

XRD and HRTEM analyses of stacking structures in sudoite, di-trioctahedral chlorite

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ABSTRACT

The stacking structures of sudoite, di-trioctahedral chlorite from two different localities are investigated by powder X-ray diffraction (XRD) and high-resolution transmission electron microscopy (HRTEM). XRD analyses using a Gandolfi camera revealed that the structures of both specimens are similar, corresponding to a one-layer *Ibb-4* (*1A*) polytype. HRTEM observations indicate that the stacking sequence is characterized by a largely uniform intralayer shift of $a/3$ in the $-X_1$ direction (X_i represent the directions along the pseudohexagonal axes) and by an interlayer displacement of similar magnitude in either the $-X_2$ or $-X_3$ direction. Stacking disorder is primarily caused by the mixing of interlayer displacements in the two directions. This disorder is more common in the lath-shaped crystalline specimen from Berezovsk, Russia than in the fine platy crystalline specimen from Otré, Belgium. DIFFaX simulations of the powder XRD patterns for this stacking model reproduced the observed features well for both specimens. The stacking configuration of these sudoite specimens is considered to be controlled by the corrugation of basal oxygen planes in the 2:1 layer and the corresponding deformation in the brucite-like interlayer sheet.

Keywords: Crystal structure, sudoite, transmission electron microscopy, polytypism