Petrology and geochemisty of the Central Indian Ridge peridotites: ridge processes and prehistory

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The southern end of the Central Indian Ridge (CIR) is characterized by an intermediate-spreading mid- ocean ridge (5 cm/year, full spreading rate) that is different from the Atlantic (slow-spreading) and the Pacific (fast- spreading) ocean ridges. It is, therefore, the southern end of the CIR which will provide us with unique opportunities to study the magmatic and tectonic evolution along an intermediate mid-ocean ridge. Three submersible expeditions of the SHINKAI 6500 and one dredge expedition of the Hakuho-maru were conducted in the southern end of the CIR. Here we summarize petrological and mineralogical characteristics of peridotites from the studied area.

Peridotites recovered from the studied area are generally characterized by moderately to highly depleted melt components. The partial melting of these peridotites is followed by chemical modification through interaction with a wide range of melts from relatively less evolved to highly evolved characteristics, resulting in the formation of gabbroic to felsic veins. Moderately to highly depleted melt components in the studied peridotites can be explained as being either residue after a relatively high-melt productivity period in intermediate-spreading ridges or a geochemically distinctive domain which has suffered from partial melting in the past rather than partial melting beneath the present mid-ocean ridge systems.

We also recovered orthopyroxene-rich lithologies from a small knoll along the CIR. The orthopyroxenite is characterized by a distinctively high in radiogenic Os (187Os/188Os) isotope signatures (0.1475- 0.1499) with relatively high in Re contents (382-402 ppt) whereas the Os isotope of the harzburgite is slightly lower than the present-day depleted MORB mantle (0.123-0.126). Mixing of depleted mantle with exotic component that have an isotopic component with high 187Os/188Os ratios, i.e., radiogenic Os components, are required for the sample. We conclude that ancient subduction-modified mantle domains, probably formed at continental margin of the Gondwanaland, now exists beneath the Central Indian Ridge.