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Electrokinetically driven reversible self-assembly of colloidal particle bands near the wall[1] NECMETTIN CEVHERI, MINAMI YODA, Georgia Institute of Technology — Recent studies in microchannels have shown that the near-wall dynamics of neutrally buoyant dielectric colloidal (radii $a < 1$ μm) suspended particles are affected by an electric field of magnitude E applied parallel to the wall. Evanescent-wave particle velocimetry was used to study $a = 245$ nm fluorescent polystyrene particles suspended at volume fractions of $O(10^{-4})$ in combined electroosmotic (EO) and Poiseuille flow of an aqueous electrolyte solution, which is effectively the superposition of simple shear and uniform flows within 0.5 μm of the wall. In "counterflow," where the EO opposes the shear flow through fused-silica microchannels, at a large enough value of E so that flow reversal occurs in the near-wall region, the particles self-assemble into concentrated bright "stripes" along the streamwise direction alternating with dark stripes containing almost no particles with a consistent cross-stream spatial frequency. These stripes are only observed within ~ 1 μm of the wall, and disappear in the absence of an electric field. These observations suggest the existence of a novel electrokinetic instability, and could lead to new methods for controlled self-assembly of particles into anisotropic colloidal crystals.

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