

Abstract Submitted
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Effect of divalent ions on electroosmotic flow¹ SUBHRA DATTA, A.T. CONLISK, Ohio State University, HAIFENG LI, MINAMI YODA, Georgia Institute of Technology — The electroosmotic flow (EOF) rate in fused silica microchannels is found to decrease when trace quantities of salts containing the divalent cations Ca^{2+} and Mg^{2+} are added to a background electrolytic solution (BGE) containing a salt of monovalent ions. Moreover, the observed effect is quantitatively different for the two ions Ca^{2+} and Mg^{2+} . Since electrostatic interactions should be identical for ions of the same valence modeled as point charges, a description of the electric double layer (EDL) based on the Poisson-Boltzmann equation alone cannot account for these experimental observations. Experiments to measure EOF in the presence of Ca^{2+} and Mg^{2+} in the BGE were carried out using nano-particle image velocimetry (nPIV). A model for the charge development at the silica-BGE interface (site binding model) that accounts for the chemical interactions of the BGE ions with the silica surface is developed. The model predictions are in good agreement with the experimental observations on the effect of divalent cations as well as data from the literature on how properties such as pH and ionic strength affect electroosmotic flow rates in a BGE containing only monovalent ions.

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