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Correlations between Dynamical Heterogeneity and Viscoelasticity of Confined Colloidal Suspensions under Oscillatory Shear PRASAD SARANGAPANI, YINGXI ELAINE ZHU, University of Notre Dame, Department of Chemical and Biomolecular Engineering, Notre Dame, IN 46556 — In this talk, we present a recent rheological study of confined amorphous colloidal thin films under oscillatory shear using a home-designed micron-gap rheometer interfaced with a confocal microscope. We visualize the response of "hard-sphere" poly-(methyl methacrylate) (PMMA) particles of 1.2 μm in diameter to applied shear deformation and simultaneously measure the viscous and elastic moduli of PMMA colloidal thin films of bulk volume fraction, ϕ= 0.43-0.57, confined at gaps ranging from 50 μm to 1-2 μm. For confined PMMA colloids under shear at gaps where an applied deformation is sufficiently large to induce non-linear responses, we find commonality in particle dynamics where strongly non-affine motion causes particles to move as cooperatively rearranging groups. However, on average the length scale of these groups is larger than the typical length scales of dynamical heterogeneities for the un-sheared thin films and typically approaches the order of confining dimension. We quantify the nature of shear induced flow cooperativity and its relation to a shear thickening transition observed in the limit of large strain amplitudes.

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