Effect of Liner in GC chromatogram

Internal Diameter

The first parameter to consider when selecting a liner is the vapor volume which will be produced by the sample. When a sample is introduced into a heated liner its volume will increase greatly during vaporization. The amount of this expansion is determined by the solvent used, the temperature of the inlet and the pressure inside the liner.

The liner volume must be sufficient to accommodate the gaseous sample. If the diameter of the liner is too small the sample will expand beyond the capacity of the liner. This will result in sample loss both through the septum purge flow and split line and give disrupted sample transfer onto the column. This will likely be seen as peak tailing and poor peak area reproducibility.

If the diameter of the liner is too large there will be a large dead volume, which will increase the sample transfer time leading to peak tailing. The quartz wool packing in a FocusLiner™ (detailed below) helps prevent this diffusion.

The vapor volume for a sample can easily be calculated by following the calculation in appendix A. The table provides vapor volumes for common GC solvents at different temperatures and pressures.

Split and Splitless Liners

After ensuring the correct internal diameter has been selected for your liner the next thing to consider is what type of injection is going to be used. Thermo Scientific FOCUS and TRACE instruments recommend different liners for split and splitless injections. This is generally not required with the Thermo Scientific TRACE 1300/1310 and some other manufacturer's instruments, although specific split and splitless liners are available.

Split liners are typically open ended at the bottom (Figure 1) This enables the split flow to pass across the bottom of the liner removing a portion of the sample allowing a split injection to be performed. Consult your GC manual for correct column insertion distance.

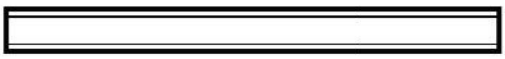

Figure 1: Thermo Scientific Split Liner 5 mm x 105 mm

Splitless liners are typically tapered at the bottom (Figure 2) with the column inserted into the taper. This helps to funnel the sample onto the column and minimizes sample contact with reactive metal components in the inlet during the time the split flow is off during splitless injection. Consult the GC instrument manual for correct column insertion distances.

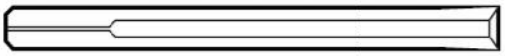

Figure 2: Thermo Scientific Splitless Liner 5 mm x 105 mm

Shown in Figure 3 is a comparison using a splitless and split liner in a splitless injection with a sample of alkanes. Notice how the peak shape and height of the early eluting (more volatile) compounds is severely affected when using the incorrect (split) liner. This is caused by poor sample transfer onto the column for the more volatile compounds. The taper in a splitless liner helps funnel the sample onto the column. If a split liner is installed this does not occur meaning sample transfer occurs over a longer time period resulting in peak tailing.

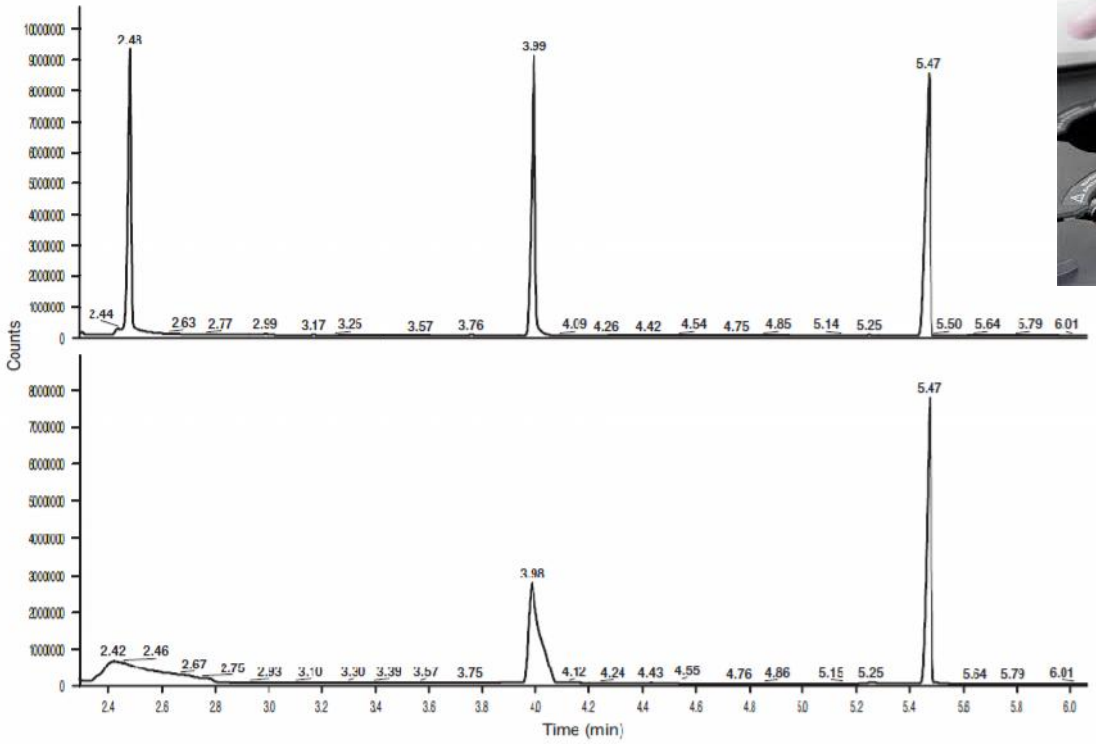

Figure 3: The effect of using the wrong liner in splitless mode (n-alkanes). Top chromatogram, splitless (correct) liner, bottom chromatogram split (incorrect) liner