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Colloidal particle migration within microchannels in combined Poiseuille and electrokinetic flows SHAURYA PRAKASH, VARUN LOCHAB, The Ohio State University — Recent discoveries show that dilute colloidal particle suspensions with diameters $<1\mu m$ are assembled to distinct colloidal bands within microchannels (100 – $300\mu m$ wide x $34\mu m$ deep x 4cm long). Band formation requires opposing Poiseuille and electrokinetic flows. Band formation also requires a minimum applied potential threshold at a given shear rate. Band formation is a function of particle size and volume fraction, particle and channel wall zeta potential, electrolyte concentration, and the minimum electric field thresholds change non-monotonically for particle mixtures. Here, we discuss the broad parameter ranges to elucidate robustness of particle migration to and away from walls, formation of particle bands, and influence of fluid properties on particle migration and band formation. Interestingly, in co-flow with Poiseuille and electrokinetic flows, particles migrate away from the microchannel walls with aggregation near the bulk of the microchannel. Colloidal particle migration away from or towards the microchannel walls is likely due to the particle slip velocity with respect to the fluid. The particle migration is attributed to an electrophoretic lift-like force, analogous to the inertial lift forces in sedimentation flows.

Shaurya Prakash
The Ohio State University

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