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Rupture of thin films of power law fluids on a substrate VISHRUT GARG, SUMEET THETE, OSMAN BASARAN, Purdue University — Applications in coating, drying, foam stability and drop coalescence require an in-depth understanding of the dynamics of the rupture of thin films. A number of emerging applications in the field involve fluids that exhibit power law (deformation-rate-thinning) rheology. In a power law fluid, viscosity is not constant but is proportional to the deformation rate raised to the n−1 power, where $0<n\leq1$ is the power law exponent (n=1 for a Newtonian fluid). Previous studies by Vaynblat and co-workers (2001) and Zhang and Lister (1999) have focused on the rupture of free films and ones supported on a substrate, respectively, for Newtonian fluids. Here, we study the rupture of a thin film of a power law fluid on a substrate under the balance between destabilizing Van der Waals pressure and stabilizing capillary pressure. The power law scaling in time of the film thickness, the lateral length scale, and fluid velocity is determined analytically and confirmed by numerical simulations.

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