

Characterizing property distributions of polymeric nanogels by size-exclusion chromatography

Nanogels are highly branched, swellable polymer structures with average diameters between 1 and 100nm. Size-exclusion chromatography (SEC) fractionates materials in this size range, and it is commonly used to measure nanogel molar mass distributions. For many nanogel applications, it may be more important to calculate the particle size distribution from the SEC data than it is to calculate the molar mass distribution. Other useful nanogel property distributions include particle shape, area, and volume, as well as polymer volume fraction per particle. All can be obtained from multi-detector SEC data with proper calibration and data analysis methods. This work develops the basic equations for calculating several of these differential and cumulative property distributions and applies them to SEC data from the analysis of polymeric nanogels. The methods are analogous to those used to calculate the more familiar SEC molar mass distributions. Calibration methods and characteristics of the distributions are discussed, and the effects of detector noise and mismatched concentration and molar mass sensitive detector signals are examined.

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