

Harzburgite xenoliths from Oshima-Oshima volcano revisited: the upper mantle material of back-arc basin

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Harzburgite xenoliths from Oshima- Oshima volcano, off Hokkaido, Japan have been examined petrologically and geochemically as a mantle material beneath the Sea of Japan. As noted by Ninomiya and Arai (1992) harzburgite is quite rarely found in andesite of the Nishiyama Middle lava (Yamamoto, 1984) of the Oshima- Oshima volcano. Ultramafic rocks (dunite, wehrlite, clinopyroxenite, harzburgite) usually enclosed or cut by gabbroic rocks, making composite xenoliths.

The Oshima-Oshima harzburgite has been found as small (2 cm across) angular fragments within hornblende gabbro. The fragments are metasomatically altered by the gabbroic melt to various extents from the margin. We expect the central part is intact in chemistry. The harzburgite exhibits protogranular texture and contains very small amount of clinopyroxene. Fo of olivine is around 91 and the Cr# (= Cr/[Cr+Al] atomic ratio) of spinel is around 0.5.

Clinopyroxene grains were analyzed for incompatible trace elements by La-ICP-MS. They show flat to weakly V-shaped REE patterns; possibly affected by surrounding gabbroic magma. Middle to heavy REE contents may be intact for clinopyroxene in the center of the fragments. Calculated REE contents of the melts in equilibrium with the harzburgite clinopyroxene are within the range for least fractionated basalts obtained from the Sea of Japan, indicating the harzburgite can be a restite for the Japan-Sea basalts. Chromian spinel in backarc basin basalts usually have intermediate Cr#,s, from 0.3 to 0.6, suggesting harzburgitic restite for them. Combined with this, harzburgite is predominant within the upper mantle beneath the back-arc basin. H₂O flux derived from the slab partly contributes to the relatively high degree of partial melting of the mantle peridotite on backarc-basin opening.