Ideas to work around the Helium Shortage

# Switching from Helium to Hydrogen: Lessons from the State Hygienic Laboratory, University of Iowa

The State Hygienic Laboratory at the University Of Iowa (UIA) has two core gas chromatography-mass spectrometry (GC/MS) methods of the CDC Laboratory Response Network, initially developed using Helium (He) as a carrier gas.  A couple years ago they successfully switched to run on Hydrogen (H2) instead.

Some important changes had to be implemented:

* Because H2 is less viscous than He, the instrument pressure will be significantly lower using H2 than with He, with no other modification made to the system.
* UIA attempted to find longer GC columns to use with H2 that worked for the method analytes, but could not find a satisfactory substitute considering they sometimes have to inject water vapor into the GC column, which is normally catastrophic to conventional GC columns.
* In order to keep the same column as used with He, UIA instead installed a column restriction capillary between the validated GC column and the mass spectrometer to help increase the backpressure of the system. Without the restricted flow, the “calculated” pressure of the Agilent GC system was actually negative.
* The restriction capillary serves a second purpose: to allow changing of GC columns without venting the mass spectrometer (a small amount of air does push into the mass spec detector interface, but not enough to require venting).
* Agilent’s newer instrumentation (post – year 2000 or so) is automated to electronically shut off the flow of H2 should a leak occur.  So the explosive risk of using H2 is actually quite low.
* H2 is technically a superior mobile phase to He, due to the ability of molecules to diffuse into and out of the stationary phase of the column easier when carried through the GC with H2 than with He, likely attributable to the lower viscosity of H2 than He.
* It is possible that the ionization efficiency of molecules in the source of a mass spec is not as efficient when using H2 vs. He.  It is true that vacuum systems are less efficient at removing H2 molecules vs. He molecules, and therefore you cannot achieve quite as low of a pressure (better vacuum) when using H2 vs. He.  But usually, simply getting the Agilent mass spectrometer into the 1x10-5 pressure region is plenty low for GC/MS.

# Mississippi Department of Health

The Organic Environmental Chemistry section at the Mississippi Department of Health has switched to using nitrogen as the purge gas on the 524.2- trihalomethanes (THM) method. They find that nitrogen works well on THMs, yet are not convinced that nitrogen works as well on the 524.2-VOCs. Their next steps are to try hydrogen on a GC.MS as a carrier gas.