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### **Dynamics of Polymer-Nanoparticle Mixtures**

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Mixtures of polymers and particles occur in a variety of applications. Traditional applications of polymers in such systems include their role as colloidal stabilizers, and in rheological modifiers. Many of these applications are characterized by the feature that the polymer size is much smaller than the size of the particle. However, more recent developments in nano- and biotechnology applications have moved the polymer-particle mixtures from the “colloid limit” to the “nanoparticle limit” where the polymer size is comparable to or larger than the size of the particle. At the equilibrium level, the curvature of the particle now plays an important role in determining the interactions and phase behavior. At a dynamical level, conventional “continuum” wisdom no longer applies, and counterintuitive property relationships have been observed. This talk will focus on recent work in our group to develop and apply novel computer simulations to address the issue, “how does the equilibrium, dynamical and property aspects of nanoparticle-polymer mixtures differ from their colloidal counterparts?” Applications of our findings to the context and experiments of polymer nanocomposites will also be presented.