

REE POTENTIAL OF BAUXITE-RELATED RESOURCES IN THE ESEE REGION: FOCUS TO CROATIA

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REEBAUX is a project funded by European Institute of Innovation and Technology (EIT Raw materials), which deals with the REE potential of bauxite-related resources in the ESEE countries focusing to Croatia, Hungary, Montenegro and Slovenia. Although a great deal of bauxite-related industry has ceased in the region, some bauxite exploitable deposits and red mud accumulations have been left behind. They require an assessment in respect of critical raw materials policy in Europe, and in particular REE. So far, 47 bauxite deposits and 4 red mud landfills have been addressed in this respect within the project activities.

A part of the project results achieved so far is presented here. They are collected by exploring bauxite deposits in Lika and Dalmatia regions of Croatia. In general, bauxites are indirectly a potential source for REE; after they are treated in Bayer process for alumina production, bauxite residue is commonly left behind with an increased REE content relative to the input bauxite raw material (usually twice the original REE content in bauxite¹).

The bauxite deposits in Lika and Dalmatia visited during the project tasks are of Triassic and Paleogene (Eocene) age². In the area, bauxite deposits are numerous, however, mostly contain low economic reserves. Several number of exploited, partially exploited and unexploited deposits have been evaluated.

An average mineral composition of the collected bauxite samples is as follows: gibbsite, boehmite, hematite, anatase, in some cases goethite, kaolinite and rutile also occur. X-ray diffraction (XRD) did not show any authigenic REE mineralisation, however, it does not exclude occurrence of REE minerals as accessory phases (low abundances). For aluminium industry, several deposits reach very favourable Al₂O₃/SiO₂ ratios (4.5 and up), with Al₂O₃ topping values over 55% in some cases.

REE abundances were determined using ICP-MS after lithium borate fusion and subsequent acid dissolution. Total REE content in the bauxite samples ranges from 380-3495 ppm, with a usual inhomogeneous distribution within individual deposits. Mamutovac deposit near Oklaj (Šibenik-Knin County) was studied into more detail due to interesting reserves still available for exploitation. A drilling operation was carried out down to the deposit footwall that is composed of Upper Cretaceous

rudist limestone (sampled bauxite core up to a depth of 25.1 m). The samples were collected at 23 depth intervals. Total REE abundances range 312-772 ppm.

Limited leaching experiments were performed for selected bauxite samples from several localities by using a modified aqua regia dissolution technique (HNO₃:HCl:H₂O = 1:1:1). The leaching experiments showed a variable REE recovery from as low as 17% up to over 60% (Figure 1). Unleached REE are most likely contained in minerals like monazite and xenotime, which were not detected in the XRD patterns due to low abundances. Among major constituents, Ca (47-100%) and Fe (10-90%) are most significantly leached out. However, Ca absolute amounts are low, and only calcite is sporadically observed in XRD patterns. On the other hand, iron concentrations are significant (8-25%), mostly accounting for hematite and sometimes goethite. XRD data of the leached samples indicate dissolution of hematite and goethite, but occurrence of magnetite in some cases. On the other hand, Fe leaching rates could be also partially related to amorphous iron oxyhydroxide phases.

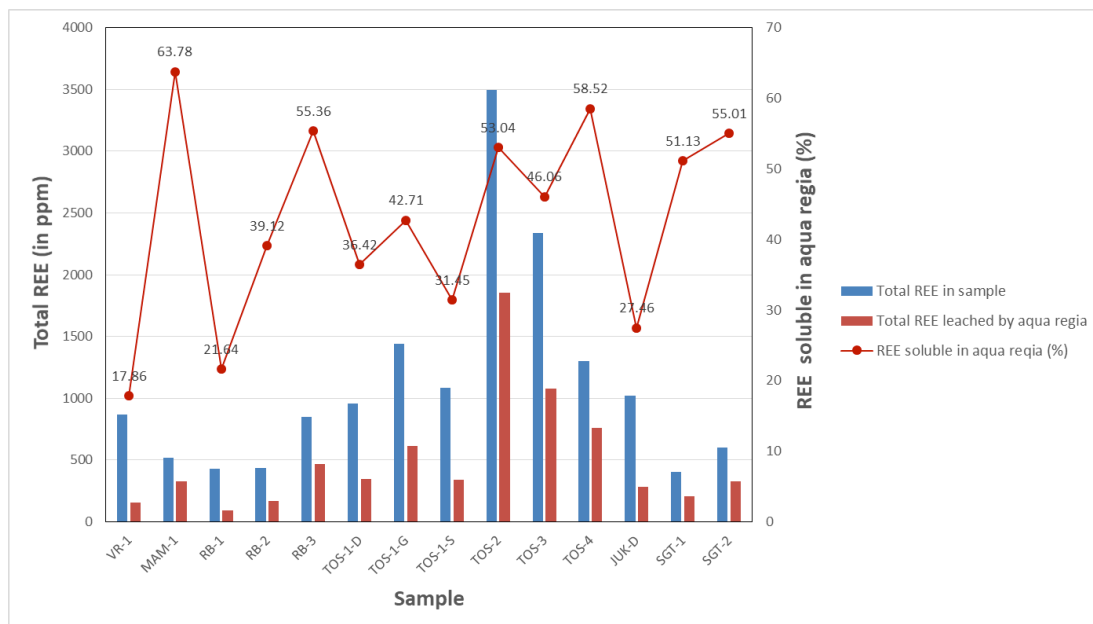


Figure 1: Total REE content leached with aqua regia relative to the total REE content in the selected bauxite samples (sample localities: VR-Vrace, MAM-Mamutovac, RB-Rudopolje, TOS-Tošići-Dujići, JUK-D-Jukići-Đidare, SGT-Stari gaj, Obrovac)

References

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