Geophysical Research Abstracts, Vol. 8, 02157, 2006
SRef-ID: 1607-7962/gra/EGU06-A-02157

Occurrence and distribution of zeolites in an Early Miocene ignimbrite from the Romana district (NW Sardinia, Italy): insights on post-depositional alteration processes.

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The Cenozoic calcalkaline volcanics of Sardinia host important deposits of industrial minerals, as kaolin, bentonites, and zeolites. In NW Sardinia, zeolitization affects several ignimbrite deposits, forming part of a >500 m Early Miocene continental volcano-sedimentary succession. In the Romana district, where numerous clinoptilolite-rich ignimbrite deposits occur, the large (up to 100 m thick, about 20 km^2 in extension) rhyolitic *Romana ignimbrite (RI)* represents one of the most important volcanic units. The *RI* shows typical ignimbrite layering, with reverse grading of pumiceous and lithic fragments. Features as accretionary lapilli and glass shard type indicate the *RI* as the distal product of a phreato-magmatic eruption. Qualitative/quantitative XRPD analyses assessed a clinoptilolite-smectite-mordenite-opal CT authigenic mineral association, with high clinoptilolite contents (>50 wt%), and minor mordenite (<10 wt%). SEM observations evidenced growth of clinoptilolite on smectitic rims within altered glass shards, and of mordenite on clinoptilolite and opal CT. The crystallization sequence is smectite→clinoptilolite→opal CT→mordenite. Zeolite contents laterally and vertically vary, increasing in the most fine-grained and/or pumiceous layers. Clinoptilolite contents >80 wt% were determined in the ash-cloud surge. Type and distribution of zeolites, and volcanological evidences, suggest a pervasive zeolitization process by water/volcanic glass interaction, starting in the hydromagmatic water-rich cooling unit after its emplacement, guided by glass chemistry, water contents, pH of fluids and temperature.