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Effect of divalent ions on electroosmotic transport in a sodium chloride aqueous solution confined in an amorphous silica nanochannel¹ A.T. CONLISK, HARVEY ZAMBRANO, The Ohio State University, NECMET-TIN CEVHERI, MINAMI YODA, Georgia Institute of Technology, COMPUTA-TIONAL MICRO- AND NANOFLUIDICS LAB TEAM, THE FLUIDS, OPTICAL AND INTERFACIAL DIAGNOSTICS LAB TEAM — A critical enabling technology for the next generation of nanoscale devices, such as nanoscale "lab on a chip" systems, is controlling electroosmotic flow (EOF) in nanochannels. In this work, we control EOF in an aqueous sodium chloride (NaCl) solution confined in a silica nanochannel by systematically adding different amounts of divalent ions. Multivalent ions have a different affinity for the silica surface and different hydration characteristics in comparison to monovalent ions. Therefore by adding Mg⁺⁺ and Ca⁺⁺ to the sodium chloride solution, the electroosmotic velocity and the structure of the electrical double layer will be modified. The effects of adding Mg⁺⁺ and Ca⁺⁺ will be compared using non-equilibrium molecular dynamics simulations of the EOF at different electric fields of a NaCl solution in a silica nanochannel with different fractions of Ca⁺⁺ and Mg⁺⁺ ions. In general, the wall zeta-potential magnitude, and hence the EOF velocity, decreases as the Ca^{++} or Mg^{++} concentration increases. The system responds linearly with electric field. We will compare the computational results with the experimental data of Cevheri and Yoda (2012).

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