
Sequential Active Alteration of Rhyolitic Volcanic Rock to Endellite and a Precursor Phase of It at a Spring in Michoacan, Mexico

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Abstract: Sequential alteration of volcanic rock of rhyolitic composition to a precursor of endellite, and thence to tubular endellite, may be observed at a hot spring about 27 km north of Ciudad Hidalgo, Michoacan, Mexico. Ojo Caliente de Laguna Larga (or Verde) yields H₂S-SO₂-containing water, temperature about 45° C pH 3.5–3.7, from multiple orifices in vesicular and slabby rock with which the water reacts.

First-stage alteration of the rock consisted of permeation and dissolution, accompanied by deposition of clay substance in vesicle walls. The clay substance, although "amorphous" to X-rays, yields a weak DTA of endellite, and kaolinite. It is interpreted as a precursor of endellite. Further reaction included continued filling of vesicles and spreading argillation which coalesced between vesicles and other rock pores. Ultimately, the rock was completely "digested" to well-defined endellites.

Strong desilication and depotassication of the rock is indicated by the dissolved substances in the spring water: Si 59.1 (equivalent to 127 SiO₂) ug/ml: Al, 1.63; Fe, 0.65; Mg, 0.21; Ca, 178; Na, 0.73; K, 13.7. Despite high K⁺, predominantly high H⁺ and Al³⁺ induce formation of endellite. The clay-water system accords well with stability diagrams.

Allophane-endellite in Indiana and endellite at Stanford, Kentucky, are formed from cold, strongly acid, meteoric-water solutions high in Si and Al relative to kaolinite dissolved in water. Factors of genesis common to both hot- and cold-water endellite are cited, suggesting that they are premissively critical, but not necessarily restrictive, to the origin of endellite.

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