ANISOTROPIC DIFFUSION IN ALKALI FELDSPAR: RECONSTRUCTION OF THE COMPOSITION-DEPENDENT DIFFUSION COEFFICIENTS

Petrishcheva, E., Abart, R. & Schaeffer, A.-K.

University of Vienna, Department of Lithospheric Research, Althanstrasse 14, A-1090, Vienna, Austria
e-mail: elena.petrishcheva@univie.ac.at

Reconstruction of intrinsic system parameters such as particle mobilities or diffusivities from experimentally observable data is a complicated and practically-relevant inverse mathematical problem. An important example is given by nonlinear diffusive transport in one spatial dimension where the diffusion coefficient is an unknown function of concentration. Here reconstruction of the diffusivity versus concentration is performed using a known semi-scale solution of the diffusion equation.

The above technique can be generalized for the case of the anisotropic nonlinear diffusion. To this end we prepared many plane-parallel samples with different orientations with respect to the crystal structure. The effective diffusivity along a specific direction is reconstructed from the measured concentration profile. The full diffusion tensor is derived from the set of effective diffusivities.

We use this approach to obtain the diffusivity tensor for Na-K interdiffusion in alkali feldspar and reveal its dependence on concentration. The results are tested by solving the nonlinear diffusion equation and comparing the numerical solutions with the experimentally observed concentration profiles.