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Effect of confinement induced structures on suspension rheology MEERA RAMASWAMY, BRIAN LEAHY, YEN-CHIH LIN, ITAI COHEN, Department of Physics, Cornell University — Understanding the flow behavior of confined colloidal systems is important in many industrial settings ranging from inkjet printers to pharmaceuticals. Confined colloidal suspensions under shear demonstrate many fascinating responses including vorticity-aligned strings in colloidal liquids and buckled phases in crystals. Despite the extensive studies of these confinement induced structures, the interplay between these exotic structural responses and the suspension rheology remains poorly understood. Here, we use a confocal rheoscope to image the suspension particle configuration while simultaneously measuring its stress responses. The confocal rheoscope has two precisely-aligned parallel plates that can confine the suspension with a variable gap size ranging from 3 to 20 particle diameters, allowing us to measure the response of the system as a function of the gap size. Moreover, we alter the rheological properties of the sample by adding a small amount of dimers. The dimers undergo Jeffery orbits at large strains and deform the confinement induced structures of the spheres, leading to a viscosity change. We discuss the results of these experiments and their implications in the areas of micro and nanofluidics.

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