

Abstract Submitted
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Microstructure does not matter (sort of): dimensionless groups for viscoplastic drop impact on thin films¹ SAMYA SEN, ANTHONY G. MORALES, RANDY H. EWOLDT, University of Illinois at Urbana-Champaign — We quantitatively test dimensionless groups for predicting the onset of splash behavior in drop impact of yield-stress fluids on thin films. Results are relevant to fire suppression, painting, and spray coating with viscoplastic fluids. A single dimensionless quantity, $IF(D/t)$, a non-trivial extension of the generalized Reynolds number, collapses high-dimensional data and separates the maps into different impact regimes. Even for fluids with different microstructure, we observe a constant critical value of $IF(D/t)$ for a stick-splash transition, which is only a factor of two larger for “glassy” Carbopol microgel suspensions compared to “gel” Laponite suspensions. We discuss possible reasons for the mismatch in the critical value and raise a more general issue that dimensionless quantities can be sensitive to the range of available rheology data. We also test thixotropically “aged” Laponite, to further test the results. The results demonstrate that microstructure and chemistry do not matter (to leading order) if the right macroscopic rheological properties are selected for the dimensionless quantity. Reference: Sen et al., “Viscoplastic drop impact on thin films,” *J. Fluid. Mech.* (2020). <https://doi.org/10.1017/jfm.2020.147>

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