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Spinel lherzolites from the lithospheric Mantle part of the paleo-Pacific Plate in Viliga, NE-Russia.

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Mantle xenolith bearing olivine melanephelinites from the Okhotsk sector of the Okhotsk-Chukotka Volcanic Belt (OCVB), northeastern Russia occur as small isolated volcanoes emplaced within massive late Early to Late Cretaceous subduction related calc-alkaline rocks.

The mantle xenoliths are typical medium to fine grained anhydrous spinel lherzolites that are strongly to weakly foliated with intensive to minor recrystallisation into mosaic texture. Whole rock composition reveals their fertile nature. The contents of Al_2O_3 and CaO, with exception of one sample with Al_2O_3 =1.72 wt% and CaO=1.63 wt%, range from 2.82-4.61 wt% and 2.60-4.06 wt% respectively. Their Ca/Al ratios vary between 1.04 and 1.24 with an average close to 1.2 (n=11) suggesting anomalously high clinopyroxene abundance. The primitive mantle normalized whole-rock REE have flat patterns or patterns with slightly elevated LREE [$(La/Yb)_N$=0.48-1.38]. Striking is the fact that the sample with the highest Al_2O_3 and CaO contents does not correspond to the sample with the highest REE concentrations. The REE in clinopyroxenes have systematically decreasing normalized-abundances from Sm to La, implying that the LREE enrichments in the whole rock REE patterns are attributed to circulation of minor intergranular fluids/melts as hydrous phases like amphibole and/or phlogopite are absent.

Equilibration temperatures and pressures calculated for the Viliga samples range between 1050˚C – 1160˚C and 15kbar – 21kbar respectively. Ca – diffusion rates in olivine reveal a rapid transport to the surface (2 - 6 days) of these peridotites.

Using two different methods, whole-rock major elements (Takazawa et al., 2000) and

clinopyroxene trace elements (Norman, 1998), model calculations have shown that the fertile lherzolites can be accomplished by 2-6% batch melting, whereas the depleted lherzolites require 15% batch melting of a primitive source.

Though the xenolith bearing olivine melanephelinites are located within subduction related massive calc-alkaline rocks, the xenoliths have not been affected by metasomatic processes and believed that their source is not the supra-subducted mantle but rather the lithospheric mantle of the subduction slab. The cessation of the interaction between the paleo-Pacific plate and the northeast Russian margin at $\sim$ 85 m.y. (Hourigan and Akinin, 2004) apparently caused a "piecemeal" collaps of the first followed by intrusion and ascent of olivine melanephelinitic magma, which entrained xenoliths from the lithospheric mantle of the subducted plate in the pliocene through the generated window(s). The fact that the sampled xenoliths do not show evidence for subduction related metasomatism and that their Nd and Sr isotopes have MORB signature (Akinin et al., 1997) are consistent with "piecemeal" collapse of the paleo-Pacific plate.

Literature

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