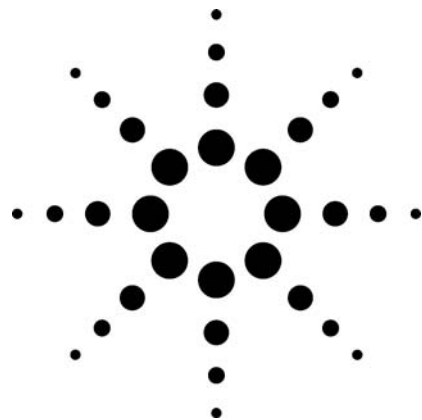


Agilent Preconditioned Ferrules for Reduced Contamination

Technical Overview



Introduction

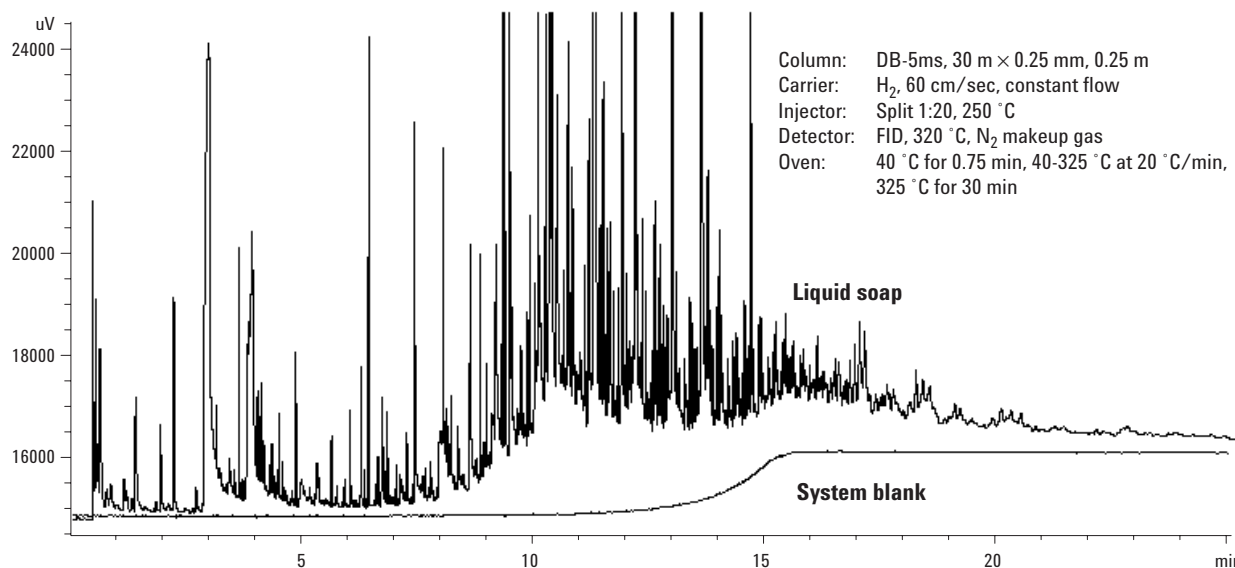
The ferrules you use to seal your GC column in the injection port and the detector have the obvious task of creating and maintaining a leak-tight seal. The design characteristics are critical for proper sealing as well as maintaining that seal over an often broad temperature range that can exist inside a GC oven.

Typically, not much thought is given to the source of the ferrules or how one handles and uses them, but there is a significant contribution, and the

purity of all inlet and detector consumables can contribute to the noise of the chromatographic signal. Most chromatographers are taught that care must be taken in the way the column is handled during installation.

Discussion

Figure 1 shows an example of how even trace residues left on the tip of a capillary column while it is being installed can generate a monstrous background that can persist for days or even weeks.



Procedure:

1. One very small drop of liquid placed on one fingertip.
2. Fingertip was wiped with paper towel to remove as much of the offending material as possible.
3. Lightly touched the part of the column sticking up above the ferrule.
4. Installed column into injector.
5. Set oven temperature to 40 °C.
6. Started oven temperature program as soon as oven reached 40 °C.

Figure 1. Effect of system contamination from fingers during column installation.



This same care also applies to the inlet and detector. Not only in how ferrules are handled during installation and routine maintenance, but also, less obviously, to the way in which the ferrules are treated before they are packaged, as well as how they are packaged to prevent them from becoming contaminated before they can be used in your GC.

Whether you use graphite ferrules (GRF) or graphitized/Vespel™ (GRF/VSP) ferrules, the manner in which either of the ferrule types are handled during manufacture, packaging, and finally in the GC laboratory can have a profound effect on chromatographic system noise. Agilent works closely with suppliers to get the best possible performance through the appropriate choice of raw materials, manufacturing design, handling, and packaging to ensure that our ferrules stay clean and are ready to use.

Agilent GRF and GRF/VSP ferrules are packaged in individual compartments within the convenient dial dispenser shown in Figure 2.

Using clean tweezers, each set of ferrules was carefully removed from their respective packages and placed into separate 10-mL static headspace vials. Both of these samples were then analyzed in an Agilent G1888 Headspace Sampler. After heating the ferrules to 150 °C and equilibrating for 1 hour,



Figure 2. Agilent ferrule packaging.

a 1-mL headspace sample was analyzed by GC-FID. It is obvious that the contaminants that are out-gassed at elevated temperatures from the competitor's GRP ferrules can contribute considerable background until they have completely desorbed.

Figure 3 is a chromatographic comparison of two Agilent GRF ferrules and two similar ferrules from Competitor A that are packaged in a plastic tube.

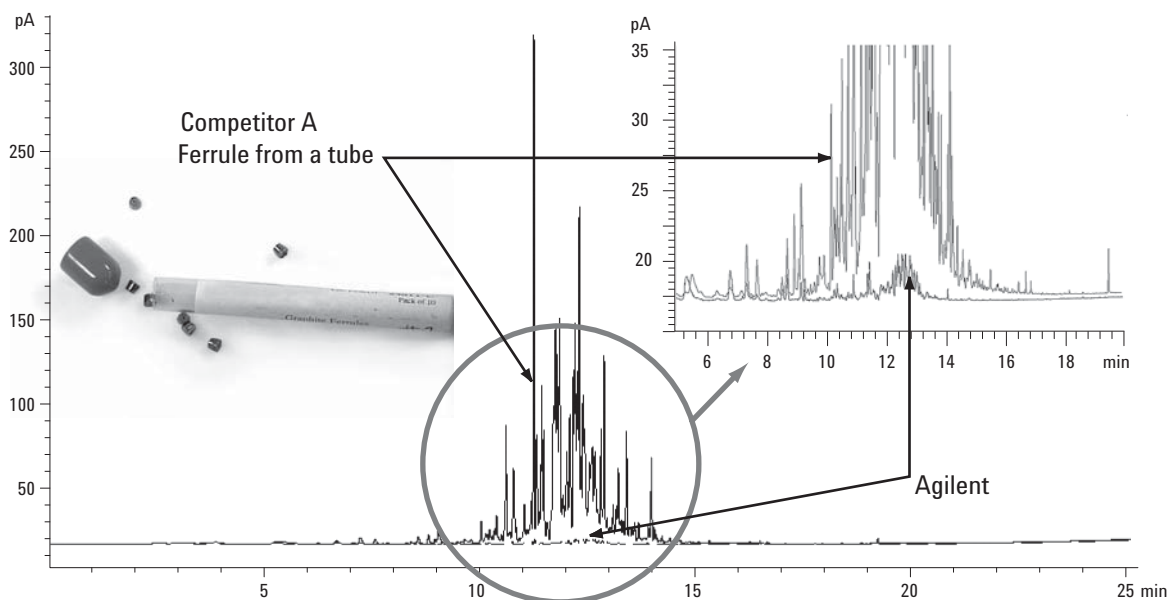


Figure 3. Chromatographic comparison of Agilent graphite ferrules and Competitor A ferrules from a tube.

In a similar experiment, a Competitor B GRF ferrule from a plastic reclosable box was analyzed (Figure 4).

Particularly in the case of GRF ferrules, the Agilent GRF ferrules demonstrated a significant improvement as seen by the reduction of out-gassed contaminants that are traceable to residual manufacturing materials on the competitor's product, or semivolatile contaminants that are picked up on the surface of the disks while in the plastic tubes used to store their ferrules. Graphite, a crystallized carbon with traces of Fe and SiO₃ and

other minerals, is a good absorbent of contaminants in its environment. The starting material should be clean before the ferrule is pressed into its form, but even then the product needs to be kept in an environment that minimizes exposure to contaminants that will outgas when the injection port and the GC oven are heated to very high temperatures.

Similar comparisons are shown for GRF/VSP ferrules from Agilent and from Competitor B (in bag) and Competitor A (in tube) in Figures 5 and 6, respectively.

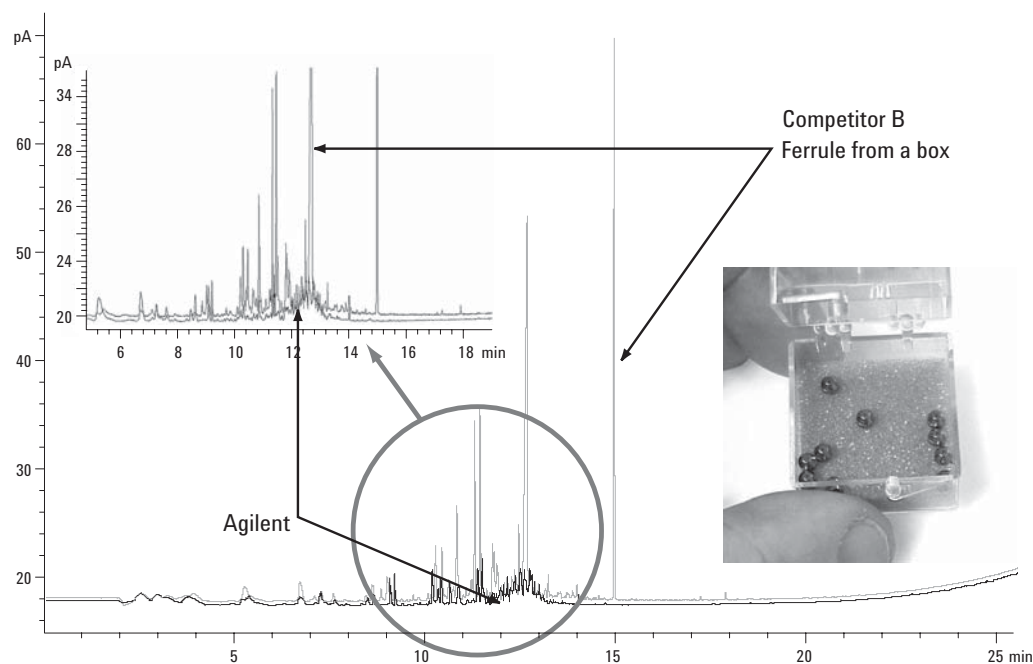


Figure 4. Chromatographic comparison of graphite ferrules from Agilent and Competitor B ferrules from a box.

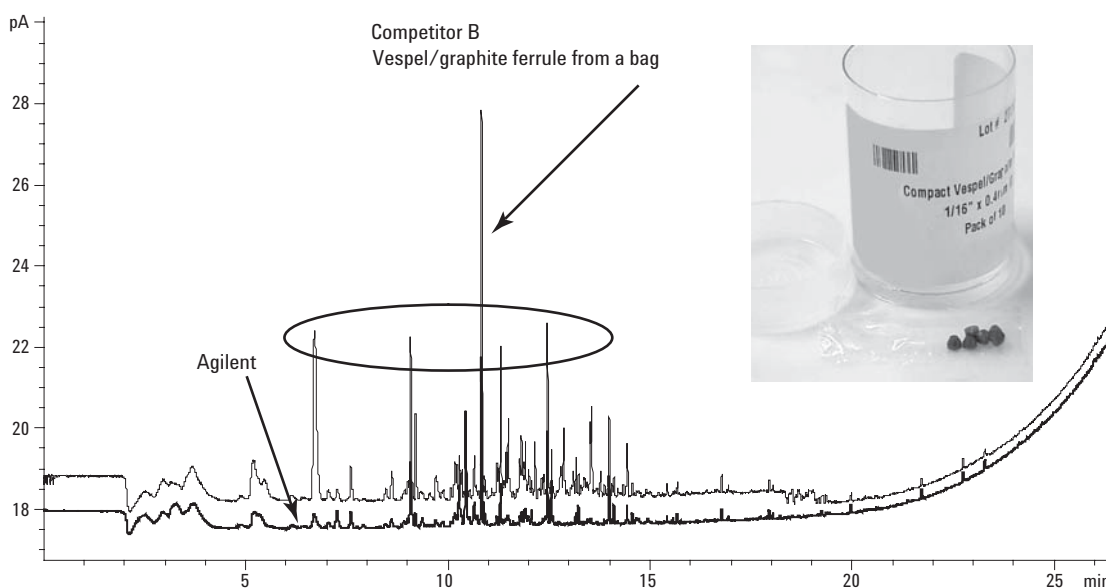


Figure 5. Chromatographic comparison of Agilent GRF/VSP ferrules and Competitor B GRF/VSP ferrules from a bag.

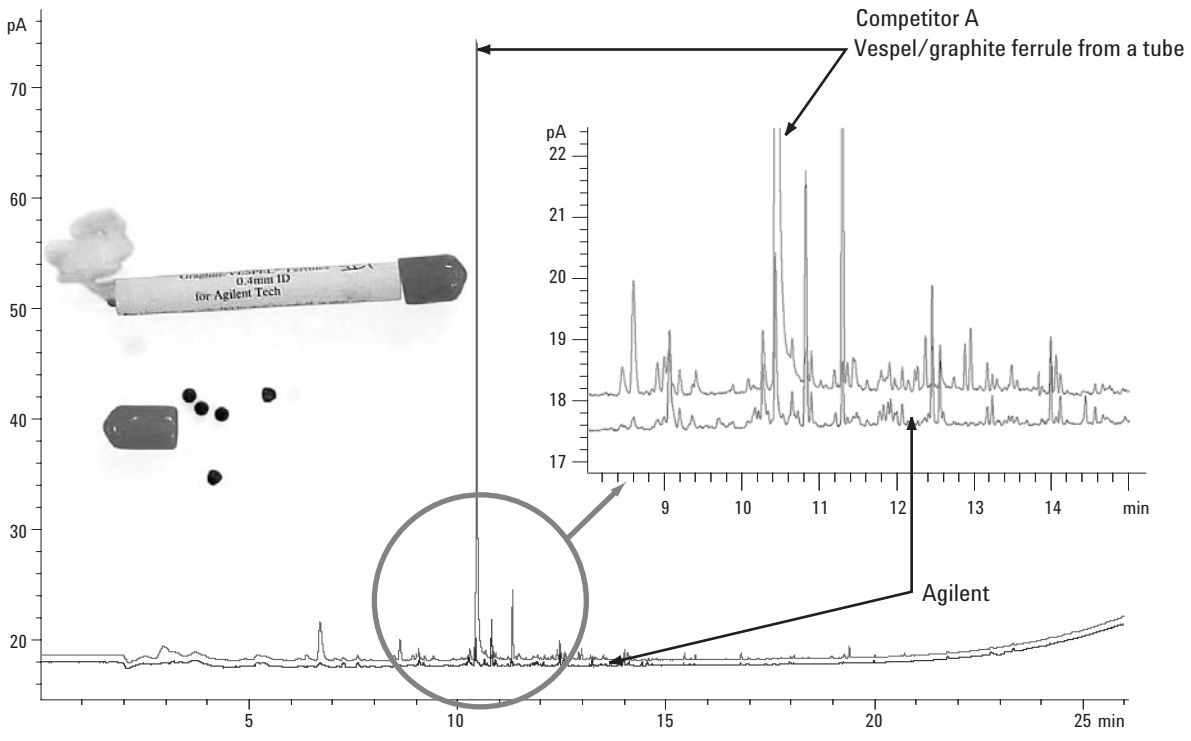


Figure 6. Chromatographic comparison of GRF/VSP ferrules from Agilent and Competitor A GRF/VSP ferrules from a tube.

Another small yet nice convenience is that the dial-a-ferrule packaging makes it much easier to see when it is time to reorder more ferrules. See Figure 7.

consumables causes background disturbances that require extended conditioning time, then productivity suffers. Agilent preconditioned ferrules, in combination with our nonstick septa and nonstick O-rings from contaminant-free packaging, and applying clean handling practices during installation, will result in rapid maintenance routines, thereby getting your instrument back up and running quickly.

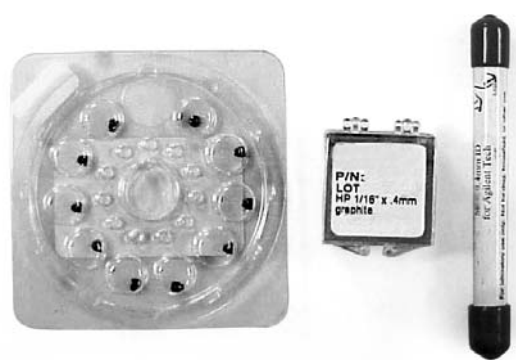


Figure 7. Agilent's packaging allows for easy determination of remaining ferrules.

Combined, the effects on system background noise from contaminants derived from septa, liner O-rings, and ferrules, should be a consideration when looking for ways to improve GC laboratory productivity. If installation of any of these

General Purpose Graphite Ferrules (Short Ferrules)

Description	Unit	Part No.
For use with capillary columns that have an inside diameter of 0.32 mm	10/pack	5080-8853
For use with capillary columns that have inside diameters of 0.05 to 0.25 mm	10/pack	500-2114
For use with capillary columns that have inside diameters of 0.45, 0.53 mm	10/pack	500-2118
For use with capillary columns that have an inside diameter of 0.53 mm	10/pack	5080-8773

85% Vespel, 15% Graphite Ferrules (Short Ferrules)

Description	Unit	Part No.
For use with capillary columns that have inside diameters of 0.1, 0.18, 0.20, 0.25 mm	10/pack	5181-3323
For use with capillary columns that have an inside diameter of 0.32 mm	10/pack	5062-3514
For use with capillary columns that have inside diameters of 0.45, 0.53 mm	10/pack	5062-3512

Preconditioned 85% Vespel, 15% Graphite (Long Ferrules)*

Description	Unit	Part No.
For use with capillary columns that have inside diameters of 0.1, 0.18, 0.2, 0.25 mm	10/pack	5062-3508
For use with capillary columns that have an inside diameter of 0.32 mm	10/pack	5062-3506
For use with capillary columns that have inside diameters of 0.45, 0.53 mm	10/pack	5062-3538

100% Vespel High-Performance Ferrules (Short Ferrules)**

Description	Unit	Part No.
For use with capillary columns that have inside diameters of 0.1, 0.18, 0.2, 0.25 mm	10/pack	5181-3322
For use with capillary columns that have an inside diameter of 0.32 mm	10/pack	5062-3513
For use with capillary columns that have inside diameters of 0.45, 0.53 mm	10/pack	5062-3511

85% Vespel, 15% Graphite, Specialty 2-Hole Ferrules***

Description	Unit	Part No.
For use with capillary columns that have inside diameters of 0.1, 0.18, 0.2, 0.25 mm	10/pack	5062-3580
For use with capillary columns that have an inside diameter of 0.32 mm	10/pack	5062-3581

*These ferrules are recommended for use with Agilent GC/MS transfer lines using P/N 05988-20066, MS interface column nut.

**These ferrules are recommended for use with Agilent's Cool-On-Column injection port.

***These ferrules require the use of a special column nut, P/N 05921-21170.

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