Synthesis of 3:2 Layered Silicic Acid from Synthetic Gyrolite and its Intercalation Substitution with Tetrabutylammonium Ion

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Abstract

This work investigated the reaction between synthetic gyrolite and tetrabutylammonium iodide in DMF at room temperature. The resulting 3:2 layered silicic acid was used to prepare anion-exchange material with organic cations. The structure and properties of the resulting materials were characterized by X-ray diffraction, thermogravimetric analysis, and elemental analysis. The results showed that the 3:2 layered silicic acid could be effectively functionalized with organic cations, leading to a variety of applications in anion-exchange materials.
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Abstract

This paper studies the reaction of synthetic gyrolite with appropriate amount of hydrochloric acid in N,N-Dimethylforamide (DMF) for the formation of layered silicic acid, and the substitutional intercalation reaction of the layered silicic acid with tetrabutylammonium hydroxide in DMF at room temperature. Based on the evidence observed, the acid leaching process was confined predominantly to the interlayer sheet of the synthetic gyrolite, resulting in the formation of 3:2 layered silicic acids with DMF filled in the interlayered space. The derivative with expanded interlayer spacing is facilitated for its interlayer intercalation with tetrabutylammonium ion, leading to the formation of 3:2 alkylammonium ion modified layered calcium silicate organic-inorganic hybrid composites, which are excellent potential fillers for the polymer-layered silicate composite materials.

Keywords: layered calcium silicate, layered silicic acid, intercalation, organic-inorganic hybrid composite