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Phase-locked confocal micro-PIV measurement of three dimensional flow structure of transient droplet formation mechanism in T-shaped micro junction MASAMICHI OISHI, HARUYUKI KINOSHITA, TERUO FUJII, Institute of Industrial Science, The University of Tokyo, MARIE OSHIMA, Interfaculty Initiative in Information Studies, The University of Tokyo — This paper aims to investigate a mechanism of microdroplet formation at a micro T-shaped junction using a “phase-locked multicolor confocal micro-PIV (Particle Image Velocimetry)” technique. The multicolor system can measure dynamic behavior of each phase of multiphase flow separately and simultaneously. The phase-locking technique is necessary to reconstruct three-dimensional flow field from two-dimensional confocal micro-PIV measurement data. We successfully obtained each temporal phase of periodic phenomenon non-invasively by detecting passage of droplet from transmitted light of optical proximity sensor. Additionally, the phase-locking technique also enables picking up same condition of formation frequency, size and translational velocity of droplet to minimize instability of droplet formation phenomenon. As a result, three-dimensional flow structure of the droplet formation was successfully reconstructed and the droplet formation mechanism was investigated by the flow interaction between each phase.

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