

PETROCHEMICAL AND GEOCHEMICAL FEATURES OF DIAMONDIFEROUS ECLOGITES FROM THE UDACHNAYA KIMBERLITE PIPE, YAKUTIA (RUSSIA)

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There are known several types of eclogites from kimberlite pipes, origin of which is connected with different genetic processes (JERDE et al., 1993, JACOB, 2004).

This work is devoted to study of processes of eclogite formation on example of 60 xenoliths of diamondiferous eclogites from the Udachnaya kimberlite pipe (Yakutia, Russia). The crystallization of these rocks took place at $T = 900 - 1400$ °C, $P = 35 - 55$ kbar. These parameters show the formation of the xenolith majority under mantle conditions.

The chemical composition of rock-forming minerals of the eclogites and the presence of accessory minerals (ilmenite, rutile, corundum, kyanite and sulfides) allow to divide the eclogites into three groups: magnesian, magnesian-ferrous and high-alumina varieties.

The bulk composition of the eclogites was determined by X-ray fluorescent analysis. The received data were compared with the some get from oceanic basalts of different types. Several similar and differ features were determined. Both for eclogites and oceanic basalts the same correlations between $f = Fe/(Fe+Mg)$ and $(Mg+Fe)/Si$ was established. This points to the magmatic nature of the Udachnaya eclogites. These eclogites and oceanic basalts differ by TiO_2 and SiO_2 contents and have absolutely different correlations between $(Mg+Fe)/Si$ and Al/Ca . Another essential evidence of magmatic origin of the Udachnaya eclogites is positive correlation between Ni-content and $f = Fe/(Fe+Mg)$, and negative correlation Co with $f = Fe/(Fe+Mg)$. The contents of Na_2O , K_2O and FeO were determined by atomic-absorption method. The diamondiferous rocks are characteristically enriched in Na_2O and K_2O .

The study of garnet REE patterns from eclogites the Udachnaya pipe was carried out by neutron-activation analysis and secondary ion mass-spectrometry methods. There are three types of REE distribution in the garnets were established: "typical" garnet patterns, unusual garnet REE patterns with negatively-sloped HREE and garnets with positive Eu anomalies. These data are confirmed the earlier information (JERDE et al., 1993). The correlation between the type of REE patterns and CaO content in the garnets was determined. The "typical" garnet patterns are specific only for this mineral (with contents ≤ 6 wt.% CaO) from the magnesian and magnesian-ferrous eclogites. The garnets with unusual REE patterns are characterized by higher concentrations FeO (19.31 wt.%) and CaO (9.59 wt.%) and occur in the magnesian-ferrous type of eclogites. The garnets (9.15 - 11.27 wt.% CaO) from the high-alumina eclogites are characterized by REE patterns with positive Eu anomalies.

We conclude that magnesian- and magnesian-ferrous eclogites from the Udachnaya kimberlite pipe were probably formed in processes of crystallization differentiation in upper mantle. Some high-alumina eclogite xenoliths may be of crustal origin.

References

- JERDE, E.A., TAYLOR, L.A., CROZAZ, G., SOBOLEV, N.V & SOBOLEV, V.N. (1993): Diamondiferous eclogites from Yakutia, Siberia: evidence for a diversity of protoliths *Contrib. Mineral. Petrol.*, 114, 189-202.
JACOB, D.E. (2004): Nature and origin of eclogite xenoliths from kimberlites. *Lithos* 77, 295-316.