P191-TU

PECULIAR DISTRIBUTION OF LABILE ORGANIC MATTER PRECIPITATED IN INACTIVE CHIMNEY ON HYDROTHERMAL SYSTEM AT SOUTH MARIANA

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Massive sulfide deposits accompanying with microbial habitats that consist of chimneys and underlying mounds are formed by deep-sea hydrothermal activity derived from tectonic settings (e.g. Huber et al., 2002). The southern area of the Mariana Trough between the ridge and the trench is marked by complex tectonics forced by the curvature of the subduction zone. There are several hot spots along with the ridge [e.g. Baker et al., 2005], which are basalt-base and sometimes forms iron-rich hydrothermal chimney. Chimney growth is initiated by focused venting of high temperature hydrothermal fluid from a fracture on the seafloor. Mixing of hydrothermal fluid and seawater at temperatures of ca. >150ºC causes saturation and precipitation of anhydrite which provides structural support and physico-chemical gradient in terms of temperature, composition and redox state.

In order to characterize distribution of biologically labile organic matter precipitated in hydrothermal chimney, we collected inactive chimney samples from Fryer site, Yamanaka site, and Pika site during YK03-09 cruise over the south Mariana area (143˚37'E, 12˚57'N). Some of them were divided into three types of structural locality: 1) interior potion, which situated almost center of fluid vein, 2) middle portion, which situated external zone between interior portion and exterior portion, and 3) exterior portion, which situated most external zone exposed to ambient cold sea water. Some vent portions were also compared with other locality behaviour.

Concentration of organic matter in fresh basalt was very low on the whole. Performing X-ray photoelectron spectroscopy (XPS), precipitation of organic matter and iron-oxide were evidently observed in past hydrothermally altered fluid vein beneath massive mound. Exterior and vent portion contained most abundant organic matter on the basis of total organic carbon (TOC, mean 0.06 wt%) and total nitrogen (TN, mean 0.01 wt%). Additionally concentration of extractable protein (enzyme) and DNA in corresponding portions were higher than those of middle and interior portion (Figure 1). Hence distribution of microbial potential were peculiarly high in the point. Stable carbon isotopic ratio of organic carbon

varied from -19.4 to –21.5 permil, -18.7 to –23.2 permil and –20.3 to –25.7 permil in exterior, middle and interior portion respectively (vs. PDB). Two dimensional X-ray fluorescent (XRF) analysis described a mineral assemblage such as chalcopyrite ($CuFeS_2$), pyrite (FeS_2), and sphalerite (ZnS), resulting a slight positive correlation with the locality. The origin of biologically labile organic matter localized in chimney structure will have to be identified on that it derived from endogenous and/or exogenous production.

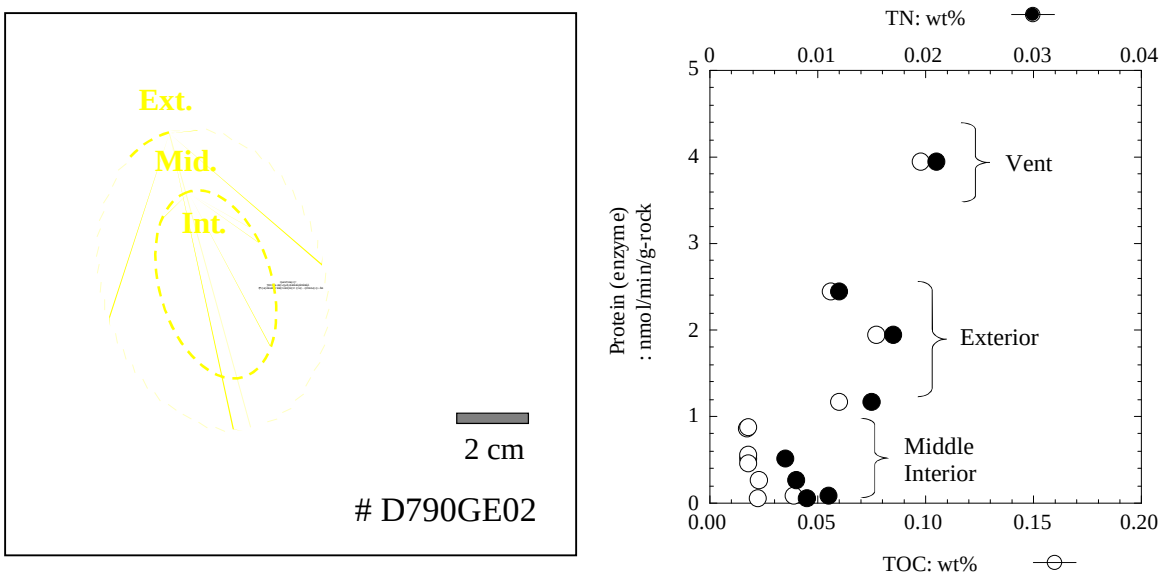

Figure 1. Correlation between organic content (TOC & TN) and protein (enzyme).

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