

## Geochemistry and mineralogy of the hydrothermal system at Suiyo Seamount

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Archean Park Project focuses on the influence of magma-hydrothermal activities on biological communities of seafloor hydrothermal system developed on atop of Suiyo seamount, Izu-Bonin island-arc.

We made 2 to 6m depths drillings near the black smokers, using the Benthic Multicoring System (BMS) and RV Daini-HakureiMaru.

The core samples from drill holes at the south-east south margins of hydrothermal area, contain feldspar and cristobalite of dacite and pumice origin, and sulfides, anhydrite, barite and montmorillonite of hydrothermal origin. Meanwhile, the core samples from central part of the hydrothermal system contain sulfides, anhydrite, barite, chlorite / montmorillonite mixed-layer minerals, mica and chlorite with little or no feldspar nor cristobalite. Hydrothermal clay minerals change from montmorillonite to chlorite and mica through chlorite / montmorillonite mixed-layer minerals with depths.

Sulfid-rich core samples contain Au(up to 42ppm), Ag(up to 1.550ppm), Cu(0.6%), Pb(up to 0.6%), Zn(up to 40%), As(up to 1.440ppm), Hg(up to 55ppm), Sb(up to 96ppm), Se(up to 44ppm). Lead isotope ratios ( $^{206}\text{Pb} / ^{204}\text{Pb} = 18.546$  to  $18.562$ ,  $^{207}\text{Pb} / ^{204}\text{Pb} = 15.535$  to  $15.551$ ,  $^{208}\text{Pb} / ^{204}\text{Pb} = 38.322$  to  $38.375$ ) of sulfide-rich samples are very similar to those of the dacite ( $^{206}\text{Pb} / ^{204}\text{Pb} = 18.552$ ,  $^{207}\text{Pb} / ^{204}\text{Pb} = 15.539$ ,  $^{208}\text{Pb} / ^{204}\text{Pb} = 38.333$ ).

Sulfate-rich core samples contain Ba(up to 10%), Ca(up to 30% as CaO), Sr(up to 0.4%). The Ca/Sr ratios of these sulfate-rich core samples are very similar to the seawater value, suggesting most of Ca and Sr of anhydrite are seawater origin. The  $^{87}\text{Sr}/^{86}\text{Sr}$  ratios (0.70732 to 0.70872) of sulfate-rich sample also suggests that Sr of anhydrite is a seawater origin. The  $^{87}\text{Sr}/^{86}\text{Sr}$  ratio of dacite lava is 0.70345.

Dacite lava samples with no hydrothermal alteration belong to low K(up to 0.9% as K<sub>2</sub>O), calc-alkaline dacite (SiO<sub>2</sub>, up to 67%. Al<sub>2</sub>O<sub>3</sub>, up to 16%). The hydrothermally altered dacite lava are enriched in SiO<sub>2</sub> (up to 74%), or enriched in MgO (up to 15%) and K<sub>2</sub>O (up to 3%) depending on their hydrothermal mineral assemblages. An Ar-Ar data obtained from a unaltered dacite is  $9 \pm 8$  Ka, suggesting zero age.

Oxygen and hydrogen isotope analyses were performed on clay minerals. Oxygen isotopic ratios of these clay minerals are +7.2 to +7.6 permillage for chlorite / montmorillonite mixed layer minerals, and +3.1 to +3.8 permillage for mixtures of chlorite and mica. Hydrogen isotope ratios of chlorite and mica are -24 to -36 permillage, suggesting that contribution of magmatic water is insignificant and seawater is the sole source of fluids for these clay minerals. Assuming that the oxygen isotopic ratios of hydrothermal fluid responsible for the formation of these clay minerals is seawater value, we can evaluate that the formational temperatures of montmorillonite and the mixture of chlorite and mica are 170 to 230 degrees C and 250 to 290 degrees C, respectively.