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Impact response of shear thickening suspensions ERIC BROWN, Yale University, OKTAR OZGEN, MARCELO KALLMANN, BENJAMIN ALLEN, University of California, Merced — Dense suspensions of hard particles such as cornstarch in water exhibit shear thickening, in which the energy dissipation rate under shear dramatically increases with increasing shear rate. Recent work has established that in steady-state shear this phenomena is a result of a dynamic jamming of the particles in suspension. Several dynamic phenomena observed in such suspensions have long been assumed to be a consequence of this shear thickening; strong impact resistance, the ability of a person to run on the fluid surface, fingering and hole instabilities under vibration, and oscillations in the speed of sinking of an object in the fluid. However, I will present results of experiments consisting of an indenter impacting a dense suspension which demonstrate that the strong impact resistance cannot be explained by existing models for steady-state shear thickening. I will show these dynamic phenomena can be reproduced by graphical simulations based on a minimal phenomenological model in which the fluid has a stiffness with a dependence on velocity history. These and other recent results suggest a need for new models to understand the dynamic phenomena associated with shear thickening fluids.

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