Dating hydrothermal minerals in active hydrothermal fields in the southern Mariana Trough

JUN-ICHIRO ISHIBASHI[1], KAZUHIKO SHIMADA[1], FUMIHIRO SATO[2], SHIN TOYODA[2], ASAKO TAKAMASA[3#], SHUN'ICHI NAKAI[3] AND HIDENORI KUMAGAI[4]

[1]Faculty of Science, Kyushu Univ., Fukuoka 812-8581, Japan (*corresp.: ishibashi.junichiro.779@m.kyushu-u.ac.jp)
[2]Okayama University of Science, Okayama, Japan
[3]Earthq. Res. Inst. Univ. Tokyo, Tokyo, Japan
[4]IFREE/JAMSTEC, Yokosuka, Japan
[#]Present address: Nat. Inst. Radiological Science, Japan

Ages of hydrothermal mineral samples were determined by $^{230}Th/^{234}U$ radioactive disequilibrium dating technique. Sulfide samples were collected from four active sites in the most southern region of the Mariana Trough; Snail site (located on the spreading axis), Archaean site (located on a mound 1.5 km distant from the axis), Pika site (located on an off-axis knoll 4.9 km distant from the axis) and Urashima site (located on the northern slope of the same knoll). Samples were collected from active hydrothermal vents and inactive sulfide spires during dive expeditions of YK10-10 cruise using the submersible SHINKAI6500. In addition, massive sulfide ores were cored by shallow drilling using a BMS (Benthic Multi-coring System) during the TAIGA10 cruise.

Sulfide ores collected from the hydrothermal mound of the Archaean site range in age from < 100 to 3520 years old. The growth rate of the massive sulfide ore body is calculated to be 0.12 - 1.5 mm/year based on results of the core samples. These results suggest that a few thousand years of continuous hydrothermal activity would be required for formation of massive ore deposit that overlays the hydrothermal mound 50-100 m high and 250-300 m in diameter.

Sulfide ores collected from the two hydrothermal fields located on the off-axis knoll (Pika and Urashima sites) are up to 9000 years old. When combined with geophysical evidence for crustal velocity anomaly, this mineralization is considered to be in the late-stage of the hydrothermal activity, and related to a cooling magma body.