Electrokinetically driven reversible self-assembly of colloidal particle bands near the wall\textsuperscript{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 \( a < 1 \, \mu m \)) 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 \( \mu m \) 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 \( \sim 1 \, \mu m \) 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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Minami Yoda
Georgia Institute of Technology

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