LadHyX Seminar – February 11, 15:00

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Suspension drops under extreme stress

The extraordinary hydrodynamic phenomenon of drop impact has inspired numerous studies exploring a variety of Newtonian and complex fluids. Although this is a century-old problem, there are surprisingly few studies on the impact dynamics of colloidal suspension drops. I will show that drop impact provides an ideal model system to probe suspension dynamics under complex and extreme conditions; a spreading droplet generates shear rates at least an order of magnitude higher than those that are accessible via standard rheometry. We study of the dynamics of suspension drops covering a wide range of volume fractions and impact conditions, which display a surprising range of behavior from solid-like, to liquid-like, to everything in between. As one might expect, the extent of droplet spreading upon impact decreases with increasing volume fraction or decreasing impact velocity. Surprisingly though, this trend reverses itself as the suspension approaches jamming conditions. Moreover, we observe a variety of elastic behaviors which appear in the jammed regime and are controlled by adjusting volume fraction and impact velocity. Additionally, we are able to observe partial jamming, in which only small regions of the impacting drop are solidified, behavior that would be quite challenging to infer from bulk measurements.