Mineral chemistry and Pb isotope compositions of seafloor hydrothermal deposits obtained by drillings in the Gondou field, Okinawa Trough: Preferable modern analogue of Kuroko deposit

SHUHEI TOTSUKA[1] KAZUHIKO SHIMADA[2] TATSUO NOZAKI[3,4,5,6] JUN-ICHI KIMURA[3], QING CHANG[3] AND JUN-ICHIRO ISHIBASHI[2]

[1]AIST, [2]Kyushu Univ., [3]JAMSTEC, [4]Univ. of Tokyo, [5]Kobe Univ., [6]ChibaTech
*E-mail address: s.totsuka@aist.go.jp

A scientific drilling was conducted during the cruise JM17-04 in 2017, which revealed a subseafloor structure beneath an active hydrothermal vent, Gondou field in the middle Okinawa Trough. Drilled cores provided evidence for accumulation of massive sulfide deposits up to several tens of meters below seafloor. Drilled core mineralogy indicated two distinct types of sulfide mineralization in different depths. The upper sulfide body consists mainly of sphalerite, pyrite and galena, and the sulfide occurrence was chacterized by fine-grained and compact textures. The lower sulfide rich sediment layer mainly consists of quartz and clay minerals togerther with abundant euhedral to subhedral pyrite grains and void-filling chalcopyrite within quartz clusters. The distribution of Zn-, Pb-rich sulfides and Fe-, Cu-rich sulfides in differenct horizons is reminiscent of black and yellow ores of Kuroko-type volcanic massive sulfide (VMS) deposits on land. Mineral chemistry, such as a relatively low Fe content (0 - 6%) in sphalerite and As- and Zn-rich composition in tennantite-tetrahedrite series, is also similar to that found in a typical Kuroko deposits from the Kosaka mine in the North East Japan. However, a Pb isotope study demonstrated a different signature between the modern seafloor hydrothermal deposit in the Gondou field and Kuroko deposits on land. In the Gondou field, Pb isotope compositions of galena were in a narrow range along a whole drlling depth regardless of Zn-rich, Cu-rich, and barren sediment layers. This signature is in contrast to that recognized in the Kuroko deposits on land in the Hokuroku district, where the black ore showed enrichment in sediments-derived radiogenic Pb compared with the yellow ore. The narrow Pb isotope range in the modern seafloor deposit suggests sulfide mineralization in both Zn-, Pb-rich and Fe-, Cu-rich sulfides bodies is derived from the hydrothermal fluid having the same Pb isotopic geochemical signature.