
Amorphous Aluminum Hydroxide Formed at the Earliest Weathering Stages of K-Feldspar

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Abstract: Weathering products formed on the surface of K-feldspar in Yakushima Island, Japan were investigated by X-ray powder diffraction (XRD), scanning electron microscopy (SEM), transmission electron microscopy (TEM), energy dispersive X-ray analysis (EDX) and X-ray photoelectron spectroscopy (XPS). XRD confirmed that the weathering products were composed mainly of gibbsite and halloysite. SEM, TEM and EDX clearly showed formation of amorphous aluminum hydroxide exhibiting 2 distinct habits: 1) curled fibrous or circular forms less than 0.02 μm in diameter; and 2) a spherical habit less than 1.0 μm in diameter. The fibrous aluminum hydroxide exhibited curled fibrous forms or circular forms less than 0.02 μm in diameter and gave a diffuse electron diffraction halo. EDX indicated that the material consisted mainly of Al and very small amounts of Si and Fe. The spherical aluminum hydroxide also gave similar EDX and electron diffraction characteristics to the fibrous material. These fibrous and spherical aluminum hydroxides must be formed as a metastable phase in the earliest weathering stages, and transformed into a stable phase of gibbsite and halloysite as the reaction proceeded.

Key Words: Aluminum hydroxide • Gibbsite • Halloysite • K-feldspar • Weathering product

Clays and Clay Minerals; October 1996 v. 44; no. 5; p. 672-676; DOI: [10.1346/CCMN.1996.0440510](https://doi.org/10.1346/CCMN.1996.0440510)

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