Ilmenite ultrabasite UV162/09: The role of deep metasomatism in the rock formation

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Ilmenite ultrabasite from the Udachnaya pipe (Yakutia) was studied with the help of a scanning electron microscope. The following mineral phases have been found and analyzed: olivine, ilmenite, orthopyroxene, phlogopite, garnet, clinopyroxene, sodalite, calcite, jerfisherite, hematite, spinel. The first five minerals are the rock forming minerals. The sample is non-uniform in structure, minerals distribution and chemical composition of the minerals. These variations of the composition, which demonstrates the disequilibrium of the majority of the minerals of this ultrabasite is given below (wt.%). *ga (1, 2, 5, 7, 8)*: SiO_2 40.55-42.36, TiO_2 0.7-2.21, Al_2O_3 18.99-21.7, Cr_2O_3 0.55-2.04, MgO 14.68-20.89, FeO 10.85-13.19, CaO 2.23-6.16; *opx (5, 7, 8)*: SiO_2 57.9-58.9, Al_2O_3 0-1.52, MgO 31.48-32.01, FeO 8.34-8.89, CaO 0-0.72; *opx1*: SiO_2 53.85, Al_2O_3 6.92, Cr_2O_3 0.36, MgO 25.44, FeO 11.94, CaO 1.49; *cpx1*: SiO_2 52.27, Al_2O_3 6.0, MgO 15.36, FeO 8.59, CaO 17.78; *ol (1, 2, 4)*: SiO_2 40.9-41.5, MgO 44.9-45.4, FeO 13.08-14; *ilm (1, 4, 5, 7, 8, 9)*: TiO_2 49.6-52, MgO 7.93-11.52, FeO 34.7-39.32; *phl (3, 4, 5, 6, 9)*: SiO_2 42.11-44.8, Al_2O_3 11.4-14.7, MgO 20.3-25.2, FeO 5.24-8.99, CaO 0-1.61, K_2O 10.4-11.4; *sod (6, 7)*: SiO_2 38.57, Al_2O_3 30.69, Na_2O 22.75, Cl 7.88; *jer (3, 4, 8)*: K 9.42, Fe 44.41, Ni 3.54, Cu 4.34, S 34.92, Cl 1.58.

Ga8+opx8 (I) and Alopx1+Alcpx1 (II) can be considered as equlibrium association. P-T parameters of the intermediate equilibriums of the rock, were determined from the compositions of the minerals: I – 1200°C-60kbar [1, 2]; II - 1100°C-20kbar [1, 2, 3]. The rock was formed in our opinion by the following script. Initially depleted harzburgite (olivine + orthopyroxene + few garnet) was subjected (and not once as judged from non-uniformity of the compositions) to the influence of deep aggressive fluid, which carried Fe, Ti, K, Cl, Na, S, H_2O. It was resulted in the sample treatment followed by the transformation of the existing and formation of new phases such as ilmenite, phlogopite, later jerfisherite, sodalite and Al-spinel, Al-pyroxenes, hematite and calcite at the latest stages (depth - 18-20 km).

[1] Brey & Kohler (1990) *J. Petrol.* **31**, 1353-1378. [2] McGregor (1974) *Am. Miner* **59**, 110-119. [3] 124. Wood & Banno (1973) *Contrib. Mineral. Petrol.* **42**, 100-124.

Evolution of composition of the Siberian craton lithosphere roots: Evidences from the Udachnaya xenoliths

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Udachnaya kimberlite pipe contains a unique complex of upper mantle xenoliths including practically all known types of the lithospheric mantle rocks [1]. The most deep-seated xenoliths representing lithosphere roots and carrying clear signs of secondary enrichment up to changes of initial mineral parageneses are of special interest [2, 3].

We studied a series of mantle peridotites from the depth a diamond stability field: a) megacrystalline Cr-pyrope harzburgites and dunites including diamoniferous varieties; b) initially extremely depleted peridotites carrying clear signs of intensive secondary enrichment by basanitic components; c) fresh sheared Cr-pyrope lherzolites.

Obtained results shows that ultra depleted peridotites including their diamondiferous varieties were secondary enriched in different scale by metasomatic agents having geochemical features close to carbonatitic melts. This caused enrichment in LREE and Ca, and in rare xenolits up to appearance of CPX prohibited in initial rock. Enrichment of initial ultra depleted peridotites by basanitic components was fixed in rare samples, and obviously this process was synchronous to the protokimberlite melts generation.

Sheared pyrope peridotites have a complex character of a composition evolution. Initially these rocks were depleted as a result of extraction from them melts of high degree of partial melting. Then depleted rocks were enriched by agent with high content of incompatible elements (probably carbonatitic melts) that caused significant increase of La/Yb ratio. And finally these rocks were intensively enriched by basanitic components, and their initial composition and geochemical features were significantly changed. Processes of deformation textures formation, secondary basanitic enrichment and generation of protokimberlitic melts were synchronous and an effect of the same reasons.

[1] Boyd *et al* (1997) *Contrib. Mineral. Petrol.* **128**, 228-246. [2] Pokhilenko *et al* (1993) *Russian J. Geol. Geophys.* **34**, 56-67. [3] Agashev *et al* (2006) *Doklady Earth Sciences*, **407A**, 3, 491-494.