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Tunable shear thickening: from understanding suspen- sion thickening to controlling viscosity on the fly ITAI COHEN, NEIL LIN, Cornell University, CHRIS NESS, University of Edinburgh, MEERA RAMASWAMY, Cornell University, JIN SUN, University of Edinburgh, MIKE CATES, University of Cambridge, BEN GUY, MICHIEL HERMES, WILSON POON, University of Edinburgh
— Whether contact forces play a role in 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. More importantly, this finding directly suggests a strategy for active controlling the thickening viscosities of dense suspensions. We demonstrate that by strategic imposition of a high-frequency and low-amplitude shear perturbation orthogonal to the primary shearing flow, we can largely eradicate thickening. The orthogonal shear effectively becomes a regulator for controlling thickening in the suspension, allowing the viscosity to be reduced by up to two decades on demand.

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