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Characterization of Al-Si ordering state in an alkali feldspar using atom location by channeling-enhanced microanalysis (ALCHEMI)

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Abstract

Atom location by channeling-enhanced microanalysis (ALCHEMI) was used to determine the occupancy of Al atoms in the T_{1o} site (t_{1o}) of alkali feldspar. Building on the method demonstrated by previous research, analytical electron microscopy proves to be a viable technique for fully characterizing the Al-Si ordering state in the feldspar framework. We applied this method to orthoclase from Itrongay, Madagascar, and to its heated counterpart. Our preliminary results give 0.74 and 0.37 as $2t_1$ ($=t_{1o} + t_{1m}$) and t_{1o}, respectively, for the original orthoclase, vs. 0.54 and 0.28 for heated orthoclase. Single-crystal X-ray diffraction experiments have been performed, and the results agree with our ALCHEMI measurements. This new method promises to help resolve some complex issues relating ordering paths, for example, twinning in feldspars and domain intergrowth in plagioclase.

Keywords: Al-Si ordering, alkali feldspar, channeling effect, ALCHEMI