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Petrology of peridotites in the southern part of the Central Indian Ridge: Implications for ocean floor formation

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A wide variety of peridotites (lherzolte, harzburgite, dunite and orthopyroxene-rich peridotite) including plagioclase dunite-troctolite was recovered from the southern part of the Central Indian Ridge by submersible dives & dredges using the SHINKAI 6500 and the R/V Hakuho-maru. We examined these peridotites and discuss their implications for the formation of ocenic lithosphere.

Oceanic Core Complex (25S OCC): A typical oceanic core complex (25S OCC) has been well described in this area (Kumagai et al., 2008 *Geofluids*; Sato et al., 2009 *G-cubed*). We recovered harzuburgites cut by gabbroic veins, gabbroic rocks from olivine-gabbro to oxide gabbro, granitic rocks, dolerite, basalt and their deformed rocks (Nakamura et al., 2007 *Geochem. Jour.*; Morishita et al., 2009 *Jour. Pet.*). Peridotites are residues after moderate degree (13-15 %) partial melting, then were slightly chemically modified due to infiltration of evolved melts (now gabbroic veins). Petrological and mineralogical characteristics of gabbros are basically similar to Hole 735 B gabbros in the Southwestern Indian Ridge. Deformation and alteration of these lithologies were locally concnentrated along the detachment fault, resulting in exhumation of the OCC associated with long-lived fault activities. Small serpentine bodies were also found in this area (Green Rock Hill of Hellebrand et al., 2002 *Jour. Pet.*, Yokoniwa Hills of *this study*). Petrological characteistics of these peridotites are the same as those from the OCC.

Dunite-Troctolite small body (Uraniwa Hills): We found small hills near the Kairei Hydrothermal Filed, which might compose of plagioclase dunite, troctolite olivine gabbro and dolerite based on the results from our submersible dives (Nakamura et al., 2009 *Earth Planet. Sci. Lett.*). These rocks can not be explained by crystal fractionation model but might be interpreted as the series of products after melt-mantle interactions (cf. Arai & Matsukage, 1996 *Lithos*).

Peculiar Serpentine knoll (not named yet): We recovered pyroxene-rich peridotites from a knoll along the Central Indian Ridge (Morishita et al., 2013 *AGU abst.*). Only gabbros and serpentine were recovered from the top of the seamount by dredge. Peridotite samples were classified into (1) dunite, (2) pyroxene-bearing peridotite (olivine > pyroxene) and (3) pyroxene-rich peridotite (pyroxene > olivine). It is noted that almost samples of pyroxene-bearing peridotite are nearly completely serpentinized. Spinel is usually the only relic of mantle assemblages. Spinel compositions of the pyroxene-bearing samples are 0.3-0.4, identical to those of OCCs and small peridotite bodies. Pyroxenes in both the pyroxene-bearing and the pyroxene-rich samples are orthopyroxene. We proposed that the pyroxene-rich rocks were formed by interaction with silica-rich melt/fluid in a different tectonic setting, such as subduction zone, in ancient time rather than the mid-ocean ridge setting. Our recent Os isotopic data on these rocks supports the ancient subduction-metasomatized peridotite origin.

Implications: We will discuss the implicatins of the existing of these peridotite in this region on the formation of oceanic plate.

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Keywords: Peridotite, Ocean floor, Ancient event, melt-peridotite interactions, Central Indian Ridge, troctolite