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Squeezing and de-wetting of a shear thinning fluid drop between plane parallel surfaces: capillary adhesion phenomenon THOMAS WARD, Iowa State University — The radial squeezing and de-wetting of a thin film of viscous shear thinning fluid filling the gap between parallel plane walls is examined both experimentally and theoretically for gap spacing much smaller than the capillary length. The interaction between motion of fluid in the gap driven by squeezing or de-wetting and surface tension is parameterized by a dimensionless variable, F, that is the ratio of the constant force supplied by the top plate (either positive or negative) to surface tension at the drop's circumference. Furthermore, the dimensionless form of the rate equation for the gap's motion reveals a time scale that is dependent on the drop volume when analyzed for a power law shear thinning fluid. In the de-wetting problem the analytical solution reveals the formation of a singularity, leading to capillary adhesion, as the gap spacing approaches a critical value that depends on F and the contact angle. Experiments are performed to test the analytical predictions for both squeezing, and de-wetting in the vicinity of the singularity.

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