A Chromatographic Separation of Polymers and its Application

by

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ABSTRACT

Synthetic polymers are heterogeneous in terms of molecular weight due to differences in either the life-time of active species in polymerization step or the size of oligomers or homopolymers which are coupled in each reaction step. Thus, molecular weight distribution is inherent in synthetic polymers. Copolymers are polymers which are produced from more than one species of monomers. The different units are incorporated in the polymers molecules which, not only have molecular weight distribution, causes distribution in chemical composition. Block copolymer are good example to study this complex molecular weight and chemical composition distribution derived from homopolymers by incomplete reactions. The classical approach to study the effect of the complex molecular and chemical composition distribution is based upon the dependence of solubility as chain length and composition changes. Unfortunately, solvent/non-solvent systems with separation characteristics to achieve both molecular weight and chemical composition are very scarce. Chromatographic fractionation as both analytical technique and mass separation tool applying high performance liquid chromatography (HPLC) to achieve reproducible and controllable retention behavior of polymers by chain length and chemical composition has been studied. First, retention behavior of polystyrene was controlled by changing solvent quality which can be modulated critical condition with temperature or solvent/non-solvent composition changes. Then, large scale separation and fractionation of block copolymer by its chemical heterogeneity was studied. The third part of this work was focused on chemical composition effect on the fracture of PS-b-PMMA block copolymer. The fourth part of this work was focused on the supramolecular diblock copolymer associated with H-bonding duplex.