

Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Yield stress fluid droplet impact on coated surfaces BRENDAN BLACKWELL, MARC DEETJEN, RANDY EWOLDT, University of Illinois at Urbana-Champaign — Yield stress fluids, including gels and pastes, are effectively fluid at high stress and solid at low stress. In liquid-solid impacts, these fluids can stick and accumulate where they impact, motivating several applications of these rheologically-complex materials. Here we use high-speed imaging to experimentally study liquid-solid impact of yield stress fluids on dry and precoated surfaces. With a precoating of the same material, we can observe large, long-lifetime ejection sheets with redirected momentum that extend away from the impact location. Under critical splash conditions, sheet breakup occurs and ejected droplets can be nonspherical and threadlike due to the inability of capillary stresses to deform material above a certain lengthscale. By varying the droplet size, impact velocity, surface coating thickness, and rheological material properties, we develop appropriate dimensionless parameters, quantify splash characteristics including height and radial extent of deposition, and present a regime map of impact behaviors.

Brendan Blackwell
University of Illinois at Urbana-Champaign

Date submitted: 02 Aug 2013

Electronic form version 1.4