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Effect of Confinement Induced Structures on Colloidal Suspension Viscosity MEERA RAMASWAMY, Department of Physics, Cornell University, CHRISTOPHER NESS, Department of Chemical Engineering and Biotechnology, University of Cambridge, Cambridge CB3 0AS, United Kingdom, ANDREW FIORE, Department of Chemical Engineering, Massachusetts Institute of Technology, NEIL LIN, Department of Physics, Cornell University, JAMES SWAN, Department of Chemical Engineering, Massachusetts Institute of Technology, ITAI COHEN, Department of Physics, Cornell University — Confined systems occur at widely separated length scales from the atomic to granular. In confined atomic and granular systems there is complex relationship between the microstructure and the rheology. While the same relationship in colloidal systems is interesting due to the range of structures formed, such studies are also extremely challenging because of the system size scale. Here we use a custom built confocal rheoscope to image the particle configuration in a microsphere suspension while measuring its stress response. We find a non-monotonic trend in the viscosity under confinement that is strongly correlated with the microstructure. Further, we use two simulations techniques, the first, a Stokesian dynamics simulation that calculates the full hydrodynamic stress and the second uses a lubrication approximation for the hydrodynamics and allows a repulsive particle contact contribution to the stress. The use of these techniques enables us make comparisons with experiments and determine the contributions of the different stresses (hydrodynamic and contact) to the rheology. These results provide new insights to the unique rheology of confined suspensions.

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