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Effect of Polymer Molecular Weight and Synthesis Temperature on Structure and Dynamics of Microgels[1] KRISTA G. FREEMAN, KIRIL A. STRELETZKY, Cleveland State University — Environmentally-sensitive microgels have been synthesized under varying conditions to study the dependences on polymer molecular weight (M_W) and synthesis temperature (T_{syn}). The dynamics and structure of the synthesized microgels below and above the LCST of the polymer (T_c $\sim 41^oC$) were studied using dynamic and static light scattering spectroscopy. All microgels exhibit a volume phase transition above the LCST of the polymer and undergo a reversible 15-50-fold volume shrinkage. The size distribution, structure, deswelling ability, and temperature response of microgels strongly depend on synthesis conditions. T_{syn} dependence was studied with 1000kDa polymer. Increasing $\Delta T = T_{syn} - T_C$ yields smaller microgels with a smaller swelling ratio up to $\Delta T = 8.5^oC$, after which the trend is reversed. The amphiphilic nature of the polymer may explain this trend. T_{syn} also affects the structure of microgels; low T_{syn} yields elongated particles, while high T_{syn} microgels are more spherical. Polymer M_W directly effects microgel polydispersity and temperature response. While microgels synthesized with 1000kDa polymer are relatively monodisperse, synthesis with low M_W polymers (80-370kDa) yields systems with a large population (R_h $\sim$1000nm) precipitating out of solution and a smaller population (R_h $\sim$300nm) staying in suspension. M_W also influences the temperature response of microgels; high M_W microgels show a gradual shrinkage with increasing temperature while low M_W microgels display a delayed and sudden shrinkage at high temperatures.

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