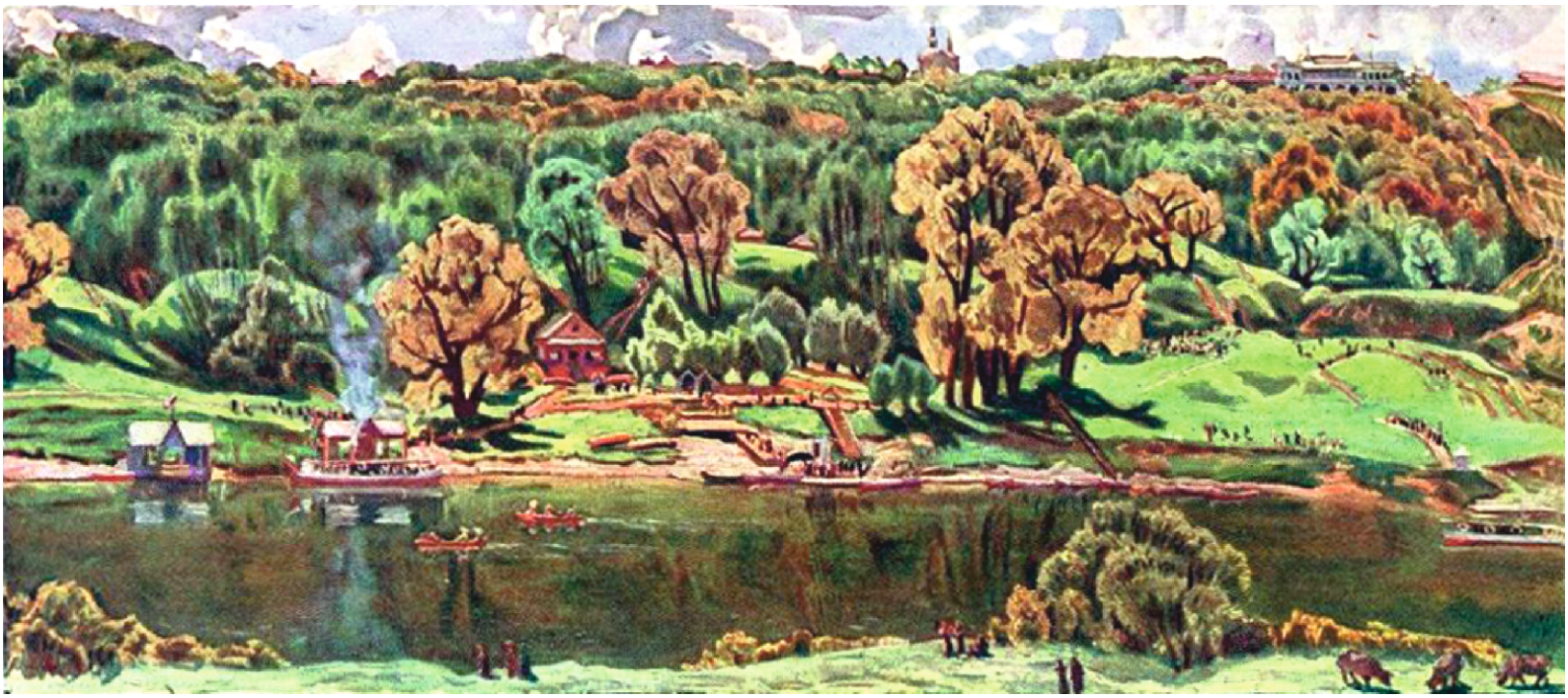
MAGMATISM OF THE EARTH AND RELATED STRATEGIC METAL DEPOSITS



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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 local MOHO. High solubility of Ni as $Ni(CO)_4$ at P=1 GPa was predicted in our paper (Simakin et al., 2016). Carbonyl decomposition can produce native Ni reported in the Avacha xenoliths.

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EXPERIMENTAL STUDY OF SUBSOLIDUS PARAGENESES OF ULTRAMAFIC LAMPROPHYRES OF THE IRKENEEVA-CHADOBETS TROUGH, SOUTHWESTERN SIBERIA AT 5 GPA

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Occurrences of alkali non-diamondiferous ultramafic lamprhophyres, which recently were found on southwest edge of Siberian craton (Kargin et al., 2016), are very informative and may help us to understand origin mechanisms and evolutions of such rocks, so comprehensive study of this case are important. Especially, experimental works on nature samples might model the system, what have been done in this work.

The first results of experimental study of a natural sample of ailikites from the Irkeneeva-Chadobets trough are presented in this paper. This sample represented ultramafic lamprophyres occurrence – Ilbokich uplift, where the rocks form a dykes. According to classification scheme (Tappe et al.,2005), these rocks are classified as ailikites. They are characterized by a porphyritic an/or globular texture, are enriched in primary magmatic carbonates (up to 25 wt.% of bulk CO_2), show great variety of olivine xeno- and/or phenocrysts, and rare pyroxene phenocrysts. Groundmass is composed of carbonates, phlogopite, clinopyroxene, spinel, ilmenite, rutile, perovskite, Ti-garnet, and K-feldspar. Variety of mineral assemblages, their composition and morphology indicate multi-stage evolution of the rocks, which included early magmatic, late magmatic and autometasomatic stages.

Variety of minerals, their composition and morphology indicates multi-stage evolution, which can be distinguished to magmatic and late magmatic, on which many autometasomatic processes occurred. Studied rocks are volatile-rich and the late stage processes strongly influenced on the paragenesis, because of that determination of solidus minerals is difficult, but very important to understand mechanism of origin. According to monomineral olivine thermometer (De Hoog et al., 2010) and some published data on ailikites (Tappe et al., 2006), the ailikite-forming melts of the the Irkeneeva-Chadobets trough were, presumably, produced at pressure about 5 GPa and temperature range 1400-1200°C (Smirnova et al., 2017). Nevertheless, the source of these rocks is difficult to

reconstruct. Along with geochemical approaches, experimental reproduction of a sub-solidus and super-solidus assemblages for these rocks at high-pressure can help to solve this problem.

We present results of the experimental study on ailikite from the Ilbokich uplift at 5 GPa and 1150 – 1500°C. Least altered ailikite sample, which is devoid of visible macro- and phenocrysts samples, was taken for the experiments. The experiments were performed with the toroidal "anvil-with-hole" apparatus and were carried out using platinum capsules. Duration of each experiment was 10 hours, exclude experiment under 1500°C, that one has been done for 3 hours. Samples were analyzed with electron microprobe in Moscow State University (JEOL JSM-6480LV) and IGEM RAS (JEOL JXA-8200).

All run samples characterized by full melting of a starting material, relative homogeneity and main mineral association: clinohumite + garnet + clinopyroxene + ilmenite + perovskite. In all experiments there are holes in ground mass, they may be a results from crumbled out carbonate, this can be proofed by rare carbonate inclusions in clinopyroxenes.

Experiments up to 1500°C are similar, but under higher temperature (1500°C) olivine became stable in this system. But in all run the grains have mosaic zonation, pores can be observed and carbonate are extremely rare, when in starting sample it was one of main phase.

This experimental data show that the area of stability of Ti-clinohumite are wide in that type of rocks, which is consistent with literature date (Hermann at al., 2007). In natural samples usually observed altered phases, which is considered as olivine, but may be in late evolution of the magma crystalized clinohumite, not olivine additional research is needed to clarify this issue.

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