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Film deposition on a partially wetting plate withdrawn from a liquid reservoir[1] PENG GAO, LEI LI, University of Science and Technology of China — A partially wetting plate withdrawn from a liquid reservoir causes the deposition of liquid films, which are characterized by trapezoidal or triangular shapes. Interesting issues include the critical condition of the film deposition, the film structures and the dependence on the plate speed of the contact-line inclination angle. In the first part of this work, we performed numerical simulations of the problem with a diffuse-interface method, and reproduced the coexistence of the thick and thin films observed in recent experiments (Phys. Rev. Lett, 2006, 96, 174504, and Phys. Rev. Lett, 2008, 100, 244502). We demonstrated that the apparent contact angle vanishes at the onset of wetting transition, consistent with the lubrication theory. The critical condition for the onset of thin films was also quantified. In the second part of this work, we presented a lubrication analysis of films with inclined contact lines. It is shown that the traditional model of constant normal speed of the contact line is only a leading-order approximation; the normal speed actually exhibits a weak decrease with the inclination angle. In addition, the inclination of the contact line results in a tangential flux of the liquid. Simple scaling relations are provided for both the normal velocity and the flux.

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