Origin of the Bentonite Deposits of Eastern Milos, Aegean, Greece: Geological, Mineralogical and Geochemical Evidence

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Abstract: The Lower Pleistocene bentonite deposits of Eastern Milos, Greece have been formed at the expense of volcaniclastic rocks under submarine conditions. Systematic variation of the major chemical elements reveals that the deposits were formed from different precursors which were erupted from different volcanic centers belonging to at least two separate volcanic provinces. The volcanic eruptions were probably subaqueous. The major authigenic phases are smectite, K-feldspar, opal-CT and the zeolites mordenite and clinoptilolite. The deposits have a complex history and have been affected by hydrothermal alteration.

The geological features of bentonites coupled by the presence of abundant authigenic K-feldspar indicate that alteration of the parent volcanoclastic rocks took place under low temperatures and is probably not related to hydrothermal alteration, which is a separate event. Hydrothermal alteration has modified both the mineralogical characteristics and the properties of bentonites. Alteration of the parent rocks to bentonites was favoured by high water: wall rock ratios and fluid flow and is associated with leaching and subsequent removal of Na, K and Ca. The source of Mg was the parent rocks and only small scale Mg-uptake from the sea water has probably taken place. The formation of authigenic K-feldspar has probably been favoured by a high K^+/H^+ activity ratio and high Si activity of the pore fluid. Such conditions might have been favoured by the pH conditions and the cooling history of the parent rocks.

Key Words: Authigenic K-feldspar • Bentonite • Electron microscopy • Hydrothermal alteration • Infrared spectroscopy • Low temperature alteration • Smectite • X-ray diffraction • X-ray fluorescence • Zeolites

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