Boxwork Fabric of Halloysite-Rich Kaolin Formed by Weathering of Anorthosite in the Sancheong Area, Korea

Gi Young Jeong[1] and Soo Jin Kim[2]

[1] Department of Geology, Andong National University P.O. Box 203, Andong 760-600, Seoul, Korea
[2] Department of Geological Sciences, Seoul National University Seoul 151-742, Korea

Abstract: Boxwork fabric in which numerous thin or thick halloysite wails are interconnected into a microscopically porous cellular pattern is widely developed in the halloysite-rich kaolin formed by weathering of anorthosite in Sancheong, Korea. Studies using optical microscopy, scanning electron microscopy, and transmission electron microscopy have been carded out in order to elucidate the detailed features and origin of the boxwork.

In the early stage of weathering, halloysite spheres formed in etch pits on the walls of microstructural discontinuities in the slightly weathered rock. With further weathering, the halloysite spheres grew to discs or flattened globules, which in turn coalesced to form large planar halloysite plates amid narrow fissures. The halloysite plates were detached by dissolution of the plagioclase in groundwater. Continued growth of the halloysite tubes in the plates resulted in the wrinkling of the plates. Finally, the plagioclase was completely dissolved by groundwater, leaving the boxwork of wrinkled halloysite walls and large pores. The relatively high rigidity of the boxwork is due to the compact agglomeration of halloysite tubes within the wrinkled halloysite walls.

Cation balance calculation shows that Al was significantly mobilized during the formation of the boxwork in the weathering environment. The well-developed microfissures, the high dissolution rate of the calcic plagioclase, and the rapid flow of groundwater in a mountainous topography with relatively steep (20 °) slope have been the factors controlling the formation of the porous boxwork in the halloysiterich kaolin of the Sancheong area.

Key Words: Anorthosite • Boxwork fabric • Halloysite • Kaolin • Scanning electron microscopy • Transmission electron microscopy

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