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Blow Up Exponents and Deviations from Ideal Taylor Cone Shapes in Ultrathin Liquid Metal Films THEODORE G. ALBERTSON[1], SANDRA TROIAN, California Institute of Technology, 1200 E. California Blvd., MC 128-95, Pasadena, CA — We employ a finite element, moving mesh model to investigate the axisymmetric flow of an ultrathin liquid metal film overlay by a thin vacuum layer confined between two circular disks held at a constant potential difference close to field evaporation values. Within nanoseconds, a small Gaussian protrusion centered about the origin evolves into a sharpened cusp elongated by Maxwell stresses and rounded by capillary stresses. Previous analytic studies [2] and numerical simulations based on marker and cell techniques [3] [4] have uncovered a self-similar regime in time where the opposing stresses and kinetic energy exhibit blow up behavior with a characteristic exponent of - 2/3, and cusp shapes that deviate from the ideal Taylor cone angle. Our simulations consistently yield exponents in the range -3/4 to -4/5, with values that depend sensitively on the choice of blowup time. We also find that deviations from the ideal Taylor cone angle become significant all along the film interface as the Gaussian amplitude increases beyond fractions of a micron.

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