
Experimental Clay-Mineral Formation from a Subvolcanic Rock by Interaction with 1 M NaOH Solution at Room Temperature

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Abstract: The alteration process of a subvolcanic rock with calcic plagioclase, pyroxene, and olivine as major components was investigated by X-ray diffraction (XRD) and analytical and transmission electron microscopy (TEM/AEM). Experimental interaction with 1 M NaOH solution led to the formation of dioctahedral beidellite to Fe-rich montmorillonite after 1 and 3 d of reaction. This range of smectite composition is similar to that from natural subvolcanic-derived soil formed from the same parent material. After 14 d of reaction, a berthierine-smectite (B-S) interstratified clay had partially replaced the smectite. Although, the presence of smectite interlayers prevented analysis of pure berthierine, berthierine-rich B-S interstratifications have a composition similar to pure berthierine. After 40 d, the alteration process led to a 7-Å S interstratification whose composition falls between greenalite and lizardite. A series of amorphous materials were also found in the 14 and 40-d experiments. The most abundant of these is a Si-Ca-Fe-rich material, whose chemical composition approaches that of the starting rock. In contrast, two other amorphous materials had a smectitic composition.

Key Words: AEM Analysis • Berthierine • Interstratification • Lizardite • NaOH Solution • Smectite

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