Agilent Technologies

Backflash and Its Impact on GC Analyses

Backflash occurs in the GC injection port when your sample's solvent expands as it's vaporized to a volume that is larger than the injection port volume. When this happens, the sample flashes back up to the top of the injection port and can cause a multitude of chromatographic problems.

When a sample is injected into the GC injection port, rapid solvent vapor expansion occurs due to the high temperature (T) of the injection port. The volume that the vaporized solvent and sample occupies is also a function of the column head pressure (P) setting and the molecular weight of the solvent.

The vapor volume for a known amount of solvent can be approximated from the Ideal Gas Law:

$V = nRT/P$

All that you need are the density (g/mL) and molecular weight (g/mole) of the solvent to allow you to calculate the number of moles (n) of the solvent in a given number of microliters of the solvent you are injecting. You can also use Agilent's free downloadable **Pressure/Flow Calculator Software** to make this calculation very easily.

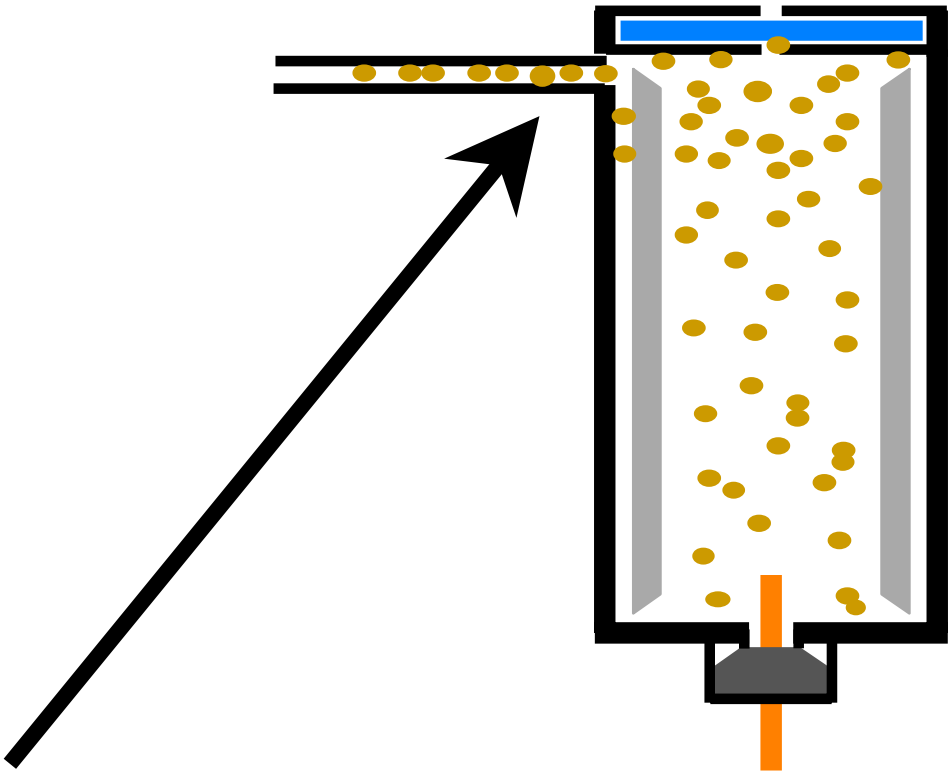
It is extremely important to know the volume of your injection port liner and the vapor volume of the solvent volume you are injecting to be assured that backflash will not occur for your GC system and method. In 100% of all cases such backflash is bad and

should always be avoided. It leads to poor reproducibility, sample loss, ghost peaks, carry-over, split peaks, tailing peaks and loss of resolution. Without doubt, backflash is the primary cause for the largest number of reported gas chromatographic anomalies.

To help prevent backflash you should:

- Use the lowest reasonable **injection port temperature**,
- Use the minimum sample injection volume that can be made to reach your required detection and quantitation limits,
- Use an injection port liner with a larger volume.
- Use a sample solvent with a higher molecular weight (if you have a choice).

GC Injector BACKFLASH



Sample expands to overfill injector liner and injection port

Some sample condenses on cooler areas (bottom of septum, metal body, etc.) leading