NUMERICS OF CHARGED TRANSPORT IN POROUS MEDIA AT PORE AND FIELD SCALE

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We consider charged transport within a porous medium which, at the pore scale, can be described by the non-stationary Stokes-Nernst-Planck-Poisson (SNPP) system and perform its homogenization. The resulting homogenized system consists of averaged macroscopic equations with effective coefficients. Auxiliary cell problems need to be solved in order to provide closedform expressions for these parameters.
The theoretical results are complemented by numerical simulations which are the focus of the talk. We present simulations of the fully coupled SNPP system using a fixed point approach. Thereby we pay special attention to the specific nonlinear couplings of the underlying system of partial dierential equations which result in particular from the electrostatic interaction.
Furthermore, we study the convergence of the pore scale model to homogenized ones for vanishing microstructure numerically. All computations are realized in Matlab applying a discretization in two space dimensions with mixed finite elements.
Moreover, our results are used to simulate colloid enhanced contaminant transport.