Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

The nonlinear structural response of colloidal suspensions under large amplitude oscillatory shear NEIL Y.C. LIN, XIANG CHENG, ITAI COHEN, Physics Department, Cornell University — When a colloidal suspension is under oscillatory shear, the particle configuration has a flow-induced anisotropy. While these structural rearrangements have been intensively studied in the linear regime where the amplitude of the applied shear is small, the nonlinear structural response of suspensions under large amplitude oscillatory shear is poorly understood. Using a shear cell coupled to a fast confocal microscope, we directly measured the microscopic structure of colloidal suspensions under large amplitude oscillatory shear. To quantify the structural response, we integrated the pair correlation function over all contact positions; this quantity is proportional to the entropic stress of the suspension. We investigated the structural/stress response of colloidal suspensions systematically with increasing shear amplitudes. We observed strong nonlinear responses in both dense and dilute suspensions under large amplitude oscillatory shear. At even higher amplitudes, we found an overshoot of the stress response in dense suspensions. Our results provide insight on the microscopic structural origin of the nonlinear response of sheared colloidal suspensions.

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Date submitted: 22 Nov 2011 Electronic form version 1.4