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Pinch-off of Electrified Jets R.T. COLLINS, M.T. HARRIS, Purdue University, W. Lafayette, IN 47907, USA, P. DOSHI, GlaxoSmithKline, King of Prussia, PA 19406, USA, O.A. BASARAN, Purdue University, W. Lafayette, IN 47907, USA — Breakup of electrified jets is important in applications as diverse as spraying, fiber spinning, separations, and mass spectrometry. Breakup of a perfectly conducting, incompressible Newtonian liquid jet surrounded by a passive insulating gas that is stressed by a radial electric field is studied by a temporal analysis. An initially quiescent jet is subjected to axially periodic shape perturbations and the ensuing dynamics are followed numerically until pinch-off by finite element analysis. Computed results are shown to accord well with linear theory for short times. Breakup times and ratios of volumes of primary to satellite drops are reported over a wide range of electric Bond numbers (electric/surface tension force), Reynolds numbers (inertial/viscous force), and disturbance wave numbers. Effects of surface charge on interface overturning are investigated. The dynamic interplay between electrostatic and capillary stresses and the influence of electrostatic stresses on local scaling laws governing pinch-off are also examined.

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