What Type of Inlet Liner is Best for My Analysis?

by Brad Rightnour, Restek GC Accessories Product Line Manager

With so manv different inlet liner designs and deactivation chemistries available, how do you determine which one is best suited for vour analvsis? Each liner geometry offers the analyst a unique sample flow, from the liner to the analytical column, through cups, cyclos, and packings designed in the inner bore of the finer. How does each design affect sample flow? Which deactivation chemistry is best for your particular analysis?

Let's look at these questions to determine the answers to liner geometry selection and deactivation.

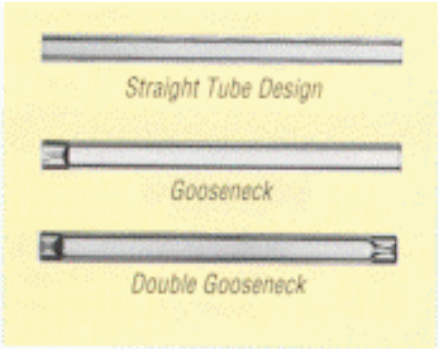
Splitless Inlet liners (Figure1)

Splitless liners are designed to hold the sample in the liner from between 0.5 and 2.0 minutes. A large surface area is not critical for splitless injections.

It is common to use packing materials whenever dim, samples are analyzed.

Figure 1

Splitless liners are designed to hold the sample in the liner for 0.5 to 2 mins A large surface area for sample vaporization is not a factor in splitless injections.



The ***straight tube design*** *is* the most common splitless sleeve design. This liner is ideal for low molecular weight samples that are not prone to thermal decomposition. if used for high molecular weight sample analysis, packing material is recommended to aid in sample vaporization. The drawback with using packing material

resulting increased residence time of the sample can cause adsorption of the high molecular NN eight compounds.

The ***gooseneck liner*** isolates the sample from the metal injection port parts situated at the base of the injector. This design funnels the sample onto the analytical column for increased splitless efficiency and decreases the breakdown of highly active compounds, such as endrin and DDT. A ***double gooseneck design*** helps to contain the sample cloud in the liner, for increased performance with larger sample introductions, but cannot be packed with wool

Split Inlet Liners (Figure2)

Split liners are designed to help vaporize the sample before it enters the column using mixing chambers and tortuous flow paths. Materials such as deactivated fused silica wool or beads, CarboFrit packing, and other packings are used to increase sample vaporization.

The most common liner for split analysis is the ***4mm straight liner witb deactivated wool.*** This offers the analyst a wide variety of options. The wool has a high surface area for more sample evaporation to occur, and promotes a uniform vapor cloud to enter the split point. This liner is the most economical of the split liners~ the drawback is that the wool increases breakdown of highly active compounds. Extensive upkeep is required to maintain analysis reproducibility when using this liner, as the wool needs to be changed frequently and its position and quantity inside the finer is critical.

Cup splitter liners offer a more homogenous vaporization through increased sample residence time in the liner. The sample passes through a series of tortuous flow paths, which aids in sample vaporization. First, the sample travels around an elongated cup and is trapped at the base of the finer, where vaporization occurs. Then it travels back up the finer and onto the column. These liners are best suited for high molecular weight compounds. The ***Cyclosplitter liners*** incorporate a cylindrical glass screw in the sample pathway. The screw helps to mix and vaporize the sample. The increased

surface area in the cylindrical glass screw also helps to trap non-vaporized sample, therefore making it ideal for dirty samples

Does Deactivation Make a Difference?

Deactivation chemistry has come a long way since acid **and DMDCS (dimethyldichlorosilane) deactivation.** With more choices available, how do you choose one deactivation chemistry over another., Deactivation of the inlet liner is critical in the introduction of the sample to the column. because the liner is the first point of contact for the sample in the inlet system. If the liner is not properly deactivated, adsorption or breakdown of the sample can occur and result in poor quantitation or misidentification of compounds (Figure 3). For the majority of analyses. liner deactivation is

necessary to ensure complete, sample transfer to the capillary column. Deactivation is especially critical for analysis of certain pesticides, herbicides, amines, acids, and drugs.

Not all deactivations are alike-different types of chemicals and processes are used to deactivate the surface of the glass. There are several types of liner deactivations available:

Pinpoint Deactivation

This is the most widely used deactivation technique for liners and typically uses DMDCS deactivation. It is good for most non-critical analyses, analysis of polyaromatic hydrocarbons (PAHs), highly concentrated samples, and non-active sample matrices. This deactivation has very low resistance to sample degradation before re-deactivation or liner replacement is needed.

Polymeric Deactivation

A polymeric deactivation provides total surface coverage. There are no exposed active sites as there are with pinpoint deactivation. Polymeric deactivadon has a high resistance to sample degradation mid shows increased response for low concentration samples and highly active samples, such as Endrin, DDT, and drugs. Endrin breakdown of less than 2% is standard when using a polymeric deactivation. Longer liner lifetimes are provided because the deactivation is bonded to the surface

Base or Amine Deactivation

This is a special deactivation for the analysis of bases and amines. This deactivation provides superior response with sample repeatability for the analysis of trace amine compounds (Figure 4).

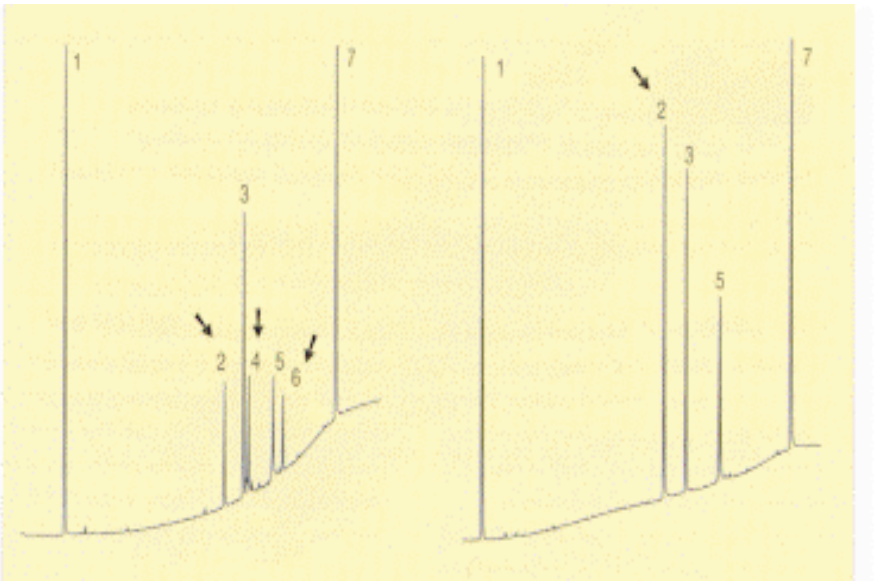
When choosing a liner for your analysis, match the liner geometry and

xxill be performing. The liner geometry and deactivation are as important as the choice of column for the analysis of special compounds. Increased performance and more accurate analyses will be the results of a thoughtful decision.

Request Restek's handy pocket reference guide ***Inlet Supplies*** (lit, cat. #59980), Or visit our website at www.restekcorp.com. The Inlet Supplies pocket guide is in at your-fingertips reference packed with liner selection information, inlet supplies, and a complete product listing.

Figure 3
Deactivated Liners Significantly Decrease Endrin Breakdown

The untreated inlet liner exhibits 62% endrin breakdown. *The deactivated inlet liner exhibits I% endrin breakdown.*

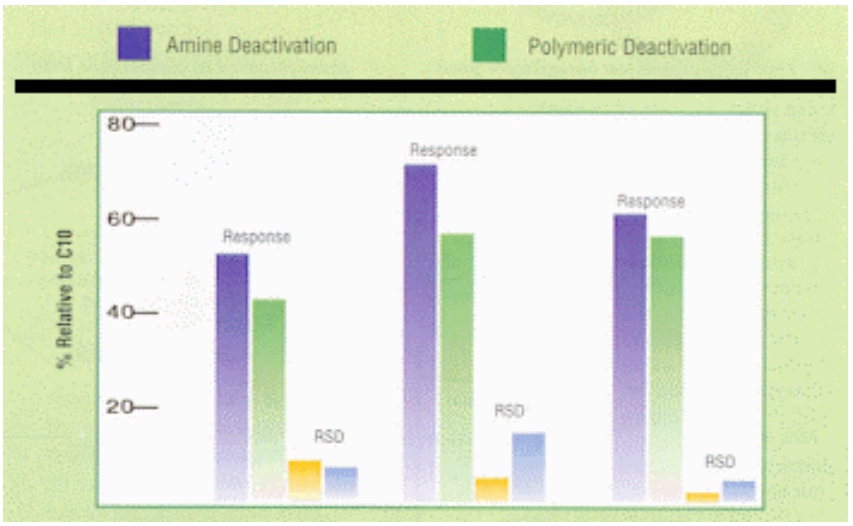


1. 2,4,5,6-tetrachloro-m-xylene
2. endrin
3. 4,4'-DDT
4. endrin aldehyde
5. methoxychlor
6. endrin ketone
7. decachlorobiphenyl

Figure 4

Response Comparison of Amine Deactivation vs. Polymeric Deactivation.

Column: 30m, 0.53mm ID, 3.0um, Rtx~5 Amine; Diethanolamine on-column concentration: 1 5ng; Injections/sleeve: 5; Inj./det. temp: 250'C/285'C Each sleeve conditioned (0 285'C for 1 hour prior to injections. HP 589011 Plus with HP 7673 Autosampler.



Splitless Recessed Goose | **Splitless Recessed Goose w/ Deactivated Wool** | **Direct Open Top Uniliner w/ Deactivated Wool**