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Formation and Electrically Induced Reversal of "Dynamic" Stagnant Caps B.S. HAMLIN, W.D. RISTENPART, Dept. Chem. Engr. Mat. Sci. Univ. California at Davis — Drops are commonly observed to move more slowly than predicted by the classic Hadamard-Rybczynski model for the drag force on an immiscible spherical drop. The discrepancy is commonly interpreted in terms of the presence of a "stagnant cap" of surfactant molecules at the trailing edge of the drop; the surfactants exert a Marangoni stress that impedes recirculation inside the drop. Here we present high-speed video of the formation and electrically induced reversal of "dynamic" stagnant caps. A charged water droplet is subjected to a sudden reversal in the direction of an applied electric field, and the overall motion of the drop and the relative motion of tracer particles on the droplet surface are observed. The droplet is shown to decelerate over a time period commensurate with the transient rearrangement of the tracer particles on the surface. We interpret the behavior in terms of the dynamic reversal of the stagnant cap, and we demonstrate that the observations are consistent with a scaling analysis of the transient cap rearrangement.

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