

Abstract Submitted
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The Electrohydrodynamics of Superimposed Fluids Subjected to Nonuniform Electric Fields ASGHAR ESMAEELI, Southern Illinois University Carbondale — The interaction of electric field with fluid interfaces has been a problem of long-standing interest; however, there is currently a resurgent of interest on the subject because of its potential applications in a host of novel microfluidic processes. A particularly attractive application is the electrolithography, where increasingly small structures can be formed in a polymeric liquid by application of a “uniform” electric field on a pair of patterned electrodes that enclose the liquid. Motivated by this and similar examples, here, we study the behavior of the interface separating two leaky dielectric fluids that are confined between two horizontal flat plates and are subjected to a nonuniform (sinusoidal) electric field. We perform Direct Numerical Simulation (DNS) using a front tracking/finite difference scheme and solve the governing electrohydrodynamics equations in the framework of Taylor’s leaky dielectric theory. The equilibrium shapes of the interface are determined as a function of the controlling parameters of the problem such as the relative thicknesses of the two fluids.

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