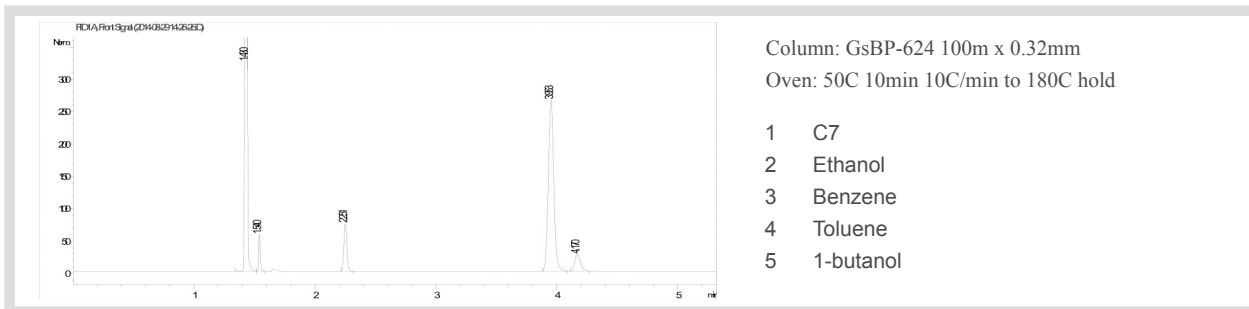
1. Acetaldehyde
2. Methanol
3. Ethanol
4. Impurity To be identified



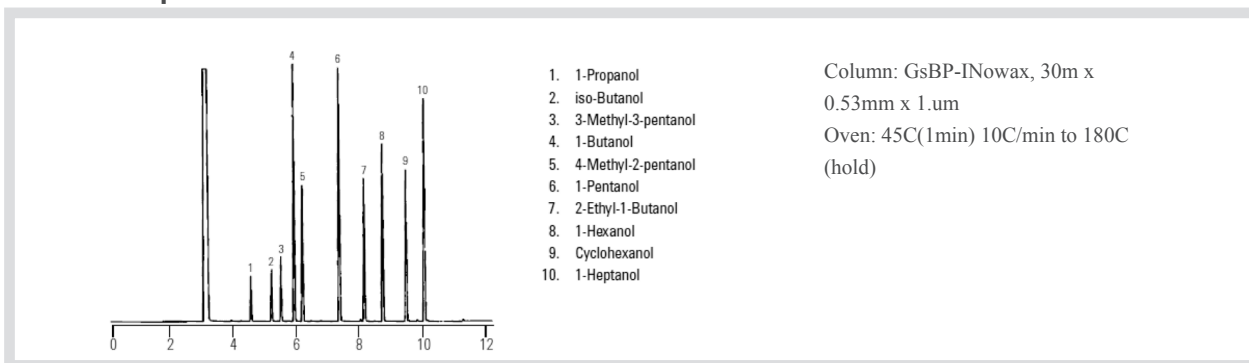
### Ethanol



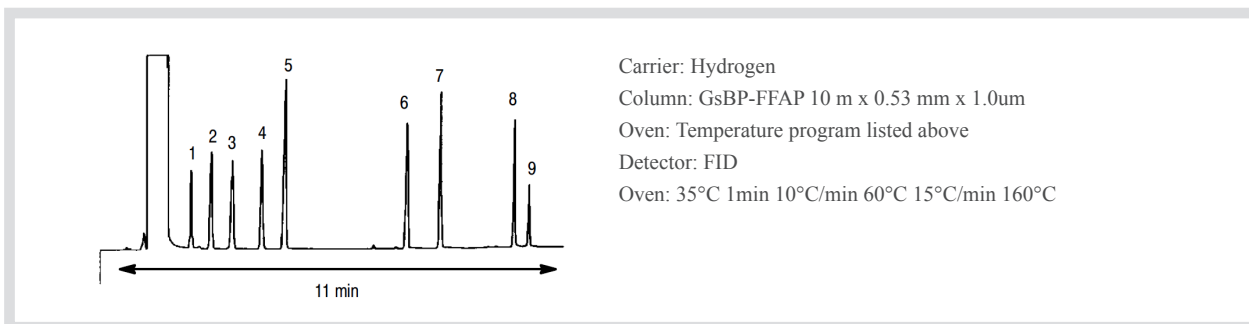
## Ethanol and Benzene



## Alcohol Separations



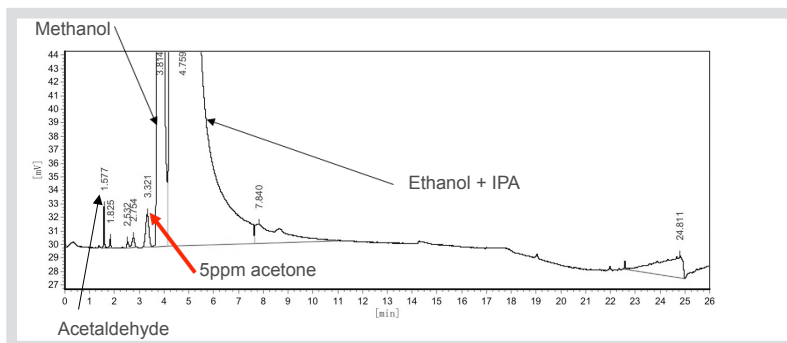
## 6. Acrylates



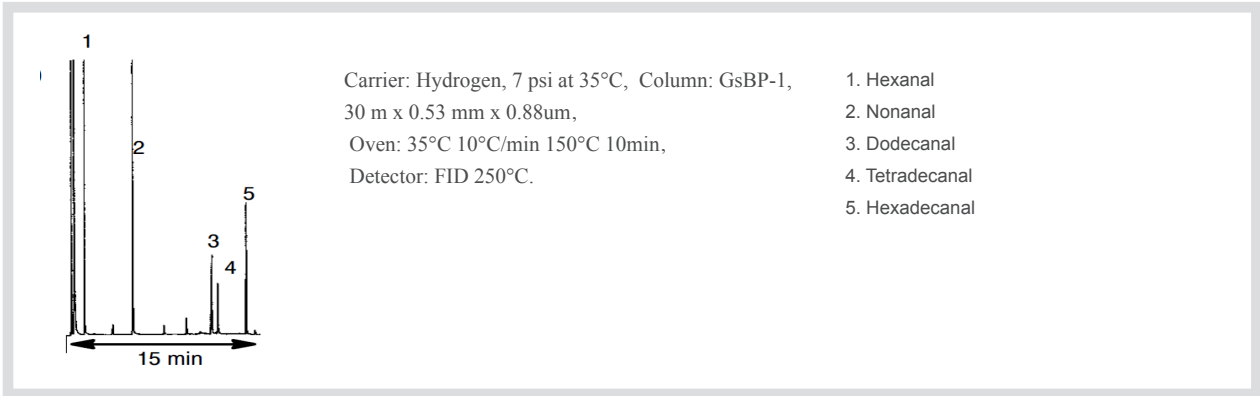
## 7. Aldehydes and ketones

### (i) Acetone

Instrument: GC/FID, HP 5890 Series II  
Column : GsBP-Inowax 30mx0.53mmx1.0um, cat no: 2053-3010  
Carrier : Hydrogen, constant pressure, holdup times (methane) 1.39—1.42min  
Injector: 250C, split. Split flow: 120ml/min  
Detector: FID, 260C  
Injection: 2ul of acetone spiking reagent alcohol  
Oven: 35C (10min) 15c/min to 180C 5min

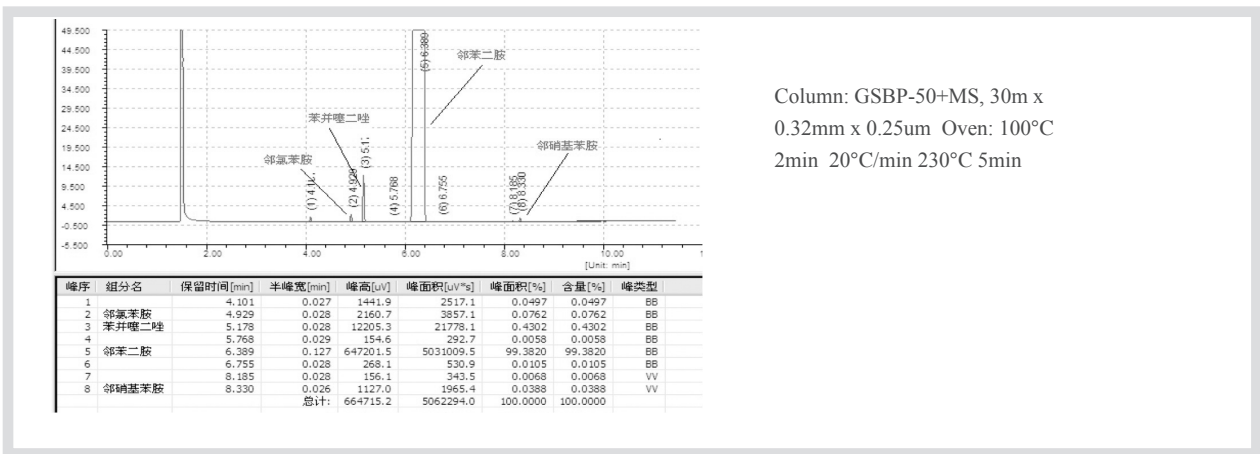


(ii) Acetaldehyde

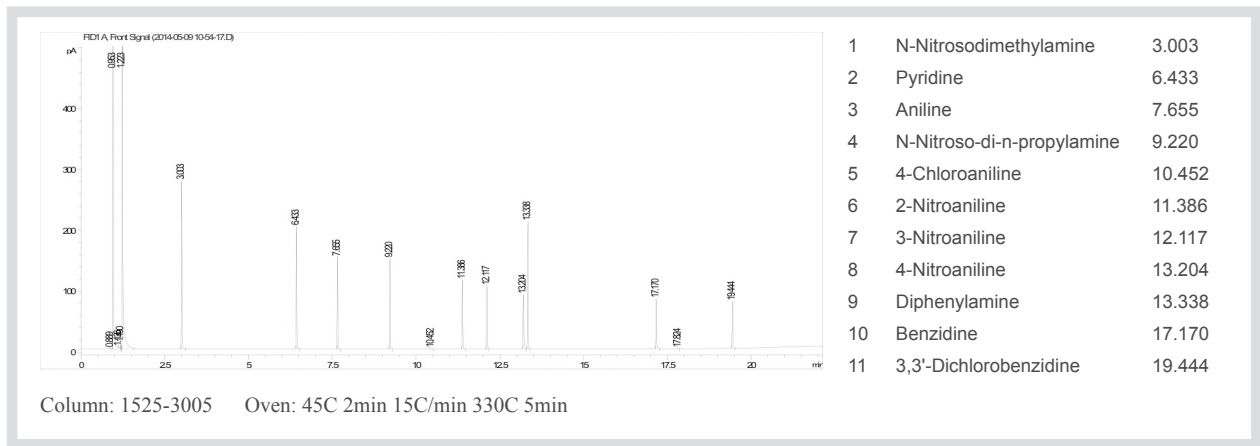


8. Amines and anilines

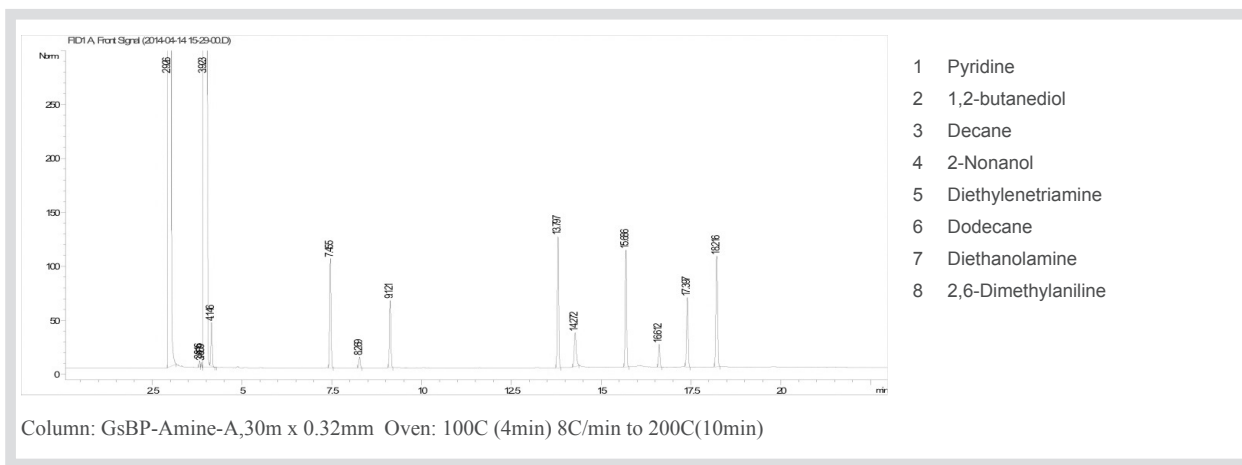
(i) Anilines GsBP-50+Ms



(ii) Aniline GsBP-5Ms



## (iii) Amine GsBP-Amine-A



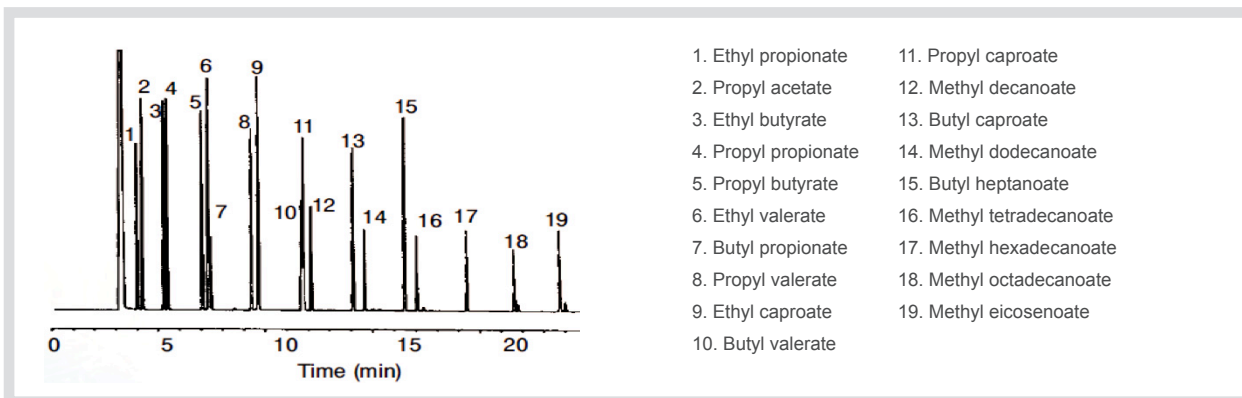
## 9. Esters

Carrier: Hydrogen, 3.0 psi (45°C) 4 ml/min constant flow

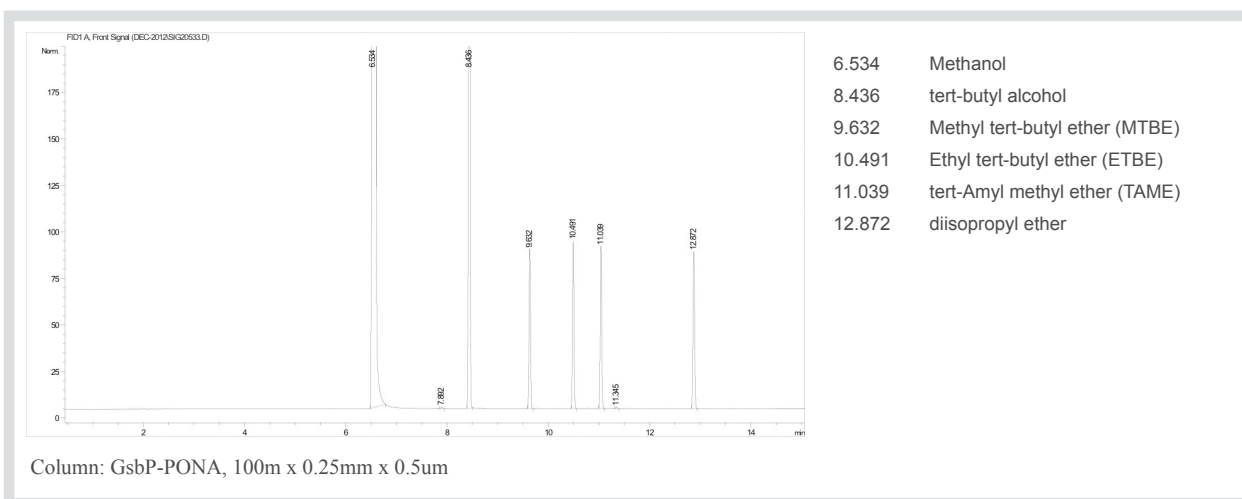
Column: GsBP-INNOWax 30 m x 0.53 mm x 1.0 um

Injection: Split (25:1), inlet 250°C Oven: 45°C 1min 5°C/min 200

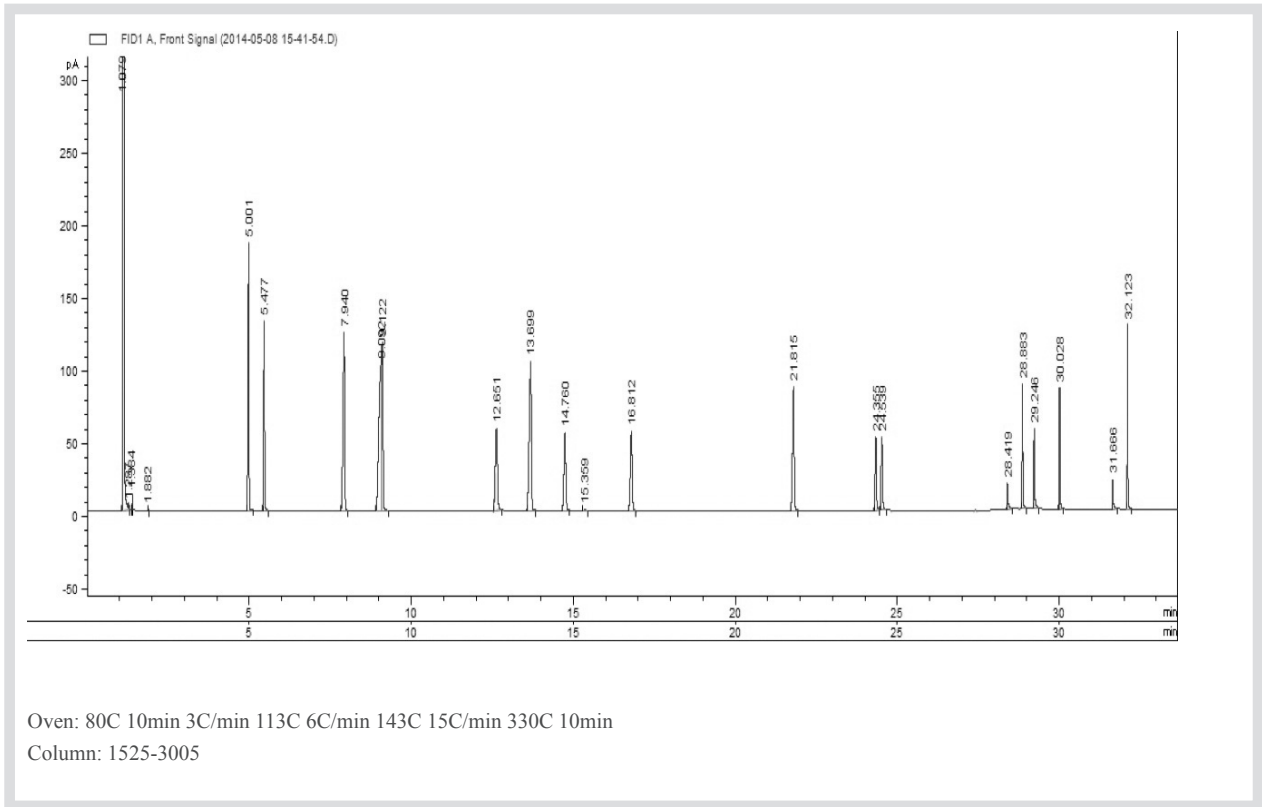
Detector: FID 250°C



## 10. Ethers



## 11. Phenols

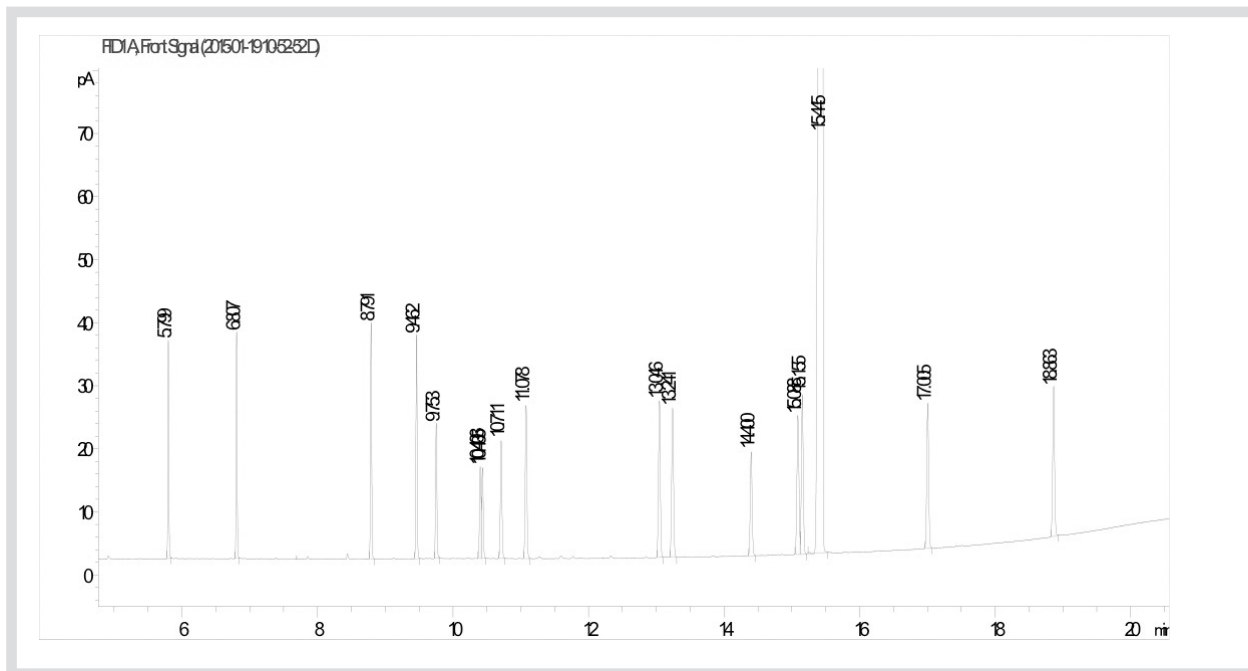


1	Phenol	5.001	11	4-Chloro-3-methylphenol	21.815
2	2-Chlorophenol	5.477	12	2,4,6-Trichlorophenol	24.355
3	2-Methylphenol	7.94	13	2,4,5-Trichlorophenol	24.539
4	3-Methylphenol	9.092	14	2,4-Dinitrophenol	28.419
5	4-Methylphenol	9.122	15	4-Nitrophenol	28.883
6	2-Nitrophenol	12.651	16	2,3,4,6-Tetrachlorophenol	29.246
7	2,4-Dimethylphenol	13.699	17	4,6-Dinitro-2-methylphenol	30.028
8	Benzoic acid	14.76	18	Pentachlorophenol	31.666
9	2,4-Dichlorophenol	15.359	19	Dinoseb	32.123
10	2,6-Dichlorophenol	16.812			

## 12. Phthalates

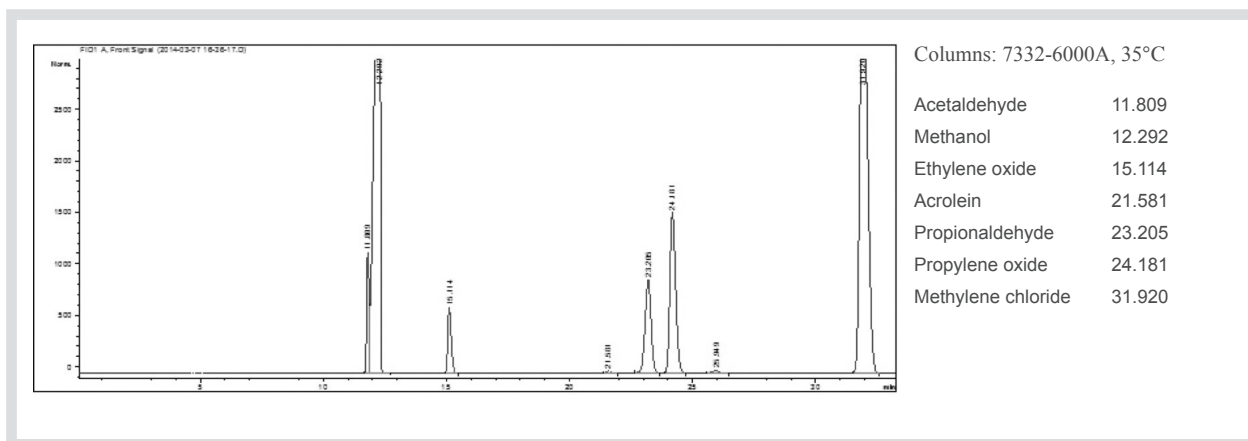
Column: 1525-3005

Oven: 80°C 0.5min 30°C/min 160°C 15°C/min 250°C 2min 8°C/min 320°C 1min



Dimethylphthalate	5.799	Di-n-hexyl phthalate	13.046
Diethylphthalate	6.807	Benzyl butyl phthalate	13.241
Phthalic acid diisobutyl ester	8.791	Bis(2-n-butoxyethyl)phthalate	14.400
Di-n-butylphthalate	9.462	Phthalic acid dicyclohexyl ester	15.088
Bis(2-methoxyethyl)phthalate	9.753	Bis(2-ethylhexyl)phthalate	15.155
Bis(4-methyl-2-pentyl) phthalate isomer	10.403	Dipentylphthalate	15.445
Bis(4-methyl-2-pentyl)phthalate	10.435	Di-n-octyl phthalate	17.005
Bis(2-ethoxyethyl)phthalate	10.711	Di-nonyl phthalate	18.863
Diamyl phthalate	11.078		

## 13. Ethylene oxides



Columns: 7332-6000A, 35°C	
Acetaldehyde	11.809
Methanol	12.292
Ethylene oxide	15.114
Acrolein	21.581
Propionaldehyde	23.205
Propylene oxide	24.181
Methylene chloride	31.920

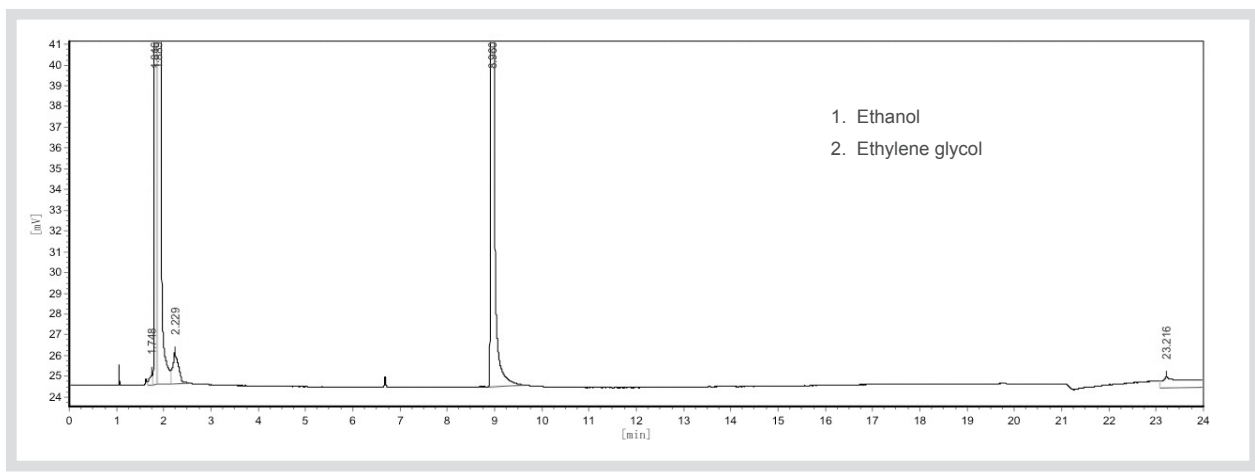


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### 14. Ethylene glycol

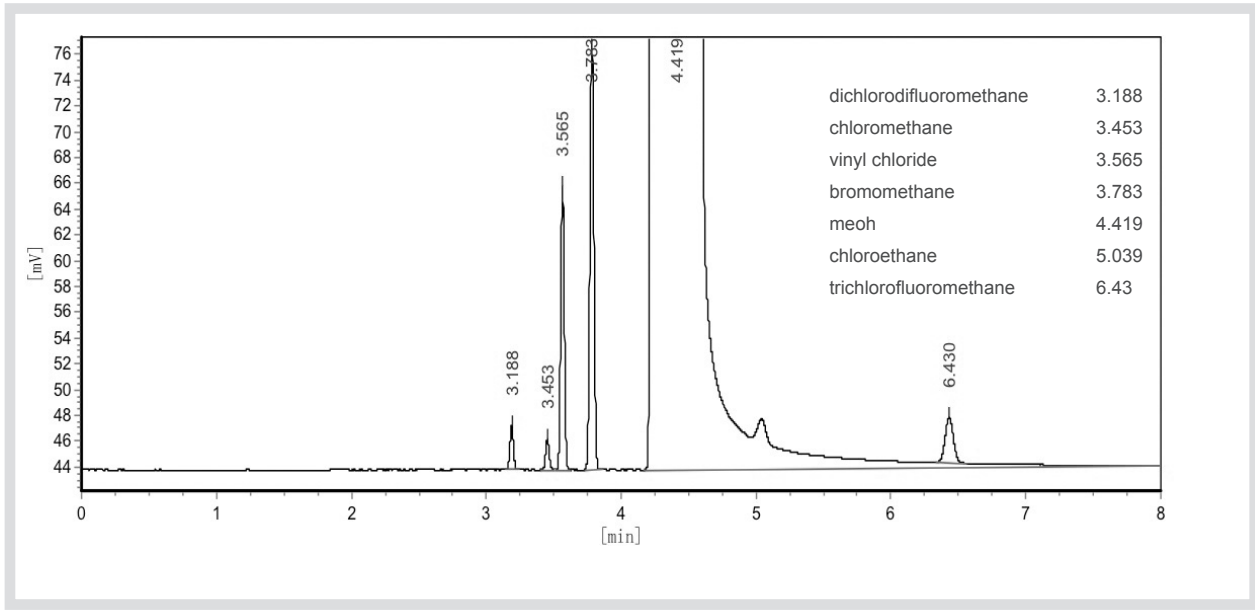
#### a. 200ppm EG in 70:30 ethanol:water, 1ul

Column: GsBP-Inowax, 30m x 0.32mm x 0.25um  
Oven: 80C (1mln) 10C/min to 200C



### 15. CFCs chlorofluorocarbons

Column: GsBP-624, 30m x 0.32mm x 1.8um  
Oven: 45°C



**GsBP™ Is Not Just Another  
Quality Column Brand**



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