
Supergene Vermiculitization of Phlogopite and Biotite in Ultramafic and Mafic Rocks, Central Korea

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Abstract: An X-ray diffraction study of vermiculitized micas in ultramafic and mafic intrusive rocks from Cheongyang, Korea, shows the following weathering sequence: mica → ordered mica/vermiculite interstratification → vermiculite. Electron microprobe analyses show the general trends of K leaching and Ca enrichment with increased weathering. The vermiculitization of phlogopite from ultramafic rocks proceeds by means of a continuous decrease in Al-for-Si tetrahedral substitutions and a progressive increase in Al-for-(Fe²⁺ + Mg) octahedral substitutions in the early stage of weathering. These substitutions occur to compensate for the excess of negative charge in the mica-like layer, in agreement with currently accepted vermiculitization mechanisms. They change to a slight increase of Al-for-Si tetrahedral substitutions in the late stage of the vermiculitization of phlogopite, owing to the oxidation of Fe despite its low content. However, the behavior of Fe in the late stage of the transformation of biotite into vermiculite is significantly different; that is, Fe increases substantially. The reason for this Fe increase in the late stage remains unresolved. Recalculations of the structural formulas on the basis of several assumptions indicate that the oxidation of Fe is necessary for the vermiculite derived from biotite to form the reasonable structural formulas.

Key Words: Biotite • Interstratification • Phlogopite • Vermiculitization • Weathering

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