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Stable Rotation of Microparticles using a Combination of Dielectrophoresis and Electroosmosis[1] PRASHANTA DUTTA, WALID REZANOOR, Washington State University — Electric field induced microparticle rotation has become a powerful technique to evaluate cell membrane dielectric properties and cell morphology. In this study, stable rotations of microparticles are demonstrated in a stationary AC electric field created from a set of coplanar interdigitated microelectrodes. The medium, particle size, and material are carefully chosen so that particle can be controlled by dielectrophoretic force, while a sufficiently high AC electroosmotic flow is produced for continuous particle rotation. Stable rotation up to 218 rpm is observed at 30 V_{p-p} applied sinusoidal potential in the frequency range of 80 – 1000 Hz. The particle spin rate observed from the experimental study is then validated with a numerical model. The model is formulated around complex charge conservation equation to determine the electric potential distribution in the domain. Stokes equation is employed to solve for AC electroosmotic fluid flow in the domain. Complexity arising from nonlinear potential drop across the electric double layer due to the application of a very large electric potential is also addressed by introducing modified capacitance equation which considers steric effect.

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