

Flow visualization of dilute colloidal suspension in PDMS microfluidic chip applying particle streak method

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A slit-like flow channel was designed to allow for fluorescent microscope visualization in the microfluidic chip fabricated with glass substrate and polydimethylsiloxane (PDMS). For the exposure time, moving fluorescent polystyrene latexes of one micrometer radius result in image streaks, where the latex concentration is sufficiently dilute underlying the condition of simple fluid. Applying the data processing method for particle streak imaging developed ourselves, the linear velocity of particle at the lateral position of the channel was determined in terms of a ratio of the real distance to the number of pixels. It is obvious that the velocity profile of suspension depends on the surface properties of the microchannel wall. The reliability of the velocity profile determined by the flow imaging is justified by comparing with the measured volumetric flow rate. We recognized the behavior of fluid slip in velocity profiles at the hydrophobic surface of PDMS wall. The slip length inferred from the experimental results was evaluated ranging 6 to 8 μ m.