Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Suppression of drop breakup in a viscoelastic bath MOHAMMAD AFZAL SHADAB, The University of Texas at Austin, THIBAUT DIVOUX, IRMGARD BISCHOFBERGER, Massachusetts Institute of Technology — A drop of a Newtonian liquid falling in a bath of another, less-dense and miscible, Newtonian liquid, deforms into a torus which is either stable or subsequently fragments into smaller structures, depending on the relative contributions of diffusive, viscous and convective forces. Here we show that the dynamics of the drop can change significantly when the bath is replaced by a viscoelastic liquid. We investigate two types of viscoelastic baths; aqueous solutions of either highly flexible polyethylene oxide (PEO) chains or stiffer carboxymethyl cellulose (CMC) chains. Remarkably, the critical condition for torus formation and drop breakup, denoted as the Fragmentation number describing the ratio of the convective time scale to the diffusive time scale, increases by more than a factor of four in PEO solutions compared to Newtonian or CMC solutions. Our results demonstrate that the onset of fragmentation is governed by the bath elasticity and the viscosity ratio between the falling drop and the bath.

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Date submitted: 20 Nov 2020 Electronic form version 1.4