MULTIDETECTOR THERMAL FIELD-FLOW FRACTIONATION AS AN INNOVATIVE TOOL FOR MICROSTRUCTURE SEPARATION OF SYNTHETIC POLYMERS

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ABSTRACT

The fractionation of polymers regarding different molecular parameters can be accomplished by traditional methods such as size exclusion chromatography (SEC) and various other types of liquid interaction chromatography.[1] SEC separates according to hydrodynamic size in solution which is mainly determined by the polymer chain length. The effect of different microstructures is rather small and, therefore, SEC is not suitable for the separation of polymers according to microstructure. Furthermore, SEC has significant limitations in the analysis of very high molecular weight compounds.

Thermal field-flow fractionation (ThFFF) is a powerful alternative to SEC as the relatively gentle fractionation conditions and absence of a stationary phase allows for the fractionation of a variety of high molecular weight and fragile compounds without shear degradation taking place. ThFFF is a channel-based fractionation technique that utilises a temperature gradient to induce thermal diffusion of analytes in order to achieve fractionation according to size and chemical composition.[2] However, the question whether it is possible to fractionate polymers according to molecular microstructure is still an unexplored area.

It is shown for the first time that, in addition to size and chemical composition, ThFFF is capable of separating polymers according to microstructure. The capabilities of ThFFF to fractionate according to microstructure is demonstrated by the separation of polybutadienes and polyisoprenes according to isomeric content as well as the separation of poly(methyl methacrylate)s according to tacticity.[3,4]

References :

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