

Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Impact of Surfactant Sorption Kinetics on Microscale Tipstreaming¹ WINGKI LEE, LYNN WALKER, SHELLEY ANNA, Carnegie Mellon University — A microfluidic flow focusing system has been used to synthesize submicron sized droplets via a thread formation mode of drop breakup. This process utilizes the interaction of fluid motion and surfactant transport to draw out a thin thread, which then fragments into a stream of tiny droplets whose sizes are orders of magnitude smaller than the size of the device. In this work, we use a homologous series of C_nE_8 ($n = 10, 12$ and 14) surfactants to probe the impact of surfactant sorption kinetics on this process. To characterize the effects of these surfactants on the thread formation process, we measure the relevant timescales for the formation of a cone-like interface, the drawing and disintegration of a fine thread, and the period with which the process repeats. We then relate these timescales to the characteristic timescales for transport of surfactants to the oil-water interface. These measurements and simple scaling analyses suggest ways to extend the thread length and optimize the overall yield of submicron droplets.

¹This research was supported by the National Science Foundation Grants Nos. CBET-0608864 and CBET-0730727. Acknowledgement is made to the Donors of the American Chemical Society Petroleum Research Fund for partial support of this research.

Wingki Lee
Carnegie Mellon University

Date submitted: 14 Nov 2008

Electronic form version 1.4