

Origin of peridotites outcropped in the westernmost margin of the southern Mariana Trench

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The Izu-Bonin-Mariana (IBM) arc is a typical intra-oceanic arc system. The forearc is non-accretionary convergent margin, where mafic crustal rocks occurred along the inner trench slope with mantle peridotites. Mariana arc system is the southern part of the IBM arc system and forms arcuately. The trench axis of the southern Mariana trench runs across Mariana volcanic arc and backarc basin (Mariana trough) and is connected to Parece Vela Basin at the westernmost area. There have been no geological studies on the westernmost Marianas trench since Hawkins and Batiza(1977). Recently, investigations for the junction area between Mariana trench and Parece Vela Basin have been conducted using the submersible Shinkai6500 (Dive 6K1397 and 6K1398) as a part of YK14-13 cruise by the R/V Yokosuka in 2014. Shinkai6500 recovered plagioclase-bearing lherzolites and harzbergites from the tectonic ridge along the inner trench slope of the westernmost Mariana Trench. The samples show coarse grained textures (>1mm), heterogeneous intermediate textures, and fine grained textures (<0.6mm). The peridotites with the coarse grained texture were sampled from the shallowest part (3705-4042m) in the dive area, whereas the peridotites with the fine grained textures were sampled from the deepest part (5996m). Olivine fabrics vary associate with texture. : (010)[100]pattern for the coarse grained textures, {0kl}[100]pattern for the fine grained textures, and various indistinct patterns for the heterogeneous textures. The variations of both olivine textures and crystallographic fabrics with depth suggest variations of deformation processes with depth. Olivine-Spinel compositions are in a range of the Olivine-Spinel Mantle Array, indicating that the peridotites are depleted residues after partial melting of the upper mantle. Spinel compositions is bimodal between moderately high Cr# spinels (up to 0.54 in 6K1398R16) and relatively low Cr# spinels (as low as 0.30 in 6K1397R18). The increase of Cr# appears to be correlated with Ti contents (0.03-0.49), indicating that melt-rock interaction under shallow lithospheric mantle conditions. Furthermore, chemical compositions of Spinel Mg# and Cr# are almost identical to those of Parece Vela Basin peridotites, suggesting that Parece Vela Basin Mantle may be exposed on the inner trench slope in the westernmost Mariana trench.

Keywords: peridotite, Mariana Trench, Parece Vela Basin, olivine, CPO