Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Rheology of a dense capsule suspension[1] R. MURTHY KALLURI, PROSENJIT BAGCHI, Rutgers University — The rheology of a dense suspension of deformable capsules in a linear shear flow is studied at low Reynolds numbers. Three- dimensional numerical simulations are conducted for initially spherical capsules using a front-tracking method. Capsules are represented as drops of Newtonian fluid enclosed by an elastic membrane and suspended in another Newtonian liquid of different viscosity. The capsule volume fraction ranges up to about 26%. This study is motivated by our earlier works [Bagchi & Kalluri, Phys Rev E, **81**, 056320 (2010); Bagchi & Kalluri, J Fluid Mech, **669**, 498 (2011)] where we show that for a *dilute* suspension the shear viscosity exhibits a nonmonotonic trend with respect to the internal-to-external fluid viscosity ratio; in particular, the shear viscosity exhibits a minimum at an intermediate viscosity ratio. In case of a *dense* suspension, we find that the shear viscosity minimum gradually diminishes as with increasing capsule volume fraction. We explain this result by decomposing the particle shear stress into elastic and viscous components. The elastic component is observed to increase but the viscous component remains constant with respect to increasing volume fraction. It is also shown that the elastic contribution is shear-thinning, but the viscous contribution is shear-thickening.

[1]Supported by NSF

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Date submitted: 05 Aug 2011 Electronic form version 1.4