



Low temperature fertile spinel lherzolites from Sikhote-Alin, Far East Russia

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The Pacific margin of East and NE Asia is part of the circum-Pacific orogenic system and could be considered as a tectonic collage of nappes, displaced terranes, accreted island arcs and accretionary complexes. This tectonic environment is the consequence of the convergence between the Palaeo-Pacific plate and the eastern Eurasian continent. It could be divided into three main units; the Koryak-Kamachatka fold belt, the Sikhote-Alin fold belt and the Okhotsk volcanic belt. The broadly defined Sikhote-Alin fold belt here refers to a nearly N-S belt extending north from the southern shoreline of the Okhotsk Sea south to the northern margin of the Japan Sea.

The Mantle xenoliths come from Tuttochi, a locality close to Khabarovsk, Sikhote-Alin. The xenoliths are spinel peridotites, their sizes vary from 3 to 8 cm in diameter and they are exceptional fresh. The majority of the samples are coarse grained with protogranular texture. However a number of xenoliths have transitional textures from relatively coarse grained protogranular to fine grained equigranular textures. Hydrous phases such as phlogopite and/or amphibole were not found so far. The most striking feature is the fact that part of the xenoliths show heavy infiltration of melts. These melts circulate intergranular and react with the neighbor minerals creating veinlets with variable thickness that consists of glass and new forming minerals. Especially, their interaction with orthopyroxene results often to its almost entirely consumption, indicating that the invaded melt was silica undersaturated but rich in alkalis.

According to their modal composition the xenoliths are fertile spinel lherzolites as also can be inferred from the compositions of the constituent minerals. Olivine is forsteritic with Fo varying from 89.3 to 90.1 and the average NiO content is 0.37 wt%. The mg# of orthopyroxene and clinopyroxene vary from 0.895-0.904 and 0.904-0.915, respectively and the spinel is Al₂O₃-rich with an average of cr# = 0.100.

According to the REE abundances in cpx the spinel peridotites could be divided into three groups; group 1 has chondrite normalized REE with a concave upwards pattern. The LREE depletion expressed by the La/SmN ratio is medium to strong and varies from 0.11 to 0.53. The group 2 does not show any enrichment or depletion in LREE (La/SmN=0.64-1.05) and the group 3 shows an enrichment in LREE (La/SmN=1.85). While the chondrite normalized LREE abundances in cpx demonstrate variable enrichments and depletions, the HREE do not show significant differences among the three groups. Their overall Dy/YbN ratios vary from 1.05-1.16.

In the primitive mantle normalized incompatible trace elements clinopyroxenes show moderate negative Ti anomaly in respect to their neighbor elements. Same behavior has been observed for Zr.

The lithospheric mantle underneath Tuttochi is a fertile spinel lherzolite, which experienced low degrees of partial melting. Model calculation has shown that the lithospheric mantle in this area, according to model calculations, has experienced 1-5 % batch melting. Also the calculated equilibrium temperatures for the xenoliths at 1.5 GPa are relative low and range from 780° to 940°C.