Partitioning and speciation of Fe, Ti and Cr in high-quality diasporic bauxite from Greece

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Greece is the eleventh largest producer of bauxite in the world (2.2×10^6 tons in 2007 according to USGS). The exploitation of deposits, hosted in Mesozoic limestones of central Greece, is performed by three mining companies whereas there is also an Al metallurgical plant. The mineralogy of Greek bauxites is not particularly variable; diaspore and/or boehmite (AlOOH polymorphs), hematite (Fe_2O_3), goethite (FeOOH) and anatase (TiO_2) are major phases in the case of typical Fe-enriched (red) bauxite containing 57% Al_2O_3. Of special interest is the high quality Fe-depleted (white) bauxite composed of diaspore and anatase (powder-XRD) and containing 80% Al_2O_3. In this case the partioning and speciation of the main metal impurities (TiO_2: 3%, Fe: 17500 ppm, Cr: 1235 ppm) is crucial. A microscopic study perfomed using SEM-EDS/WDS and HRTEM/EELS shows rounded anatase microparticles and nanoparticles, dispersed into the diasporic matrix, as well as individual needle-shaped rutile nanoparticles (which are diffrent TiO_2 polymorphs with no Fe). HRTEM/EELS and Mössbauer spectra reveal that Fe is present as Fe^{3+} ions in the framework of the diaspore, and also in the form of Fe mineral nanoparticles and/or Fe nanominerals (e.g. [1]) that are between 25 and 45 nm in size. X-ray absorption spectra, obtained in the SUL-X beamline of the ANKA Synchrotron facility (Germany) confirm the existence of Cr^{3+}, most probably in the structure of the diaspore, in accordance with previous Raman spectra.

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Geochemistry, geochronology and tectonic implications of cross-arc ridge volcanism in the Southern Kermadec Arc, SW Pacific.

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The crustal architecture of the southern Kermadec Arc – Havre Trough island arc – back arc basin system is distinguished by a general NE-SW structural grain and by sediment-free and –filled grabens or sub-basins. Prominent arc-normal topographic ridge features extending from the extant, but inactive, Colville Ridge to the presently active volcanic arc across the Southern Havre Trough invite comparison to similar structures indentified in other back arc basins (e.g. Marianas and Izu-Bonin).

In this paper we review the sea floor geology, as revealed by swath and multibeam mapping and ocean bottom photography, and the petrology and geochemistry as determined on dredge samples from a 100 km wide cross-arc ridge transect between 35°20′S and Rumble V volcano on the active Kermadec arc. We report results from K-Ar and $^{40}Ar/^{39}Ar$ dating experiments on selected samples that provide a temporal framework in which to review the geochemistry of rock samples that are mainly basaltic in composition. A K-Ar age of 5.4±0.1 Ma for the Colville arc constrains events to younger than this age. However, there is no systematic age progression across the back-arc towards the active volcanic front.