

# Hg and Pb isotope ratios of the Suiyo seafloor hydrothermal system and Kuroko deposits

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Archaean Park Project focuses on the influence of magma-hydrothermal activities on biological communities of submarine hydrothermal systems. This report presents Hg and Pb isotope data of core samples obtained using Benthic Multi-coring System (BMS) drilling. This drilling was performed to investigate a submarine hydrothermal system developed in a caldera on the summit of the Suiyo Seamount in the Izu-Bonin Island-Arc, south of Japan.

The mineralization and hydrothermal alteration in the 200\*200 m venting area of the Suiyo Seamount is investigated on the basis of drill core from depths of 2~6 m below the seafloor. The sulfide samples exhibit characteristically high Au (less than 42 ppm), Ag (less than 1,500 ppm), As (less than 1,440 ppm), Hg (less than 55 ppm), Sb (less than 96 ppm), and Se (less than 44 ppm). Scanning X-ray fluorescence spectroscopy indicates that Au and Hg occur as micro veinlet in the sulfide samples.

The Hg mineralization was studied using Hg isotope ( $^{196}\text{Hg}$ ,  $^{199}\text{Hg}$ ,  $^{200}\text{Hg}$ ,  $^{202}\text{Hg}$ ,  $^{204}\text{Hg}$ ) analysis with a MC-ICP-MS (Thermo Finnigan Neptune). The analytical procedure is as follow;

- 1) 1.5g of each sample was weighted out into a clean labeled 20ml glass tube.
- 2) With adding 0.6 ml of conc.  $\text{HNO}_3$  and 1.8ml of conc.  $\text{HCl}$  to the sample. The sample was heated for about 2 hours.
- 3) DI  $\text{H}_2\text{O}$  was added to each sample to reach the final volume of 10ml.
- 4) Each sample was centrifuged for 15min (2500rpm).
- 5) Hg concentration of each sample was determined using Flow Injection Mercury System.
- 6) Each sample was mixed with  $\text{SnCl}_2$  and then with argon (carrier gas). After gas liquid separation, the argon delivered Hg to the torch directly. All other metals were removed to drain.

Because there is no available standard material for Hg isotope analysis, we used S-HG02027 (Inorganic Ventures, Inc) for the standard. We analyzed Hg isotope ratios of dacite lava and sulfide samples from the Suiyo seafloor hydrothermal system. We also analyzed Hg isotope ratios sulfide and sedimentary rock samples from Middle Miocene fossil seafloor hydrothermal systems (Kuroko deposits) for comparison.

$^{196}\text{Hg}/^{202}\text{Hg}$ ,  $^{199}\text{Hg}/^{202}\text{Hg}$  and  $^{200}\text{Hg}/^{202}\text{Hg}$  ratios of Suiyo sulfides increase with increasing their Hg contents, suggesting light Hg isotopes accumulated during the mineralization. The lead isotope ratios ( $^{206}\text{Pb}/^{204}\text{Pb} = 18.546\sim 18.562$ ,  $^{207}\text{Pb}/^{204}\text{Pb} = 15.535\sim 15.554$ ,  $^{208}\text{Pb}/^{204}\text{Pb} = 38.322\sim 38.375$ ) of the Suiyo sulfides are very similar to those of dacite lava ( $^{206}\text{Pb}/^{204}\text{Pb} = 18.552$ ,  $^{207}\text{Pb}/^{204}\text{Pb} = 15.539$ ,  $^{208}\text{Pb}/^{204}\text{Pb} = 38.333$ ), suggesting that lead, as well as Hg, is of magmatic origin.

There is no such a relation between Hg isotope ratios and Hg contents in Kuroko sulfides, indicating complicated Hg mineralization of Kuroko deposits. The  $^{196}\text{Hg}/^{202}\text{Hg}$ ,  $^{199}\text{Hg}/^{202}\text{Hg}$  and  $^{200}\text{Hg}/^{202}\text{Hg}$  ratios of Kuroko sulfides may be explained assuming that the contribution of sediment Hg play an important role for the mineralization. The lead isotope ratios reported in literatures (e.g. Fehn et al., 1983) also suggest the importance of sediment Pb for Kuroko mineralization.

## REFERENCE

Fehn U., Doe E. R. and M.H. Delevaux (1983): The distribution of lead isotope and the origin of Kuroko ore deposits in the Hokuroku district, Japan. *Economic Geology*, Monograph 5, pp.488-506.