PETROCHEMICAL SERIES OF KIMBERLITE ROCKS OF ARKHANGELSK PROVINCE.

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Kimberlite and related rocks diatrems are located in 4 regions of the North of Russian platform: on Zimni Bereg, Onega peninsula, Terski Bereg and Middle Timan. In each region volcanic rocks will form in a different measure a differentiatic series and take a definite part of a uniform range of rocks with successive strengthening "basaltic" properties (decrease of Mg, Ni, Cr, increase of Al, Fe, Sc): from kimberlites up to melilititites and picrites. A beginning of this arreu - in the field of mantle dunites and peridotites, ending - in the field of basalts.

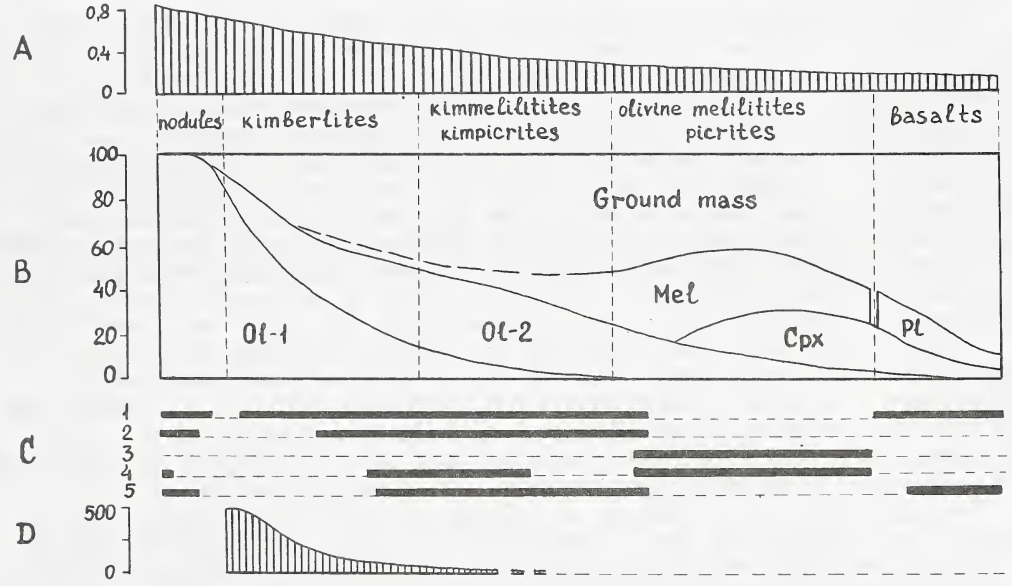

Figure 1. Change composition scheme of volcanic rocks of North Russian platform.
A - change magnesion (MgO/sFeO+MgO,mas.%) of rocks; B - modal composition of rocks (vol.%); C - volcanic rocks: of Zimni Bereg, 1 - Al-series, 2 - Fe-Ti-series; 3 - Onega peninsula; 4 - Terski Bereg; 5 - Middle Timan; D - diamondferous (rel.un.).

On Zimni Bereg there are two contrast groups of kimberlite rocks: 1. Aluminous series (kimberlites - kimmelilitites - pyroxene-free olivine melilitites); 2. Iron-titanium series (kimberlites - kimpicrites - melilitic picrites). For Al-series rocks characteristically very low contents of all incoherent

elements, presence of spinel and pyrope ultrabasitic nodules, prevalence of chrome-spinelid and absence picroilmenite; for rocks Fe-Ti-series - sharp increase of incoherent elements (first of all Ti, Ta, Th, Hf), abundance of pyrope and phlogopite-ilmenite ultrabasitic nodules, ubiquitous presence of picroilmenite.

On Onega peninsula volcanic rocks (pyroxene-free olivine melilitites - olivine melilitites - melilitites) are extremely poor in incoherent elements; among deep-scated minerals there are only chrome-spinelide and chrome-diopside.

On Terski Bereg are advanced the rocks of a range "kimberlites - pyroxene-free olivine melilitites - olivine melilitites - melilitites", for them characteristically the moderate contents of incoherents elements, picroilmenite is not detected.

On Middle Timan the kimberlite rocks (kimberlites - kimmelilititites - pyroxene-free phlogopite-olivine melilititites) are characterized by the moderate contents of incoherent elements; they contain the nodules of spinel and pyrope ultrabasites, chrome-spinel and picroilmenite are present about in equal quantities.

Kimberlite rocks of two series of a Zimni Bereg will form the different change of compositions trends in ranges on strengthening of "basaltic" properties. On the diagram of A.A.Marakushev,1984 (fig.2) trand of Al-series rocks coincides with axial part of the areas of compositions of deep ilmenite-free rocks: spinel and pyrope dunites, peridotites - pyroxenites - eclogites; and trend of Fe-Ti-series kimberlite rocks deviates to the compositions of ilmenite peridotites and pyroxenites. The volcanic rocks of Onega peninsula belong to the Al-series, making the most "basaltic" part, and on Terski Bereg and Middle Timan kimberlite rocks will form series of a intermediate types (with attributes both Al- and Fe-Ti-series).

Conformity of a peculiarity of mantle nodules and of kimberlites indicate that the distinctions between series of kimberlite rocks are stimulated by features of initial deep rocks melting of the mantle substrate (including a mantle metasomatism). Geochemical distinctions are displayed in features of incoherent elements distribution in kimberlites .

The distinctions between a volcanic rocks inside each of series are stimulated by a quantitative ratio in them of relict of initial mantle rocks and products of krystallisation of melt in subvolcanic conditions, and as well as features of differentiation of melt.Geochemical distinctions are displayed in features of distribution of coherent elements in kimberlites

The rocks of Fe-Ti-series of Zimni Bereg are close to a kimberlites of Jakutia and Group-1 of Africa, on the base of mineral composition and geochemical characteristics. The rocks of a Al-series will form independent array - from Group-2 of Africa they distinguish sharply by the lowered contents of incoherent elements. Australian lamproites differ from kimberlite rocks of both series of the North Of Russian platform by the sharply increased contents of incoherent elements (especially Zr, Hf, Th, Ba) and by ratio of a iron and titanium.

It is possible to allocate three contrast series of kimberlites and related rocks: aluminous, iron-titanium and

lamproitic. In some regions the kimberlite rocks will form series of a intermediate types. A beginning of trends of all kimberlite rocks series - in the area of mantle dunites and peridotites.

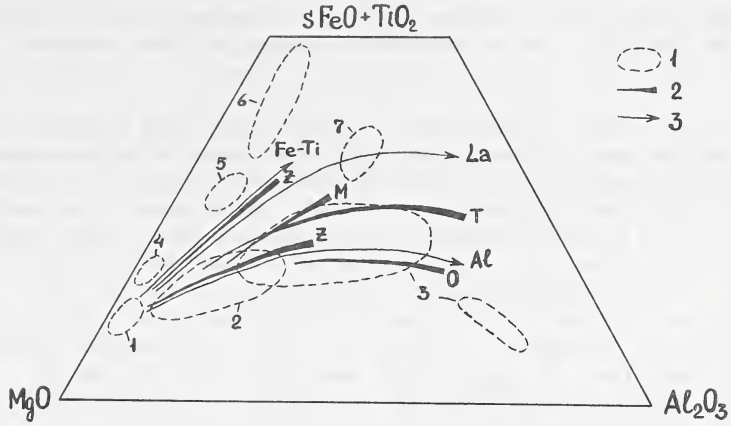

Figure 2. Kimberlite rock composition trends (diagram by Marakushev).
1 - Deep rock inclusion composition areas in kimberlites: spinel and pyrope dunite and peridotite (1), pyrope pyroxenites (2), eclogites (3), pyrope dunites and peridotites with ilmenite (4), phlogopite-ilmenite peridotites (5), phlogopite-ilmenite pyroxenites (6), rutile eclogites (7); 2 - kimberlite rock trends of Zimni Bereg (Z), Onega peninsula (O), Terski Bereg (T), Middle Timan (M); 3 - volcanic rock trends: Al-series kimberlite (Al), Fe-Ti-series kimberlite (Fe-Ti), lamproite (La) (Jaques and others,1986).

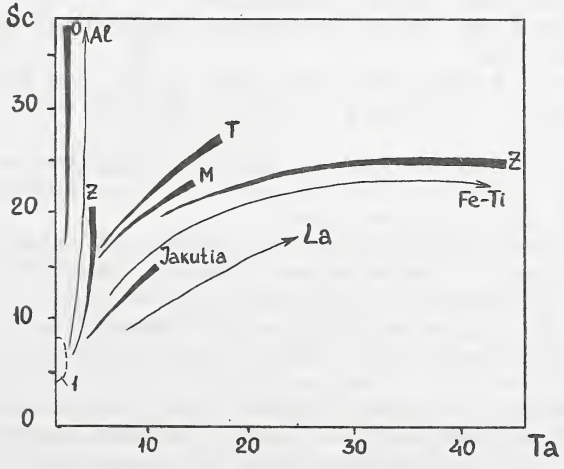

Figure 3. Kimberlite rocks composition trend with the coordinates Ta-Sc (ppm.).

Conditional signes on fig.2.

Marakushev A.A. Peridotite nodules in kimberlites and basalts as a sign of lithosphere deep structure. 27 IGC, petrology, reports, vol.9,Moscow, Nauka, 1984, p.155.
Jaques A.L., Levis J.D., Smith C.B. The kimberlites and lamproites of Western Australia, Perth, 1986, 268 pp.