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Droplet velocity in a micrometric Hele-Shaw Cell BENJAMIN REICHERT, AXEL HUERRE, ESPCI/CNRS, OLIVIER THEODOLY, Aix-Marseille Universite, ISABELLE CANTAT, IPR-Rennes, MARIE-CAROLINE JULLIEN, ESPCI/CNRS — Droplet-based microfluidics is a growing field often requiring an accurate synchronization for automated systems. The question we address is the prediction of a viscous droplet velocity pushed by a surrounding liquid set at a fixed mean velocity. In a previous work, we showed that the level of confinement plays a crucial role by investigating the lubrication film thickness. Two regimes have been observed [Huerre et al., PRL accepted 2015]: at low capillary number the film is so thin that intermolecular forces come into play setting the film thickness at a constant value whatever the capillary number, at higher capillary number a scaling law is observed following Hodges et al. model [Hodges et al. JFM 2004]. As the properties of the lubrication film impacts the dissipation mechanisms, we expect that the level of confinement also plays a crucial role in setting the droplet velocity. We have performed rational experiments (investigating viscosity ratio, droplet confinement). We show that two regimes of droplet velocity as a function of capillary number are also observed and, in the capillary regime the droplets go faster than the one estimated from models. We propose a refined model taking into account a modified droplet dissipation that should be useful for the community.

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