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Effect of the electric field ratio on electroosmotic flow patterns in cross-shaped microchannels by the lattice-Boltzmann Method ALVARO SOCIAS, DIEGO OYARZUN, Universidad de Santiago de Chile, AMADOR GUZMAN, Pontificia Universidad Catolica de Chile — The electroosmotic flow (EOF) pattern characteristics in cross-shaped microchannels flow are important features when either suppressing or enhancing flow features for injection and separation or mixing of multiple species are the wanted objectives. There are situations in EOF in cross-shaped microchannels where the fluid flows toward unexpected and unwanted directions under a given external electric field that depends of both the applied electric field and lengths of the different channels. This article describes the effect of the electric field ratio, defined as the ratio between longitudinal nominal electric field E_{Long} =(V_E-V_W)/(L_W+L_E) and the nominal electric field E_a =(V_S-V_E)/(V_S+V_E), where E, S and W define the east, south and west directions of the cross-shaped microchannel; V is the externally applied voltage and L is the length, on the EOF characteristics in a cross-shaped microchannel. We use the lattice-Boltzmann method (LBM) for solving the discretized Boltzmann Transport Equation (BTE) describing the coupled processes of hydrodynamics and electrodynamic. Our numerical simulations allow us to determine the EOF pattern for a wide range of the electric field ratio and E_a such that inverted flow features are captured and described, which are very important to determine for flow separation or mixing.

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