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Tipstreaming from the rear of surfactant laden droplets traveling through a microchannel TODD MOYLE, LYNN WALKER, SHELLEY ANNA, Carnegie Mellon University Department of Chemical Engineering — Microscale tipstreaming is a hydrodynamic phenomenon able to generate submicron sized droplets in a microfluidic device. The tipstreaming process results in the generation of a thin thread from a highly curved interface. In this work, we present observations of tipstreaming occurring at the rear of droplets translating along a microchannel. Drops are formed in a flow focusing geometry at geometry-controlled formation conditions. The drops then accelerate in the exit channel due to the addition of continuous phase liquid from two intersecting channels. Upon acceleration, the droplets form a highly curved tip at the rear and begin to shed a stream of tiny drops. The distance between the acceleration point and the location downstream at which tipstreaming occurs depends on surfactant concentration, drop size, and flow rate of the added continuous phase liquid. We examine the effect of these parameters on the tipstreaming process. Because tipstreaming occurs downstream of the acceleration point, after the drop has attained a new steady state velocity, we hypothesize that the adsorption of additional surfactant on the interface is the primary factor driving the onset of tipstreaming. We use these measurements to probe the timescale for surfactant adsorption to the droplet interface.

Todd Moyle
Carnegie Mellon University Department of Chemical Engineering

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