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Manipulation of nanoparticles using dielectrophoresis and fluid flow. SOPHIE LOIRE, IGOR MEZIC, University of California, Santa Barbara — We present numerical simulations on dielectrophoretic (DEP) separation and trapping performed in a titanium-based microchannel linear electrode array. The use of electric field and in particular dielectrophoresis (DEP) have a great potential to help miniaturize and increase the speed of biomedical analysis. Precise control and manipulation of micro/nano/bio particles inside those miniaturized devices depend greatly on our understanding of the phenomena induced by AC electric field inside microchannels and how we take advantage of them. The device is designed to generate inhomogeneities in electric- field magnitude. This allows positive and negative DEP (p-DEP and n-DEP). Moreover, it can also produce inhomogeneities in electric-field phase, hence authorizing traveling wave DEP (twDEP). We show that fluid flow effects are substantial and can affect the particle motion in a positive (enhanced trapping) and negative (trapping when separation is desired) way. An advection-diffusion equation is used to numerically simulate the system. The study of the combination of the three electrical effects with diffusion, predicts the location of the trapping regions. We finally investigate the limits of particle size that can be accurately controlled.

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