Microfluidic Transport in Serpentine Channels with Newtonian Slip Boundary Condition

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Understanding the physics of micro/nanofluids is significant for the optimum design of devices. Hydrophobic materials have become attractive for use in MEMS fabrications, and the channel surface usually has inhomogeneous properties. This poster presents a full analysis of electrokinetic flows with boundary slip at channel surfaces. We developed the explicit model, where the externally applied body force originated from between the nonlinear Poisson-Boltzmann field and the flow-induced electric field was employed in the Navier-Stokes associated with the Nernst-Plank equation. We have obtained numerical results of the slip flow in highly charged rectangular serpentine channels that constitutes another source of the Taylor dispersion. Many studies have contributed to the slip behavior, in which Newtonian fluid slip occurs in hydrophobic surfaces. The fluid slip induces a higher flow velocity, while the presence of electric double layer retards the flow rate. If the slip is absent, higher apparent viscosity and friction factor would be predicted. Velocity profiles are computed with variations of curvature and electric surface potential.