Surfactant Free Emulsion Polymerization of Poly(styrene-co-methyl methacrylate) Microspheres: Correlation of Microsphere Characteristics with Monomer Reactivity and Water Solubility

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Abstract

Polymeric microspheres have been used in a broad range of applications from chromatographic separation techniques to analysis of airflow over aerodynamic surfaces. The preparation of microspheres from many polymer families has consequently been extensively studied using a variety of synthetic approaches. Although there are a myriad of polymeric microsphere synthesis methods, free-radical initiated emulsion polymerization is one of the most common techniques. In this work, poly(styrene-co-methyl methacrylate) microspheres were synthesized via surfactant-free emulsion polymerization. The effects of the co-monomer composition and addition time on particle size distribution, particle formation, and particle morphology were investigated. Particles were characterized using dynamic light scattering and scanning electron microscopy to gain further insight into particle size and size distributions. Reaction kinetics were analyzed through consideration of characterization results. A particle formation mechanism for poly(styrene-co-methyl methacrylate) microspheres was proposed based on characterization results and known reaction kinetics.