

## Isotopic geochemistry of hydrothermal activity in Kagoshima Bay

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Numerous hydrothermal fumaroles were observed in the Aira Caldera of Kagoshima graben. The isotopic geochemistry of hydrothermal gasses was studied.

The isotopic ratios of sulfide sulfur were around +5 permil for the primary sulfide minerals in Sakurajima Volcano, +7 permil for the H<sub>2</sub>S gas from 200m fumaroles, and about +23 permil for the H<sub>2</sub>S gas from 100m fumaroles. This suggests that the sulfur in the hydrothermal solution is mainly of magmatic origin with a small amount of biogenic sulfur, and that the sulfur isotopic ratio of the hydrothermal solution increased by precipitation of galena and others. On the other hand, carbon isotopic ratio of carbon dioxide in the hydrothermal fumarole suggests some role of bio-activity in the sediments below the sea floor.

Numerous active hydrothermal fumaroles were observed in the Aira Caldera of Kagoshima graben. In spite of its shallow depth (<200m), precipitation of sulfide and sulfate was recognized on the sea floor. Sulfate-reducing bacteria, sulfur-oxidizing bacteria and other vent fauna such as a tube worm (*Lamellibrachia satsuma*) were observed around the hydrothermal vents. In this study, the isotopic geochemistry of hydrothermal gasses was considered from the aspect of the evolution of hydrothermal activity.

All over the area, sulfate-reducing bacteria were producing framboidal pyrite in sea floor mud, and sulfur-oxidizing bacteria lived around vents, forming minerals. The basin of the Wakamiko Caldera (200m in depth) was characterized by; 1) stagnation of anoxic sea water in the summer season, 2) precipitation of stibnite, realgar, orpiment, silver mineral, and barite around the vents, 3) the occurrence of oil around vents. On the other hand, the knoll area on Aira Caldera (100m in depth) had a comparatively stronger fumarole, living tube worms, and no sulfide minerals other than biogenic pyrite.

The isotopic ratios of sulfide sulfur were around +5 permil for the primary sulfide minerals in Sakurajima andesite lava, around +6 to +7 permil for the H<sub>2</sub>S gas from fumaroles at 200m water depth, and +16 to +23 permil for the H<sub>2</sub>S gas from fumaroles at 100m water depth. The isotopic ratios of sulfide minerals (0 to +5 permil) other than biogenic pyrite, native sulfur (+5 to +10 permil) and sulfur oxidizing bacteria (+6 to +9 permil at 200m, and around +19 permil at 100m) showed corresponded approximately with the venting H<sub>2</sub>S gas. This suggests that the sulfur in the hydrothermal solution is mainly of magmatic origin with a small amount of biogenic sulfur, and that the sulfur isotopic ratio of the hydrothermal solution increased by precipitation of galena, argentite, stibnite and others of which the fractionation factors with H<sub>2</sub>S is negative. On the other hand, carbon isotopic ratio of carbon dioxide in the hydrothermal fumarole suggests some role of bio-activity in the sediments below the sea floor.