

Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Universal cone angle of ac electrosprays due to net charge entrainment NISHANT CHETWANI, SIDDHARTH MAHESHWARI, H.C. CHANG, University of Notre Dame — The slender meniscus that is obtained by the application of high frequency AC field is quite distinct from DC Taylor Cone. This AC cone shows a continuous longitudinal growth and has much smaller half cone of $\sim 11^\circ$. Mass spectrometry on the microjet from the AC cone shows that dissociation reaction occurs at the tip but only the low- mobility anionic species are entrained to produce a charged cone. These free negative charges relax to the interface to produce a non-uniform surface charge density that scales with respect to the azimuthal radius as $\rho^{-\frac{1}{2}}$ to balance the singular normal capillary pressure. Repulsion of this entrained surface charge and the Maxwell pressure they induce are estimated with an elliptic integral and a variational formulation produces anormal stress balance with capillary pressure that is only satisfied at a universal angle of 12.6° degrees for the liquids with high dielectric constant in good agreement with the measured values for the organic solvents used in experiments

Nishant Chetwani
University of Notre Dame

Date submitted: 30 Nov 2008

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