

DROPLET-ACTUATED MICROCHANNEL MIXER

K. Yamamoto^{1,2}, R. Sakurai¹ and M. Motosuke^{1,2}

¹Department of Mechanical Engineering, Tokyo University of Science, Tokyo, Japan;

²Research Institute for Science and Technology, Tokyo University of Science, Tokyo, Japan

yam@rs.tus.ac.jp

Mixing and concentration control in microchannels are essential to Lab-on-a-chip devices[1,2]. In this study, droplets are exploited to mix two fluids flowing in parallel to induce intense interfacial disturbance[3]. The proposed mixing mechanism enables us to control the mixing level on demand with a stable operation.

To demonstrate the mixing, water and colored water or particle-dispersed water are mixed in the microchannel. Oleic acid is chosen for the dispersed phase and the droplets are introduced to the mixing channel together with the continuous phase (water). In the mixing channel, the oil droplets strike the mixing front and the interfacial area of two mixing fluids increases as shown in Fig. 1. We found that the striking motion plays a significant role in the mixing and the mixing level can be controlled by adjusting the droplet-striking frequency, channel geometry, and droplet diameter, whereas the confluence angle of inlets for two to-be-mixed fluids has less effect.

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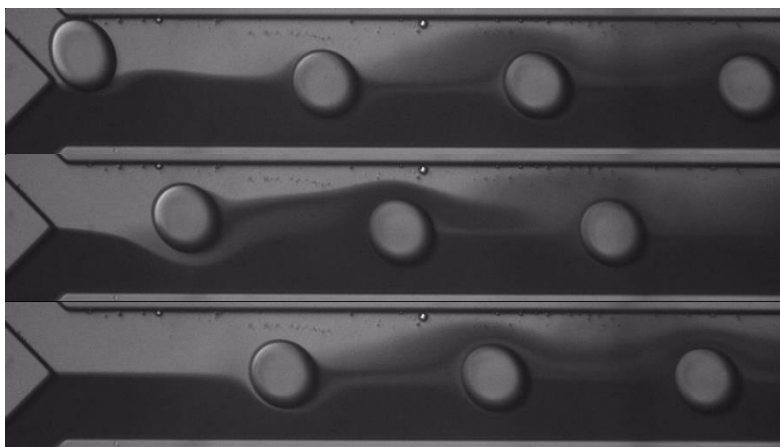


Fig. 1. Successive images of the mixing in a microchannel induced by the droplet injection (channel width = 250 μm).

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