Flow imaging of colloidal suspensions in PDMS-based microfluidic chip using fluorescence detection technique

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Conventional microfluidic-based lab-on-a-chip is usually fabricated with hydrophilic glass substrate and hydrophobic poly(dimethyl siloxane) (PDMS). This inhomogeneous surface condition changes the flow rate at either applied pressure or electric field. For the exposure time in taking a photograph, a moving fluorescent polystyrene latex colloid results in a track at image. Applying the relevant principle, we measure the linear velocity of particles at the positions of the channel with digital images. We prepared the lab-on-a-chip, in which a one-dimensional flow was developed. This one-dimensional channel has 100 μm length, and the diameter of fluorescent polystyrene latex sphere is 2 μm. To obtain the distance of the sufficiently dilute fluorescent polystyrene latex colloids in one-dimensional flows, we used the ratio of the real distance to the number of pixels. We obtain the particle velocity profiles with various conditions such as solution pH and electrolyte concentration in microfluidic chip underlying inhomogeneous surface condition.