

Geochemical study of High-T hydrothermal fluid and chimney obtained from Tarama Hydrothermal Vent Field in southern Okinawa Trough

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In 2017, active hydrothermal venting of over 300-deg. fluid was found at 1840 m deep seafloor on the slope of Tarama Knoll in Southern Okinawa Trough during dive survey of DSV/Shinkai 6500. The venting site involved with hydrothermal chimneys was named YZ site. On this knoll warm shimmering site (about 20-deg. higher than the ambient seawater), named Fox Site, involved with sediments rich in iron oxide was found near the summit in 2009, but high-T venting site had not been identified then. This knoll is located slightly south from the main rifting zone of Southern Okinawa Trough and belonging to a volcanic chain of Ishigaki seamounts. During the dive surveys in 2017 hydrothermal chimney fragments and venting fluids were collected and provided for geochemical study.

Chimney fragment samples were obtained from active chimneys by the manipulators of DSV. The samples were observed and analyzed using the microscope, XRD, EPMA. Those samples were classified into three types; (1) arsenic sulfide-rich type, (2) anhydrite-rich type, and (3) metal sulfide-rich type. The mineral composition of each sample was similar to the chimney mineral composition reported from multiple hydrothermal systems in the Okinawa Trough (e.g., Izena Cauldron, Daiyon-Yonaguni Knoll, Hatoma Knoll).

Chemical and isotopic compositions of the sampled hydrothermal fluids and pore fluids from the both sites were measured. Those results indicate significant contribution of sedimentary organic matter, although Tarama Knoll is mainly composed volcanoclastics of felsic rocks. It also suggests that the high-T fluid venting from YZ site has no significant difference in the redox state (oxygen and sulfur fugacities) and the isotopic compositions of methane are comparable with those of other hydrothermal fluids occurring in the Okinawa Trough. In addition, the estimated endmember fluid compositions of each site are different, suggesting that those fluids are supplied from individual hydrothermal reservoirs.

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