Geochemical behavior of REE and minorelements in andosoil

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purpose

The purpose of this study is to consider an important factor for long-term change in non-radioactive elements of soil. This may give us informations of the geochemical behavior in the elements composing high level radioactive nuclear waste. Generally,it is planed that the nuclear waste is disposed to deep underground 1500m-1000m depth. Long-term erosion causes that the site of underground disposal becomes shallower past. In such environment, oxygenated groundwater may dissolves the nuclear waste and radioactive elements migrate considerably. However, there has been no natural analogue studies on the migration is shallow depth environment. The one of the most important purpose is to clarify the long-term migration of elements whose chemical characters are similar to those of radioactive elements. We studied the geochemical behavior of such natural analogue elements,particulaly rare earth elements(REE),U and Th in soil environment.

Samples and analytical methods

The samples were collected from outcrop along the mountain path in Yanagawa Hadano city Kanagawa. Point A is the cross section of only andosoil and point B is the cross section of soil changing from andosoil to loam. These samples were analyzed for majior elements,minor elements and REE by using Icp-ms,EPMA. Minerals in the samples were identified by X-ray diffraction method(XRD).

Results and Discussion

The minerals consisting of the soil for the primary minerals are feldspar,volcanic glass,olivine,magnetite,and pyroxene and the secondary minerals are kaolinite,halloysite,allophane,goetite. It is possible that the solubility of these minerals is causing a great effect to the soil elemental mobility. Too see the behavior in soil,all the concentration is normalized by Al concentration by using its stability,because it is generally accepted that Al migration is very small due to very small solubility of Al bearing minerals(halloysite etc). From the result,it is apparent that the concentration of minor elements and REE varied with depth,and the variation is different from elements to elements. These differense depend on the solubility of minerals and rock facies. Namely it was found that the behaviors are considerably different in andosoil and loam. From the relation between loam and the elements in minerals,it is considered that physical parameters(ionic radix and ion potential etc) are greatly affecting the variations in the contents of elements with depth.

Conclusions

Variation of minor elements during weathering is affected by variety of primary minerals consisting of soil and solubility of minerals. Ther is significant relation between physical parameter,and concentration change in REE. As to the elemental mobility,REE removed from the soil due to long-term(about 6,000 years) weathering,but the degree of elemental mobility of REE is less than that of alkali and alkali earth elements but more than that of immobile elements such as Fe,Al and Mn. U and Th mobilities are very small.