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Effect of Confinement on Suspension Rheology MEERA RAMASWAMY, BRIAN LEAHY, YEN-CHIH LIN, ITAI COHEN, Department of Physics, Cornell University — Confined systems are ubiquitous in nature and occur at widely separated length scales from the atomic to granular. While the flow properties of both atomic and granular systems has been well studied, examining the rheology of the intermediate length scale in colloidal suspensions is challenging. We use a confocal rheoscope to image the particle configuration in a suspension of silica microspheres 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 30 particle diameters, allowing us to measure the response of the system as a function of the gap size. We find that the viscosity of the system decreases with confinement in sharp contrast to the increase reported in atomic and granular systems. The microscopy images indicate that this decrease in viscosity is due to the formation of particle layers in this shear regime where hydrodynamic forces dominate particle interactions. We discuss these results and their implications.

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