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Electrically Modulated Partial Coalescence of Oppositely Charged Droplets J.C. CREASEY, B.S. HAMLIN, W.D. RISTENPART, Dept. Chem. Engr. & Mat. Sci., Univ. California at Davis — Oppositely charged drops fail to coalesce above a critical field strength, despite the attractive force between the opposite charges. Here we report a technique to externally control the extent to which a charged droplet is allowed to coalesce. For sufficiently low ionic conductivities, the degree of coalescence of water drops in oil can be tuned from complete coalescence at low field strengths to complete non-coalescence at high field strengths. Strikingly, in this regime the size and charge of the daughter droplet are both independent of the drop conductivity. We present evidence that the charge transfer is instead dominated by convective effects associated with the capillary-driven penetration of a vortex into the larger drop. Moreover, we demonstrate that measurements of the size of the daughter droplet are consistent with a model based on a balance between capillary forces and electrostatic repulsion.

William Ristenpart
Dept. Chem. Engr. & Mat. Sci., Univ. California at Davis

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