Francoanellit $K_3Al_5HPO_4)_6(PO_4)_2 \cdot 12H_2O$: Struktur und Synthese durch topochemische Entwässerung von Taranakit

Francoanellite $K_3Al_5(HPO_4)_6(PO_4)_2 \cdot 12H_2O$: Structure and Synthesis by Topochemical Dehydration of Taranakite

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Single crystals of synthetic francoanellite $K_3Al_5(HPO_4)_6(PO_4)_2 \cdot 12H_2O$ could be obtained for the first time by topochemical dehydration of taranakite crystals. An X-ray structure determination showed francoanellite to be the mineral with the second longest crystallographic axis described hitherto. Crystal data: space group R3c, a = 869.0(2), c = 8227(1)pm, Z = 6, R_g = 0.042. Francoanellite is a layer structure mineral having six layers of composition $[K_3Al_5(HPO_4)_6(PO_4)_2(H_2O)_{12}]$, connected by hydrogen bonds. The rigid layer is formed by columns of corner sharing hydrogen phosphate tetrahedra and AlO_6-octahedra which are interconnected by additional six-coordinated Al ions. In trigonal holes of the layer orthophosphate ions are situated. The structure of francoanellite is very similar to the structure of taranakite $K_3H_6Al_5(PO_4)_8 \cdot 18H_2O$ which has planar water interlayers between the Al-phosphate layers. A neutron scattering experiment with subsequent Rietveld refinement of the powder pattern gave the H-atom positions. Hydrogen bonds in francoanellite are formed within the rigid layers and between them.

During the reaction taranakite → francoanellite crystals in an intermediate stage of dehydration could be obtained. From the c-axis of 8858 pm and one-dimensional electron density projections it can be proposed that in these crystals every second water interlayer was lost and a first order staging product of the deintercalation of water from taranakite was formed.

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