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Thermo-actuated migration in a micro-system MARIE-CAROLINE JULLIEN, UMR 7083 CNRS ESPCI, BERTRAND SELVA, Unité Mixte Rhodia CNRS 5258, ISABELLE CANTAT, Université de Rennes 1, MMN, LABORATOIRE GULLIVER TEAM, LOF TEAM, INSTITUT DE PHYSIQUE DE RENNES TEAM — Digital microfluidics require element displacement by simple means featuring high integration rates. Within this context, the transport and handling of elements constitutes a problem [Squires and Quake, 2005]. This context has rekindled interest in the Marangoni surface effect, which refers to tangential stresses along an interface. Producing a surface tension gradient by imposing a temperature gradient is especially efficient and easy to control. In a recent paper, we have shown [Selva et al., Phys. Fluids (2011)] that a bubble undergoing a constant temperature gradient is indeed set into motion. However, the direction of motion (toward the cooler side) is in contradiction with experiments performed at the millimetre scale in which bubble migration is driven towards hoter regions. We believe this observation is due to the PDMS deformability. Indeed, PDMS expands when the temperature increases. A temperature gradient inside a microsystem results in a cavity thickness gradient, and thus leads to the bubble travelling towards the thicker part of the cavity. The physical phenomena involved in such a system are multifaceted (PDMS dilation, thermocapillarity, solutocapillarity) and may have either complementary or opposite effects depending on the experimental conditions.

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