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Investigating droplet internal flow in concentrated emulsion when flowing in microchannel using micro-PIV CHIA MIN LEONG, Mechanical Engineering, Rensselaer Polytechnic Institute, YA GAI, Aeronautics and Astronautics, Stanford University, SINDY K. Y. TANG, Mechanical Engineering, Stanford University — Droplet microfluidics has enabled a wide variety of high throughput applications through the use of monodisperse droplets. Previous fluid studies of droplet microfluidics have focused on single drops or emulsions at low volume fractions. The study of concentrated emulsions at high volume fractions is important for increasing the throughput, but the fluid dynamics of such emulsions in confined channels is not well understood. Here we describe two-dimensional, mid-height measurements of the flow inside individual drops within a concentrated emulsion using micro-PIV. The emulsion has 85% volume fraction and flows as a monolayer in a straight microfluidic channel. The effects of confinement and viscosity ratio on the internal flow patterns inside the drops were studied. The results show rotational structures inside the drops always exist, and are independent of viscosity ratio for the conditions tested. The structures depend on droplet mobility which in turn, depends on the confinement of the emulsion and the location of the drops in the channel. To our best knowledge, no work has probed the flow field inside droplets of concentrated emulsions at high volume fractions in confined channels. Current work is in progress to measure the three-dimensional flow field in such system.

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