

Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Curvature affected flow in surfactant films¹ JENNIFER FROMM, PADMINI RANGAMANI, STEFAN LLEWELLYN SMITH, University of California, San Diego — Free surface surfactant films are comprised of two organized surfactant molecule monolayers surrounding an interstitial fluid region. Thin soap films have been an important experimental tool for modeling two dimensional fluid flow. The relationship between the bulk flow regime in the interstitial fluid and the chemical behavior of the monolayers has been well established for flat films. Surfactant films with non-zero curvature have the potential to exhibit different fluid flow patterns than flat films due to surface tension and curvature effects. We provide a rigorous asymptotic study of the equations governing the motion and composition of a spherical fluid surfactant film, investigating the effects of dimensionless parameters on the resulting leading-order dynamical equations. Our findings indicate that the interstitial fluid flow is affected by film curvature especially in surfactant solutions of concentration above the critical micelle concentration, at which point the bending effects of the monolayer films contribute to the governing equations.

¹This material is based upon work supported by the National Science Foundation Graduate Research Fellowship Program under Grant No. DGE-1650112. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Jennifer Fromm
University of California, San Diego

Date submitted: 09 Aug 2020

Electronic form version 1.4