Abstract Submitted
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Shear-Induced Rotation of Axisymmetric Particles in Poiseuille Flow in the Electric Field[1] MARIJA NIKOLIC-JARIC, DOUGLAS J. THOMSON, GREG E. BRIDGES, GRAHAM A. FERRIER, University of Manitoba, Dept. of Electrical Engineering — Rotation of axisymmetric ellipsoidal particles in a slow viscous flow with uniform shear is described by Jeffery orbits; spherical models for biological particles and cells ignore this effect. We investigate fundamental aspects of Jeffery rotation and its effects on the change of impedance associated with a particle passing over a pair of coplanar electrodes in a microfluidic channel. Periodically changing orientation of a rotating non-spherical particle as it passes the electrodes results in impedance anisotropy and a varying signal amplitude. This periodic variation places limits on the uncertainty in flow impedance detection of axisymmetric model particles and biological cells. Conversely, calculations of Jeffery orbits predict that the period of these variations will yield estimates of the ellipticity of a single cell, an outcome that can be exploited in studies of composition, cycles and kinetics of a wide variety of biological cells in a short period of time. This work will lead to the ability to better discriminate between the particles exclusively on the basis of the electrical signal, vital to highly integrated lab-on-chip applications.

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Marija Nikolic-Jaric
University of Manitoba, Dept. of Electrical Engineering

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