

## Trial data of noble gas analysis using new preparation system to measure submarine hydrothermal fluids: comparison for STD gas

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Hydrothermal activity is an essential phenomenon to drive geochemical differentiation on the Earth's surface, which should form polymetallic massive sulfide ores. Noble gas isotopes are regarded to be a powerful tracer even for the geochemical study on hydrothermal activity; however, there are abundant interference volatiles, e.g. halogens and hydrogen sulfide.

Here, we designed a new preparation system to remove such volatiles using non-traditional gettering materials. This new preparation system consists of following components: the water preparations system, composite gettering system (halogen getter, sulfide getter and Ti-Zr getter), cryogenic pump, SAES-getter pump and charcoal trap to analyze the all noble gases (He, Ne, Ar, Kr and Xe). The three types of getters effectively remove halogens, sulfides, abundant water vapor and other active gases for respective gettering step. After the absorbing sea water by cold trap and collection Ar-Kr-Xe fraction in the charcoal trap, the gettering procedure were taken under the following orders: halogen gettering, sulfide gettering, water vapor and active gases. For the efficient removal of sulfides, an exposure to the halogen-getter of the extracted gases prior to the exposure to the sulfide getter is required. Then, respective He and Ne fraction, separated with cryogenic pump, was measured. Next, Ar, Kr and Xe fraction were further purified and separated with charcoal trap, respectively. Further, the new preparation system has compact volume, which needs small amount of seawater sample of 2-5 cc in volume. It is almost 1/20 compared to the typical requirement for He isotope measurement. This newly designed preparation system has been applied to the Patent filing (Application Number: 2015-234839).

In this time, we tried to analyze He isotopes the Kaminoyama hot spring source of water (sampled at November, 2011) included with high sulfide components, environmental water included with high chloride components, which are compared with Kaminoyama STD gas made at 1984 in Yamagata Univ. ( $KS \cong 5.7Ra$ , Tamura et al., 2005, now kept in Okayama Science Univ.) and Helium standard of HESJ made in Osaka Univ. (Matsuda et al., 2000,  $Ra = 20.63 \pm 0.10$ ). In this study, 2011 Kaminoyama hot spring Helium gas measured about 7Ra, which is little higher the data of Horiguchi et al., (2010) reported value, Togatta  $\cong 6.1Ra$  (sampled at 2006). Thus, the Helium isotope is changed since 2006 before 2011 and relative higher than 1984, which is possible to be connected with activity of the Zao volcanism after Mega-Earthquake. Here, we reported trial data of Kaminoyama hot spring water using a new preparation system compared to the noble gas standards of Kaminoyama gas and HESJ.

Keywords: submarine hydrothermal fluids, noble gas, gettering system