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Droplet migration toward and away from wall in micro-flow YENG-LONG CHEN, SHIH-HAO WANG, WEI-TING YEH, Academia Sinica — The hydrodynamically-induced particle migration phenomenon in microfluidic flow has been applied for cell isolation and particle separation. First-order analysis has been able to predict the migration velocity due to particle surface inertial stress and particle deformation, for small Reynolds Re and Capillary (Ca) numbers [1]. However, at moderate flow rates, non-linear dependences of particle migration on flow rate are found [2]. We employed lattice Boltzmann-immersed boundary method to examine the dependence of droplet migration on Re, Ca, and the droplet inner/outer viscosity ratio λ. We found that whether a droplet migrates towards or away from the wall at steady state depends strongly on λ. At high flow rates, droplets with lower inner viscosity migrate towards the center. At low flow rates, there is an optimal λ at which the droplet steady state position is closest to the channel center. This result agrees with prior experimental observations for oil in water droplets [3]. The consequences for particle separation will be discussed.

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[2] Y.-L. Chen, RSC Advances, 2014, 4, 17908
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