

Origin of basement lithosphere in the Izu-Ogasawara-Mariana arc and the back-arc basin areas

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Serpentinites derived from the upper mantle peridotites have been obtained from the basal slope of Ohmachi seamount, Izu-Ogasawara arc (Yuasa et al., 1999; Niida et al., 2001), which represent rocks of the deep-seated lithosphere of the arc. The serpentinites contain a number of primary grains of olivines with Mg#=0.90-0.91 and NiO=0.31-0.41wt%, suggesting a slightly depleted nature of the upper mantle. The primary orthopyroxenes are poor in Cr₂O₃ contents, which are similar to those from the subcontinental lithosphere generated at the beginning stage of continental break-up, such as Antarctic Seamount B and Zabargad, in contrast to those from Hess Deep and those of highly depleted peridotites from fore-arc ophiolites.

Petrological data from the Izu-Ogasawara-Mariana arc and the back-arc basin areas is still inadequate to understand origin of such a fertile mantle peridotite derived from those island arc settings. The following three different processes should be examined as possible origin for peridotites having a fertile upper mantle signature.

1. Originated from a slightly depleted upper mantle beneath continental margin, which has been existed prior to opening of the back-arc basin in this area.
2. Originated as a mantle plume peridotite with a fertile nature, in relation to slow lifting generated during opening of the back-arc basin in this area.
3. Modified into fertile peridotite from a pre-existed depleted upper mantle peridotite during recent island arc type magmatism.