
Mineralogy and Genesis of Clays in Postmagmatic Alteration Zones, Makurazaki Volcanic Area, Kagoshima Prefecture, Japan

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Abstract: Two distinct zonal sequences of clay minerals (H- and L-type) were found around silicified rocks in the Makurazaki volcanic area, Kagoshima Prefecture, Japan. The clay mineral sequences from the inner to the outer parts of the alteration aureoles are: 1. H-type, pyrophyllite → dickite → $2M_2$ mica → sudoite → tosudite; and 2. L-type, kaolinite → rectorite → smectite. The structural formula for the sudoite is: $(Al_{1.04}Mg_{1.28}Fe^{3+}_{0.20}Ti_{0.03}Li_{0.01}K_{0.02}Na_{0.01}(OH)_6Al_{2.00}(Si_{3.54}Al_{0.46})O_{10}(OH)_2$. It is characterized by relatively large amounts of Mg and very small amounts of Li. The polytype is identified as IIb. The chemical analysis of tosudite shows that the sample is composed of an interstratification of sudoite-like and beidellite-like layers. The structural formula for rectorite is: $(K_{0.45}Na_{0.19}Ca_{0.01}Mg_{0.01})(Al_{1.81}Fe^{3+}_{0.04}Mg_{0.13}Ti_{0.03})(Si_{3.41}Al_{0.59})O_{10}(OH)_2$, suggesting that the nonexpandable and expandable layers have K-mica-like and beidellite-like compositions, respectively. These clay minerals in the H- and L-type alteration aureoles were formed under relatively high- and low-temperature conditions, respectively, with pH value and K- and Mg-activities increasing as the fluids ascended through the wall rocks.

Key Words: Makurazaki volcanic area • Alteration aureoles • Mode of occurrence • Mineralogical properties • Sudoite • Tosudite • Rectorite

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