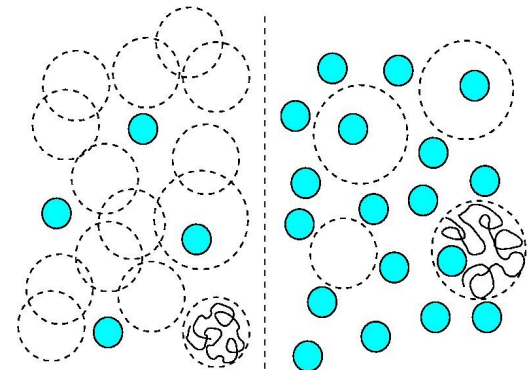


# Demixing of Colloid-Polymer Mixtures: Influence of Electrostatic Interactions and Polymer Conformations

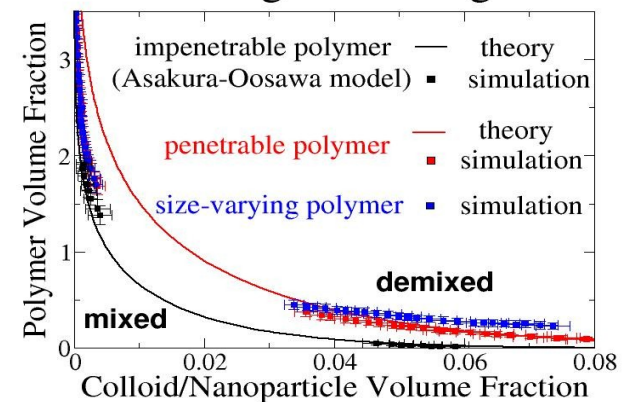
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Suspensions of colloidal particles are encountered throughout recovery and processing of petroleum – from drilling fluids to well stimulation suspensions, oil sands slurries, and tailings ponds. Petroleum suspensions are often mixtures of polymers and charged colloids or nanoparticles. Since bulk demixing can radically alter thermal, mechanical and rheological properties, miscibility is a property of vital practical importance.

How does miscibility of colloid-polymer mixtures depend on the conformation of monomers in the polymer chains? Conversely, how are polymer conformations influenced by the concentration of colloids or nanoparticles? Our recent Monte Carlo simulations demonstrate that thermodynamic phase behavior (miscibility) can vary significantly with the size and shape of the polymer coils and that polymer conformations can be very sensitive to confinement by colloids and penetration by nanoparticles. The phase diagram at right illustrates how the coexistence between colloid-rich and colloid-poor bulk fluid phases can be modified by size variations and penetrability of the polymer coils. (Here the mean polymer radius of gyration is three times the nanoparticle radius.)



Demixing Phase Diagram



Conformational change (e.g., radius of gyration) of polymer coils stabilizes mixtures of polymers and (smaller) nanoparticles against demixing.