Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Chemically Driven Interfacial Convection P.M.J. TREVELYAN, A. DE WIT, Center for Nonlinear Phenomena and Complex Systems, CP 231, Université Libre de Bruxelles, 1050 Brussels, Belgium, S. KALLIADASIS, Department Of Chemical Engineering, Imperial College London, SW7 2AZ, UK — This study examines chemically driven interfacial convection for a two layer system in a Hele Shaw cell under microgravity conditions. The two immiscible liquids each have a reactant dissolved into them. The two reactants A and B react at the interface to produce a surfactant S through the mechanism A+B $\rightarrow$ S. Tangential stresses due to interfacial gradients of S are induced via the solutal Marangoni effect which generates interfacial motion. A two-dimensional model containing the Navier-Stokes and mass transport equations of the chemical species in the bulk along with the surfactant transport equation on the interface and appropriate boundary conditions is constructed for small amplitude interfacial deformations. For suitable parameters the linear stability analysis predicts an instability. To explore the evolution of the system approximate nonlinear solutions are obtained.

Philip Trevelyan
Center for Nonlinear Phenomena and Complex Systems, CP 231,
Université Libre de Bruxelles, 1050 Brussels, Belgium

Date submitted: 28 Jul 2006 Electronic form version 1.4