

The behavior of vanadium between water and basalt

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In the surrounding area of Mt. Fuji, central Japan, it has been reported that vanadium concentration is relatively high (0.05-0.1 (mg/l)) in ground water and river water, due to the dissolution of vanadium from basalt. This concentration is 50 to 100 times high compared to the normal concentration of vanadium in natural waters. However a compositional relationship between surface waters and rocks has not been reported. The reason is vanadium is usually not considered as a contaminant in the water. Therefore, this study experimentally examines the behavior of vanadium in ground water and basalt interaction, and the migration behavior of vanadium in ground water in the surrounding area of Mt. Fuji based on the experimental study. In the experiment, the basalt samples of different ages were used and the experiment on the dissolution and adsorption of vanadium from the basalt was performed. The behavior of vanadium dissolved in aquifers in Mt. Fuji area was considered. The results of the dissolution adsorption experiments showed that the dissolved vanadium species in water were affected by pH and dissolved oxygen. In addition, the vanadium in basalts is considered to be contained in magnetite, in pyroxene and in the volcanic glass and to have adsorbed onto each minerals surface. The extraction experiment of vanadium from them revealed the existing chemical forms of vanadium are different in different basalt samples.

Application of NICA-Donnan model to modelling of Eu(III) solubility in the presence of deep groundwater humic substances

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Modelling of radionuclide bindings by deep groundwater humic substances (HSs) is a key subject for assessing the carrier effects of HSs on migration of radionuclides in geological disposal system of high level radioactive waste. The NICA-Donnan model of which generic parameters are prepared [1, 2] is one of the most useful models for the modelling of metal-ion bindings by soil and surface water HSs in a variety of solution conditions. However, its applicability to the deep groundwater HSs has yet to be elucidated. In this study, to clarify the applicability of the NICA-Donnan model and its generic parameters, the Eu(III) solubility simulated by the model and parameters were compared to the experimentally obtained solubility in the presence of HSs isolated from deep groundwaters at the depth of 250 to 500 m in Horonobe area, Hokkaido, Japan.

The solubility experiments showed the results that apparent solubility of Eu(III) were not enhanced in the presence of the deep groundwater HSs (i.e. fulvic acids or humic acids), while the solubility was enhanced in the presence of Aldrich humic acid. The NICA-Donnan model and its generic parameters successfully simulated the solubility enhancement by the Aldrich humic acid. However, they could not simulate the apparent solubility in the presence of the deep groundwater HSs. These results suggest that the NICA-Donnan model and/or its generic parameters cannot be applied to the modelling of trivalent radionuclide bindings by the deep groundwater HSs in the Horonobe area. Based on the Eu(III) binding characters of HSs, the reason on the disagreements between the experiments and the simulations will be discussed.

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[1] Milne *et al.* (2001) *Environ. Sci. Technol* **35**, 2049–2059.

[2] Milne *et al.* (2003) *Environ. Sci. Technol* **37**, 958–971.