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Numerical simulation of liquid-liquid plug formation in a T-shaped cylindrical micro-channel[1] MAXIME CHINAUD, EVANGELIA ROUMPEA, PANAGIOTA ANGELI, University College London, JALEL CHERGUI, DAMIR JURIC, LIMSI-CNRS, SEUNGWON SHIN, Hongik University, Republic of Korea, LYES KAHOUADJI, OMAR MATAR, Imperial College London
— We present experimental studies and three-dimensional simulations using the code BLUE for different fluid flow rate combinations in a tubular T-junction. All branches have internal diameters equal to 200 μm. The dispersed phase consists of a water/glycerol solution injected from the side branch of the junction, while the continuous phase is silicon oil injected along the main channel axis. BLUE is a new massively parallel Navier-Stokes solver for multiphase flows. Communication across process threads is handled by MPI message passing procedures. The method for the treatment of the fluid phase interfaces and, in particular, capillary forces uses a hybrid Front Tracking/Level Set technique which defines the interface both by a discontinuous density field as well as by a local triangular Lagrangian mesh. This structure allows the interface to undergo large deformations including rupture or coalescence of fluid interfaces.

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