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High Order WENO Simulation of Electrokinetic Instability in a Cross-Shaped Microchannel QIAN LI, YANN DELORME, STEVEN FRANKEL, Purdue University — Electroosmotic flow with electrokinetic effects is the primary method of fluid handling in micro-total analysis systems. Knowledge of electrokinetic instabilities (EKI) is required to trigger instabilities in applications like low Reynolds number micromixing or to suppress them in applications such as sample injection, separation and controlled diffusion-limited reaction processes where the minimum sample dispersion is needed. A novel multiblock high order in-house solver based on WENO scheme is applied to simulate the EKI for multiple electrolyte solutions with different electric conductivities in a cross-shaped microchannel. 3D simulations are performed to explore the effects of variations of applied electric field, electric field ratio, and conductivity ratios on the EKI phenomena, and to determine the critical value of electric field required for instabilities. The validity of the numerical study is assessed by comparing the numerical results with the experimental data.

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