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Bubble Dynamics and Breakup in a T-junction at Moderate Reynolds Numbers. OCTAVI OBIOLS, ROGER RANGEL, University of California, Irvine — The deformation and breakup of droplets and bubbles in an immiscible carrier liquid in microchannels has been extensively investigated in the literature. In this study, we address the case of bubbles and drops in a centimeter-scale T-junction at moderate Reynolds numbers, a problem that is relevant for fluidics and emulsion processing applications. The main features include complex oscillating transients, recirculation stabilization, and drop stabilization against breakup. In particular, very elongated drop shapes are observed, which would be unstable in the unbounded case and can be explained in terms of wall-induced distortion of the flow field. We show that wall effects can be exploited to obtain nearly monodisperse emulsions in confined flows. Surface tension also plays an important role on the breakup of the dispersed phase. Different drop sizes can be obtained depending on the Capillary number as well as the bubble initial size. A mechanism for finding the non-breakup and break-up regions depending on bubble size is found. It is found with different initial flow rates of the matrix flow, the non-breakup regime allows for the bubble to remain attached to the bottom wall of the T-junction. In the breakup regime, the elongation of the drop results in a significant delay for breakup, allowing for the study of the breakup time and location. Results are presented for different Ca and Re numbers.

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