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Quantifying colloidal particle bands and their formation in combined electroosmotic and Poiseuille flow[1] ANDREW YEE, NECMETTIN CEVHERI, MINAMI YODA, Georgia Institute of Technology — Recently, we have shown that suspended radii $a = 245$ nm particles flowing through a microchannel driven by the combination of a dc electric field and pressure gradient (where the resulting electroosmotic and shear flows are in opposite directions) are attracted to the wall at low electric field magnitude $|E|$, then assemble into concentrated bands that only exist within a few μm of the wall above a threshold value of $|E|$, $|E_{\rm cr}|$. The ~ 6 μm wide bands are aligned with the flow direction and are roughly periodic along the cross-stream direction. This talk focuses on quantitative characterization of these bands, for example how $|E_{\rm cr}|$, the time required for bands to form after applying the electric field $T_{\rm o}$, and the number of bands depend upon parameters such as particle volume fraction φ, shear rate $\dot{\gamma}$, $|E|$, and a. The dynamics of the particles within the bands are visualized by imaging a mixture of particles with different fluorescent labels. The visualizations show that the particles are in a liquid state within these bands, and suggest that the particles nearest the wall move in the direction of the electroosmotic flow, while those farther from the wall move in the direction of the shear flow.

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