

Occurrence of hydrothermal kaolin minerals beneath the Iheya North Knoll hydrothermal field in the Okinawa Trough

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Introduction

Kaolin minerals is known as common alteration minerals observed in on land geothermal or fumarole area. On the other hand, only few studies reported occurrence of kaolin minerals in seafloor hydrothermal fields. As an example, occurrence of kaolin minerals was reported at the Jade site in the Izena Hole in the Okinawa Trough by Marumo and Hattori (1999). Recently, seafloor drillings conducted at the Iheya North Knoll in the Okinawa Trough revealed occurrence of kaolin minerals in sediment cores obtained from the vicinity of active hydrothermal fields. We conducted X-ray diffractometric analysis (XRD) and Scanning Electron Microscope (SEM) observation of the sediment samples. In this presentation, we report depth profiles of clay mineral assemblage in sediment below active hydrothermal fields, with interest in the relationship with a profile of metal elements content in the sediment.

Sampling and methods

Sediment cores were obtained by drilling at Hole C9016B (27° 46.6' N, 126° 54.6' E, depth = 1124m) in the vicinity of Aki site during CK-14 expedition in 2014, and by drilling at Site BMS-I-4 (27° 47.4' N, 126° 53.9' E, depth = 1048m) located 200 m east from the Original site, during TAIGA11 cruises in 2011. Identification of clay minerals was conducted by X-ray diffraction technique (XRD) after separation of clay minerals and by scanning electron microscope (SEM) observation of bulk sediment.

Results and discussion

In the Aki site, change of dominant clay mineral assemblage along depth was recognized as below; smectite and illite in 0-9 mbsf, illite and kaolin mineral in 9-11 mbsf, and illite and Mg-chlorite below 11 mbsf (to 91 mbsf). Detailed investigation of the kaolin-rich layer revealed change of occurrence of kaolin minerals along depth as below; spherical kaolin minerals at 8.88 mbsf, plate-like kaolinite and tubular halloysite at 9.18 mbsf, and crystal kaolin minerals at 10.83 mbsf. It is interesting to note occurrence of sphalerite and barite were identified in the 9.18 mbsf sediment but not observed in 10.84 mbsf. Profile of trace elements content in bulk sediment (Nozaki et al., in this meeting) corresponded to the occurrence of sulfide/sulfate minerals in the sediment. High contents of Ba, Zn and Pb were notable in the 9.81 mbsf sediment, whereas high contents of Cu and Ag were recognized in the 10.28 mbsf sediment.

In the Original site, intense alteration represented by dominant occurrence of kaolin minerals was recognized in sediment from just a few 10 cmbsf to 3.5 mbsf. Also in the sediment from this site, occurrence of sphalerite, galena and barite was identified.

As mentioned above, occurrence of kaolin minerals associated with sphalerite and barite was recognized in relatively shallow depth below the seafloor located at a few hundred meters apart from the active venting in two hydrothermal sites in the Okinawa Trough.

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