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Interfacial rheology in complex flow JEFFREY MARTIN, STEVEN HUDSON, National Institute of Standards and Technology — Multiphase liquid systems are omnipresent in and essential to everyday life, e.g. foods, pharmaceutics, cosmetics, paints, oil recovery, etc. The morphology and stability of such systems depend on dynamic interfacial properties and processes. Typical methods utilized to measure such interfacial properties often employ drops that are much larger and flows that are much simpler than those encountered in typical processing applications. A microfluidic approach is utilized to measure dynamic structure and kinetics in multiphase systems with drop sizes comparable to those encountered in applications and flow complexity that is easily adjustable. The internal circulation and deformation of an aqueous droplet in clear mineral oil is measured using particle tracers and a detailed shape analysis, which is capable of measuring sub-micron deviations in drop shape. Deformation dynamics, detailed drop shape, interfacial tension, and internal circulation patterns and velocities are measured in Poiseuille and transient elongational flows. Flow kinematics are adjusted by varying the microchannel geometry, relative drop size, and drop height. The effects of confinement on interfacial dynamics and circulation patterns and velocities are also explored.

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