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Inviscid Breakup of Bubbles and Drops With and Without Surface Charge JUSTIN BURTON, University of Chicago, PETER TABOREK, University of California, Irvine — We present boundary-integral simulations of the breakup of inviscid bubbles and droplets, with and without surface charge. In our simulations, an inner fluid volume of density ρ_1 is surrounded by an exterior fluid of infinite extent and density ρ_2. When there is no charge on the surface, we see excellent agreement with previous work, except for intermediate density ratios, where the simulations are plagued by oscillatory instabilities not observed in experiments [1]. With the addition of surface charge, initially spherical drops and bubbles are unstable to small perturbations above a critical surface charge density. For the droplet limit, the charged drop forms a "lemon" shape before ejecting a highly charged jet from the tips of the "lemon," where the size of the jet scales with the square of the inverse surface conductivity. For the bubble limit, we find that fission always takes place by the formation of a "peanut"-shaped bubble, where breakup takes place at the center of the bubble, regardless of surface conductivity. For intermediate densities, combinations of droplet and bubble fission are observed.

[1] J.C. Burton and P. Taborek, Phys. Rev. Lett. 101, 214502 (2008)

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