

Geochemical variation across the segment in the southernmost segment of the Central Indian Ridge

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Chemical compositions of Mid-Ocean Ridge Basalt (MORB) reflect chemical characteristics of source mantle beneath the ridge. Therefore, MORB is one of the windows to understand the nature of upper mantle chemistry. Recent our petrological and geochemical investigations of MORB at the southern segments of Central Indian Ridge (CIR) reveal the heterogeneous nature of MORB-source mantle (Sato et al., 2015). Sato et al. (2015) concluded that the MORB from the off-ridge area at the CIR southernmost segment (off-ridge MORB) have more primitive major element compositions ($Mg\# = 70$) and more depleted trace element compositions (e.g., $Nb/Zr < 0.02$) than the N-MORB. Furthermore, the degree of the depletion of trace element increases for the samples away from the present spreading axis.

Off-ridge MORB is enriched in radiogenic Sr than the MORB from the present spreading axis in spite of their depletion in trace element compositions. The off-ridge MORB recovered away from the present spreading axis is more enriched in radiogenic Sr, i.e., $^{87}Sr/^{86}Sr$ ratio varies as a function of distance from the spreading axis. Nd isotope ratios of off-ridge MORB have a similar range ($\epsilon Nd = +7.6$ to $+8.2$) to those of the present axis MORB ($\epsilon Nd = +7.8$ to $+8.7$; Nishio et al., 2007), and they do not show any systematic variations in contrast to Sr isotopes.

The $^{206}Pb/^{204}Pb$ ratios of the off-ridge MORB range from 17.1 to 17.6, and they are similar to the present axis MORB (17.3 to 17.7). The $^{207}Pb/^{204}Pb$ ratios of the off-ridge MORB vary from 15.44 to 15.48, and they are similar to those of the present axis MORB (15.44 to 14.56). The $^{208}Pb/^{204}Pb$ ratio of the off-ridge MORB ranges from 37.1 to 37.6, and they are slightly less radiogenic than those of the present axis MORB (37.2 to 37.7).

Although Pb isotope ratios of the off-ridge MORB are similar to those of the present axis MORB, both $\Delta 8/4$ and $\Delta 7/4$ (the offset of $^{208}Pb/^{204}Pb$ and $^{207}Pb/^{204}Pb$ relative to the Northern Hemisphere reference line at a given $^{206}Pb/^{204}Pb$, as defined by Hart, 1984) of the off-ridge MORB are different from those of the present axis MORB. $\Delta 8/4$ of the off-ridge MORB ranges from 65 to 75, which is higher than the values of the present axis MORB (58 to 65). Particularly, the MORB away from the present spreading axis has systematically higher $\Delta 8/4$ and $\Delta 7/4$.

The geochemical and isotopic evidence indicates that the off-ridge MORB at the CIR southernmost segment has the following characteristics as a function of distance from the spreading axis: depletion in trace element, enrichment in radiogenic Sr, higher $\Delta 8/4$ and $\Delta 7/4$. These systematic variations might result from systematic distributions of the mantle domain beneath the CIR spreading axis.

Keywords: MORB, Central Indian Ridge