

On Mixing in Micro- and Nanochannel Systems

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Electroosmotic flow in micro/nanochannels with heterogeneous surface potential or surface charge density is investigated. The mixture of interest is an aqueous solution of monovalent electrolytes. While a number of authors have investigated periodic arrays having heterogeneous potential, there has been no systematic study on the effect of a single region of variable wall potential. In this work the distributions of potential, velocity and mole fractions are calculated numerically; this distribution of potential leads to reversed flow and the structure resembles that of the classical Lamb vortex. The effect of the convective terms is investigated and the mixing properties of both micro and nano sized devices are discussed. In particular, it is shown that efficient mixing in nanochannel geometries is much easier than in the bigger microchannels. Numerical results for the mixing index are compared with experimental data and the results are very good.