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Forces and flows during high speed impacts on a non-Newtonian suspension[1] MELODY LIM, JONATHAN BARES, ROBERT BEHRINGER, Duke University — Above a certain mass fraction of particles, suspensions of dense granular particles in water exhibit non-Newtonian behavior, including impact-activated solidification. Although it has been suggested that the solidification of the suspension depends on interactions with the suspension boundary, quantitative experiments on the forces experienced by the boundaries of the suspension have not been reported. In the present experiments, we determine the magnitude and timings of impactor-driven events in both the boundaries and body of the suspension using high-speed video, tracer particles, and photoelastic container boundaries. We observe a shock-like propagation in the cornstarch suspension during impact. The dynamics of this shockfront are strongly correlated to the dynamics of the intruder. Additionally, we observe a second extremely fast shockfront, associated with the propagation of forces to the boundaries of the suspension. The dynamics of this shockfront do not depend on the intruder dynamics, but are correlated to the volume fraction of cornstarch particles in the suspension.

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