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Determination and characterization by numerical simulations of flow mixing due to electrokinetic instabilities in cross-shaped microchannels.[1] ESTEBAN GUERRERO, DAMING CHEN, Pontificia Universidad Catolica de Chile, LOGAN HAGEMAN, University of Texas, Austin, AMADOR GUZMAN, Pontificia Universidad Catolica de Chile — This article describes a computational study of flow mixing in microchannels due to electrokinetic instabilities that are compared to experimental results obtained in a cross- microchannel with an ionic solution of potassium chloride with two different ionic concentrations, with the purpose of determining the parameter combinations to produce the onset of flow mixing and its characteristics. For the numerical simulation process carried out using a finite element method-based commercial code, we applied a typical zeta potential used in other articles as a boundary condition for the microchannel walls. For the experiments, we used a commercial silicon glass (Caliper NS95) microchannel. For determining a flow mixing regime, we use the concept of "mixing index" established by (Fu et al., 2005) for an electrical conductivity ratio range of 18 to 52 with an electric field range of 1100 to 1900 V/cm. From our numerical simulation results we have found a threshold for the electrical Rayleigh number for starting a flow mixing regime, and a minimum microchannel characteristic length for achieving a 90% of flow mixing that will allow us to significantly reduce the mixing time.

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