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**A high fidelity electrokinetic flow model for the prediction of electrophoregrams in on-chip electrophoresis applications** HAO LIN[1], RAJIV BHARADWAJ[2], JUAN G. STANTIAGO, Stanford University, BIJAN MOHAMMADI, University of Montpellier II, France — On-chip electrophoresis is a growing field with increasing chemical and bioanalytical applications such as genomics and proteomics. The use of multicomponent and heterogeneous electrolyte configurations can often lead to complex flow behavior. In this work, we present a high-fidelity, low computational cost electrokinetic flow model for the modeling and optimization of electrophoresis separations. The model adopts a depth-averaged approach that captures convective-dispersion processes, and includes important physical effects such as electrical body force and fully nonlinear multi-species electromigration. The corresponding numerical scheme is based on a finite volume approach using a monotonic upstream-centered construction (MUSCL). The numerical model can simulate arbitrary electrolyte and sample configurations, and capture the complex evolution of sharp, narrow sample peaks and high pre-concentration (stacking) ratios. Exemplary results showing both field amplified sample stacking and isotachophoresis processes are presented. The development of such models is critical to the efficient design and optimization of on-chip CE methods and devices.

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