Abstract Submitted
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Effect of Marangoni Flows on the Shape of Thin Sessile Droplets Evaporating into Air[1] YANNIS TSOUMPAS, SAM DEHAECK, ALEXEY REDNIKOV, PIERRE COLINET, TIPs Laboratory, Université Libre de Bruxelles — With the help of Mach-Zehnder interferometry, we study the (largely) axisymmetric shapes of freely receding evaporating sessile droplets of various HFE liquids. The droplets evaporate into ambient air and, although the liquids are perfectly wetting, possess small finite contact angles reckoned to be evaporation-induced. The experimentally determined droplet profiles are shown here to deviate, under some conditions, from the classical macroscopic static profile of a sessile droplet, as this is determined by gravity and capillarity. These deviations are attributed to a Marangoni flow, due to evaporation-induced thermal gradients along the liquid-air interface, and are mostly observed in conditions of high evaporation. Unlike the classical static shapes, the distorted experimental profiles exhibit an inflection point at the contact line area. When a poorly volatile liquid is considered, however, the temperature differences and the Marangoni stresses are weak, and the measurements are found to be in a good agreement with the classical static shape. Overall, the experimental findings are quantitatively confirmed by the predictions of a lubrication model accounting for the impact of the Marangoni effect on the droplet shape.

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