Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

**Non-Coalescence of Oppositely Charged Droplets** ANDREW BELMONTE, W. G. Pritchard Labs. Dept of Mathematics, Penn State, W.D. RISTENPART, F. DOLLAR, D.A. WEITZ, H.A. STONE, School of Engineering and Applied Sciences, Harvard University — We demonstrate the existence of a critical electric force above which oppositely charged droplets do not coalesce. The application of an external electric field causes appropriately positioned and oppositely charged droplets to migrate toward one another in a viscous oil. Upon contact, surface tension acts to pull the droplets together. For low droplet charge or applied field strengths, the droplets coalesce, but at higher charges or field strengths the droplets are repelled from one another after contact - they appear to bounce off one another. We derive the critical conditions for bouncing based on a competition between charge transfer, viscosity, and surface tension. These results have broad implications for applications where charged drops are manipulated by electric fields, including microfluidics, atmospheric science, and electrospray ionization.

Andrew Belmonte
Dept of Mathematics, Penn State

Date submitted: 07 Aug 2007 Electronic form version 1.4