Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Shear Driven Aggregation in Latex Colloids SURESH AHUJA, Retired — Reynolds number is small in colloidal flow and therefore, colloidal volume fraction and Peclet number are important. AS the volume fraction and attractive coupling between particles increase, relaxation time and Weisenberg number become significant. Shear-induced aggregation of latex colloids is due to the interplay between the shear-induced formation and breakage of latex .particles. While particle size is limited by breakage, their number density increases with the shearing-time. Upon cessation of shear, the particles interconnect into an assembly held by grainy bonds. It results in increase in yield stress and dynamic modulus. A contact model enables aggregates maintaining their structures under low stress while being restructured under high stress. Modeling involves solution of Navier- Stokes equation with moving particles as boundary condition for the flow like using the Lattice Boltzmann approach or by using (accelerated) Stokesian Dynamics. Alternate approach is to model the fluid phase by soft repulsive particles with pair-wise noise and friction, known as dissipative particle dynamics (DPD). This method by construction produces full inertial hydrodynamics, but applying the correct fluid-particle boundary condition is non-trivial. Both particle to particle and particle to wall collisions can be considered using Johnson-Kendall- Roberts (JKR) analysis of collision dynamics of dissipative forces using a soft-sphere modeling technique. Our experimental work used emulsion polymerized latex that was subjected to steady and dynamic shear. Yield stress, dynamic modulus and relaxation time increased on shearing in conjunction with changes in aggregate size.

Suresh Ahuja
Retired

Date submitted: 15 Nov 2012 Electronic form version 1.4