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Micro-droplet formation via 3D printed micro channel ZHEN JIAN, JIAMING ZHANG, ERQIANG LI, SIGURDUR T. THORODDSEN, King Abdullah University of Science and Technology — Low cost, fast-designed and fast-fabricated 3D micro channel was used to create micro-droplets. Capillary with an outer diameter of 1.5 mm and an inner diameter of 150 μm was inserted into a 3D printed cylindrical channel with a diameter of 2 mm. Flow rate of the two inlets, insert depth, liquid (density, viscosity and surface tension) and solid (roughness, contact angle) properties all play a role in the droplet formation. Different regimes - dripping, jetting, unstable state - were observed in the micro-channel on varying these parameters. With certain parameter combinations, successive formation of micro-droplets with equal size was observed and its size can be much smaller than the smallest channel size. Based on our experimental results, the droplet formation via 3D printed micro T-junction was investigated through direct numerical simulations with a code called Gerris. Reynolds numbers $Re = \rho UL/\mu$ and Weber numbers $We = \rho U^2 L/\sigma$ of the two liquids were introduced to measure the liquid effect. The parameter regime where different physical dynamics occur was studied and the regime transition was observed with certain threshold values. Qualitative and quantitative analysis were performed as well between simulations and experiments.

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