An approach to characterize industrially important polyacrylate mixtures by thermal field-flow fractionation

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The optimal performance of polymers used for industrial application requires a thorough characterization including determination of molar mass, size and chemical composition. These applications often involve a mixture of polymers rather than a single polymer; therefore emphasis needs to be placed on determining chemical heterogeneity in mixtures.

Size exclusion chromatography (SEC) is a commonly used technique for determining molar mass. However, SEC separates polymers by their hydrodynamic size; thereby limiting its usefulness for the analysis of polymer mixtures containing similar sized but different composition species\(^1\)). In addition, SEC is not applicable to ultrahigh molecular weight polymers because of shear degradation and suffers sample loss due to adsorption to the column packing material\(^2\)). Thermal field-flow fractionation (ThFFF) is an alternate and complementary technique to SEC. The former utilizes a temperature gradient acting perpendicular to the carrier flow\(^3\)) and an open channel to separate polymers. ThFFF is able to separate polymers based on size (similar to SEC) and has the additional capability to differentiate by chemical composition due to differing thermal diffusion coefficients, \(D_T\), of the components. Thermal diffusion, which has been demonstrated to be specific for each polymer-solvent system, opens up possibilities for achieving separations of complex polymer mixtures. The open FFF channel design also allows for the analysis of ultrahigh molecular weight polymers and microgels.

This presentation will describe the use of ThFFF to characterize the industrially important class of acrylate polymer mixtures and microgels.

References: