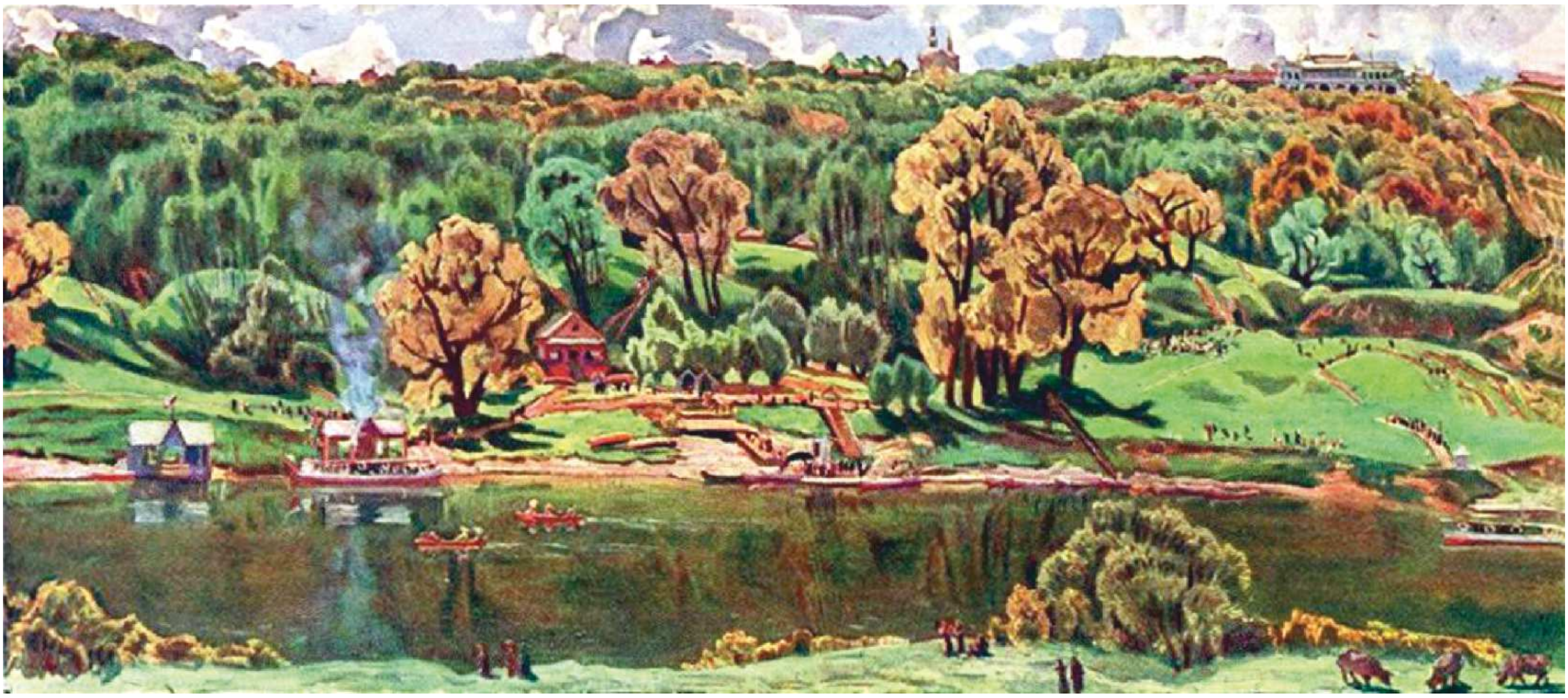
MAGMATISM OF THE EARTH AND RELATED STRATEGIC METAL DEPOSITS



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VERNADSKY INSTITUTE OF GEOCHEMISTRY
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Magmatism of the Earth and related strategic metal deposits

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The mineral deposits of strategic metals are vulnerable to political and economic changes, and their availability is essential for high-technology, green energy, and other applications. The most of they are related to the deep – seated alkaline magmas.

This book offers a collection of papers presented at the 35th International Conference on Magmatism of the Earth and Related Strategic Metal Deposits held from September 3th to 7th 2018 in Moscow, Russia.

The conference articles are focused on the understanding of the geological processes that produce high concentrations of critical metals in geological systems such as the metal transport in the mantle (possibly from the core-mantle boundary) and crust and enrichment processes, hydrothermal and metasomatic processes leading to the formation of such significant deposits. Papers in this book give a representative overview including mineralogy, geochemistry and origin of strategic metals deposits.

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The cover pictures - Sparrow Hills, May. Konstantin Fedorovich Yuon, 1910.

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EXPERIMENTAL STUDY OF AMFIBOLIZATION IN GABBRO FROM TIKSHEOZERSKY MASSIF (NORTH KARELIA)

Kovalskaya T.N.**, **Varlamov D.A., Shapovalov Yu.B., Kalinin G.M., Kotelnikov A.R.

Institute of experimental mineralogy, Chernogolovka, Osipyana str., 4, Moscow dictrict, Russia, Tatiana76@iem.ac.ru

The Tikshozero massif belongs to the formation of ultrabasic alkaline massifs with carbonatites, but it is located south of the main cluster of carbonatite massifs in the Karelian-Kola province, in the circumpolar part of North Karelia, to the south of the city of Kandalaksha (Metallogeny ..., 2001). A detailed study of rock-forming minerals and their parageneses in all types of rocks of the Tiksheozero Massif (North Karelia) revealed that they are all subject to intense postmagmatic changes. The development of chlorite and serpentinite is characteristic of ultrabasic rocks (olivinites, clinopyroxenites). In a number of cases, these minerals almost completely replicate grains of olivine and clinopyroxene (Kovalskaya et al., 2017). In gabbroids, a secondary amphibole develops. It forms rims around the cores of clinopyroxene, often with resorption (Fig. 1). Sometimes amphibole completely replaces clinopyroxene. By composition, the newly formed amphibole responds to pargasite, a typical mineral of postmagmatic associations (Perchuk, Ryabchikov, 1976).

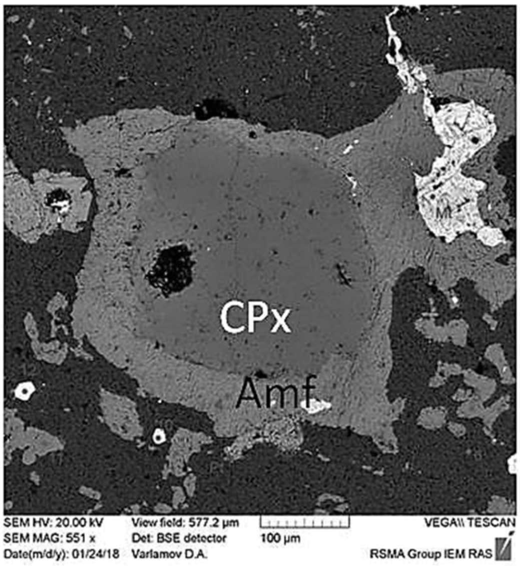

Fig. 1. Clinopyroxene with an amphibole rim. Gabbro. Tiksheozero massif.

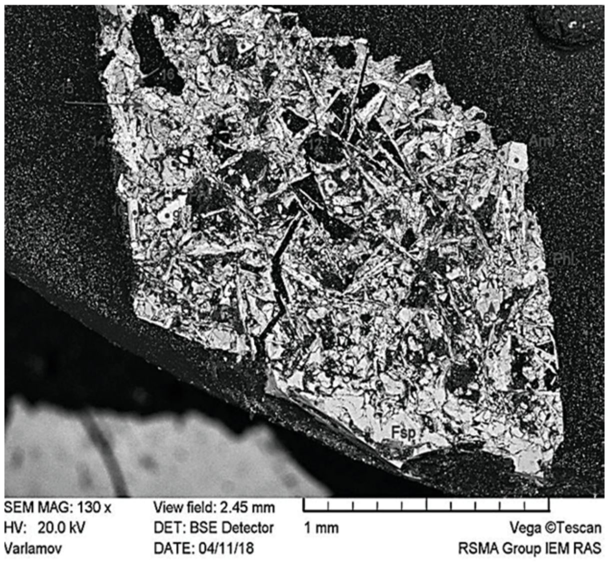

Fig. 2. Products of experiments on amphibolization of gabbro.

In order to recreate the conditions for the formation of postmagmatic changes in the gabbro, experiments were conducted to simulate gabbro amphibolization, since amphibole fringes around clinopyroxenes were found in gabbro samples from the Tiksheozero massif (Fig. 1). As initial components in the experiments, we took: a ground gabbro from the array of Lukkulaisvaara (Table 1), KF solutions of 1M and 2 M in a ratio of 1:10 to the weight of the sample. The duration of the experiments was 10 days. First, the reaction mixture was heated to 1100 oC and P = 3 kbar, kept at these parameters for 1 hour, then wasobaric cooling to 850 oC, P = 3kbar followed by holding for 10 days at these parameters. For the experiment we used platinum ampoules with a diameter of 5 mm. The experiments were carried out on a high pressure gas installation. The products of the experiments were a small-crystalline mass (Fig. 2) of a greenish-gray color. Investigation using a microprobe CamScan MV2300 showed that amphiboles formed in the experiments from the grinded gabbro massif of Luqqulaisvaara were formed, similar in composition to the amphiboles of the Tiksheozero massif of the pargasite group (Fig. 3).

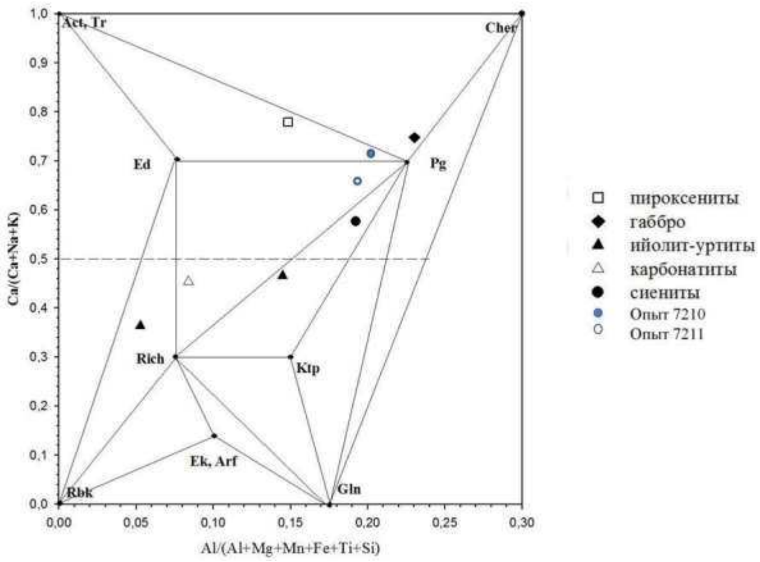

Fig. 3. Amphiboles of the Tikshozero Massif.

On the basis of the obtained data, it is possible to assume two variants of coexistence of pyroxenes and amphiboles in rocks of the Tmksheozero massif:

1. Natural amphiboles encountered in rocks along with pyroxenes are not paragenetic with them.
2. Natural amphiboles encountered in rocks together with pyroxenes have been altered (with increasing Ca content) during the evolution of the massif, possibly during carbonatization and development of the K-containing fluid. In favor of the second assumption is the presence in all these rocks along with pyroxene and amphibole and essentially calcium carbonate, as well as the presence of potassium minerals and the results of experimental studies.

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