

Geochemical implications of Sr isotopic compositions in hot springs, Korea

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Though, at present, there is no volcanic activity, high temperature hot springs with more than 40°C water temperature occur near to Jurassic and Cretaceous granite area in South Korea. In order to clarify the heat source of the hot springs in the South Korea, we carried out a geochemical study using Sr isotope compositions of the hot spring water being collected from the fourteen area for 5 years. In this report, we discuss some relationship between the distribution of granites and geochemical characteristics of Sr isotope ratios from the high temperature hot springs.

The hot springs in the Jurassic granite area are mainly of Na-HCO₃ type, whereas those of the Cretaceous granite area are Na-Cl(-SO₄) type. In Sr isotope ratios, ⁸⁷Sr/⁸⁶Sr ratio of the hot springs in the Jurassic granite area range in 0.710 to 0.730, whereas those in the Cretaceous granite area range 0.700 to 0.710. In addition, ⁸⁷Sr/⁸⁶Sr ratio from each hot spring is constant for five years, respectively. Another interesting characteristic of ⁸⁷Sr/⁸⁶Sr ratio of the hot springs from the South Korea is that each ⁸⁷Sr/⁸⁶Sr ratio from the hot springs corresponds well to the initial ⁸⁷Sr/⁸⁶Sr ratio of the granite itself at the area that the hot spring occurs. The ⁸⁷Sr/⁸⁶Sr ratio of the hot springs is divided into also three groups according to geographical classification of South Korea such as eastern, western and southern part.

The correspondence between the ⁸⁷Sr/⁸⁶Sr ratio of the hot springs and the initial ⁸⁷Sr/⁸⁶Sr ratio of the hot spring-bearing granite indicates that the high temperature hot springs in South Korea may be derived from the heat source related with the Mesozoic granite though it is difficult to think that the Mesozoic granite itself is the heat source of the hot spring.

Mineralogical study on the uranium sorbed biotite

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Experimental

Large books of biotite were crushed to less than 3 mm. Some biotite samples were oxidized with H₂O₂ solution (34%) for 2 weeks. The biotite was characterized by a series of techniques, including XRD, SEM, TEM, and chemical analysis. A range of experimental reactions with biotite were conducted at a solid to solution ratio of 1:100 in 50 mL centrifuge tubes. U^{VI} solutions were prepared by adding UO₂(NO₃)₂·6H₂O (Reagent grade) to deionized water (electrical resistivity at 25°C > 16.6 mol/Ωcm⁻¹). Solution compositions covered pH 3.0-9.0, and U^{VI} = 0.2 mM.

Results and interpretation

The XRD patterns of biotite changed by the effect of oxidation treatment: a lowering of peak height, a broadening of peak width, a low-angle shift of the (001) peak, and a high-angle shift of the (060) peak. Iron oxidation and cation loss from the biotite were occurred and caused a decrease in the *b*-dimension with the formation of discontinuities, resulting in partial hydrous interlayers (<10%).

U sorption was higher on the fresh biotite rather than on the one treated with H₂O₂. At low pH (pH 3), U was mainly sorbed onto the biotite interlayer, replacing K elements from the interlayer sites. In addition, U sorption was affected by the surficial condition of the biotite such as its morphology and edge types.

TEM recorded nano-scale U-rich zones in the interlayer region for those samples with relatively high uranium sorption.

References

- White A.F. and Yee A., (1985), *Geochim. Cosmochim. Acta* **49**, 1263-1275.
 White A.F., (1990), In *Mineral-Water Interface Geochemistry*, MSA, 467-510.