SR, C, O ISOTOPE COMPOSITION IN KIMBERLITES OF THE NORTH-RUSSIAN PROVINCE (USSR).

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As compared with the Yakutian kimberlites which intruded in the crust of carbonate composition, the kimberlites of the North-Russian Province intruded into the Vendian terrigenous sequence mainly consisting of quartz sandstones, argillites and siltstones. The sedimentary cover is nearly 1 km thick. The new kimberlite province is located in the tectonic mobile zone (within the Zimnegorsk aulacogen) in the marginal part of the platform. This specific occurrence is responsible for morhological as well as compositional features; (i) existence of sills along with pipes; (ii) a wide composition variation in kimberlites including appearence of picrites; (iii) development of such secondary minerals as sepiolite and saponite along with serpentine; (iv) low concentration of a carbonate component in the rock of pipes.

The denudation of pipes from the North-Russian Province is small and amonts to several tens of meters. The upper parts of the pipes are filled up by the rocks of the crater facies (breccias and xenotuff breccias). In the pipe bodies the massive varieties are fairly rarely observed. The autoliths in breccias consist of massive fine-porphyritic kimberlites. The sills are also composed of the same type of massive kimberlites with a high concentration of carbonate component.

The isotope composition of Sr was determined at the Institute of Geochemistry in Irkutsk, and compositions of C and O were measured at CNIGRI Institute in Moscow. The table shows these results as well as calcite contents in the rocks and Sr in calcite., It should be noted that Sr in the carbonate phase was determined from acid extracts. This could lead to overestimating the values of Sr contents in calcite. The isotope Sr composition of silicate phase of kimberlites as well as picrites in pipe bodies has stable values and varies within a narrow range $(^{87}Sr/^{86}Sr)_{norm}$=0.7050-0.7057. The close isotopic characteristics indicate a common magmatic source for kimberlites and picrites of the North- Russian Province. The carbonate phase of the pipe kimberlites and picrites has $^{87}Sr/^{86}Sr$ ratios ranging from 0.7047 to o.7111. The low values, similar to those of the silicate phase , are estimated for autoliths. Similar low ratios (0.7036-0.7050) are found for a carbonate component of kimberlite sill Mela that suggets its magmatic nature. The Sr isotope composition of hydrothermal calcite (0.7095) is intermediate between the values which characterize the host rocks (o.711-0.713) and the mantle carbonate phase of kimberlite (0.704-0.705).

Together with the study of Sr isotope composition δO^{18} and δC^{13} were measured for the same samples in the carbonate component. As compared with the Yakutian kimberlites (for which the correlation between the isotope characteristics of Sr and O has been revealed (Kostrovitsky,1986)), in kimberlites of the North-Russian Province the correlation between Sr and C and between C and O is more distinctive.

Table of Sr, C, O isotope composition in kimberlites of the North-Russian Province

No	Rock	Pipe, sill	$CaCO_3$ in rock in wt%	Sr, in wt%	$^{87}Sr/^{86}Sr$	δC^{13}, in ‰	δO^{18}, in ‰
	Kimberlites (carbonate phase)						
1c	xenotuff-breccia	Karpinskaya	1.2	0.99	0.7095	-3.1	+25.7
2	- " - carbonated	Koltsovskaya	11.0	0.07	0.7111	-1.6	+22.7
3c	breccia	Lomonosov	1.5	1.01	0 7092	-5.1	+22.1
4c	autolith	Karpinskaya	1.3	1.49	0.7057		
5	- " -	Lomonosov	11.0	0.52	0.7047	-6.8	+12.8
6c	porphyric massive	Anomaly-695	45.0	0.035	0.7079	-8.1	+20.2
7c	porphyric massive	Mela sill	80.0	0.16	0.7036	-4.7	+22.1
8c	- " -	- " -	88.0	0.22	0.7050	-5.4	+21.7
9c	hydrothermal veined calcite	Lomonosov	44.0	0.013	0.7095	-1.5	+22.6
	Kimberlites (silicate phase)						
3s		Lomonosov		0.015	0.7057		
6s		Anomaly-695		0.023	0.7051		
7s		Mela sill		0.05	0.7052		
	Picrites (carbonate phase)						
10c	porphyric massive	Dike Igmo-Ozersk	2.0	0.49	0.7098	-1.1	+26.8
11c	xenotuff breccia	Yurasskaya	13.8	0.077	0.7085	-3.9	+24.3
12c	breccia	Nenok	1.5	0.17	0.7101	-6.6	+21.4
	Picrites (silicate phase)						
10s		Dike		0.023	0.7050		
13s	massive	Krutiha		0.03	0.7052		
	Host rocks (carbonate phase)						
14c	dolomite (xenolith)		80.0	0.046	0.7108	-0.6	+26.0
15c	sandstone		14.5	0.021	0.7131	-2.8	+20.2

C^{13} value of magmatic calcite varies from -4.7‰ to -7.6‰, of hydrothermal calcite and carbonized kimberlites from -1.5‰ to -1.6‰, of host rocks of the sedimentary cover from -0.6‰ to -2.8‰ in the PDB system. Oxygen from the carbonate component of kimberlite is marked by a heavy isotope composition, as a rule δO^{18}>+20‰ in the SMOW system. The value δO^{18} (+12.8‰) is similar to the mantle value only in a single sample of autolith.

Discussion. The main features of Sr, C and O isotope systematics in the kimberlites from the North-Russian platform are similar to those described elsewhere for kimberlites from the other provinces. The endogenic melt component in the kimberlites and picrites is characterized by low $^{87}Sr/^{86}Sr$ (0.704 to 0.706) ratio, typical range of δC^{13} (-5‰ to -8‰). The relatively high δO^{18} values result from profound changes of the kimberlites by the secondary hydrothermal-metasomatic processes. On the whole, the‰ isotope compositions of Sr, C and O indicate a significant influence of the host rocks on kimberlites. The carbonate component of kimberlites in the pipe bodies was mainly formed due to this influence. The mantle carbonate is preserved in the massive porphyritic varieties of kimberlites and picrites only.

Kostrovitsky S.I. (1986) Geochemical features of the kimberlite minerals. Publ. House "Nauka", Novosibirsk, 263 p. (in Russian).