KORY'S GC TECK–TIPS

Optimizing Method Parameters for Fast GC Column Dimensions

When scaling down GC column dimensions for Fast GC, there are a few things that can be optimized to achieve the sharpest peaks, fastest run times, and best sensitivity. Though not all are necessary, they are recommended to achieve optimum results.These are listed below.

1. **Flow** – The smaller ID columns have a smaller internal volume and therefore will require a smaller flow rate (mL/min) to achieve the same linear velocities. Most new instruments use Electronic Pressure Control (EPC) and can account for this as long as the correct column dimensions have been entered into the instrument software and the correct linear velocity of carrier gas (in cm/sec) is used.
2. **Inlet** – The smaller flow rate through the column will have an effect on the total flow through the inlet. In some cases, this can cause distortion of peaks that need to be corrected.
    a. One way to do this is to use an inlet liner with glass wool in the middle of the liner. This will result in one site of vaporization and help restrict the sample to one area in the liner causing sharper peaks in the detector.
    b. A second way to help sharpen peak shapes is to temporarily increase the flow through the inlet only during the injection. This can be done using the pressure pulse option available in EPC based instruments. This option increases the inlet pressure and therefore the flow through the inlet keeping similar transfer rates onto the column. To avoid affecting the separation, only keep the pressure pulse operational for the duration of the injection (example 0.5 minutes for a splitless injection with a 0.5 minute splitless hold time).
3. **Oven** – There are two things to account for in the oven. The first is related to the slower flow rate through the inlet and is used to help focus analytes on the column that may still not be transferred onto the column fast enough. The second is related to the shorter column length.
    a. If analytes are still being smeared onto the column because of slower overall flows in the inlet, it may be necessary to focus the analytes thermally onto the column by lowering the initial oven temperature. If possible, use an initial temperature that is at least 40°C below the boiling point of the earliest eluting compound. In some instances, lowering the initial oven temperature further may additionally improve the peak shapes of early eluting compounds.
    b. The smaller ID columns are usually shorter and will require less time to elute an analyte from the column. Therefore, the temperature ramps can usually be increased to keep analytes eluting at the same elution temperatures.
4. **Detector** – Though there is not much to optimize in the detector, please keep in mind that the column flow should have decreased so the detector make-up flow may need to increase to account for the overall lower flow. Also when looking at peak responses, pay attention to the S/N more than the overall intensity of the peaks. One way to increase inlet flow is to increase split ratios. This can result in lower peak heights, but may still result in higher S/N because shorter and smaller ID columns offer less noise. Therefore the overall sensitivity of the method may improve though the absolute intensity may decrease.

By following these steps, the results that you were achieving on larger ID columns can be transferred to a smaller ID column but still give the advantages of faster run times, sharper peaks, possibly better resolution, and improved sensitivity.

Key words: Fast GC, Sensitivity, Noise

Author: Kory Kelly