Inertness: What does it Mean for your Gas Phase Results?

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Introduction

Inertness from injection to detection

In gas chromatography, active substances readily find and adsorb onto active sites anywhere in the flow path of a modern GC system. From injection to detection, maintaining inert surfaces in the flow path is essential for achieving narrow, Gaussian peaks, low level detection, and accurate results for active analytes.

As laboratories process heavy matrix samples- often using minimal sample preparation, and demand for more sensitive analytical methods increase, the need for a suite of inert flow path components that line the road analytes travel becomes a necessity. Activity anywhere in the flow path can lead to

- poor peak shapes
- improper quantitation
- missed analytes

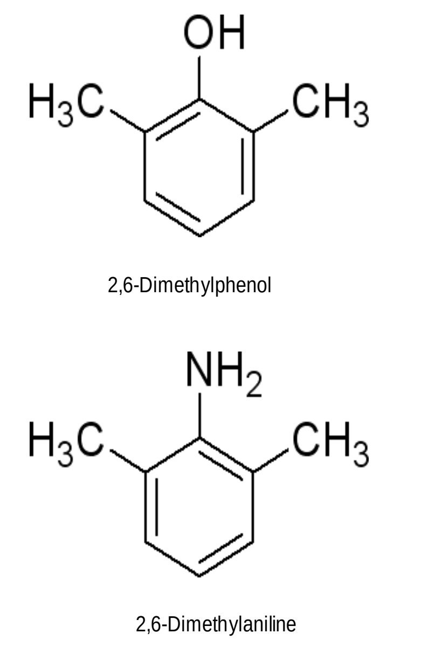
The right results, faster

Agilent offers a wide variety of highly inert columns and supplies to accommodate even the most challenging analysis. Implementing an inert flow path ultimately results in sharper peaks, greater sensitivity, and better resolution. As a result, laboratories can benefit through

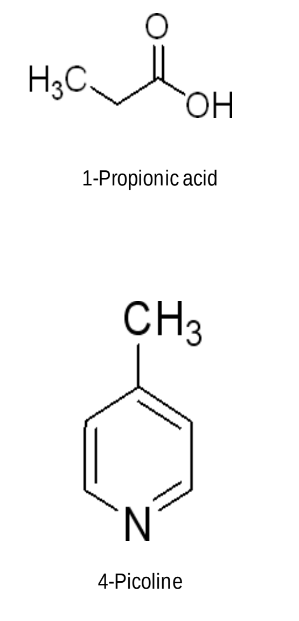
- Decreased need for maintenance
- Fewer reworks
- Less recalibration

Consequently, laboratories will enjoy significant gains in sample throughput and increased confidence in reported results.

Testing with Demanding Probes



Grob's Mix Probes

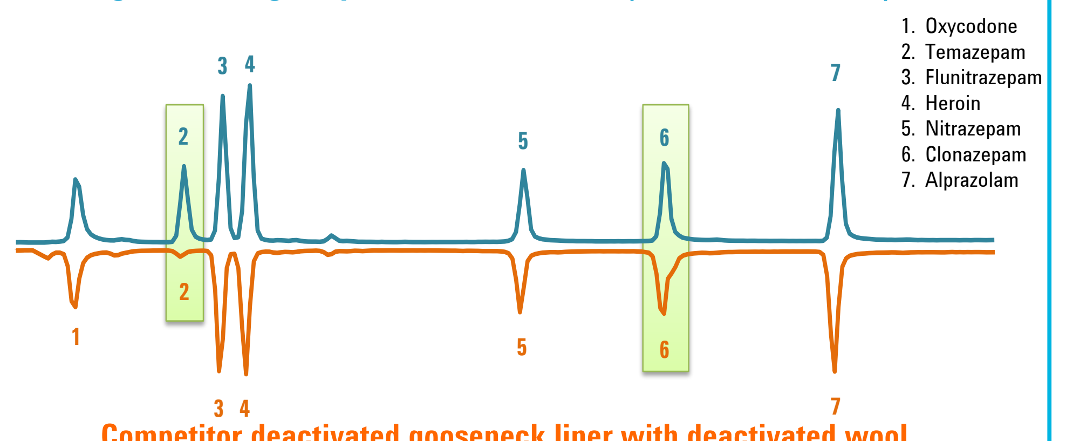


Ultra Inert Probes

AGILENT
INERT
FLOW PATH

Inertness Examples- Liners Columns and Flow Path

Agilent UI single tapered liner with wool (Part No. 5190-2293)



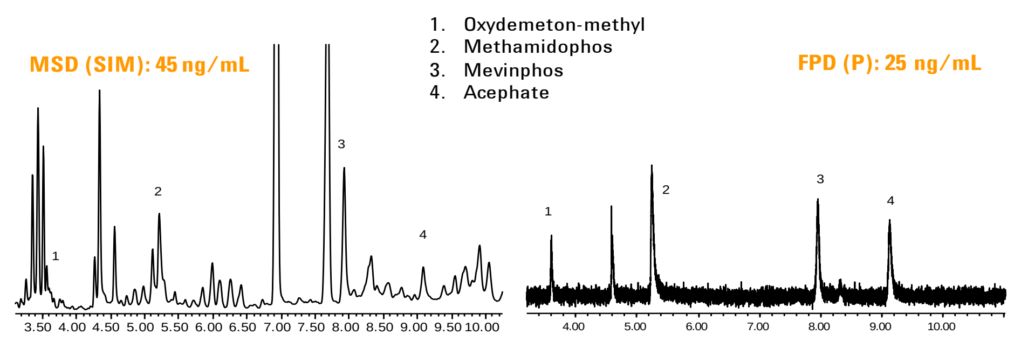
Competitor deactivated gooseneck liner with deactivated wool

Forensic basic drugs test conditions:

Column: DB-5ms UI, 15 m x 0.25 mm, 0.25 µm (Part No. 122-551UI)
Sample: 5 ppm Checkout mixture for GC/MS forensic/toxicology analyzer (Part No. 5190-0471)
Injection: 1 µL splitless @ 280 °C (hold 0.75 min)
Oven: 100 °C (0.5 min) to 325 °C at 20 °C/min and hold 2.5 min
Carrier gas: He, 18.74psi (adj to RT lock), constant pressure
Detector: Agilent 5975C MSD; Source temp @ 300 °C , Quad temp @ 150 °C , Transfer line @ 300 °C
Acquisition mode; SIM/Scan

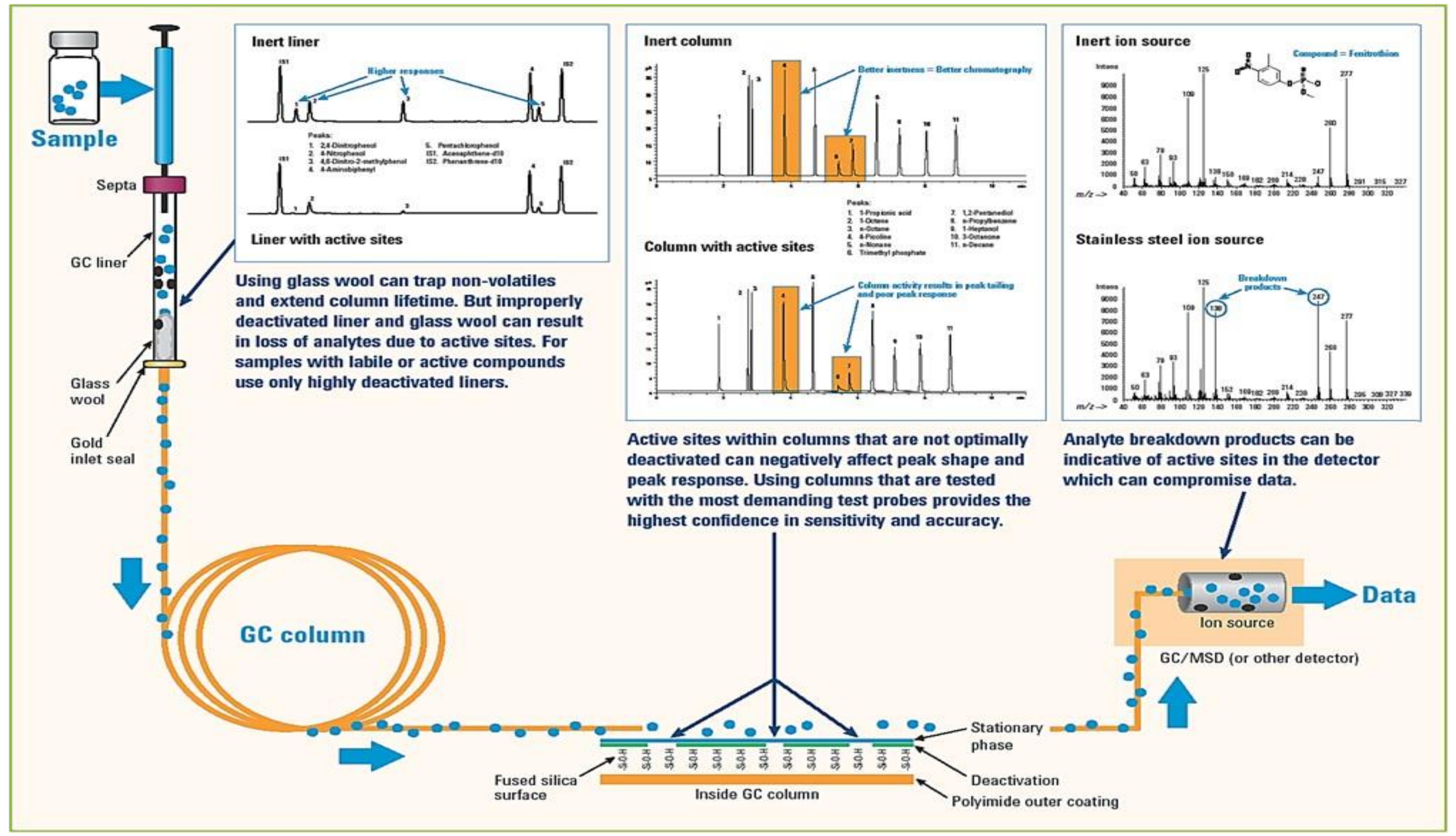
Application Note 5990-7596EN

Excellent Peak Shape for Polar Pesticides
at low levels on Agilent J&W DB-35msUI column



GC/MSD/FPD: 7890/5975C with 3-way splitter w/ makeup (3:1 split MSD:FPD)
Column: DB-35ms UI 20m 0.18mm 0.18µm. Agilent part #121-3822UI)
Restrictor 1 to MSD 1.2m x 0.15mm ID deactivated fused silica (Col 2)
Restrictor 2 to FPD 1.4m x 0.15mm ID deactivated fused silica (Col 3)
Inlet 1 µL, Splitless, 250°C
purge flow 60mL/min at 0.25 min, gas saver 20mL/min at 2 min
Carrier Helium, Col 1: constant pressure 43.5psi @ 95°C
AUX 6: 3.8 psi constant pressure
Col 2: 1.797 mL/min flow @ 95°C, Col 3: 0.5679 mL/min flow @ 95°C
Oven 95°C (1.3 min) to 125°C (15°C/min), 5°C/min to 165°C,
2.5°C/min to 195°C, 20°C/min to 280°C, hold 3.75 min
Postrun backflush 5 min @280°C;
backflush pressure 70 psi, inlet pressure 2 psi
FPD 250°C, Hydrogen 150 mL/min, Air 110 mL/min
Makeup 60 mL/min Cnst col + makeup
MSD: Transfer line 310°C Source 310°C Quad 150°C

Application Note 5990-7165EN



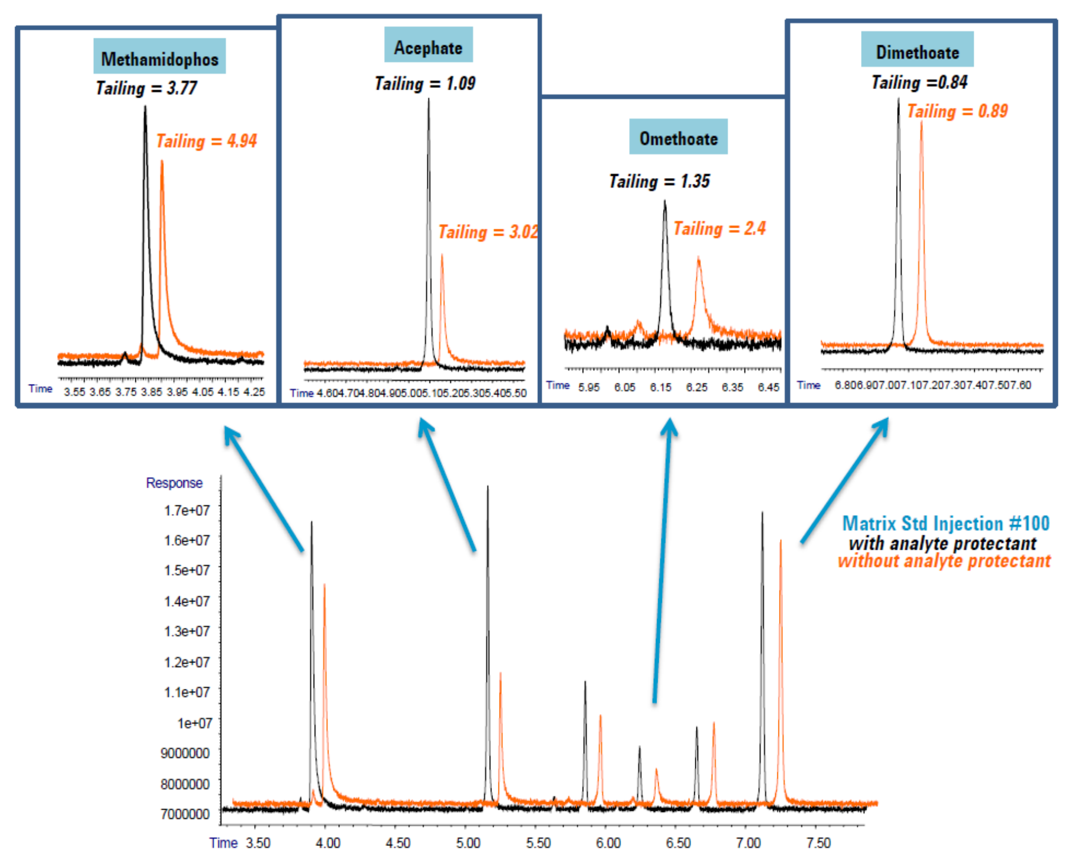
Using glass wool can trap non-volatiles and extend column lifetime. But improperly deactivated liner and glass wool can result in loss of analytes due to active sites. For samples with labile or active compounds use only highly deactivated liners.

Active sites within columns that are not optimally deactivated can negatively affect peak shape and peak response. Using columns that are tested with the most demanding test probes provides the highest confidence in sensitivity and accuracy.

Analyte breakdown products can be indicative of active sites in the detector which can compromise data.

Organo-Phosphorus Pesticides in an Olive Oil Matrix

Peak Shape and Response Comparison
with analyte protectant vs. without analyte protectant



Pesticide	%RSD 10 injections	50 injections	100 injections
Methamidophos	1.0	1.2	2.7
Acephate	1.9	2.4	5.1
Omethoate	2.1	4.8	9.4
Dimethoate	1.5	2.4	3.8

A final example shows how effective the combination of UI liners, UI columns and analyte protectant can be for some particularly challenging organophosphorus pesticides in a QuEChERS olive oil matrix. In this example even after 100 injections of sample matrix the %RSDs are below 10% for methamidophos, acephate, omethoate and dimethoate.

Application Note 5990-8235EN

Conclusions

- Testing with aggressive probes is necessary for consistent and reliable inertness performance
- Ultra Inert liners with deactivated wool provide both low surface activity and highly reproducible sample vaporization
- Use Ultra Inert columns for critical applications
- Best choice for trace level analysis
- Think of the Inert Flow Path as a system for consistently delivering better results for active analytes

References

"Addressing Concerns In QC Tests for GC Columns" Walt Jennings and Ken Lynam, Agilent Technologies publication 5990-9961EN

"Ultra Inert (UI) Wool Liner Performance Using an Agilent J&W DB-35ms UI Column with and without an Analyte Protectant for Organophosphorus (OP) Pesticides" Ken Lynam and Doris Smith, Agilent Technologies publication 5990-8235EN