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Static and Dynamic Contact Angles of Immersed Ferrofluid Droplets SOUVICK CHATTERJEE, Virginia Tech, DIPANWITA BHOWMIK, Jadavpur University, ACHINTYA MUKHOPADHYAY, IIT Madras, RANJAN GANGULY, University of Illinois Chicago — Ferrofluid plug driven micro-pumps are useful for manipulating micro-volume of liquids by providing remote actuation using a localized magnetic field gradient. Inside a microchannel, the ferrofluid experiences combined actions of different relevant body forces. While the pressure, viscous and magnetic forces can be estimated using established techniques, the surface tension force requires information about the contact angle between the ferrofluid and glass capillary wall. We address this phenomenon through experimental characterization of static and dynamic contact angles of oil based ferrofluid (EFH3) droplets on glass surface immersed in pure or surfacted distilled water. The equilibrium static contact angle is found to significantly reduce in presence of a magnetic field. Dynamic contact angles are measured through high-speed imaging as the ferrofluid droplets slide along an inclined glass surface. Variation of contact angle hysteresis, which falls outside the Hoffmann Tanner equation for this case, is also investigated as a function of contact line velocity. A strong dependence is found between the contact angle hysteresis and the wetting time. Findings of the work is useful for designing ferrofluid plug-driven microfluidic plugs for different lab-on-a-chip applications.

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