
Vermiculitization of Phlogopite in Metagabbro, Central Turkey

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Abstract: Dioctahedral vermiculite occurs in an isolated metagabbro klippe (Kuraçalı Metagabbro) that belongs to the Central Anatolian Ophiolites from central Turkey. Both the metagabbro and the structurally underlying high-grade metamorphic rocks are intruded by granitic rocks. The Kuraçalı Metagabbro is characterized by its well-developed compositional layering, and the presence of vermiculitized phlogopite-rich layers. Petrographic and mineralogic studies show that the primary mineral phases in the host rock are diopside, tschermakitic hornblende, Fe-rich phlogopite, and plagioclase. Secondary minerals are hornblende, actinolitic hornblende, Fe-rich phlogopite, and vermiculite. A two-phase history of alteration involving acidic weathering and alkaline metasomatism is suggested for the dioctahedral vermiculite and secondary Fe-rich phlogopite, respectively. The alteration of phlogopite to dioctahedral vermiculite proceeded both along cleavage planes and at crystal edges. The vermiculite is colorless to pale yellow with weak pleochroism and shows optical continuity with the parent mineral. Vermiculite flakes, analyzed semi-quantitatively by scanning electron microscope-energy dispersive analysis (SEM-EDS) and electron microprobe (EMP), are characterized by partially expanded interlayers, K depletion, and Mg and/or Al enrichment. X-ray diffraction (XRD) and differential thermal analysis-thermal gravimetric (DTA-TG) analyses indicate that phlogopite is not a pure phase, although it is the dominant one. The XRD patterns show the presence of both dioctahedral vermiculite having dehydrated interlayers and hydroxy-Al interlayers, and interstratified phlogopite-vermiculite. The transformation of phlogopite to vermiculite is thought to represent an initial stage of weathering in an acidic environment.

Key Words: Central Anatolian Ophiolites • Metagabbro • Mineral Weathering • Phlogopite • Vermiculite

Clays and Clay Minerals; February 2001 v. 49; no. 1; p. 81-91; DOI: [10.1346/CCMN.2001.0490107](https://doi.org/10.1346/CCMN.2001.0490107)

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