Effect of chemical kinetics on permeability of a porous rock:Scaling by concentration of active fluid

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Abstract

Pores and fractures in rocks are continuously being reshaped through different chemical and physical processes. Fluids filling the pore space and carrying different chemical species are responsible for these changes. In the present work we study the effect of chemical kinetics on the reshaping of pore structure and thereby on permeability. A simulation study is carried on a 2-dimensional random porous structure. The particles permeate with a constant Peclet number and their diffusion is represented through a random walk. Changing the probability of interaction varies the strength of the chemical reaction between the fluid and the rock. This study is done for different concentrations of the active material in the fluid. A scaling law is found to exist between the changes in permeability with reaction rate.