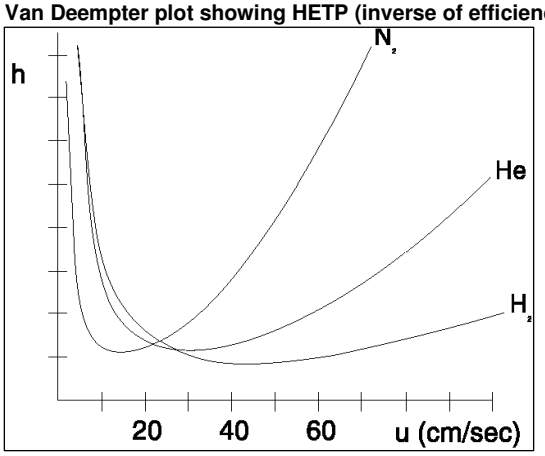
KORY'S GC TECK–TIPS

Carrier Gas Selection

There are three common choices that are used for carrier gasses in gas chromatography: Hydrogen, Helium, and Nitrogen. The key factors to consider in choosing a carrier gas are efficiency of the gas at a given linear velocity, availability, and cost.

The chromatographic efficiency of each carrier gas will vary as a function of the linear velocity. This relationship is shown for each gas in a Van Deempter plot (below) where the Y-axis is the HETP (Height Equivalent of a Theoretical Plate) and the x-axis is the linear velocity. Essentially, a lower Y-axis value means a more efficient separation with better resolution while the greater linear velocity will result in a faster chromatogram.

Van Deempter plot showing HETP (inverse of efficiency) vs. linear velocity



- Nitrogen is the most efficient carrier gas at low linear velocities with an optimum efficiency at **~10cm/sec**. As the flow varies from this value, the efficiency quickly decreases. This is very important on older systems without EPC (Electronic Pressure Control) to keep the linear velocity consistent as changes in temperature alter the viscosity and linear velocity of the carrier gas. Nitrogen is also readily available and usually the least expensive of the three carrier gasses.
- Helium has an optimum linear velocity of **~25cm/sec** and the efficiency will not be as greatly affected as nitrogen if the linear velocity is changed. Helium is more expensive and may have limited availability in some areas.
- Hydrogen is relatively inexpensive and is the most efficient carrier gas for faster linear velocities with an optimum linear velocity of **~40 cm/sec.** It is also the most forgiving of the three gasses when changing the linear velocity. However, hydrogen can be flammable in certain mixtures with oxygen or air. Advances in gas handling equipment can be used to help maximize safety though. Hydrogen is also readily available and is relatively inexpensive

Carrier Gas Advantages/Disadvantages

	Nitrogen	Helium	Hydrogen
Advantages	• Inexpensive • Readily available	• Faster	• Fastest • Inexpensive
Disadvantages	• slow	• More costly	• Flammable

For a much more in depth discussion of carrier gas selection, please request a copy of Technical Note TN-2037 from your Phenomenex representative.

Key words: Van Deempter, carrier gas, hydrogen

Author: Kory Kelly

© 2009 Phenomenex, Inc. All rights reserved.