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Between microdroplets and microfluidics: Liquid/liquid interfaces do not brake up at a junction of hydrophilic microchannels KYOSUKE SHINOHARA, YUTO YOKOYAMA, TORU TORII, KOJI OKAMOTO, University of Tokyo, VISUALIZATION LABORATORY TEAM —
The intermediate state between microdroplets and microfluidics in two immiscible fluids is described. It was found that Y-shaped two-phase flow is formed with a stable liquid/liquid interface at a cross-junction in a hydrophilic microchannel. A velocity vector map, obtained by micro-particle image velocimetry, reveals the Y-shaped flow consists of aqueous phase flow along the edge of the channel and an acrylate monomer phase flow penetrating the center. The transition from the Y-shaped flow to other flow patterns can be characterized by a state diagram that depends on the capillary number and the Weber number of each injecting phase. The Y-shaped flow again has provided us the importance of the balance among viscous force, surface tension force, and inertia force in microscopic scale.

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