Numerical Modelling Of The Membrane Polarization Effect For Realistic Shapes Of The Pore Space

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Abstract

The Spectral Induced Polarization (SIP) is a promising electrical method, which can be used to predict the saturated hydraulic conductivity of consolidated and unconsolidated porous media. It is important to investigate how the SIP response is affected by the shape and distribution of the pore sizes.
In this work the simulation software COMSOL Multiphysics® has been used to numerically model the membrane polarization effect for realistic shapes of the pore space consisted of pores with different sizes and dispersions. The pore size distribution and the specific surface area of the porous medium correspond to an empirical distribution of a specific sandstone rock sample, measured by mercury porosimetry. The governing equations are defined using the Partial Differential Equations (PDEs) interface and solved in frequency domain. The calculated SIP parameters, such as the phase maximum and the relaxation time of the simulated SIP spectra are compared to those of the laboratory measurements.

Figures used in the abstract

Figure 1