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Using Shear Reversal and Biaxial Shear Flows to Investigate Anisotropic Shear Thickening in Colloidal Suspensions NEIL LIN, Department of Physics, Cornell University, BEN GUY, MICHIEL HERMES, CHRIS NESS, JIN SUN, WILSON POON, SUPA, School of Physics and Astronomy, University of Edinburgh, ITAI COHEN, Department of Physics, Cornell University —
Shear thickening is a ubiquitous phenomenon in suspension flow where an increase in shear rate gives rise to an increase in viscosity. Whether contact forces play a role in continuous shear thickening of colloidal systems where hydrodynamic contributions are thought to dominate remains highly controversial. By performing shear reversal experiments on silica and latex colloidal particles, we directly measure the hydrodynamic and contact force contributions to the suspension viscosity. We find that contact forces are not only present, but dominate the shear thickening response. Since there are no system-spanning force networks in our low-volume fraction suspensions, it is not clear whether the thickening is isotropic or biased resulting in an anisotropic viscosity. To answer this question we employ biaxial shear rheology to determine whether thickening in such suspensions is isotropic. We apply a primary dominant shear flow to thicken the suspension, and simultaneously measure the suspension viscosity along the orthogonal direction using a secondary weak flow. We report on the evolution of this orthogonal viscosity as the system is driven into the shear thickening regime.

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