Whole rock compositions of the Nikanbetsu peridotites, Hidaka belt, Hokkaido.

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The Nikanbetsu peridotite complex, Hidaka belt, Hokkaido, is composed mainly of plagioclase lherzolite (95%), with small amount of spinel lherzolite, harzburgite, dunite and mafic rocks. They exhibit a layered structure. Recently, Takahashi (2001) suggested that the complex represents a hotter portion than the Horoman complex and incipient partial melting took place in fertile lherzolites within spinel-plagioclase facies, during final ascent of the complex. Important information about incipient melting process can therefore be obtained by comparing the Nikanbetsu and Horoman peridotites. Whole rock major and trace element abundances of the Nikanbetsu peridotites were determined by X-ray fluorescence, PW1480, at the University of Tokyo. Al2O3 and CaO show straight inverse correlations with MgO. On the other hand, TiO2, Na2O, Sr and Y show convex downward trends against MgO. These trends are very similar to those of the Horoman peridotites (e.g., Yoshida and Takahashi, 1997; Takazawa et al., 1999), except that the range of the Nikanbetsu plagioclase lherzolite is wide and covers the whole range for the Horoman plagioclase lherzolite and fertile part of the symplectite-bearing lherzolite. The Nikanbetsu peridotites lack depleted harzburgite member, which contains more than 48% MgO. Plagioclase lherzolite sometimes hosting abundant plagioclase-rich veins is plotted at the low MgO end of the trend defined by Nikanbetsu peridotites, and is close to the composition of the primitive mantle (e.g., McDonough and Sun, 1995).

Takazawa et al. (1999) concluded that the polybaric melting of garnet peridotite could explain the convex downward trends, e.g. for Na2O against MgO, of the Horoman peridotites. The similarity of the variation trends may suggest that the layering of the Nikanbetsu complex had been formed at the same stage as the Horoman complex. Depleted plagioclase lherzolite occurs only between fertile plagioclase lherzolite and spinel lherzolite, and it sometimes contains symplectitic aggregates of which spinel has plagioclase rinds. These facts suggest that the depleted plagioclase lherzolite was originated from symplectite-bearing lherzolite. Its plagioclase was possibly formed from a low-degree partial melt and/or through a subsolidus decompressional reaction during final ascent under high-temperature conditions. The fact that the plagioclase lherzolite, sometimes with abundant plagioclase-rich veins, has kept the most fertile composition indicates the rapid cooling of the complex shortly after incipient partial melting to prevent large-scale melt segregation. This interpretation is consistent with existence of Na-Ca zoning in plagioclase in the Nikanbetsu peridotites.