Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Constant stress and pressure rheology: a unified perspective on the arrest of colloidal suspensions MU WANG, JOHN BRADY, California Institute of Technology — We study the constant pressure and stress rheology of dense hard-sphere colloidal suspensions using a novel Brownian dynamics simulation algorithm. The simulations show an arrested region exhibiting viscosity divergence between the glass and the jamming transitions. Both the suspension shear and normal viscosities near the arrested region display universal power law divergences that depend solely on the volume fraction distance from the corresponding arrest point. We further found that the microscopic particle diffusion correlates with the suspension pressure through a Stokes-Einstein-Sutherland-like relation. With an estimation of the effect of hydrodynamic interactions and a careful analysis of the accessible volume in the experiments, the simulations are in quantitative agreement with the experiments of Boyer et al. [PRL 107, 188301 (2011)] in the non-Brownian limit. The simulations clearly show the fundamental role of the jamming transition in the dense suspension rheology, and illustrate the great care needed when performing and analyzing experiments and simulations near the maximum allowable volume fractions.

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Date submitted: 30 Jul 2014 Electronic form version 1.4