Graduate Student Research Seminar

Fall 2021

Fluid rheological effects on streaming dielectrophoresis in a post-array microchannel

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3:00 pm (EST) – 132 Fluor Daniel Building

Abstract

Insulator-based dielectrophoresis (iDEP) has been mainly demonstrated for particle and cell manipulation in Newtonian fluids. Recent studies show that fluid rheology can have strong effects on iDEP and electroosmotic flow in single-constriction microchannels. However, it is yet to be understood about how iDEP in non-Newtonian fluids depends on the geometry of insulating structures. We report an experimental study of the fluid rheological effects on streaming DEP in a post-array microchannel that presents multiple contractions and expansions. The iDEP focusing and trapping effects in the viscoelastic polyethylene oxide solution are comparable to those in the Newtonian buffer, which is consistent with the observations in the single-constriction microchannel. Similarly, the insignificant iDEP effects in the shear thinning xanthan gum solution also agree with those in the single-constriction channel except that gel-like structures are observed to only form in the post-array microchannel under large DC electric fields. In contrast, the iDEP effects in the viscoelastic and shear thinning polyacrylamide solution are significantly weaker than in the single-constriction channel. Moreover, instabilities occur in the electroosmotic flow and appear to be only dependent on the DC electric field. These phenomena may be associated with the dynamics of polymers as they are advected around the posts.

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