
Formation of Vermicular Kaolinite from Halloysite Aggregates in the Weathering of Plagioclase

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Abstract: Halloysite and kaolinite coexist in anorthosite weathering profiles in the Sancheong district, Korea. X-ray diffraction (XRD) analysis on a transect of partially weathered anorthosites reveals an increasing amount of kaolinite development with weathering age. Microtextures were examined by scanning electron microscopy (SEM) of thin sections and raw samples in an attempt to resolve the genetic relation between halloysite and kaolinite. In the earliest stage of weathering, halloysite ellipsoids and short tubes form on the plagioclase surfaces. The successive formation of new grains from the early grains results in globular aggregates where halloysite grains are partially interconnected. With the further progress of weathering, the halloysite grains coalesce from the inner part of the aggregate outward, and convert into stacked kaolinite plates. Continuous addition of halloysite grains on existing plates and their subsequent conversion into plates form long vermicular kaolinite. Solid-state transformation is suggested as a major conversion mechanism. Concurrently with its successive transformation into kaolinite, halloysite also continuously precipitates, giving rise to overgrowths on vermicular kaolinite. Halloysite forms as a kinetically favored metastable precursor and is subsequently transformed into thermodynamically stable kaolinite. Halloysite and kaolinite coexist temporarily in the weathering profile far from equilibrium.

Key Words: Halloysite • Kaolinite • Scanning Electron Microscopy • Weathering

Clays and Clay Minerals; June 1998 v. 46; no. 3; p. 270-279; DOI: [10.1346/CCMN.1998.0460306](https://doi.org/10.1346/CCMN.1998.0460306)

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