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Experimental study of the flow pattern around a bubble confined in a microfluidic Hele-Shaw cell[1] YANNIS TSOUMPAS, CHRISTOPHE FAJOLLES, FLORENT MALLOGGI, LIONS, NIMBE, CEA, CNRS, Université Paris-Saclay, CEA Saclay, 91191 Gif sur Yvette Cedex, France — The flow field around a bubble moving with respect to a surrounding liquid in a Hele-Shaw cell can usually be characterized by a recirculating flow, which is typically attributed to a Marangoni effect due to surface tension gradients generated by a non-uniform distribution of surfactants (or temperature) along the liquid-gas interface. In the present study, we try to visualize such a flow employing 3D micro-particle tracking velocimetry. We perform experiments on an immobile flattened air bubble that is surrounded by a flow of aqueous solution of surfactant (SDS), in a microfluidic chamber described in the work of Sungyon Lee et al. (Soft Matter, 2012, 8, 10750). The suspending fluid is seeded with spherical micro-particles, with those captured by the recirculating flow orbiting in a three-dimensional trajectory in the vicinity of the liquid-air interface. We address the effect of velocity of the surrounding fluid, surfactant concentration and bubble radius on the recirculating flow pattern. The case of a liquid-liquid interface, with a hexadecane drop as the dispersed phase, is also discussed.

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