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A critical angle for electrocoalescence of conical droplets JAMES BIRD, Harvard University, WILLIAM RISTENPART, University of California at Davis, ANDREW BELMONTE, Pennsylvania State University, HOWARD STONE, Princeton University — Oppositely charged droplets suspended in air attract one another and, when the droplets are sufficiently close, electrical stresses deform the leading edges into cones. Here we investigate whether or not the liquid cones coalesce immediately following contact. Using high-speed imaging, we find that the coalescence behavior depends on the cone angle, which we control by varying the drop size and the applied voltage across the drops. The two drops coalesce when the slopes of the cones are small, but recoil when the slopes exceed a critical value. We propose a surface energy model (volume-constrained area minimization) to describe the transition between these two responses. The model predicts a critical cone intercept angle of 30.8°, which is in good agreement with our measurements.

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