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Non-isothermal spreading dynamics of self-rewetting droplets DIMITRIS MAMALIS, KHELLIL SEFIANE, The University of Edinburgh, KIRTI CHANDRA SAHU, Indian Institute of Technology Hyderabad, GEORGE KARA-PETSAS, National Technical University of Athens, OMAR K. MATAR, Imperial College London — We study the spreading dynamics of droplets on uniformly heated substrates. More specifically, we consider the case of binary alcohol mixtures which exhibit a non-monotonic dependence of the surface tension on temperature; these systems are often referred in the literature as self-rewetting fluids. We show through experiments that the early-stage spreading exponents depend non-monotonically on the substrate temperature in contrast to the monotonic dependence of pure liquids. In addition, we observe through the use of IR thermography visualization the formation of spontaneous travelling waves which develop along and across the free surface of the evaporating droplet and influence the spreading behaviour. Finally, we develop a theoretical model based on lubrication theory and derive an evolution equation for the interface accounting for capillarity and thermocapillarity. Using this model we investigate the effect of varying droplet wettability, which is linked to the temperature of the solid surface, on the spreading dynamics.

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