

Abstract Submitted
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Interfacial rheology in two-phase microchannel flows STEVEN HUDSON, JEFFREY MARTIN, NIST — Droplet dynamics are studied experimentally by particle tracer velocimetry and shape analysis to measure interfacial retardation in various flow fields, surfactant concentrations and interfacial sorption dynamics. Aqueous drops in mineral or silicone oils are investigated in Poiseuille flow in rectangular channels. The drop size (tens of microns) is small compared to the channel height and width. The drop size is also small compared to an intrinsic length scale defined by surfactant mass transport coefficients, so that the experiments may probe a regime where interfacial sorption dynamics are relevant. The interfacial mobility of the drop is compared with fully mobile predictions and is found to range from a few percent to nearly full mobility, as surfactant concentration is adjusted. The effect of channel asymmetry on drop circulation is also tested. The droplet shape relaxation rates are measured, indicating the local surfactant concentration and interfacial tension. The interfacial tension and Marangoni effects are thus measured in a single experiment.

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