Criteria of the mantle metasomatism intensity and diamond grades of kimberliotes

Alexander Ivanov¹, Zdislav Spetsius¹, and Mikhail Vavilov²

¹Scientific research geological enterprise, ALROSA, Mirny, Russia
²Sobolev Institute of geology and Mineralogy, SB RAS, Novosibirsk, Russian Federation

We proposed an assessment of the intensity of metasomatic processes in mantle sampled by kimberlites on the example of samples of pyrope compositions from kimberlites with a known diamond grade. The intensity of metasomatic dissolution was estimated on the Ti correlations, for low and high Cr pyropes.

For the titanium content in the pyrope compositions, positive high correlation coefficients were determined for such elements as Hf, Zr, Na typical for the processes of alkaline H₂O metasomatism. Binary diagrams makes it possible to determine the main relationship between the mineral-forming elements in the compositions of pyropes and its mineral impurities. We concluded that this metasomatism leads to the dissolution of low-chromic pyropes but diamonds still remain and may continue to grow. A higher degree of metasomatism the pyropes are characterized by a high content of titanium, for pyropes with high chromium contents. High degree of metasomatism brings to dissolution of pyropes and diamonds.

Burren kimberlite pipe Dennis, Pobeda, and Zarnitsa contains more than 14 % pyrope grains ad diamond affinity according to N. V. Sobolev, 1971. Dennis and dimond bearing pipes Pobeda is burren and Zarnitsa ~0.3 crt/t

It is considered [1-5] that if the sample contains grains from diamond-bearing ecological parageneses, or creased percentage of grains from diamond-bearing parageneses according to N. V. Sobolev [1], should contain diamonds. But for pyropes containing chromium oxides, Cr pyropes with TiO₂ > 0.6 weight %, should be burren. As well even if there is high grain content o from the cluster group G10 according to the classification Dawson J. B., Stephens W. E. [2]. Grant RFBR 19-05-00788.

The method is based on calculating and constructing a histogram of known chemical characteristics compositions of chromspinel. Structures at calculation of ratio of ulvashpinel minal from chromshpinelid compositions with creation of histograms.
At double prevalence in the samples of picritic and websterite paragenesis - kimberlite does not contain diamonds.

Kimberlite of Shchukina pipe does not contain diamonds
Zarya kimberlite is poorly diamondiferous
Although it is already necessary to take into account the diamond-bearing paragenesis.

Yubileynaya pipe is moderately diamondiferous.
With the dual prevalence of kimberlite and diamond-bearing over the first two

Aykhal pipe is highly dimondiferous
Nyurbinkaya kimberlite is hurricane diamondiferous