Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Contact line dynamics of a liquid meniscus advancing into a microchannel with chemical heterogeneities CHRISTOPHE WYLOCK, TIPs Department, Universite Libre de Bruxelles, Belgium, MARC PRADAS, Department of Chemical Engineering, Imperial College London, UK, BENOIT HAUT, PIERRE COLINET, TIPs Department, Universite Libre de Bruxelles, Belgium, SERAFIM KALLIADASIS, Department of Chemical Engineering, Imperial College London, UK — We examine the motion of a liquid meniscus and associated contact lines advancing into a two-/three-dimensional (2D/3D) microchannel with chemically heterogeneous inner walls. Our study is based on a phase field model of the Cahn-Hilliard type, appropriately modified to take into account the interaction between the fluid and the walls. By solving this model numerically, we characterize the influence of the chemical disorder of the walls on both the interface and contact line dynamics. We perform a detailed statistical analysis of our numerical results by generating several chemical disorder realisations. Examination of the advancing and receding motion of the contact lines in the 2D case reveals that the apparent contact angle suffers a hysteresis behaviour induced by the wall disorder and enhanced as the disorder strength is increased. For the 3D system it is shown that the surface chemical disorder makes the interface and contact line undergo a kinetic roughening process, characterised by a scaling growth with pinning-depinning effects and associated avalanche dynamics.

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Date submitted: 05 Aug 2010 Electronic form version 1.4