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Transport of Analytes under Mixed Electroosmotic and Pressure Driven Flow of Power Law Fluid

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Abstract : In this study, we have analyzed the transport of analytes under a two dimensional steady incompressible flow of power-law fluids through rectangular nanochannel. A mathematical model based on the Cauchy momentum-Nernst-Planck-Poisson equations is considered to study the combined effect of mixed electroosmotic (EO) and pressure driven (PD) flow. The coupled governing equations are solved numerically by finite volume method. We have studied extensively the effect of key parameters, e.g., flow behavior index, concentration of the electrolyte, surface potential, imposed pressure gradient and imposed electric field strength on the net average flow across the channel. In addition to study the effect of mixed EOF and PD on the analyte distribution across the channel, we consider a nonlinear model based on general convective-diffusion-electromigration equation. We have also presented the retention factor for various values of electrolyte concentration and flow behavior index.

Keywords : electric double layer, finite volume method, flow behavior index, mixed electroosmotic/pressure driven flow, non-Newtonian power-law fluids, numerical simulation
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