Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Effect of surfactants on stability of a moving interface in a Hele-Shaw cell. CAROLYN GRAMLICH, G.M. HOMSY, Department of Mechanical Engineering, University of California, Santa Barbara — Viscous fingering of immiscible fluids in a Hele-Shaw cell has been seen experimentally to be influenced by effects of surfactants on the interface between the fluids. A reasonable hypothesis is that Marangoni stresses due to a spanwise gradient in surfactant concentration are responsible. We analyze the problem of soluble surfactant transport in the Hele-Shaw cell and use matched expansions to derive effective boundary conditions including surfactant effects. These are then used to analyze the linear stability of a displacement flow. We find that Marangoni stresses due to differential adsorption of surfactant induce a secondary flow causing wavelength-dependent destabilization of the interface.

G. M. Homsy
Department of Mechanical Engineering
University of California, Santa Barbara

Date submitted: 12 Aug 2005 Electronic form version 1.4