Agilent Technologies

Retention-Time Locking: Advantages in GC–MS SIM Acquisitions

Harry F. Prest, Agilent Technologies, Palo Alto, California

Retention-time locking (RTL) is a powerful technique that allows analysts to replicate compound retention times with different gas chromatography (GC) instruments using the same nominal column regardless of detection scheme. Essentially, RTL produces a situation in which compound retention times can be made permanent and universal. *Permanent* in that the compound retention times on any single GC instrument can be fixed and precisely reproduced after typical column maintenance such as cutback or replacement. *Universal* refers to the capability of replicating compound retention times on other GC instruments that may be operating either in the same laboratory or another located elsewhere in the world. RTL has many benefits such as simplifying method exchange, improving QA–QC, simplifying training and standard operating procedures, and allowing development of compound retention time (RT) databases to aid identification and confirmation. Applying the RTL benefit of permanent compound retention times is especially useful for GC–MS selected-ion monitoring (SIM) methods.

GC–MS SIM is widely applied to improve sensitivity for target compounds, and it often is the method of choice for complicated samples. The key aspect of SIM is that only ions representative of the compounds of interest are monitored. Because the compounds elute at specific times, efficient SIM requires constructing groups of ions appropriate to the elution of the compounds and, during acquisition, switching between SIM groups at the times the compounds elute. This requires precise compound retention times and accurate SIM ion group times. Obviously, if the compounds change retention times, changes are required in the SIM ion group times. In complicated samples, frequent column cutback or replacement often is necessary and requires re-editing SIM ion group times. For SIM methods with many compounds (that is, more than eight), this can become complicated. However, if retention times do not change, the same SIM acquisition method can be used continually.

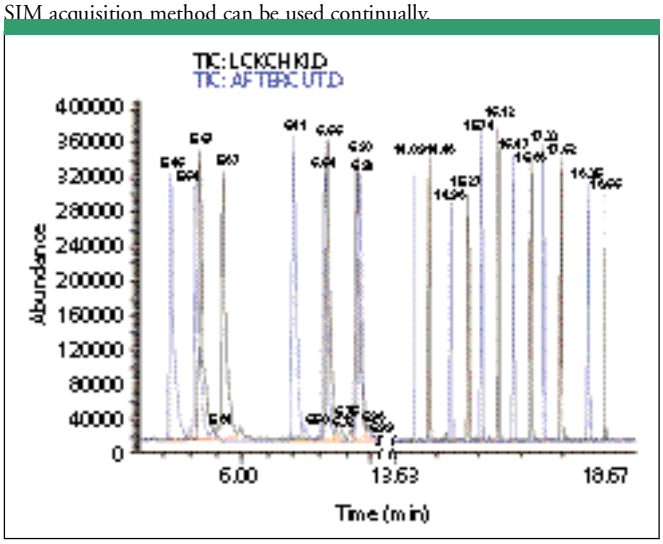

Figure 1: Total ion chromatogram comparing the sections from the early (left side) and mid-range (right side) of two acquisitions before (black) and after (blue) a typical column cutback. Notice the shift in retention times is not the same for the early or later eluting compounds.

RTL Results

As an illustration, consider maintaining a SIM method for polycyclic aromatic hydrocarbons (PAHs). Figure 1 shows a comparison of sections from the early and mid-range of two chromatograms; one before (black) and one after (blue) a typical column cutback. Notice in the right side the analytes have moved forward approximately 0.4 min, and one would be tempted to simply add a 0.4-min hold to the GC method to maintain the same SIM method. However, the left side of Figure 1 shows that the early eluting compounds have moved by times ranging from approximately 0.2 min to 0.25 min, so trying to add a fixed amount to the initial oven hold time method would cause some compounds to fall out of the SIM windows. By locking the retention time to one of the PAHs, such as a surrogate (deuterated PAH), the PAH RTs become fixed, and relocking the method after maintenance produces the original RTs for all compounds as shown in Figure 2. This means the original SIM method can still be applied without alteration to either SIM ion groups or quantitation database RTs. The same would be true for column maintenance, which can create even larger changes in RT.

For More Information

Details can be found at the Agilent web site (www.agilent.com/chem) by searching for retention time locking in the on-line literature section.

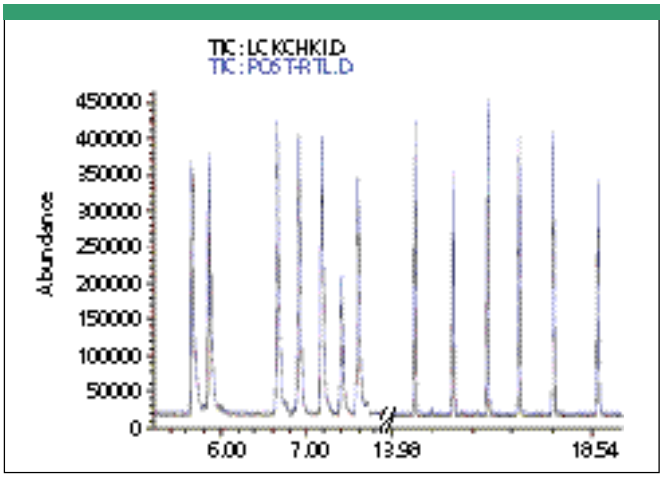

Figure 2: As in Figure 1, two total ion chromatograms are shown previous to a column cutback (black) and after a cutback of approximately 1 m and implementation of RTL (blue). Notice RTL adjustment of the method and corrects the retention shifts for both early and later eluting compounds.

Agilent Technologies
Life Sciences and Chemical Analysis Div.
1601 California Avenue, Palo Alto, CA 94303
tel. (800) 227-9770
www.agilent.com/chem