The Nonsberg-Ultental peridotites, which occur within migmatized gneiss, are thought to represent former mantle-wedge material involved in a continent-continent collision in Palaeozoic times. On petrographic basis, Obata and Morten (1987) recognized the transition from coarse-grained protogranular spinel-peridotites to deformed fine-grained garnet- and amphibole-bearing peridotites with porphyroclastic and granoblastic polygonal textures. During the spinel-peridotite stage, the intrusion of mantle-derived melts gave origin to pyroxenite veins that eventually underwent a subsolidus equilibration under garnet-facies conditions (Morten and Obata, 1983). Thermobarometric estimates for the coarse-grained spinel-peridotites have been estimated at 1100-1230°C and 14-21 kbar whereas the fine-grained gar-

**ABSTRACT**

The Nonsberg-Ultental peridotites, which occur within migmatized gneiss, are thought to represent former mantle-wedge material involved in a continent-continent collision in Palaeozoic times. On petrographic basis, Obata and Morten (1987) recognized the transition from coarse-grained protogranular spinel-peridotites to deformed fine-grained garnet- and amphibole-bearing peridotites with porphyroclastic and granoblastic polygonal textures. During the spinel-peridotite stage, the intrusion of mantle-derived melts gave origin to pyroxenite veins that eventually underwent a subsolidus equilibration under garnet-facies conditions (Morten and Obata, 1983). Thermobarometric estimates for the coarse-grained spinel-peridotites have been estimated at 1100-1230°C and 14-21 kbar whereas the fine-grained gar-

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**PLATINUM-GROUP ELEMENTS ABUNDANCES IN A MANTLE WEDGE: THE NONSBERG-ULTENTAL PERIDOTITES, EASTERN ITALIAN ALPS**

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Fig. 1 - C1 chondrite-normalized PGE patterns.
net-peridotites give equilibration temperatures of 700-800°C at 25-28 kbar (Nimis and Morten, 2000). The bulk-rock composition of both peridotite types reveals their moderately depleted nature (Al₂O₃ = 4.2-2.0 wt. %) and shows a general enrichment in LREE, LILE and depletion in HFSE (Morten and Obata, 1990). Similarly, trace-element abundances in amphiboles are characterized by a strong LILE/HFSE fractionation (Rampone and Morten, 2001). These geochemical signatures have been related to the interaction between the peridotite and H₂O-rich fluids. These metasomatic fluids probably represent residual liquids left after crystallization of leucosomes during the migmatization of the host gneisses. In summary, the Nonsberg-Ultental peridotites underwent this sequence of events: (1) equilibration under high-T spinel-facies conditions; (2) intrusion of mantle derived melts; (3) subduction and equilibration under garnet-facies conditions and concomitant cooling due to incorporation in a crustal slab and (4) metasomatic enrichment by crustal-derived fluids.

The concentrations of the platinum-group elements (PGE) Ir, Ru, Rh, Pt and Pd were determined in 10 well-characterized peridotites that are representative of the different rock types. The analytical procedure employed has been described in Meisel et al. (2003).

Absolute PGE concentrations range between 1.79 and 5.39 ppb for Ir, 3.29 and 9.83 ppb for Ru, 1.18 and 2.43 ppb for Rh, 3.78 and 11.53 ppb for Pt and 4.74 and 11.75 ppb for Pd. Apart from a phlogopite-bearing peridotite (MO10), these concentrations are higher than the PGE contents estimated for the primitive upper mantle (McDonough and Sun, 1995). The CI-chondrites normalized PGE patterns (Fig. 1) are similar for all the samples. They show an increase in the IPGE region (from Ir to Rh) and a positive PdN/PtN ratio. Moreover, the relative PGE abundances of peridotites (with the exception of MO10) are comparable, from 0.007 to 0.020 x CI-chondrites. The PdN/IrN is generally suprachondritic and do not show correlation with the Al₂O₃ contents. The lower PGE contents in the phlogopite-bearing peridotite MO10, which has been collected at the contact between a fine-grained amphibole-peridotite and a garnet-pyroxenite, may be explained with the interaction between the ambient peridotite and the hot, mantle-derived melts that originated the pyroxenite layer. The estimated temperature for these hot melts (> 1400°C) is well above the liquidus temperature of both monosulfide solid solutions and Fe-Ni-Cu phases, i.e. the hosts of PGE. Therefore, the percolation of these hot rising melts may have lowered the PGE budget of the peridotite MO10 by partially removing its sulfides content. As a result, the peridotite-melt interaction may have produced PGE- and S-enriched melts that percolated the mantle wedge before the crustal-derived metasomatism. It is most likely that the crystallisation of such melts generated sulfide liquids that may be responsible for the PGE enrichment observed in the Nonsberg-Ultental peridotites. The subsequent fluid-dominated metasomatic event did not affect the PGE signature in the different rock-types as shown by the uniformity of the PGE patterns.

REFERENCES


