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Hydrothermal synthesis of ammonium illite

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Abstract

Synthetic gel and glass of illitic composition, natural kaolinite, and mixed-layer illite-smectite were used as starting materials for hydrothermal synthesis of ammonium illite. Ammonium illite was prepared from synthetic gel by hydrothermal treatment at 300 °C. The onset of crystallization began within 3 h, and well-crystallized ammonium illite appeared at 24 h. Increasing reaction time (up to four weeks) led to many illite layers per crystal. In the presence of equivalent proportions of potassium and ammonium, the gel was transformed to illite with equimolar contents of K and NH_4. In contrast, synthesis using glass under the same conditions resulted in a mixture of mixed-layer ammonium illite-smectite with large expandability and discrete illite. Hydrothermal treatments of the fine fractions of natural kaolinite and illite-smectite produced ammonium illite from kaolinite but the illite-smectite remained unchanged.