Challenges from an Industrial Perspective in the Molecular Structural Characterization of Polyolefins

A. Willem deGroot, Jeff Weinhold, Wallace Yau, and Ryan DePuit

The Dow Chemical Company
Freeport, Texas

In routine GPC, Triple Detector GPC, TGIC (Thermal Gradient Interaction Chromatography), and CEF (Crystallization Elution Fractionation), it is a general practice to rely on standards to calibrate our systems. Once our systems are calibrated it is common practice to proceed in running unknown samples and assume that the results will be of sufficient quality to solve a given problem. However, it is possible to take another step and apply model compounds to further evaluate the quality of our chromatography systems. By doing this we can potentially find and solve small problems in our system that we didn't know existed or that we simply ignored in the past. Further, this information can give us confidence that ignoring known chromatography issues is a valid choice. For high temperature GPC, triple detector GPC and comonomer fractionation techniques, metallocene polyolefins can make excellent model compounds. They are produced in the reactor in a very statistically predictable manner so simple mathematics can be used to describe their molecular weight distributions, their comonomer distributions and their long chain branching distributions. With this information in hand one can then compare the predicted results with the actual measured results to determine how well our system is performing. In this discussion, I will show several examples of how these model compounds have been used in our characterization 'tool box' at Dow to help us further understand how these techniques fractionate our polymers and how they can be used to further our knowledge of polymer molecular structure determination.