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**Axisymmetric Deformation of Droplet with an Adsorbed Surfactant Monolayer in a Steady Electric Field**[1] YU HAN, CHARLES MALDARELLI, Benjamin Levich Institute and Department of Chemical Engineering, City College of the City University of New York, New York, NY 10031, USA , JOEL KOPLIK, Benjamin Levich Institute and Department of Physics, City College of the City University of New York, New York, NY 10031, USA — Electrocoalescence is the process in which pairs of conducting droplets suspended in a continuous dielectric liquid phase are deformed, drawn together and merge upon the application of an electric field. It is an essential unit operation for separating water droplets in a crude oil. Asphaltenes indigenous to crude oil can adsorb on the interface and form highly elastic layers which resist coalescence. We use the boundary integral method to simulate the axisymmetric deformation of a water droplet in dielectric oil in a steady electric field. The insoluble adsorbed monolayer is considered as a Newtonian surface fluid interface with a dilatational viscosity but negligible shear viscosity. The surface tension is described by a Langmuir equation of state. Higher local surface coverage lowers the surface tension but results in a larger elastic stress which resists deformation. We show that the overall effect of the monolayer is to promote droplet deformation, and that elastic effects are significant at large deformation. The surface dilatational viscosity does not affect the equilibrium shape but dominates the dynamic process over a small bulk viscosity. The critical electric capillary numbers beyond which the droplet will break up are determined as a function of surface coverage.

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