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Droplet breakup in microfluidic T-junctions at small capillary numbers

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Abstract / Résumé
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 breakup process agrees well with the analytical theory of Leshansky and Pismen [Phys. Fluids 21, 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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