Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Phase Behavior of Dilute Carbon Black Suspensions and Carbon Black Stabilized Emulsions MICHAEL GODFRIN, Center for Biomedical Engineering, School of Engineering, Brown University, AYUSH TIWARI, Department of Civil Engineering, Thapar University, ARIJIT BOSE, Department of Chemical Engineering, University of Rhode Island, ANUBHAV TRIPATHI, Center for Biomedical Engineering, School of Engineering, Brown University — We use para-amino benzoic acid terminated carbon black (CB) as a tunable model particulate material to study the effect of inter-particle interactions on phase behavior and steady shear stresses in suspensions and particle-stabilized emulsions. We modulate inter-particle interactions by adding NaCl to the suspension, thus salting surface carboxylate groups. Surprisingly, yield stress behavior emerged at a volume fraction of CB as low as $\phi_{CB} = 0.008$, and gel behavior was observed at $\phi_{CB} > 0.05$, well below the percolation threshold for non-interacting particles. The yield stress was found to grow rapidly with carbon black concentration suggesting that salt-induced hydrophobicity leads to strong inter-particle interactions and the formation of a network at low particle concentrations. The yield stresses of CB-stabilized emulsions also grows rapidly with carbon black concentrations, implying that inter-droplet interactions can be induced through the tuning of carbon black concentration in emulsion systems. Emulsions stabilized by ionic surfactants show no inter-droplet interactions. In contrast, oil droplets in the CB-stabilized emulsion move collectively or are immobilized because of an interconnected CB network in the aqueous phase.

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Date submitted: 30 Jul 2014 Electronic form version 1.4