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Thermocapillary motion of bubble under the action of gravity in a self-rewetting fluid OMAR MATAR, Imperial College London, MANOJ TRIPATHI, KIRTI SAHU, Indian Institute of Technology Hyderabad, India, GEORGE KARAPETSAS, University of Thessaly, Volos 38334, Greece, KHELLIL SEFIANE, University of Edinburgh, Edinburgh — The motion of a bubble driven under the action of buoyancy and thermocapillarity inside a tube with a non-uniformly-heated walls, containing a so-called "self-rewetting fluid" is investigated. The surface tension of the "self-rewetting fluid" exhibits a parabolic dependence on temperature with a well-defined minimum. We perform direct numerical simulation of axisymmetric bubble motion in a fluid whose temperature increases linearly with vertical distance from the bottom of the tube for a range of Bond and Gallileo numbers, and for various parameters that govern the functional dependence of surface tension on temperature. We demonstrate that bubble motion can be reversed and then arrested in self-rewetting fluids for sufficiently small Bond numbers; this in contrast with the linear fluid (surface tension linearly decreases with increasing temperature). We also demonstrate that considerable bubble elongation is possible under significant wall confinement, and for strongly self-rewetting fluids and large Bond numbers. In the Stokes flow limit, we derive the conditions under which a spherical bubble can come to rest in a self-rewetting fluid whose temperature varies linearly in the vertical direction, and demonstrate that this is possible for both positive and negative temperature.

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