KIMBERLITE AND LAMPROITE COMPARATIVE PETROGEOCHEMISTRY

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The discovery of very high-grade diamond-bearing lamproites in 1979 in Australia [1] has stimulated the study on correlation between kimberlite and lamproite chemical composition. For purpose of petrogeochemical comparison of lamproites and kimberlites from the Siberian platform with lamproites of Western Australia 25 rock speciments (15 of lamproitic series and 10 of kimberlitic one) have been analysed in the Earth Crust Institute for content determination of 11 oxides (SiO_2, TiO_2, Al_2O_3, Fe_2O_3, FeO, MgO, CaO, Na_2O, K_2O, CO_2, H_2O) and of 19 microelements (Ba, Li, Rb, Sr, Pb, Th, U, Zr, Nb, Y, La, Ce, Sc, V, Cr, Co, Ni, Zn, Sn). Rock samples of lamproitic series are represented by leucitites, leucitic lamproites and potassic minettes; kimberlite samples include basaltoid and micaceous varieties.

Has been made for the total sampling from 42 objects with 30 components in very of them (25 analyses on our data and 17 analyses of lamproites from Western Australia [1, table 31-34]) Computer-aided factor analysis.

The factor diagram for rockforming oxide and microelement contents (Fig.1) well illustrates, on the one hand, the difference between kimberlites and lamproites and, on the other, between lamproites of the Siberian platform and lamproites of Western Australia: kimberlites contain more of MgO, CO_2 and compatible elements (Cr, Ni, Co); lamproites of Western Australia are enriched in TiO_2 and in a quite a number of incompatible elements (Sn, Pb, Rb, Zn, Th, Ce, La); lamproites from the Siberian platform are characterized by higher Al_2O_3, Na_2O, U, V contents. In addition, the rocks of lamproitic series possess higher SiO_2, K_2O, Sr, Zn, Y, Ba contents compared to kimberlites, but lamproites and kimberlites of the Siberian platform are richer in FeO and CaO compared to lamproites of Western Australia. Fe_2O_3, Li and Sc contents do not show distinct regularities in distribution between three rock groups.

As diagram shows kimberlites of the Siberian platform and West Australian lamproites are located in the right half of the diagram (positive direction of the second factor) and lamproitic

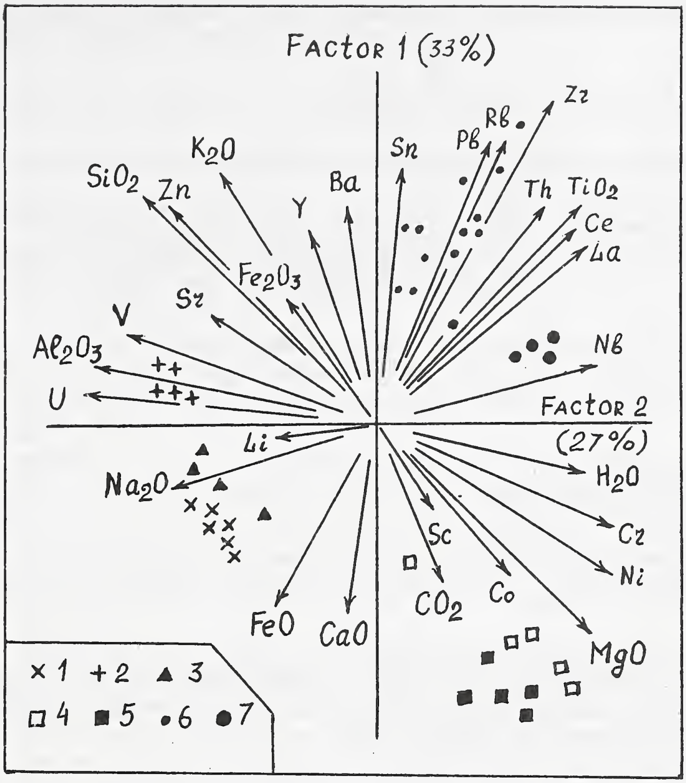

Fig. 1. Factor diagram for oxide and microelement contents in lamproites and kimberlites of Siberia and in lamproites of Western Australia (n = 42).
1-5 - Siberia: 1 - leucitites, 2 - leucitic lamproites, 3 - potassic minettes, 4 - micaceous kimberlites, 5 - basaltoid kimberlites; 6, 7 - West Australia: 6 - leucitic lamproites, 7 - olivine lamproites.

series of the Siberian platform is placed in the left one (negative direction of the second factor). Taking into account the fact, that the former is diamond-bearing rocks and the later is barren of diamonds, one may suggest that kimberlites of the Siberian platform and lamproites of Western Australia have been generated from magmatic melts initiated within diamond-pyrope depth facies, and lamproites of the Siberian platform - were generated from magmatic melts originated at shallower depth above the diamond stability level.

Lamproites of Western Australia and kimberlites of the Siberian platform are enriched in incompatible elements (Fig. 2), but lamproites are more largely, except for Nb and U. Incompatible element distribution pattern for kimberlites of the Siberian platform compared to their distribution curve for West Austra-

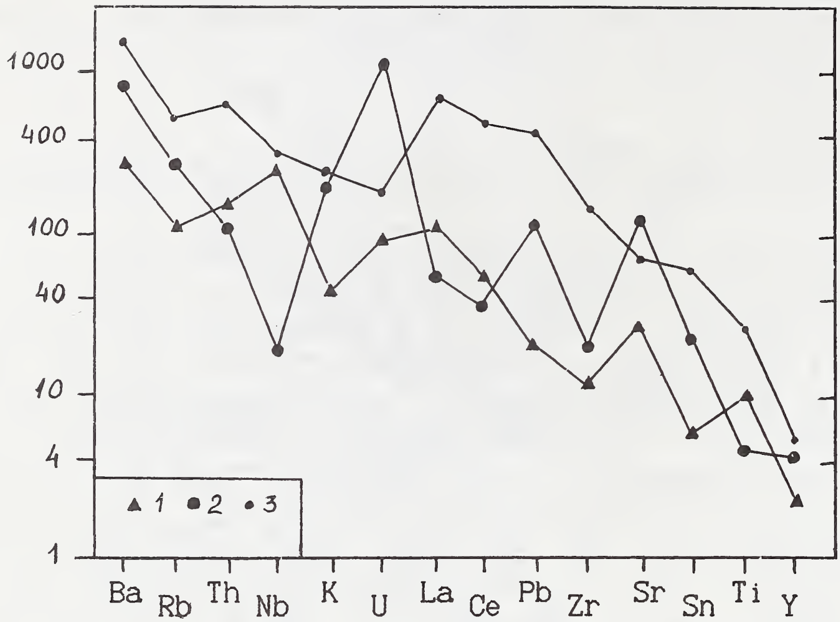

Fig. 2. Incompatible element distribution pattern for kimberlites (1) and lamproites (2) of Siberia and for lamproites (3) of West Australia relative to a primitive mantle [2].

lian lamproites with their total averall low content demonstrate a maximum for Nb, U, Sr, Ti and a minimum for Rb, K. Lamproitic series of the Siberian platform exibits even greater differentiation in incompatible element contents: a maximum for U, Rb, Sr and a deeper minimum for Nb, La, Ce, Zr and Ti.

Variations in petrogenetic and minor element contents of initial melts for three rock groups (kimberlites and lamproites of the Siberian platform and lamproites of Western Australia) are probably related to differencies in mantle substratum composition (different ration of ultrabasic rocks and eclogites) and to particularities of mantle metasomatism manifestation.

REFERENCES

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2. Sun, S.S., and McDonough, W.F. (1989) Chemical and isotopic systematics of oceanic basalts: Implication for mantle composition and processes. In Magmatism in the ocean basins, p.313-345. Oxford, Blackwell.