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Titanium in garnets as indicator of inhomogeneous composition of lithosphere mantle

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The inhomogeniety of lithosphere mantle under platforms is the well known fact considered by numerous researchers (Sobolev, 1976; Griffin et al, 1999), who primarily dwell upon the ratio of different parageneses of rocks composing the mantle, e.g. pyroxenite, eclogite, lherzolite and dunite-harzburgite. In this paper the garnets with a high content of TiO_2 (>0.2%) are discussed. The low-Tigarnets are found in many kimberlite pipes both in the northern and southern fields of the Yakutian Province. This fact agrees with assumption about high-Mg and low-Ti composition of lithosphere mantle. The garnet composition from two neighboring northern fields of the Yakutian province shows that they embrace the Ti-rich blocks of lithosphere mantle.

We studied the composition of high-pressure minerals from heavy fraction of kimberlites for Chomurdakh (pipes: Chomur, Svetlaya, Snezhnaya, Druzhba, Ural'skaya, Olimp, dyke Pereval'naya) and Ogoner-Yuryah (pipes: Vasileostovskaya, Baltiyskaya, Aerogeologicheskaya) fields. The heavy fraction of kimberlites of these pipes basically consists of magnesian ilmenite; the number of garnet grains is less 1/100 parts of total number of ilmenite grains. The garnet from these pipes belongs to pyroxenite-vebsterite and eclogite associations. Garnets of diamondiferous dunite-harzburgite paragenesis are absent or occur as single grains.

The remarkable feature of garnets from almost all explored pipes, but pipe Ural'skaya, is their high-Ti composition. From 50 to 100 % of all garnets from heavy fraction of kimberlites are characterized by the TiO_2 content more than 0.2 % (to 1.9 %). Such unusually high content of high-Ti garnets in the kimberlites of Chomurdakh and Ogoner-Yuryah fields possibly reflects profound metasomatic transformations of separate blocks of lithosphere mantle in the north of Siberian platform.

In the conclusion it should be marked that the high content of Ti is the feature of composition of most kimberlites and basic rocks occurring in the northern termination of the Siberian platform. The question is whether the processes of Ti enrichment of separate blocks of lithosphere mantle, kimberlite and basic rocks are genetically interrelated. This issue should definitely be further explored.

References:

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