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The electrokinetics of near-wall colloidal particles measured by evanescent-wave particle velocimetry[1] YUTAKA KAZOE, University of Tokyo, MINAMI YODA, Georgia Institute of Technology — Understanding the near-wall dynamics of suspended colloidal particles subject to electric fields is of interest in microfluidics. Most previous colloid science studies using total internal reflection microscopy to study these dynamics have considered a single particle in a quiescent fluid. We instead analyze the dynamics of an ensemble of fluorescent particles illuminated by evanescent waves using multilayer nano-particle tracking velocimetry (MnPTV). The technique exploits the decay of the evanescent-wave intensity with wall-normal distance z to extract near-wall particle z-distributions and flow velocities at different distances from the wall. Here electrokinetically driven flows through $\sim$40 μm deep fused-silica channels are studied using MnPTV. The results for tracers of radii $a = 100$ nm to 500 nm show that the particle distributions near the wall are highly nonuniform due to electrostatic and van der Waals effects, and that the distributions vary with both the applied electric field E and a due to forces that scale as $E^2$and a^2. Despite this variation in the near-wall particle distributions, the MnPTV results give Brownian diffusion coefficients that agree with theoretical predictions and the uniform velocity profiles typical of electroosmotic flow.

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Minami Yoda
Georgia Institute of Technology

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