Temperature fields due to thermocapillary migration of microdroplets

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Abstract

Mirodroplet-based microfluids have much attention recently, not only because of the desire to incorporate fluids devices into MEMS, but also because of potential applications in biological science. In a lab on a chip, one of the active control of microdroplets is thermocapillary force, i.e., surface tension formed by adding temperature gradient in direction of the microdroplet motion. The thermocapillary forces are closely related to the temperature distribution and evolution in and out the microdroplets. In this paper, using the front-tracking method, we numerically investigate the thermocapillary microdroplet migration processes and identify that the velocity fields are almost the same, but the quasi-state or accelerating motions of the microdroplets depend on the patterns of temperature fields in the microdroplets. Moreover, effects of physical parameters on the thermocapillary microdroplet motions are also discussed.

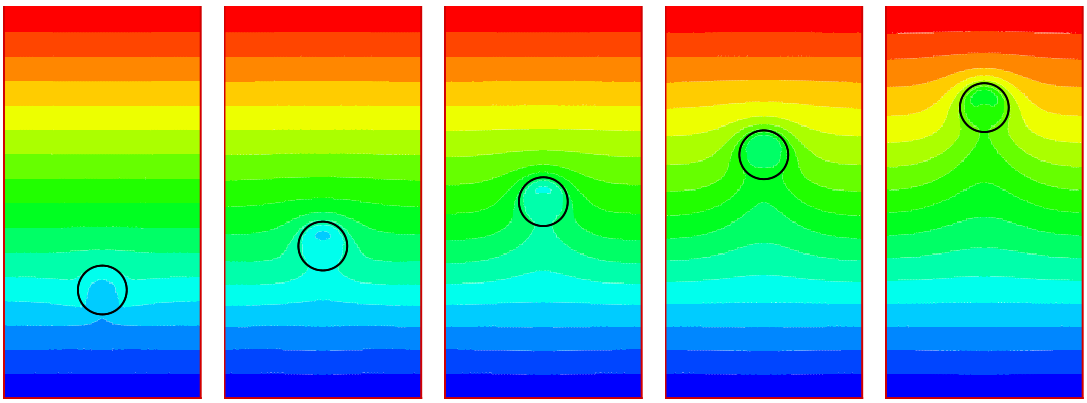

Fig.1 Isotherms from the computation of thermocapillary microdroplet migration with the microdroplet size r_0=0.5mm.