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AN INERT GC FLOW PATH HAS NEVER BEEN MORE CRITICAL

The Measure of Confidence

See why inside...



Agilent Technologies

As samples become increasingly active and more complex, you cannot afford interferences introduced by the flow path. A non-inert flow path can cause peak tailing and signal loss, it can also take or hide components in your sample, so you would never know what was missing. Repeating or verifying suspect analyses wastes resources, hinders productivity, and costs you money. And, unreliable results can have catastrophic implications in terms of environmental safety, food quality, and inaccurate accusations of drug abuse.

To achieve the lower detection limits demanded by increasingly tough regulatory obligations, and quantify active analytes with confidence, you need the most inert GC flow path you can get.

Where's the problem?

Every stage of the flow path can degrade your results, from the inlet liner to the ion source. *Figure 1* shows the different components of the flow path where a lack of inertness can impact your results.

What's the solution?

Here are **Agilent's top five tips for GC flow path inertness** to give

you confidence that nothing has been lost from your sample, even at trace levels, and that optimum productivity is achieved.

1. Maintain the inlet to maintain results

Inlet cleanliness is critical to reliable, repeatable GC results. The choice of consumables, including septa and liner O-rings, affects the speed and quality of routine inlet maintenance. This is particularly important if you're working with trace, ECD and MSD analyses, when out-gassing or silicone residue can be a problem. Inlet

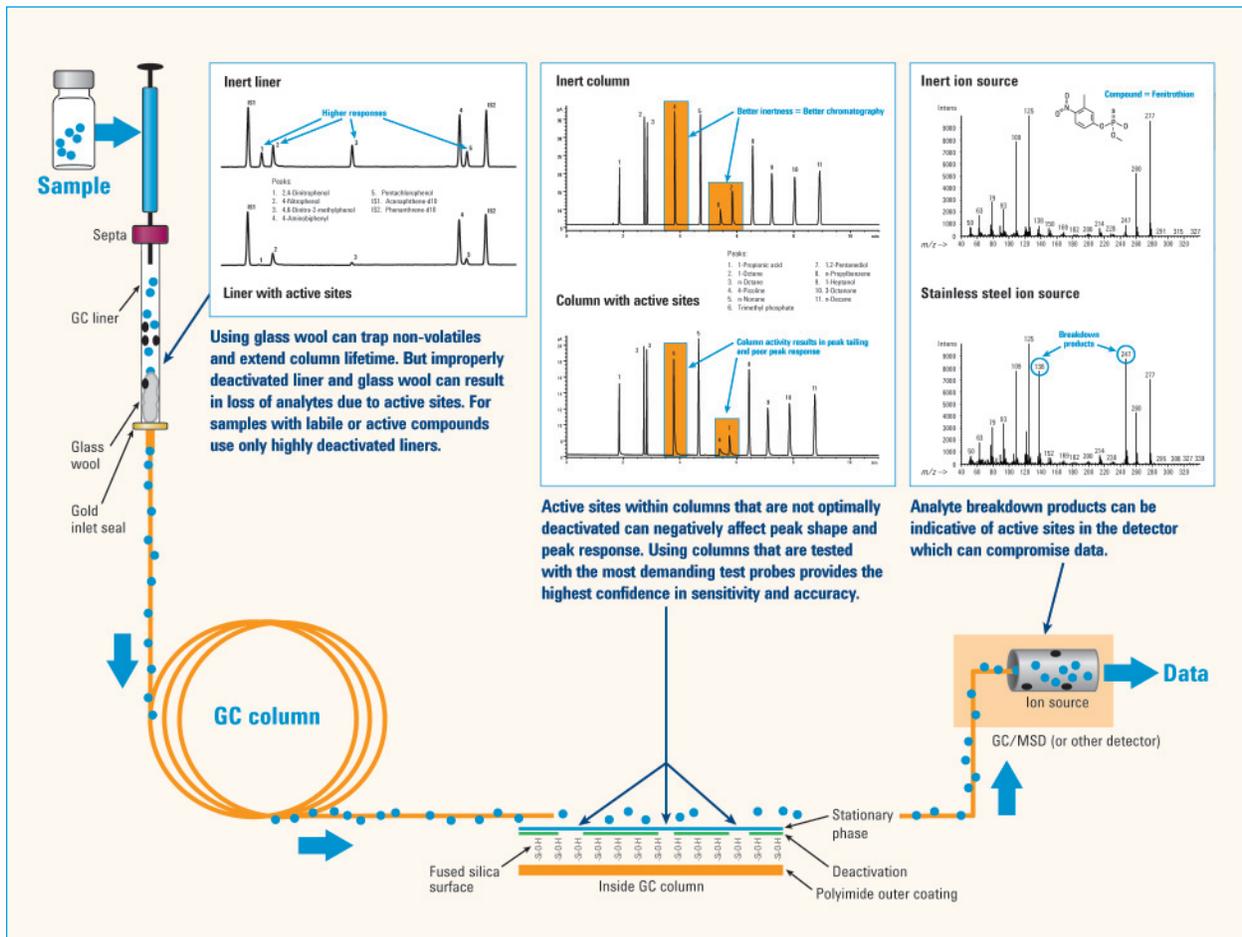


Figure 1. Are you building the most inert flow path?

cleanliness is thus a major concern in GC. The best option is to use Agilent septa and O-rings made from the purest materials, manufactured in clean facilities, and purposefully packaged to maintain cleanliness and prevent contamination during shipping and handling.

Silicone components in the heated inlet are known to stick to hot metal surfaces. Adherent residues force unscheduled inlet cleaning, reducing productivity. You can avoid this problem by selecting treated O-rings and septa that stops them from sticking to the metal surface of the inlet. The contaminant-free material prevents adhesion and unnecessary inlet cleaning, saving downtime and expense.

Preventive maintenance helps ensure peak instrument performance and productivity. Inspect and replace worn or dirty flow path supplies, such as syringe needles, septa, ferrules, and inlet seals on a regular basis, to eliminate leaks and minimize downtime. Record any changes in your lab book. Using Agilent certified vials, caps, septa, ferrules, and gold inlet seals can also extend the inert GC flow path. Gold seals are made from stainless steel, electro-polished and gold plated. The smooth exterior provides an inert surface that reduces breakdown of active compounds, as well as reducing the risk of leaks.

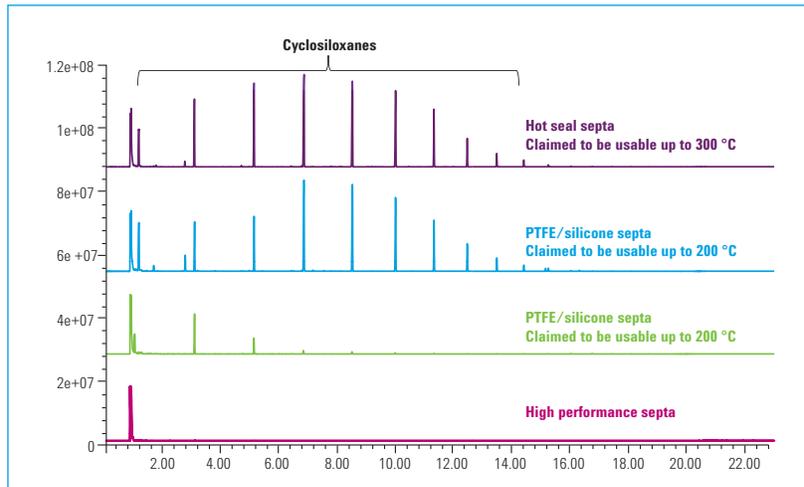


Figure 2. GC/MS chromatogram comparison of vial blank with different PTFE/silicone headspace septa and Agilent high performance septum. Vials were equilibrated at 300 °C for 30 minutes. Using a high performance septum delivers a chromatogram free of contamination.

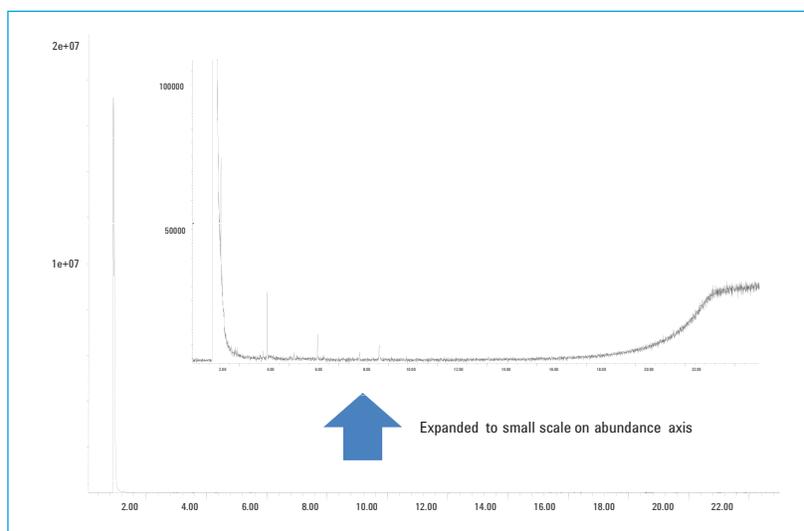


Figure 3. The Agilent high performance septum provides significantly cleaner blank background at high temperature headspace testing. Even with an expanded abundance scale, the 300 °C vial blank chromatogram with an HP septum shows few siloxane peaks, with very low abundance.

You can also use Agilent high performance (HP) septa that are manufactured from a material lined with a very robust silicone/rubber. These heat treated septa significantly reduce the amount of siloxanes that leach out of the material, and offer favorable chemical compatibility. Because they

provide dramatically cleaner backgrounds under very stringent operating conditions. HP septa are your best option for reliable and efficient headspace analysis-high-temperature GC.

Figure 2 shows a comparison of high performance and

*“In my 30 years of experience in running virtually every US EPA semi-volatile method... like Methods 608, 625, 508, 525.2 and of course 8270... the performance of the **Agilent J&W DB-UI8270D GC column** has raised the bar for semi-volatile analysis. With both conventional inlet technologies (Split/Splitless and LVI inlets) and on-column introduction, the Agilent J&W DB-UI8270D has demonstrated:*

- ▶ *Superior chromatographic resolution (PAHs specifically are phenomenal!)*
- ▶ *Superior inertness (reactivity of acid-fraction components like 4-Nitrophenol and 2,4-Dinitrophenol which have low pKa values is minimal)*
- ▶ *Superior breakdown characteristics (4,4'-DDT and Endrin breakdown is well below all method requirements and in many examples <5%!)*
- ▶ *Superior peak tailing performance of Pentachlorophenol and Benzidine (Benzidine, for example is Gaussian in peak shape)*

As a result of my continued research and work with clients, the Agilent J&W DB-UI8270D GC column will be the column of choice for my continued work and the recommended GC column to my clients analyzing under the core set of US EPA methods for semi-volatile analysis.”

Jeffery S. Hollis

Owner/Consultant

AnalySense - Sacramento, CA

non-high performance septa. The contaminant-free cleanliness of the chromatogram produced using HP septa is clearly evident. *Figure 3* is an expanded view, showing how high performance septa provide industry-leading chromatographic purity at 300 °C.

2. Don't lose sample at injection

Inlet liners are critical links in the sample flow path, and can be a source of activity and analyte loss. Liner design and chemistry impact the transfer of compounds into the column because active sites in the liner and the glass wool can cause loss of analyte; therefore, you should always use a reliably deactivated liner suited to your injection technique, and change the liner as needed. This will maximize sample transfer and minimize sample loss.

**Best-in-class
liner deactivation
performance**

Agilent Ultra Inert Inlet Liners give you a robust, reproducible and reliable inert flow path, even when containing wool.

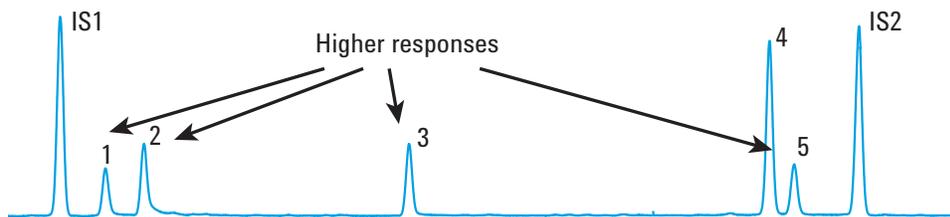
Learn more at

www.agilent.com/chem/uiliners



Semi-volatiles suitability

Agilent Ultra Inert single taper liner with wool (Agilent Part No. 5190-2293)



Peak identification:

1. 2,4-Dinitrophenol
 2. 4-Nitrophenol
 3. 4,6-Dinitro-2-methylphenol
 4. 4-Aminobiphenyl
 5. Pentachlorophenol
- IS1. Acenaphthene-d10
IS2. Phenanthrene-d10

Restek Siltek deactivated gooseneck liner with deactivated wool (cat. # 22406.213.5)

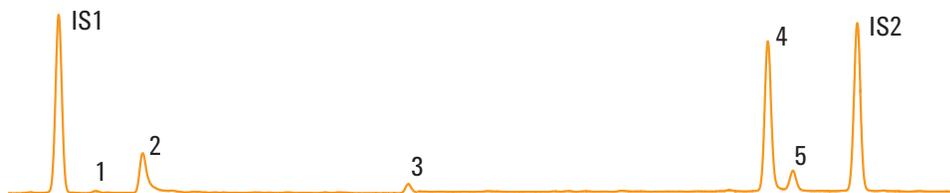


Figure 4. Using an Agilent Ultra Inert Inlet Liner preserves analyte integrity (above) compared to a liner without this capability (below)

Inlet liners with wool are widely used because the wool promotes homogenous sample mixing and better quantitation. Using a liner with wool seems like the obvious solution to trap high-boiling point matrix interference and prevent 'junk' from contaminating GC or GC/MS systems. However, glass wool liners can have drawbacks. The active sites on the wool surface can trap sensitive analytes, preventing these compounds from being delivered to the column for separation and analysis, and therefore causing significant loss of system sensitivity.

Now, you can inject heavy matrix samples and retain sensitivity by using Agilent Ultra Inert Inlet Liners with

wool, for trace level analyses such as semi-volatiles, pesticides, and even drugs of abuse. As well as protecting the inlet and column, and ultimately the MS source, the highly deactivated surfaces of these liners and wool are so inert that the negative impact of surface activity is significantly reduced, as shown in *Figure 4*.

If you test environmental samples, or samples extracted from plasma or urine, you will be dealing with heavy matrix samples that can have a marked effect on instrument condition every day. This is not an issue for Agilent Ultra Inert Inlet Liners, which provide excellent consistency even with heavy matrix samples.

The high level of inertness permits use of glass wool to trap the non-volatiles in the matrix, extending lifetime and protecting the column and the detector.

3. Use an Ultra Inert column with low activity

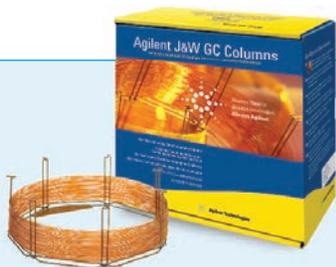
Peak shape and response can also be adversely affected by what happens to analytes in the column, so inertness is very important. High column inertness minimizes compound loss and degradation for more accurate quantitation of active analytes, especially at trace levels of acids, bases, and other active compounds.

To ensure consistent column inertness, it is vital to choose a column that has been tested to

(Continued)

ensure optimal inertness and low bleed.

For example, the unique ultra inert testing that only Agilent J&W offers ensures the most reliable qualitative and quantitative results, and unmatched column-to-column reproducibility, for your most challenging compounds. With the industry's only Ultra Inert testing, every column is tested for peak height ratios and tailing for acids, bases, and other chromatographically demanding compounds so you



Industry leading Agilent J&W Ultra Inert GC columns

Agilent J&W Ultra Inert GC columns push industry standards for consistent column inertness and exceptionally low column bleed, resulting in lower detection limits and more accurate data for difficult analytes. Learn about the new DB-624UI GC column for environmental, food and pharma at www.agilent.com/chem/624UI Learn how to get optimal inertness for environmental semi-volatile analysis with the new DB-UI8270D at www.agilent.com/chem/UI8270D

can have utmost confidence in your challenging trace-level results. And you can see ultra inert performance yourself as an individual performance summary sheet is shipped with every Agilent J&W Ultra Inert GC column.

When installing the column, start with high-quality ferrules and examine column ends for chips and burrs under magnification. Make sure the column is positioned at the recommended depth into the inlet and detector.

4. Don't forget the detector

To ensure accurate quantification and high sensitivity, the entire flow path must be highly inert, including detector surfaces. This is especially true of mass spectrometers, where an inert ion source is necessary to prevent active compounds from attaching to metal surfaces. Analyte breakdown products can indicate active sites in the detector that can compromise your data. The best inert sources are constructed of a solid inert material, as opposed to an inert coating that can wear away over time.

5. Profit by purifying your gases

Ensuring gas hygiene is one of the most important steps you can take to optimize GC system performance. Impure gases can introduce contaminants, or cause installation delays, premature instrument failure, and flawed results. Plus, the inefficient use of increasingly

Cleanest gas delivery for your most reliable analysis

Clean gases reduce the risk of column damage, sensitivity loss, and instrument downtime, while contaminants in gases can significantly affect your analysis. Learn about Agilent gas clean products at www.agilent.com/chem/gasclean



expensive and rare gas can go right to your bottom line.

Impurities in gases can activate glass wool in liners and accelerate septum degradation, causing high background signals and ghost peaks. This leads to time-consuming troubleshooting. Inserting gas filters in the gas line immediately before your GC inlet greatly reduces the level of impurities, thus improving trace analysis. Contaminants entering the GC column will also be reduced, which is critical for high temperature analysis and is essential for longer column lifetime. Gas filters also ensure clean gas delivery, provide fast stabilization and reduce helium gas consumption.

Total costs vs. helium consumption

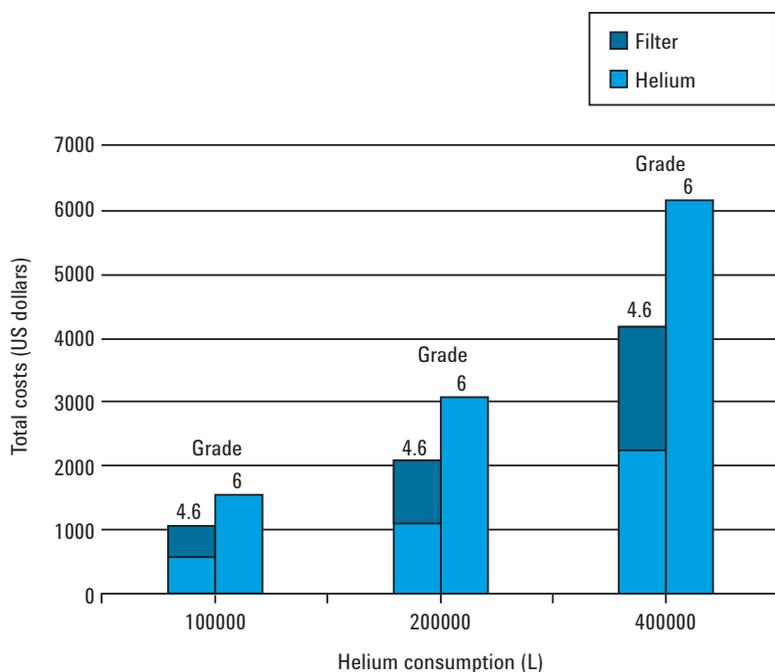


Figure 5. Potential cost savings when using the Agilent Gas Clean Filter System and 4.6 grade helium rather than 6.0 grade helium.

A good gas clean filter system lets you use 99.996% (4.6) pure helium and get high quality analytical results, instead of the more expensive 99.999% (5.0) or 99.9999% (6.0) grade. *Figure 5* compares the costs of filtered and non-filtered carrier gas using helium grade 4.6 and 5.0. The expected cost saving is around 30%.

Use the Agilent Gas Clean Filter System for oxygen, hydrocarbons and moisture to avoid loss of sensitivity and accuracy of the GC, and damage to your system.

Keep your GC clean – and working

With a busy schedule and countless demands on your time, it can be easy to lose sight of the need to optimize for an inert flow path. However, if you don't manage the inertness of your system, you risk jeopardizing your instrument, your column, and your results, with a potentially serious impact on economy and productivity. So ensuring an inert GC flow path has never been more critical. And Agilent continues to lead the way with inert flow path solutions. ♦



Speed up GC column selection with the Agilent J&W GC Column Selection Guide

The *Agilent J&W GC Column Selection Guide* makes it easier to choose the right GC column for all your applications. The step-by-step guide helps you choose a stationary phase based on factors such as selectivity, polarity, and phenyl content and understand how column diameter influences factors such as efficiency, solute retention, head pressure, and carrier gas flow rates. Order your copy at www.agilent.com/chem/getguides

Quantify active analytes with confidence

Agilent Ultra Inert components work together to deliver industry-leading results, to give you utmost confidence in your results. Learn more at www.agilent.com/chem/ultraintert

Optimize your flow path for inertness



Ensuring an inert GC flow path has never been more critical

As volatile samples become smaller, increasingly active, and more complex, the ability to avoid interferences caused by flow path activity is critical.

- A non-inert flow path can cause peak tailing and signal loss. It can mask or hide active compounds, which can result in non-detection of trace analytes present in the sample.
- Repeating or verifying suspect analyses wastes resources, hinders productivity, and hurts your bottom line.
- Unreliable results can have catastrophic consequences in terms of environmental safety, food quality, and accurate drug analysis.

Obtain vital information for your detection limits, identify active analytes, and optimize your flow path.

Optimizing your GC flow path for inertness

Using glass vials and non-metallic and activated column filters. The inappropriate use of metal vials or glass vials can result in loss of volatile and/or active analytes. For use only highly deactivated flows.

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Top 5 T for GC flow inertness

1. Minimize the flow path
2. Prevent sample adsorption
3. Select a column to minimize adsorption
4. Remember your detector
5. Use a gas purifier

Agilent Technologies

Learn how to optimize your flow path for inertness so you can achieve the ultra-low detection levels today's demanding analyses require.

Order your free poster today at www.agilent.com/chem/uiorder



Open a QR reader application on your smartphone and scan.

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