Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Localized stresses in Shear Thickening Suspensions VIKRAM RATHEE, DANIEL BLAIR, JEFFERY URBACH, Georgetown University — The bulk rheological response of concentrated suspensions is well documented but the microscopic origin of shear thickening remains poorly understood. One challenge is the lack of experimental technique to measure local stresses. Using boundary stress microscopy, we directly measure localized stresses and determine their role in shear thickening. Surprisingly, we do not observe a smoothly increasing uniform local stress during continuous shear thickening, instead we observe that above onset stress, boundary stress microscopy reveals clearly defined regions of localized high stresses. These high stress regions are dynamic, both in space and time, and appear intermittently. As the applied stress is increased, these high stress regions become larger fraction of total surface area. Since the characteristic size of high stress regions is comparable to gap size we speculate that these regions span the system, percolating from top to bottom. Our results suggest that CST arise from increasingly frequent localized discontinuous transition from a low viscosity state to high viscosity state.

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Date submitted: 10 Nov 2016 Electronic form version 1.4