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Rearrangement dynamics of concentrated emulsions in a tapered micro-channel YA GAI, Department of Aeronautics and Astronautics, Stanford University, CLAUDIU STAN, SLAC National Accelerator Laboratory, SINDY TANG, Department of Mechanical Engineering, Stanford University — We describe the flow of a monolayer of monodisperse droplets within a high-volume-fraction emulsion in a tapered micro-channel. The flow of droplets in micro-channels can be non-trivial, and may lead to unexpected phenomena such as long-period oscillations and chaos. Previously, there have been studies on concentrated emulsions in straight channels and channels with bends. The dynamics of how drops flow and rearrange in a tapered geometry has not yet been characterized. At sufficiently slow flow rates, the drops arrange into a hexagonal lattice. At a given x-position, the time-averaged droplet velocity magnitudes are uniform. The instantaneous drop velocities, however, reveal a different pattern. A wave-like pattern is observed from the kymograph of droplet velocities at a fixed x-position in the channel where the number of rows of drops decreases from N to N-1. Such wave-like pattern arises from the collective slipping motion of the drops in the rearrangement zones along the 60 degrees axes, the easy slip directions of a hexagonal lattice. To our knowledge, such reproducible slipping motion has not been reported. Current work is in progress to identify the physical factors that govern such slipping motion.

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