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Modeling of evaporating ultra-thin films and contact lines[1]
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— A new lubrication-type model applying to evaporating ultra-thin films is presented. This evolution equation generalizes earlier ones found in the literature by incorporating the effects of finite thermal conductivity of the vapor and of temperature discontinuity across the evaporating/condensing interface. The latter effect is accounted for through a set of generalized interfacial conditions derived from irreversible thermodynamics. The model is first applied to determine the conditions under which a film of given thickness is stable to hydrodynamic disturbances. Then, steady nonlinear solutions in the form of contact lines connecting a constant-slope region with an adsorbed film are found, and particular attention is devoted to the peak of the mass flux at the contact line, as well as to the apparent contact angle. The influence of various effects on these quantities is also considered.

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