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Continuous size-based dielectrophoretic particle sorting in a microfluidic device BARUKYAH SHAPARENKO, HAN-SHENG CHUANG, HOWARD HU, HAIM BAU, University of Pennsylvania — The dielectrophoresis (DEP) force acting on a particle passing through a nonuniform electric field is proportional to its volume, making DEP well-suited for size-based particle sorting. Pinched flow fractionation uses the geometry constraints of a narrow segment of microchannel to effect size-based separation. We combine these two techniques in series to create a size-based microfluidic sorting device, using negative DEP to allow for continuous particle sorting. An interdigitated array of five L-shaped electrodes permits the sorting of up to five different particle sizes. For a given set of particle sizes ($\sim$ 1–10 μm), this sorting process can be optimized by using the applied potentials on the electrodes as our optimization parameters. Through on-chip voltage control of the electrodes, we can achieve sorting for various sets of particle sizes with the same microfluidic device geometry. We compare the computational optimization solution to an analytical solution and with experimental results.

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