

GPC analysis at different flow rates to overcome shear degradation.

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Gel permeation / size-exclusion chromatography can be performed for several samples that range from a few hundred to several million daltons in molar mass. Analysis of low molar mass samples is relatively straightforward; however, it requires proper skill to analyze high molar mass, especially to avoid sample degradation in the dissolution step and in the analysis.

Small column packing particles, low porosity frits, and narrow bore tubing generate significant shear and extensional forces in GPC systems, which may affect large polymer chains. Large packing particle size and frit porosity are therefore used to prevent molecular shear degradation of those samples.

Polymer degradation results in chain scission. In a SEC chromatogram this leads to a shift of the polymer peak towards greater elution volumes (low molar masses) and therefore in wrong results. To prevent this shear degradation process, the use of large particle size columns (with lower plate count) is recommended and this typically demands to have two different sets of columns (for normal and for very high MW samples).

A new approach is presented here to use a single set of high plate count small particle size columns, that can be used both at standard flow rate with normal samples and at lower flow rate, to decrease shear degradation, with high MW samples. This approach is especially important for users with only one GPC system available and different types of samples to characterize.