

Polymer Synthesis At and Beyond the Limits of Characterization: Limitations of SEC

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Size exclusion chromatography (SEC) has, over the past half-century, become the method of choice for characterizing molecular weights and molecular weight distributions of polymers and copolymers. The popularity of SEC in part reflects its simplicity and easy implementation; using only three solvents and commercially available columns, hardware, and software, almost any soluble polymer can be characterized. Advances in calibration methods and implementation of molecular weight/molecular size sensitive detectors have further entrenched SEC as the premier technique for polymer molecular weight determinations.

However, a number of recent studies on model polymers using new and powerful techniques, such as MALDI-TOF-MS and, especially, temperature gradient interaction chromatography (TGIC), reveal *serious limitations of SEC as a method for characterizing polymers ranging from simple linear polymers made by anionic polymerization to complex copolymer architectures*. In this presentation, I will review some of these limitations which are largely a consequence of three factors: the large band broadening effects in SEC, its inherently poor resolution, and the size-based separation mechanism.