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Drop impact on permeable meshes with yield-stress fluids RANDY EWOLDT, BRENDAN BLACKWELL, ATHREY NADHAN, Univ of Illinois - Urbana — Yield-stress fluids, such as pastes and gels, can stick and accumulate where they impact. To understand coating of complex topography, we experimentally study the ability of drops to accumulate on permeable solid meshes (rigid surfaces with small, evenly spaced openings). Whereas Newtonian fluids can adhere on meshes with sufficiently small lengthscales due to surface tension, yield-stress fluids can adhere due to rheological properties and accumulate much larger volumes. When inertial stresses are sufficiently high compared to the yield stress, a drop can pass through a mesh, breaking into smaller fluid particles with varying shapes, sizes, and velocities in the process. In contrast, when inertial stresses are sufficiently low compared to the yield stress, a drop can stick to the open mesh as though it were an impermeable solid surface. Drop size, impact velocity, mesh geometry, and rheological material properties are varied. Layers of spaced meshes are also examined, demonstrating a range of behaviors and the ability to coat internal aspects of complex topography. Dimensional analysis is performed to characterize material transmittance, velocity variations, and material spreading as a function of the geometric, kinematic, and rheological parameters.

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