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Two-phase hydrodynamic model for air entrainment at moving contact line TAK SHING CHAN, JACCO SNOEIJER, Physics of Fluids Group, Department of Science and Technology, University of Twente, the Netherlands — The moving contact line problems are challenging because they involve multiple length scales. One interesting case arises when an advancing liquid of high viscosity entrains the surrounding phase, such as air. In this presentation, we introduce a hydrodynamic model that generalizes the lubrication theory in order to take into account the velocity fields of the two phases. Assuming that the curvature of the interface is small we derive a differential equation for the interface profile at stationary state. We found that there is a critical capillary number above which no steady meniscus can exist and instability will occur. For example, air bubbles will be entrained into the liquid at the advancing contact line. However, we found no instability when neglecting the viscosity of the surrounding phase, illustrating the two-phase nature of the problem.

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