

Abstract Submitted
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How Do Droplets Acquire Charge? W.D. RISTENPART, B.S. HAMLIN, Dept. Chem. Engr. & Mat. Sci., Univ. California at Davis — Liquid droplets immersed in a poorly conductive medium are known to acquire charge upon contact with an electrified surface. Although there is some evidence that electrochemical reactions limit the degree of charge transfer, the details of the underlying mechanism are unclear. Previous work has relied on estimates of the drop charge obtained from a balance between the electrophoretic driving force and viscous drag, which necessitates an accurate description of the hydrodynamic resistance experienced by the drop. Here we establish a procedure to directly measure the droplet charge using a high resolution electrometer. Simultaneous high speed video and voltammetry provide a quantitative comparison of the drop charge obtained by the two methods. We find significant deviations between the measured charges and Maxwell's limiting case for the charge acquired by a perfectly conducting rigid sphere in contact with a planar electrode. We interpret the discrepancy in terms of electrochemical limitations, and we provide physical evidence that under appropriate conditions electrochemical reactions play a key role in the charge transfer to the drop.

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