Thin film lubrication dynamics of a binary mixture: nonlinear simulations

Ion Dan Borcia[*], **Michael Bestehorn**[†]

[*] Department of Theoretical Physics II and
Chair of Aerodynamics and Fluid Mechanics,
Brandenburg University of Technology, 03046-Cottbus, Germany
e-mail: iborcia@physik.tu-cottbus.de

[†] Department of Theoretical Physics II,
Brandenburg University of Technology, 03046-Cottbus, Germany
e-mail: bes@physik.tu-cottbus.de

ABSTRACT

Nonlinear numerical simulations were performed for oscillatory dynamics of a binary mixture thin film with deformable surface. For the 3D case two configurations are considered: infinitely extended layer and narrow channel. For the first case, periodic boundary condition in both horizontal directions are considered. For the second geometry, one assumes periodic boundary conditions in the channel length direction and no slip conditions at the channel walls. In order to describe the systems the basic equations for a mixture of two completely miscible fluids systematically developed in [1] for the case of long wave approximation are used. Holes or drops are obtained depending on the film thickness. For positive values of the Soret separation ratio the behavior is similar to that of one component fluids. For negative values oscillatory behavior can occur. The nonlinear simulations shows that the Soret effect can drive a multitude of interesting behaviors: accelerated coarsening, oscillatory patterns, drops with soliton like behavior.

REFERENCES

[1] M. Bestehorn and I.D. Borcia *Thin film lubrication dynamics of a binary mixture: Example of an oscillatory instability*, Phys. Fluids **22(10)**, 104102, 2010.