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Electrokinetic flow characteristics of two fluids with different electrical conductivities in cross-shaped microchannels by the lattice-Boltzmann Method AMADOR GUZMAN, Pontificia Universidad Catolica de Chile, ALVARO SOCIAS, DIEGO OYARZUN, Universidad de Santiago de Chile — Electrokinetic inestabilities (EKI) in microchannels flow are important to determine and characterize when either suppressing or enhancing flow features for injection and separation or mixing of multiple species are desired features. Convective and absolute electrokinetic instabilities (EKI) can be triggered or suppressed by active means such as externally applied AC or DC on the channel inlet, outlet and walls, and passively by building geometrical patterns on the wall channels such as grooves or waves. EKI are caused when a strong conductivity gradient between two fluids with different conductivities under an externally applied electric field becomes unstable. We model and simulate electrokinetic flow in a cross-shaped microchannel of two fluids with different electrical conductivity under an applied electrical field among the microchannel wells. We use the lattice-Boltzmann method (LBM) for solving the discretized Boltzmann Transport Equations (BTE) describing the coupled processes of hydrodynamics, electrodynamic and concentration of species of three fluids having different electrical conductivities under an external voltage in a cross-shaped microchannel with grooves in the outlet channel. Our numerical simulations predict well the conductivity gradient across the interface among the fluids and the unstable behavior of this interface when the local Rayleigh electrical number achieved, setting up EKIs.

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