Uranium and radium isotope ratio at Korean hot spring water

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The hydrological characteristics of the groundwater were affected by surrounding geology and water-rock interaction. To understand hydrogeology, various applications of isotope geochemical techniques for geothermal investigations have been applied.

Uranium and Radium are natural radionuclides and they have isotopes. To understand water-rock interaction and hot spring water environments ^{234}U, ^{238}U, ^{226}Ra, and ^{228}Ra were analyzed using extractive radiochemistry and LSC measurements.

Uranium isotope was extracted with HDEHP and counted with LSC. Radium isotopes were separated using Ba coprecipitation and ^{226}Ra was counted with LAC and ^{228}Ra was analyzed with HPGe γ-detector. Among them ^{228}Ra is below detection limit.

Sample	U(μg/L)	$^{234}U/^{238}U$	Ra-226 (Bq/L)
SCHS	1.50	1.0	<0.003
DGHS	5.03	0.69	<0.003
BAHS	0.04	-	<0.003
BKHS	<0.01	-	0.005
MGHS	0.68	1.17	0.010
DRHS	3.58	1.50	0.006
HYHS	0.68	1.06	0.145
DSHS	0.17	-	<0.003
ASHS	5.94	0.80	<0.003
YSHS	49.7	0.71	<0.003
PDHS	0.01	-	0.031
SAHS	0.07	-	0.014
PCHS	1.39	1.0	<0.003
GHHS	0.011	-	<0.003

Table 1. Uranium and radium istope values in Korean hot spring water.

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Relative B-Li-Cl compositions: Capability and limitation to direct observation of deep geofluid

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Some recent studies invoked that the variation of some fluid soluble light elements, e.g., Li, B and Cl, are capable of suggesting fluid generation depths [1, 2]. To evaluate this idea, we mesured relative B-Li-Cl compositions of fluid inclusions in quartz veins intercalated with basic/pelitic schists and eclogites of the Sambagawa belt, Japan, as foliation parallel quartz veins are capable of preserving the characteristics of syn-metamorphic fluid inclusion [3].

Li/B ratio of the crush-leached fluid extracted from quartz veins intercalated with basic schists and eclogites from Wakayama and Besshi area show a positive correlation with peak *P-T* conditions of their host rocks [4]. However, some fluid samples extracted from quartz veins hosted in pelitic schists from Besshi area have much higher Li/B ratios than those of the basic schist of the same metamorphic grade [5]. Hydrochemical facies of those samples are characterized by the dominance of Na-Cl or Na/K-HCO_3. Optical and SEM-CL observation indicate that those quartz veins are deformed with various degrees and most of them show polygonal texture. On the other hand, most crush-leached fluid extracted from quartz veins of Asemi-gawa area show discrete Li/B value. Their hydrochemical facies are characterized by the dominance of Ca-HCO_3, which is known as the characteristics of pore fluid in near surface fracture of continental crust [6], and quartz veins have strongly deformed fabric.

These results suggest that deformation during the exhumation stage, accompanied with fluid infiltration, can severely modify the compositions of fluid trapped in the corresponding veins. Despite that there are several problems in using fluid inclusions in quartz veins as a means to investigate geofluid activity, hydrochemical facies of the crush-leached fluid and quartz fabric can be clues to find the syn-metamorphic fluid.

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