

Dehydration dynamics of bikitaite: Part I. In situ synchrotron powder X-ray diffraction study

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ABSTRACT

The thermal dehydration process of the natural Li zeolite bikitaite has been studied in situ by synchrotron radiation powder diffraction. The temperature-resolved experiments were performed using a translating imaging plate system. Rietveld refinements were carried out on 42 powder patterns in the temperature range from room temperature to 800 °C. Bikitaite is stable at least up to 800 °C, the temperature at which the phase transition to γ -spodumene begins. The dehydration process begins at about 200 °C, affecting the two water sites in a similar way, and is complete at 468 °C. Such a process induces only very minor structural distortions in the framework, due to the anti-rotation of the internal T-O-T hinges. In this sense, bikitaite can be defined as a flexible but non-collapsible framework, and it is the zeolite that undergoes the lowest heating-induced distortion among those studied up to now. The high thermal and structural stability suggest that anhydrous bikitaite could be used as a solid porous matrix for embedding nanosized materials in its one-dimensional channels.