MANTLE NODULES IN KIMBERLITE ROCKS OF ARKHANGELSK.

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In Zimni Bereg area there are basalts and the kimberlite rocks of the two series: **Al-series** includes kimberlites and melilititites; **Fe-Ti-series** comprises kimberlites and picrites (Sablukov,1990). Mantle nodules are occur in kimberlite rocks of both series and only isolated grains of deep-seated minerals - in melilititites and picrites. Is investigated about 3000 inclusions of mantle rocks. Their abundanse in kimberlites is on the averange 1-2 pieces/10 metre of the drill-hole core. Xenoliths are usually strongly changed - serpentinisation, saponitisation.

Ultrabasic nodules of the Mg-Al series (according to Marakushev,1984) are represented by a spinel peridotites (facies "B"), garnetized spinel peridotites (subfacies "C1"), chrome-spinel and pyrope peridotites (subfacies "C2"), chrome-spinel and pyrope dunites (sub-facies "C3", facies "D"). Depth facies are given according to Sobolev,1975. There are rare amphibole and phlogopite peridotites, glimmerites. Rocks with hypidiomorphic textures prevail. Nodules with typical sheared texture are rare. Mantle metasomatism - amphibolization and phlogopitization are vividly manifestated in the xenoliths of facies "B", "C1" and "C2".

Ultrabasic nodules of the Fe-Ti series are represented by ilmenite and phlogopite-ilmenite lherzolites and websterites, as well as pyrope-ilmenite peridotites. A texture of rocks is usually hypidiomoirphic up to sideronitic. Sheared nodules with recrystallized olivine and ilmenite occur sometimes.

Basic inclusions are submitted by ferro-magnesium eclogites, eclogite-like rocks and granulites.

The most interesting among megacrysts are the large (up to 2.5 cm) allocation of phlogopite, having polysynthetic three - directional twinning.

There are zones of partial fusion having hyaline aggregate form, oval amygdales, neogenic grains of olivine, clinopyroxene and chrome-spinels in most of the nodule types.

The kimberlite composition is in perfect correlation with a set of mantle nodule types (fig.1). It enables to do a rough mantle rocks mapping and distinguish two types of the mantle substrate development areas: 1. depleted type - Al-kimberlite series development area; 2. enriched type - Fe-Ti-kimberlite series development area.

1. **DEPLETED** type. Mantle set is very limited but they have purely olivine (actually dunite) composition with clinopyroxene, orthopyroxene, chrome-spinel and pyrope in minor or acsessory contents. Hyperbasites are represented by a complete rock set corresponding to the hypogene facies: from the diamond-pyrope to spinel-pyroxene. All these rocks are ilmenite-free. Spinel types predominante and pyrope types are subordinate. Rocks with a typical porphyroblastic texture occur very seldom. Mantle

metasomatism is vividly manifested (amphibolization and phlogopitization). Basites are poorly represented and almost only by eclogite-like rocks, whilst typical eclogites are rare.

2. **ENRICHED** type. Mantle nodules set is very wide. It ilmenite-free hyperbasites wich comprise almost pure pyrope varieties corresponding the deepest part of the set: from diamond-pyrope to graphite-pyrope, which is often amphibolised. Unlike the 1-st type rocks, wide represented ilmenitic varieties - modal ilmenitic and pyrope-ilmenitic peridotites, pyroxenites and eclogites. Eclogite-like rocks and granulites are abundant.

Areal distribution of the two rock types is regular and shows central symmetry elements: central part of the area has enriched type, and periphery - depleted type (fig.2).

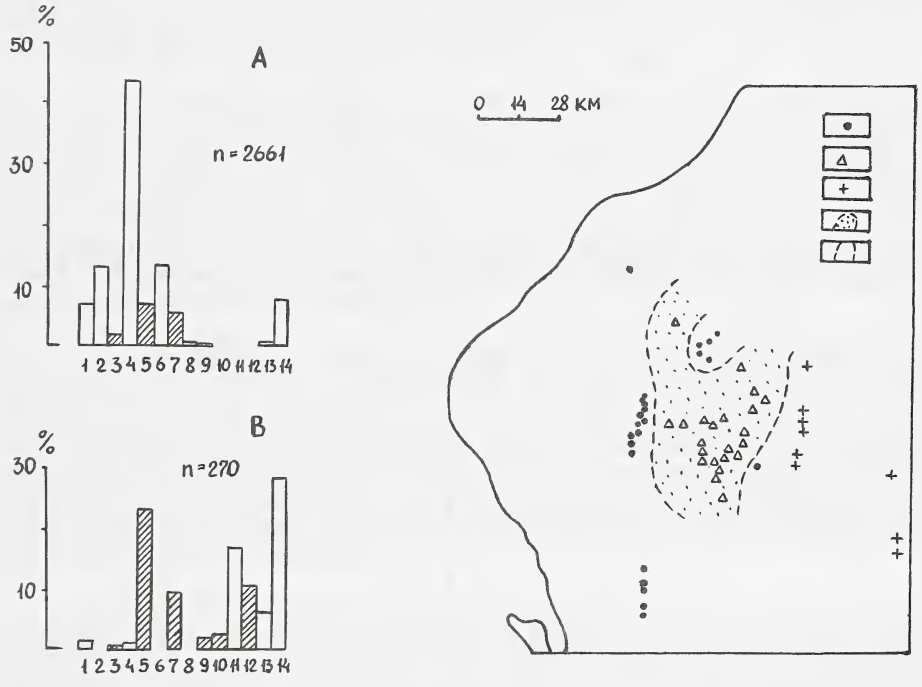

Figure 1. Mantle nodules distribution in kimberlites Al- (A) and Fe-Ti (B) series of the Zimni Bereg. 1 - olivinites, 2-9 ultrabasites of the Mg-Al-series: 3 - spinel -pyroxene facies, 4-5 - grospydite subfacies, 6-7 - coesite subfacies, 8-9 - diamond-pyrope facies, 10 - garnetized orthopyroxenites; 11-12 - Fe-Ti-series ultrabasites: 11-ilmenitic rocks, 12-pyrope-ilmenitic rocks; basic rocks: 13 - eclogites, 14 - eclogite-like rocks and granulites. The shaded columns stand for the pyrope type of ultrabasutes.

Figure 2. Deep substratum type distribution within the area of the Zimni Bereg. 1 - Al-series kimberlite rocks, 2 - Fe-Ti-series kimberlite rocks, 3 - basalts, 4 - enriched mantle substratum, 5 - depleted mantle substratum.

The preliminary quantiative estimation of the T-P parameters was conducted for nodules of Zolotitsa field - spinel and pyrope peridotites. Interval of received temperatures 800-1200° C, pressure - 17-53 kbar. The line of dependence temperature and pressure for these samples has a characteristic "inflexion", wich fixes sharp shift of conditions of deep minerals formation on a border of coesitic ("C3") and grospyditic ("C2") facies of depth. Study of chemical composition of minerals of the mantle nodules has shown, that for all minerals (Ol, Cpx, Opx, Pyr, Sp) exists a characteristic "inflexion". Trend of change of their composition at transition from coesitic to grospyditic subfacies of depth (fig.3).

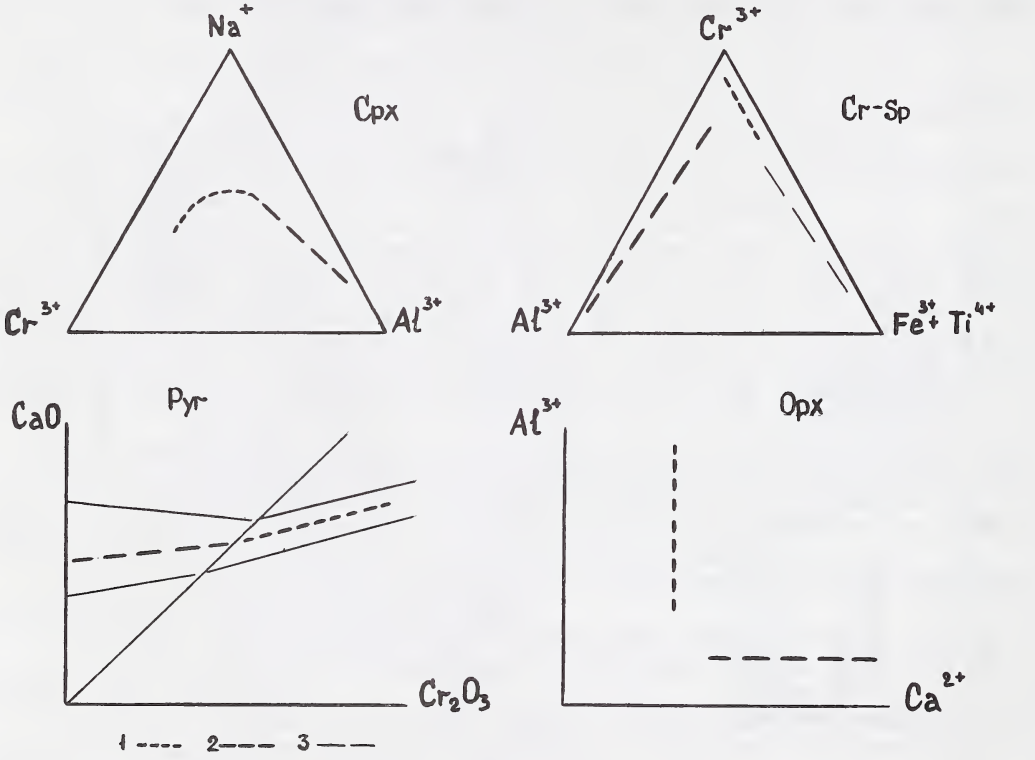

Figure 3. Alteration compositions trend of the minerals in the kimberlites of Zimni Bereg. Ultrabasitic nodules Mg-Al-series: 1 - coesite subfacies, 2 - grospydite, spinel-pyrope subfacies and spinel-pyroxene facies; 3 - second generation chrome-spinelides from kimberlite matrix.

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