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Droplet break-up in microfluidic T-junctions at small capillary numbers MARIE-CAROLINE JULLIEN, ESPCI-CNRS, MARY JANE TSANG MUI CHING, CÉLINE COHEN, LAURE MÉNÉTRIER, ESPCI, PATRICK TABELING, ESPCI-CNRS, MICROFLUIDICS, MEMS AND NANOSTRUCTURES TEAM — We perform experimental studies of droplet breakup in microfluidic T-junctions in a range of Capillary numbers lying between 4.10^{-4} and $2\ 10^{-1}$ and for two viscosity ratios of the fluids forming the dispersed and continuous phases. The present paper extends the range of Capillary numbers explored by previous investigators by two orders of magnitude. We single out two different regimes of breakup. In a first regime, a gap exists between the droplet and the wall before breakup occurs. In this case, the break up process agrees well with the analytical theory of Leshansky and Pismen [Phys. Fluids, 21(2), 023303 (2009)]. In a second regime, droplets keep obstructing the T-junction before breakup. Using physical arguments, we introduce a critical droplet extension for describing the breakup process in this case.

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