Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

Structure and stability of binary mixtures with free evolving surface[1] SANTIAGO MADRUGA, UWE THIELE[2], Max-Planck Institut for the Physics of Complex Systems, Noethnitzer Str. 38, Dresden, Germany — Thin polymer films of binary mixtures are used in technological applications as homogeneous coatings or structured functional layers. Experiments show a coupled dynamics of decomposition within the film and the dewetting of the film [1]. We propose a model of the decomposition induced profile evolution of a free surface film of a binary mixture. The model is based on model-H [2] describing the coupled transport of concentration (convective Cahn-Hilliard equation) and momentum (Navier-Stokes-Korteweg equations) fields supplemented by boundary conditions at the substrate and the free surface. After determining homogeneous and vertically stratified base states we analyse their lateral stability [3] and show that depending on the energetical bias at the surface and the mean concentration the convective transport (i) promotes the instability and (ii) induces surface deflections for the stratified base states.
[1] R. Yerushalmi-Rozen et al. Science. 285, 1254-1256 (1999). [2] D.M. Anderson et al. Ann. Rev. Fluid Mech. 30, 139-165 (1998). [3] U. Thiele, S. Madruga, and L. Frastia. Submitted to Phys. Fluids. http://arxiv.org/abs/0707.3374

[1]We acknowledge support by the EU under grant MRTN-CT-2004-005728.
[2]School of Mathematics, Loughborough University, Loughborough, UK.

Santiago Madruga
Max-Planck Institut for the Physics of Complex Systems,
Noethnitzer Str. 38, Dresden, Germany

Date submitted: 31 Jul 2007 Electronic form version 1.4