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Estimating the Slip Length using Single Quantum Dot (QD) Velocimetry[1] SHAHRAM POUYA, MANOOCHEHR KOOCHESFAHANI, CHEE LUM, Michigan State University, PRESTON SNEE, MOUNGI BAWENDI, DANIEL NOCERA, Massachusetts Institute of Technology — The motion of Quantum Dot (QD) nanoparticles is tracked within a few hundred nanometers of a surface using evanescent wave illumination. Water soluble quantum dots with a core diameter size of 6 nm and effective hydrodynamic diameter of 16 nm are used in this study. The local fluid velocity is inferred from tracking the QDs in a pressure-driven flow of an aqueous solution inside a 200 micron microchannel. An estimate of slip between the liquid and solid surface is obtained once the measured velocity is assigned to a 'mean location' based on the QD distribution that is deduced from their intensity values. Several issues, including the high diffusivity of QDs and the non-uniform distribution of the dots near to the wall, affect the interpretation of the measurements and hence the slip estimates. The effects of these parameters are discussed and methods to correctly interpret the measurements are presented. The measured velocities and QD distributions along with slip estimates are presented for a flow in a quartz microchannel with a naturally hydrophilic surface.

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Chee Lum
Michigan State University

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