ELECTROREMEDIATION MODEL: IMPACT OF GEOCHEMISTRY AND PORE SIZE DISTRIBUTION

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Electroremediation is an innovative in situ approach to remove contaminants from fine grained sediments soils. In this method electrodes are inserted into the ground and electric field is applied. The field causes a movement of charged species by electromigration and of the bulk solution by electroosmosis. Especially in natural soils the influence of geochemistry and pore size distribution are very important for electrokinetic processes. The numerical model presented here describes the coupled transport of charge and mass as well as the chemical speciation of a multicomponent system subject to an applied electric field. The major transport mechanism electroosmosis and electromigration, as well as pressure-driven convection and diffusion, are included. The model can also describe chemical reactions occurring in the bulk liquid, interactions in the soil such as heterogeneous reactions, sorption processes and electrochemical reactions occurring at the electrodes. To enable prediction of varying electroosmotic flow, the dependencies of the soil pore size distribution are determined by porosimeter measurements. Finally numerical simulations are compared to laboratory experiments of electroremediation in different soils. It is found that a geochemistry model must be included to describe the process of electroremediation accurately. Furthermore it can be shown that very small pores as well as very big pores limit electroosmotic flow.