Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

Influence of phase change on non-equilibrium contact lines PIERRE COLINET, ALEXEY REDNIKOV, SEVERINE ROSSOMME, Universite Libre de Bruxelles — Despite their crucial importance in the fields of microfluidics and in heat transfer technologies, contact lines are not yet completely understood from the modeling point of view, in particular when involving heat and fluid flows coupled by means of evaporation/condensation processes. In this presentation, such non-equilibrium contact lines are analyzed theoretically, using a lubrication-type equation incorporating relevant micro-scale effects, i.e. kinetic resistance to phase change, disjoining pressure and influence of interfacial curvature. In addition, the effect of an inert gas is also addressed. It is shown that steady contact line shapes can be accurately described by an analytical solution based on matched asymptotic expansions in a certain meaningful limit. For moving contact lines, the dependence of the apparent contact angle upon the contact line velocity is also investigated, and compared to numerical simulations of the evolution equation, for droplet-like solutions. Finally, the relevance of our results for the macroscopic modeling of heat transfer processes such as boiling, is also discussed.

Pierre Colinet
Universite Libre de Bruxelles

Date submitted: 03 Aug 2007 Electronic form version 1.4