

LadHyX Seminar – June 13th, 10:45

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Plastocapillarity

Many problems in engineering and geophysics feature the free surface flow of yield stress fluid. Although negligible at large scales (e.g. lava flows and landslides), capillary forces may become significant at small scales (e.g. coating polymeric materials and 3D printing). We show how capillary forces can plastically deform yield stress materials on small scales. In particular, the effect of yield stress on spreading droplets is considered. Experiments, asymptotic solutions, and numerical simulations are used to explain the droplets' dynamics and their final shape. Additionally, a new technique is proposed to externally control a spreading droplet's shape using temperature-dependent rheology and solidification. Finally, the general importance of plastocapillarity (when yield-stress fluids are driven by surface tension) in design and manufacturing at small scales is discussed.