Technical Tips for Avoiding Inlet Problems

Inlet issues can lead to poor chromatography and be a significant source of frustration in the lab. Many problems can be avoided by considering some basic principles. Here are some simple tips to help you improve chromatography and select the best liner for your application.

Consider Volume and Inner Diameter

Problems such as broad or tailing peaks, poor reproducibility, ghost peaks, and nonlinear response can result if sample expansion volume and linear velocity are not considered when choosing liner dimensions.

Sample Expansion Volume

When a liquid sample is vaporized inside an inlet liner, its volume expands considerably. Care should be taken to match the effective liner volume and the expanded volume of the injected sample. If the liner volume is exceeded, the sample will be forced back into the gas lines, causing irreproducible peak areas and sample carryover.

Linear Velocity

Choosing a liner with a narrow inner diameter will give a faster linear velocity (for a given flow rate), which will move the sample onto the column quickly, improving efficiency and helping keep peak widths narrow. This is particularly important for gaseous samples introduced via purge-and-trap or static headspace techniques, or when 0.18 mm, 0.15 mm, and 0.10 mm ID columns are used.

Solvent expansion volumes based on an injection port temperature of 250°C and a 10 psig head-pressure.

For a straight 4mm ID x 78.5mm long liner, the effective liner volume is approximately 500µL.

Injection Volume (µL)	Expansion Volume (µL)				
	H_2O	C_2S	CH_2Cl_2	Hexane	Isooctane
0.5	~~710~~	212	200	98	78
1.0	~~1420~~	423	401	195	155
2.0	~~2840~~	~~846~~	~~802~~	390	310
5.0	~~7100~~	~~2120~~	~~2000~~	~~975~~	~~775~~

— indicates expansion volume exceeds effective liner volume.

Protect Analytes from Active Sites

Active sites in the inlet or liner can interact with reactive analytes, resulting in poor chromatography and reduced response. Exposure of analytes to active sites can be minimized by carefully considering liner packing, geometry, and deactivation.

Packing

Sample characteristics and injection technique will dictate whether packing is used. Analyses of high molecular weight analytes, especially in split mode, benefit from the use of packing. However, while wool improves sample vaporization, protects the column from nonvolatile compounds, and permits larger volume injections, it can also be a source of active sites that cause poor peak shape. When using a wool packed liner, highly inert Sky™ liners are recommended for optimal performance. (See pages 206-209 for technical comparison.)

Specialized Uniliner® Geometry

Unliner® and Drilled Uniliner® inlet liners reduce analyte exposure by allowing a fused silica column to be connected directly to the liner through a seal made between the inner glass wall of the liner and the polyimide coating on the outside of the column. This configuration maximizes the amount of sample transferred to the GC column, minimizes sample exposure to hot injection port parts, and is a good choice for trace analyses.

Use the Drilled Uniliner® inlet liner with the hole near the bottom for semivolatile analyses or when compounds of interest could be affected by a tailing solvent peak. Use the Drilled Uniliner® inlet liner with the hole near the top for chlorinated pesticides analyses, aqueous injections, and analyses in which the compounds of interest elute away from the solvent peak. Note that instruments equipped with electronic pressure control must use Drilled Uniliner® liners, rather than standard Uniliner® liners.

Drilled Uniliner® with hole near bottom

Drilled Uniliner® with hole near top