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Moving contact lines in a vapor-liquid system: a singularity-free description in the sole framework of classical physics[1] ALEXEY REDNIKOV, PIERRE COLINET, Universite Libre de Bruxelles, TIPs-Fluid Physics — When one is lead to think about a theoretical treatment of moving contact lines in the sole framework of classical physics, the first associations coming to mind are most probably those of singularities intractable unless "regularizing" effects, beyond the classical approach, are taken into account, such as the disjoining pressure or a slip at the wall. Here we show that, contrary to such preconceptions, no contact-line singularities arise, even in the absence of these regularizing effects, in a system consisting of a liquid, its pure vapor and a superheated substrate (of interest, in particular, in boiling applications). Furthermore, no thermal singularities typically associated with this system are encountered either, even in the absence of the thermal regularizing effects such as a finite rate of the evaporation kinetics or a finite heat conductivity of the substrate. We consider, in the framework of the lubrication theory and a classical one-sided model, a contact line moving at a constant velocity (advancing or receding) and starting abruptly at a (formally) bare solid surface, the micro- contact angle being either equal to zero or finite.

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