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Forces on near-wall dielectric microparticles in combined electroosmotic and Poiseuille flow through microchannels[1] MINAMI YODA, NECMETTIN CEVHERI, Georgia Institute of Technology — Recent studies of electroosmotic (EO) flows have shown that neutrally buoyant radii $a = O(0.1\text{-}1$ μm) particles experience a "dielectrophoretic-like" repulsive force whose magnitude scales as a^2 [*Phys. Fluids* **18**:031702; *Langmuir* **27**:11481]. Tracers with different sizes could then have different velocities in the same nonuniform flow. Evanescent-wave particle velocimetry was therefore used to study $a = 125$ nm and 245 nm fluorescent polystyrene (PS) tracers in combined EO and Poiseuille flow, which is effectively the superposition of simple shear and uniform flows within 1 μm of the wall. For "coflow," where the EO and Poiseuille flows are in the same direction, the larger particles are strongly repelled from the wall; surprisingly, estimates of the magnitude of the repulsive force exceed the sum of the dielectrophoretic-like force and the shear induced electrokinetic lift force [*J Colloid Interf Sci* **175**:411]. For "counterflow," where the EO and Poiseuille flows are in opposite directions, these particles are instead *attracted* to the wall. These unexpected results suggest that the nonlinear interaction between the electric field and shear could be used to manipulate near-wall microparticles.

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