

Poster Presentation

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Investigating the annealing dependency of Al/Si distribution in Eifel sanidine

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Sanidine is the monoclinic high-T modification of K-rich alkali feldspars. Annealing at $T > 900^\circ\text{C}$ usually causes disordering of Al/Si distribution at the two non-equivalent tetrahedral sites, but it is supposedly possible to disorder samples of sanidine from Volkesfeld/Eifel at notably lower temperatures and shorter times [1]. To investigate this behavior and compare various approaches to obtain the Al/Si distribution, samples from different Eifel locations and Madagascar have been studied. Al/Si order was determined by direct and indirect methods, including X-ray and neutron diffraction of powder and single crystal samples. Neutron powder diffraction experiments were executed at the Fine Resolution Neutron Powder Diffractometer E9, single crystal neutron diffraction at the 4-circle Diffractometer E5 and diffuse neutron scattering experiments at the Flat-Cone Diffractometer E2, all located at the Berlin Research Reactor BERII. The Al/Si distribution was determined directly, refining site occupancies by applying Rietveld analysis to powder diffraction data and XTAL for single crystal data. This approach is inapplicable when using X-ray data, due to similar atomic form factors of Al^{3+} and Si^{4+} , thus indirect methods [2,3,4] were applied. X-ray powder diffraction was performed at Helmholtz Centre Berlin, single crystal X-ray diffraction was done at Ruhr-University Bochum. The obtained data was processed using Rietveld refinement and ShelXL software, respectively. It was possible to verify a dependency of decreasing Al/Si order on increasing annealing times and temperatures. Interestingly we observed different results from direct and indirect methods, regardless whether samples were untreated or annealed. Applying the direct determination method, a stronger change of Al/Si distribution during annealing was revealed. Moreover, diffuse scattering of untreated and annealed samples was detected, which may arise from hydron incorporated in the crystal lattice.

[1] Zeipert&Wondratschek, *An unusual annealing behavior of Eifel Sanidine*, *N.Jb.Miner.Mh. H.9*, 407-415, 1981, [2] Kroll&Ribbe, *Lattice parameters, composition and Al,Si order in alkali feldspars*. *Miner.Soc.Am. Rev. in Miner.*, 2nd ed., 57-99, 1983, [3] Carpenter&Salje, *Thermodynamics of nonconvergent cation ordering in minerals. 3. order-parameter coupling in potassium-feldspar*, *Am.Miner. Vol.79*, 1084-98, 1994

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