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Electrically Driven Motion of Thin Films of Dielectric Liquids
PILNAM KIM, CAMILLE DUPRAT, Princeton University, SCOTT S.H. TSAI, Harvard University, HOWARD A. STONE, Princeton University, PRINCETON UNIVERSITY TEAM — In electrohydrodynamic (EHD) pumping, fluid forces are generated by the interaction of electric fields with the charges they induce in the fluid. Here, we investigate the effect of a tangential electric field on the motion of a thin film of a dielectric liquid in a wedge-shape geometry. We first present an experiment study. We find that the fluid is driven to high electrical potential regions due to the tangential field. In addition, the liquid interface undergoes an instability in the form of a conical shape (a Taylor cone) induced by a normal electric field to the interface. We propose a thin film model using lubrication theory to describe the film thickness-velocity relationship and characterize the jetting processes that accompany the interface instability.

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