

MAR15-2014-020745

Abstract for an Invited Paper
for the MAR15 Meeting of
the American Physical Society

Settling of an object in a dense suspension

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Cornstarch suspensions exhibit remarkable behavior. Here, we present two surprising observations for an object settling in such a suspension: First, in the bulk of the liquid the velocity of the object oscillates around a terminal value, without damping. And secondly, near the bottom of the container the object comes to an expected full stop, but then accelerates again towards a second stop. This stop-go cycle is repeated up to seven times before the object comes to a final standstill close to the bottom. For the bulk oscillations we show that common shear thickening models cannot account for the observed phenomena and that the history of the suspension needs to be taken into account. A hysteretic model that goes beyond the traditional viscoelastic ones describes the experiments adequately, but due to its phenomenological origin lacks a solid physical interpretation. Subsequently, we propose a minimal jamming model to describe the behavior at the bottom. Finally, we will compare our experiments to other transient and steady state phenomena observed in dense suspensions and discuss them in the context of compressional and shear jamming.