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Droplet formation in Hele-Shaw T-junction.[1] JOSHUA RICOUVIER, PAVEL YAZHGUR, MMN Laboratory, IPGG, ESPCI Paris, ALEXANDER LESHANSKY, Department of Chemical Engineering, Technion-IIT, PATRICK TABELING, MMN Laboratory, IPGG, ESPCI Paris, MICROFLUSA TEAM — The development of digital microfluidics has attracted considerable interest towards generation of highly monodisperse microdroplets. T-junction has become an essential element of most of microfluidic chips. Despite its importance, theoretical analysis of droplet formation at T-junction is still incomplete due to complexity of physics involved. We focused on droplet generation at the Hele-Shaw T-junction. The effect of various experimental parameters, such as channel geometry, flow rates, surface tension and fluid viscosities, was thoroughly investigated. Our results show that the experimental system exhibits three distinct regimes (squeezing, dripping and jetting regimes) and point out the effect of confinement on the transitions. We demonstrate that the size of the "plug" droplet depends not only on the flow rate ratio (as described in the literature), but also on the capillary number and the channel cross-section aspect ratio. Quasi-2D flow equations allow us to perform numerical simulations and to compare them with experimental results.

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