

Occurrence of hydrothermal alteration minerals at the Jade hydrothermal field, in the Izena Hole, mid-Okinawa Trough

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Mineralization at the Jade hydrothermal field, in the Izena Hole, mid-Okinawa Trough, resembles in many aspects the Kuroko type ore mineralization. In the Kuroko type ore deposits, zonal distribution of hydrothermal clay minerals was recognized around the deposit. This study aims to reveal occurrence of hydrothermal clay minerals below the seafloor in the Jade hydrothermal field. We report mineralogy and geochemistry of hydrothermal clay minerals identified in surface sediments in the Jade field and compare with those in the Kuroko type ore deposits.

Surface sediment cores (~30 cmbsf (centimeters below the seafloor)) were collected by an acrylic push corer (MBARI-type corer) attached to remotely operated vehicle (ROV) Hyper-Dolphin. The core sampling was conducted during the NT10-17 cruise of R/V Natsushima (Japan Agency for Marine-Earth Science and Technology (JAMSTEC)) in September 2010. Minerals in the sediment were identified by X-ray diffraction (XRD), at the Department of Earth and Planetary Sciences, Kyushu University. For some sediment samples, clay fractions (<2 μ m) were collected from suspending particles in the distilled water according to the Stokes' law. Clay minerals in the clay fraction samples were identified by the XRD and analyzed chemically using a transmission electron microscope (TEM) equipped with an energy dispersive spectrometer (EDS) in the Research Laboratory for High Voltage Electron Microscopy (HVEM), Kyushu University.

A surface sediment core collected near the sulfide chimney venting high temperature fluid up to 320°C was characterized by occurrence of kaolinite, with sulfide minerals such as sphalerite and galena. The kaolinite would be related to be formed under acidic condition caused by oxidation and dissolution of the sulfide minerals by penetrating seawater. Surface sediment cores collected near clear hydrothermal fluid venting of about 100°C, which is located in 400 m distant from the sulfide chimney, were characterized by assemblage of chlorite and smectite. The chlorite had chemical composition close to Al-rich chlorite (sудоite) which was found around a few Kuroko type ore deposits. In the Kuroko type ore deposits, sudoite was considered to be stable under acidic condition because of the associated clay minerals. This study revealed occurrence of acidic alteration minerals in surface sediment at the Jade hydrothermal field, in the Izena Hole, mid-Okinawa Trough.

Keywords: clay mineral, hydrothermal alteration, Okinawa Trough