Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Onset of rebound suppression in non–Newtonian droplets post–impact on superhydrophobic surfaces DEVRANJAN SAMANTA, SOUMYA RANJAN MISHRA, PURBARUN DHAR, Indian Institute of Technology Ropar — Droplet deposition after impact on superhydrophobic surfaces has been an important area of study in recent years for its potential application in reduction of pesticides usage. Minute amounts of long chain polymers added to water has been known to arrest the droplet rebound effect on superhydrophobic surfaces. Previous studies have attributed different reasons like extensional viscosity, dominance of elastic stresses or slowing down of contact line in retraction phase due to stretching of polymer chains. The present study attempts to unravel the existence of critical criteria of polymer concentration and impact velocity on the inhibition of droplet rebound. The impact velocity will indirectly influence the shear rate during the retraction phase, and the polymer concentration dictates the relaxation timescale of the elastic fluids. Finally, we show that the governing Weissenberg number (at onset of retraction), which quantifies both the elastic effects of polymer chains and the hydrodynamics, is the critical parameter in determining the regime of onset of rebound suppression, and that there is a critical value which determines the onset of bounce arrest. The previous three causes, which are manifestations of elastic effects in non-Newtonian fluids, can be related to the proposed Weissenberg number criterion.

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Date submitted: 19 Jul 2019 Electronic form version 1.4