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Regional and local lithospheric mantle heterogeneity under the northern fields of the Yakutian kimberlite province

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The heterogeneity of the lithospheric mantle beneath the Siberian platform has become a widely accepted fact (Sobolev, 1976; Griffin et al, 1999; Tychkov et al., 2008; Ashchepkov et al., 2010-2016).
We studied the indicator minerals composition from most kimberlite pipes of the northern Yakutian fields (Chomurdakh, Ogoner-Yuryakh, West-Ukukit, Kuyoka, Molodinsky, Toluopsky). Here we pay attention to the TiO_2 in garnets - an indicator parameter of mantle heterogeneity. The majority of kimberlite pipes in northern barren fields as well as in southern diamondiferous Yakutian fields, are dominated by low-Ti garnet (TiO_2 <0.2%), which corresponds predominantly high-Mg and, respectively, low-Ti lithospheric mantle substrate. The garnet compositions in kimberlites from Chomurdakh and Ogoner-Yuryakh fields show that more than 50% of all heavy fraction garnets are the Ti-rich (> 0.2% TiO_2). TiO_2 in garnets correlates with REE, Rb, Nb, Zr and Hf. Thus, there are lithospheric mantle “blocks” which undergone metasomatic transformations by a high-Ti fluid enriched by incompatible elements.
The local heterogeneity of the lithospheric mantle under the Kuyoka field was established after garnet composition trends studying. Garnet compositions plotted in $Cr2O_3$-CaO show two different trends: 1) lherzolite paragenesis trend, dominating in the Kuyoka field; and 2) lherzolite-wehrlite paragenesis trend steep crossing wehrlite paragenesis field (an anomalous trend after Tychkov, 2008). The second trend was established for spatially adjacent Muza, Tokur and Irina pipes (north-eastern part of the Kuyoka field) as well as for Jila 87/2, Jila 79, Dyanga and Raduzhnaya kimberlite bodies (eastern part of the Kuyoka field). Notably that some pipes of these two groups have Cr-rich garnets related to diamondiferous dunite-harzburgite paragenesis. In this case, the eastern kimberlite pipes of the Kuyoka field are standout by presence of Cr-rich garnets with the unusual lherzolite-verlite paragenesis trend and diamond potential prospects. Possibly, that lithospheric mantle under east zone of Kyoika field preserved the primary mantle heterogeneity.

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