

Abstract Submitted
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Tunable solidification of cornstarch under impact: how to make someone walking on cornstarch sink RAN NIU, MEERA RAMASWAMY, Cornell University, CHRISTOPHER NESS, University of Cambridge, ABHISHEK SHETTY, Anton Paar USA, ITAI COHEN, Cornell University — Hundreds of Youtube videos with millions of views show people running on a mixture of cornstarch and water. These videos demonstrate a general phenomenon in fluid mechanics that dense shear thickening suspensions can solidify under impact. Such processes can be mimicked by impacting and pulling out a solid plate from the surface of a thickening cornstarch suspension. Here, using both experiments and simulations, we show that by applying fast oscillatory shear transverse to the primary impact or extension directions we can tune the degree of suspension solidification. The forces acting on the impacting surface can be modified by varying the dimensionless ratio of the orthogonal shear to the compression and extension flows. Simulations show that varying this parameter changes the number of particle contacts governing solidification. To demonstrate this strategy in an untethered context, we show that the sinking speed of a cylinder dropped onto the cornstarch suspension can be varied dramatically by changing this dimensionless ratio. These results suggest that applying orthogonal shear in the context of people running on cornstarch would de-solidify the suspension and cause them to sink.

Ran Niu
Cornell University

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