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MORB and mantle peridotite along southern Central Indian Ridge: Preliminary results of dredge during KH-10-6 cruise

Hiroshi Sato[1*], Kentaro Nakamura[2], Yumiko Harigane[3], Motoko Yoshizaki[4], Takamaru Ryo[5], Tanaka Yuichiro[6]

[1]Senshu University, [2]PEL, JAMSTEC, [3]University of Houston, [4]Tokyo Institute of Technology, [5]Kanazawa University, [6]The University of Tokyo

Two active hydrothermal systems, Kairei and Edmond, are found along the Central Indian Ridge (CIR) with intermediate spreading rate (~ 48 mm/year). These hydrothermal system show distinct geochemical signature in their vent fluids. The former, Kairei Hydrothermal field (KHF), is characterized by hydrogen-rich hydrothermal activity (Gamo et al., 2001, EPSL), and it is located at the first segment of CIR. The latter, on the other hand, Edmond Hydrothermal field, show normal or lower hydrogen concentrations (Gallant & Von Damm, 2006, G3), and it is located at the 3rd segment of the CIR.

Recent investigations revealed that the origin of high hydrogen concentrations of the KHF is related to the serpentinization of olivine-bearing mafic to ultramafic rocks, which are exposed around the KHF (Kumagai et al., 2008, Geofluids; Nakamura et al., 2009, EPSL). However, these rocks are collected only from eastern side of the KHF, and detail distributions of olivine-bearing mafic to ultramafic rocks around the KHF was still uncertain.

In KH-10-6 cruise, we performed 10 dredge operations around the KHF in order to reveal the geology of the north of the KHF. Further 12 dredge operations are performed from 1st to 4th segments of CIR. Descriptions of recovered samples during KH-10-6 cruise are as follows.

Yokoniwa-rise, north of the KHF
KH-10-6DR01: ol-phyric basalt with glassy surface; dolerite; gabbro; serpentinized peridotite
KH-10-6DR02: aphyric to sparsely pl-phyric basalt with glass rim
KH-10-6DR03: slightly to highly pl (-ol) phyric basalt. Large pl-phenocryst (up to 2cm in size)
KH-10-6DR04: aphyric to sparsely pl-phyric basalt
KH-10-6DR05: sparsely pl-phyric basalt with glass rim. Large pl-phenocryst (up to 2cm in size)
KH-10-6DR06: aphyric to pl-phyric basalt with glass rim in places
KH-10-6DR08: highly altered dolerite and breccia (green schist facies metamorphism)
KH-10-6DR09: fine- to coarse-grained altered gabbro with dolerite; altered oxide gabbro; serpentinite
KH-10-6DR10: ol-pl phyric basalt with glassy rim; gabbro; amphibolite; serpentinized peridotite
KH-10-6DR11: serpentinized peridotite with deformation (foliation)
KH-10-6DR12: ol-phyric basalt (ol phenocryst up to 2 mm in size); weathered massive sulfide with goethite rim; serpentinized (and weathered) peridotite

CIR-1, ridge axis and off-ridge
KH-10-6DR07: basaltic glass; aphyric basalt
KH-10-6DR20: serpentinized peridotite with serpentine vein
KH-10-6DR21: aphyric basalt with glassy rim; serpentinized peridotite; gabbro
KH-10-6DR22: Mn-coated serpentinite, aphyric basalt, and mud stone

CIR-2
KH-10-6DR17: altered basalt with chlorite vein; altered dolerite
KH-10-6DR18: basalt glass; pl-phyric basalt with glassy rim
KH-10-6DR19: serpentinized peridotite with serpentine vein; gabbro; pyroxenite

CIR-3
KH-10-6DR15: very fresh aphyric basalt with glass rind with pillow lava texture
KH-10-6DR16: very fresh aphyric basalt with glass rind

CIR-4

KH-10-6DR13: pl-phyric basalt with glass rind (pl phenocryst up to 5 mm in size); basaltic glass
KH-10-6DR14: sparsely ol-phyric basalt with glass rim

These observations clarify inter-segment scale petrological differences along southern CIR as well as geological features around the KHF. We present here the petrological preliminary features (petrography, petrology, mineralogy, and microstructures) observed in mafic to ultramafic rocks obtained from the north of KHF and the 1st to 4th segments of CIR.

Keywords: mantle peridotite, mid-ocean ridge basalt, Central Indian Ridge