Isomotive Dielectrophoresis for Particle Analysis

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Abstract

Differentiation of cells/particles is important in the medical field for determining what cells have been affected by infection or disease through the extraction of cells' dielectric properties. These dielectric properties correlate directly to the cell physiology which can change due to an intruder in the body. While most dielectrophoresis (DEP) devices have been utilized for the purpose of filtering, sorting and trapping these particles, isomotive dielectrophoresis (isoDEP) promotes the analytical potential of DEP. IsoDEP is the same concept as DEP, but uses a specific geometry which allows for subpopulation analysis of particles. The overarching goal is to create a commercial device that can be used for cell analysis that is significantly cheaper, but maintains a relatively high throughput in comparison to other techniques available; however, our current intention is to fabricate prototypes to test and validate the isoDEP analytical capabilties through a comparison to existing commercial analytical DEP systems (3DEP DEPtech Inc.). For this project, fabrication has taken place in a cleanroom and involved sputtering gold onto a glass wafer substrate. Electrode formations were firstly patterned through photolithography and gold etching. SU8 negative photoresist was then spun and patterned to form the microchannel. The experiment involves placing the particles of interest inside the device's well and running an AC current through the two electrodes on the device. This frequency causes translation of the particles under a uniform force applied due to the device's geometry. Particles velocities are then tracked and mapped to extract Clausius-Mossotti factor. The testing is ongoing, but we are hoping to see a strong relation between our results and those obtained from commercial devices.

Bio on the next page…

Biography of Presenter: Lincoln Curry is an undergraduate student at Western Kentucky University studying mechanical engineering. He is involved in the Honors College and acts as an ambassador for the university as well as being involved in several organizations on campus. Lincoln has worked as an RA for the Governor's Scholars Program at NKU in 2017 and has been awarded the title of Kentucky Colonel.