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Rare Earth Elements fractionation in native vegetation from the Moncorvo iron mines, NE Portugal

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Abstract

Fractionation of Rare Earth Elements (REE) and the accumulation and translocation indexes were measured and determined in the native vegetation [*Halimium lasianthum* (Lam.) Spach subsp. *alyssoides* (Lam.) Greuter; *Cytisus multiflorus* (L'Hér.) Sweet; and *Cistus monspeliensis* L.; *Cistus ladanifer* subsp. *ladanifer*; *Lavandula stoechas* L.] from the iron mining area of Moncorvo (NE Portugal). There is no correlation between the amounts of REE in rhizosphere and in plants. The REE concentration as the fractionation follows roots>leaves>stems in plants. A slightly enrichment in HREE were found in rhizosphere and plants (roots and stems), whereas the leaves are enriched in LREE. The accumulation and translocation depend of internal complexes ligands. The redox and pH conditions of the rhizosphere conditioned the REE uptake. Greatest bioaccumulation ability of heavy REE (HREE) was found in *C. monspeliensis*, followed by *H. lasianthum* that also, has a high capacity of the REE translocation to the aerial parts, contrary to *C. monspeliensis*. An M-type tetrad effect was determined mainly for HREE (Gd-Ho series) indicating a complexation of REE. The greatest differences in the REE fractionation patterns (mainly for HREE) are observed in stems, as a consequence of the transport function of this organ. Cerium anomaly indicates that the pH and redox conditions affected the uptake of Ce by plants, where the free ionic species are dominated in roots and leaves (positive anomaly), and stems (negative anomaly). Also the Eu-anomaly is greater in roots and leaves than in stems probably by participation in metabolic functions due to similarity with calcium.

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