



CHEMICAL AND BIOLOGICAL ENGINEERING DEPARTMENT SEMINAR SERIES

Microstructure, phase behavior and rheology for colloidal suspensions with attractive/repulsive interparticle potentials

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Time: Wednesday, October 8; 3:15 – 4:30 pm

Location: Perlstein Hall Auditorium

Abstract

Large scale dynamic simulations with hydrodynamic interactions are presented to study the phase behavior, microstructure and rheology of concentrated colloidal suspensions with varying strengths of short range attractive potentials. We document the transitions from fluid like states to crystals to gels and investigate the effects of adding varying strengths of long range repulsive potentials on the phase behavior and microstructure. Dynamic simulations confirm equilibrium predictions on the disappearance of crystalline phases with increasing repulsive forces and show significant changes in the microstructure for gel phases. The strength of the repulsive force affects both the strength and connectedness of the gel (as manifest in number of bonds per particle) as well as characteristic length scales and morphology of the gel microstructure. Comparison is made with experimental results from confocal microscopy and scattering experiments. Simulation results include direct visualizations of suspension microstructure, structure factors and statistical measures of gel morphology. Simulations for sheared suspensions document the shear thinning behavior, elastic moduli and normal stresses in the suspensions.