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Geochemical characteristics of Croatian prospective Bauxite deposit Mamutovac

Dominik Teskera, Hana Fajković¹, Nikolina Ilijanić², Nenad Tomašić¹, Nikola Gizdavec², Čobić Andrea¹, and Miko Slobodan²

¹University of Zagreb, Faculty of Science, Department of Geology, Zagreb, Croatia (hanaf@geol.pmf.hr)

²Croatian Geological Survey, Milana Sachsa 2, 10000 Zagreb, Croatia

High demand for specific chemical elements from the group of rare earth elements (REE) has led to a detailed prospection and geochemical analysis of a previously known but unexploited bauxite deposit. The Upper Eocene karst bauxite within exploitation field Mamutovac, located in the municipality of Promina in the Dalmatian Hinterland (Croatia), is such a deposit, with estimated reserves of 112,000 tone.

In order to determine REE distribution pattern in the Mamutovac la deposit, a 25meter core was obtained by exploration drilling, down to the deposit footwall that is composed of Upper Cretaceous rudist limestone. For this study 23 subsamples were singled out, on average, per each meter of a core.

The degree of lateritization is determined by the Al_2O_3 - SiO_2 - Fe_2O_3 composition diagram (after Schellman, 1986), and lateritization varies from moderate to strong, with a lower degree of lateritization in a lower part of the core, down from 15 m. Two different genetic classification systems indicate the origin of the bauxite is mafic, basaltic igneous rocks.

Main mineral phases in the bauxite core samples were determined using X-ray powder diffraction (XRPD) analysis. The mineral phases through the whole core are similar, with boehmite, gibbsite, hematite, and anatase as the main phases. Additional mineral phases determined in the core are kaolinite, goethite, and rutile.

Results of geochemical analysis obtained by inductively coupled plasma emission/mass spectrometry (ICP-ES/MS) indicate an inhomogeneous distribution of REE through the core, with two main trends: from 0-15m and from 15-25m, with some elevation of REE abundances in the lower part of the core. In the upper part of the core, total REE content (Σ REE), including Y and Sc, ranges between 352 and 630 ppm (average 500 ppm) and light REE (La-Sm) to heavy REE (Eu-Lu) (Σ LREE/ Σ HREE) ratios reach up to 10.2. For lower part Σ REE (including Y and Sc) ranges between 569 and 813 ppm (average 676 ppm) and light REE (La-Sm) to heavy REE (Eu-Lu) (Σ LREE/ Σ HREE) ratios are up to 9.82. Singificant enrichment of LREE compared to HREE is present due to the fact that HREE are highly mobile in an alkalic karst environment and consequently removed through drainage channels. The most abundant REE is Ce. Within interval, 0-15m Ce ranges between

149.3-264.9 ppm (average 210.7 ppm), while within the interval 15-25m Ce ranges 152.7-301.7 ppm (average 219.56 ppm).

Correlation analysis shows no correlation between Sc and other REE and no significant correlation between Ce and other REE or potential bearing oxides. The correlation between Sc and Al_2O_3 or Fe_2O_3 suggests that Sc is likely bound to Al-oxyhydroxides and Fe-oxyhydroxides. Correlation between REE (Sc free) and P_2O_5 indicates REE (Sc free) are probably contained in REE-bearing phosphates.

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