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Geochemical characteristics of rare earth elements in soil of the Ditrău Massif, Eastern Carpathians, Romania

Adriana Ion
Geological Insititute of Romania, , Bucharest, Romania (adi75riana@yahoo.com)

The present paper describes the level of rare earth elements in soils developed from Ditrău massif area for evaluating of the background of these elements and accurate assessment of environmental impact. Also this paper contributed to understanding the important role of parent rocks in pedogenic processes. The Ditrău Alkaline Massif represent an intrusion body with a internal zonal structure, which was emplaced into pre-Alpine metamorphic rocks of the Bucovinian nappe complex close the Neogene – Quaternary volcanic arc of the Calimani-Guurghiu- Harghita Mountain chain. The center of massif was formed by nepheline syenite, which is surrounded by syenite and monazonite. North–western and north–eastern marginal sectors are composed of hornblende gabbro/hornblendite, alkali diorite, monzodiorite, monzosyenites and alkali granite. Small discrete ultramafic bodies (kaersutite-bearing peridotite, olivine, pyroxenite and hornblendite) and alkali gabbros occur in the Jolotca area. All this rocks are cut by late-stage dykes with a large variety of composition including tinguaite, phonolite, nepheline syenite, microsyenite, and aplite. The types of soils predominant in this zone are lithosoils. These soils are shallow developed, have low content in organic matter and reflects mineralogical and geochemical composition of the bedrock. The soil samples were collected from 70 location for all type of representative rocks (approximately 10 soil sampling points for each type of rock). The samples were analyzed by inductively coupled plasma mass spectrometry (ICP-MS). The pH values of these samples varied from 3.6 to 7.3, in general, the soils from massif area are acid or weakly acidic. The pH controls the abundance of REE in soil, the concentration of REE increases with decreasing pH values. In soil samples analyzed the contents of REE follow the order: Ce > La > Nd > Pr > Sm > Eu > Gd > Dy > Yb > Er > Tb > Ho >Tm. $\sum$ REE varied from 52.59 μg g-1 to 579.2 μg g-1 , the average is 273.14 μg g-1. The chemical analysis of soil showed an enrichment in LREE (from La to Eu) and a depletion in HREE (from Gd to Lu). Relatively high levels of LREE concentration in soil are genetically associated with REE mineralization. The soil samples developed on the syenite and nephelin syenite are enriched in HREE. The REE chondrite - normalized plots showed for most soils in the sampling area strongly negative anomalies for cerium and europium, positive anomalies for gadolinium and dysprosium. The distribution of REE in soil is given and controlled by the presence of primary minerals (potasic and plagioclase feldspars) and accessory minerals (zircon, monazite, titanite, allanite, apatite, xenotime, thorite, bastnäsite) in bedrock.