Abstract Submitted
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Electrohydrodynamics of a particle-covered drop[1] MALIKA OURIEMI, IFPEN, France, PETIA VLAHOVSKA, Brown University — We study the dynamics of a drop nearly-completely covered with a particle monolayer in a uniform DC electric field. The weakly conducting fluid system consists of a silicon oil drop suspended in castor oil. A broad range of particle sizes, conductivities, and shapes is explored. In weak electric fields, the presence of particles increases drop deformation compared to a particle-free drop and suppresses the electrohydrodynamic flow. Very good agreement is observed between the measured drop deformation and the small deformation theory derived for surfactant-laden drops (Nganguia et al, 2013). In stronger electric fields, where drops are expected to undergo Quincke rotation (Salipante and Vlahovska, 2010), the presence of the particles greatly decreases the threshold for rotation and the stationary tilted drop configuration observed for clean drop is replaced by a spinning drop with either a wobbling inclination or a very low inclination. These behaviors resemble the predicted response of rigid ellipsoids in uniform electric fields. At even stronger electric fields, the particles can form dynamic wings or the drop implodes. The similar behavior of particle–covered and surfactant–laden drops provides new insights into understanding stability of Pickering emulsions.

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Petia Vlahovska
Brown University

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