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Thin-Film Drainage and Droplet Adhesion in a Microfluidic Channel JONATHAN HUI, WEI WANG, PETER HUANG, Binghamton University — In many multiphase fluid processes, such as in petroleum extraction and biochemical analysis, one often sees the lodging of immiscible droplets that block flow in a conduit. The absence of a thin-film lubrication layer surrounding adhered droplets significantly increases the threshold pressure gradient required to induce bulk flows. In this work, we investigate the thin-film drainage process that leads to droplet adhesion and study how coating droplets with charged surfactants or solid particles can prevent direct contact between the droplets and channel wall. We report on our current computational and experimental results of an oversized gas droplet in a water-filled flow channel under the influence of surface tension and interfacial electrostatic repulsion.

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