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Regimes of thermocapillary migration of droplets under partial wetting conditions JUAN M. GOMBA, GEORGE M. HOMSY, University of California at Santa Barbara — The actuation of very small droplets on rigid surfaces and inside channels is common to a large number of technological applications, such as cooling of integrated circuits, mixing of chemical products and bio-chemical analysis. In some of these, the control of drops can be achieved by thermocapillarity. Here, we study the effect of partial wetting on the thermocapillary migration of droplets along a constant temperature gradient imposed on the substrate. We solve for the temporal evolution of the droplet, taking into account the effect of wettability via a disjoining-conjoining pressure model. We find two flow regimes: one in which the droplet moves as a single entity, weakly distorted from its static shape and only very slowly losing mass into the thin film behind it; the other is analogous to the so-called "Marangoni film," with a long film profile and a capillary ridge near the apparent contact line. While they depend on all parameters, these two flow regimes appear for relatively high and low contact angle, respectively. We also show some intriguing morphologies that appear in the transition between these two flow regimes.

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