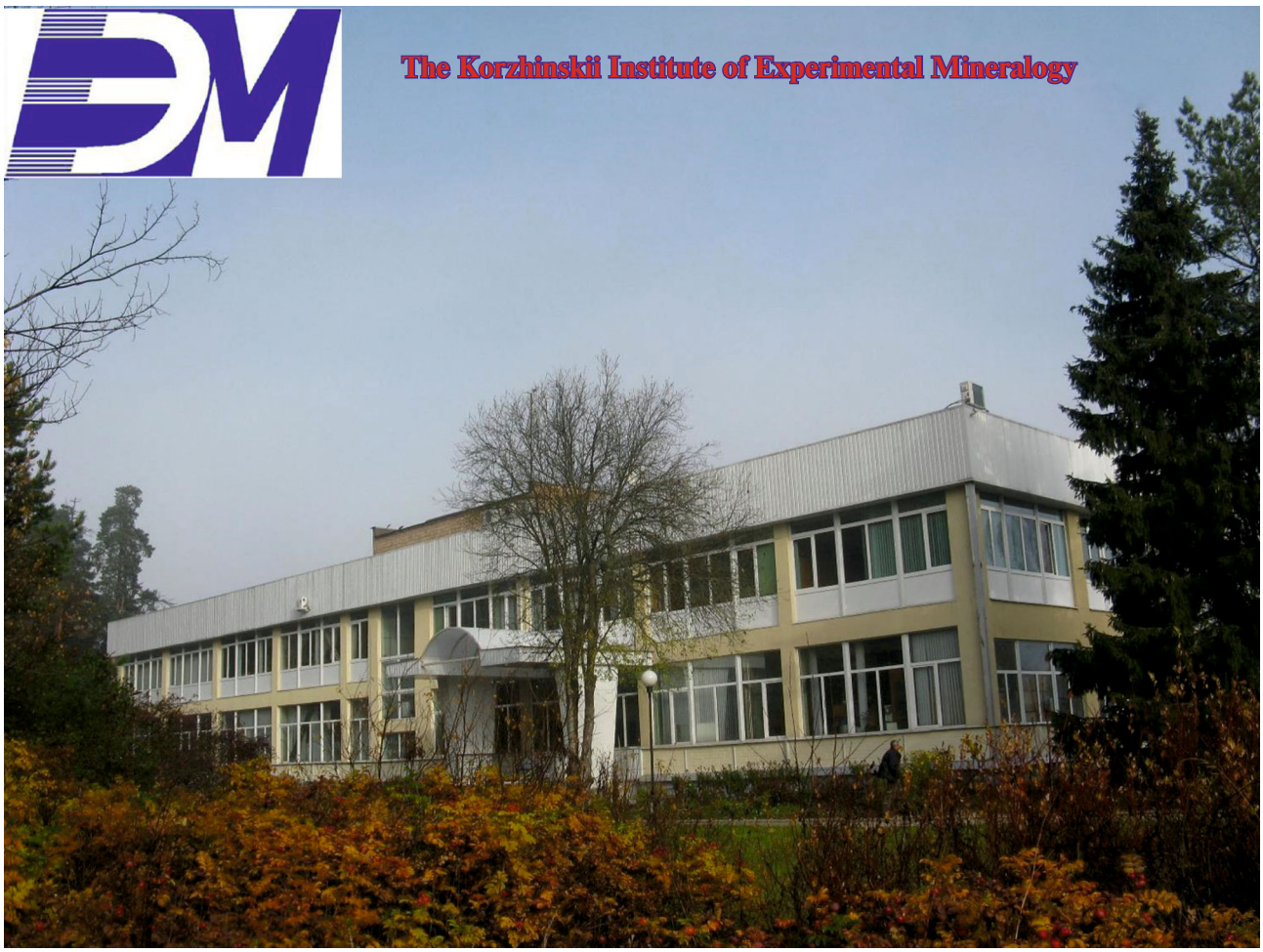
ISSN 0869-5911, Petrology, 2019, Vol. 27, No. 5, pp. 439–441. © Pleiades Publishing, Ltd., 2019.
Russian Text © The Author(s), 2019, published in Petrologiya, 2019, Vol. 27, No. 5, pp. 473–475.

# Fifty Years of the Korzhinskii Institute of Experimental Mineralogy, Russian Academy of Sciences

**DOI:** 10.1134/S0869591119050084




This issue of *Petrology* is dedicated to five decades of the establishment of the Korzhinskii Institute of Experimental Mineralogy, Russian Academy of Sciences (IEM RAS), which was founded on August 1, 1969, by Order 753 of the Presidium of the Academy of Sciences of the Soviet Union and still remains a Russia's leading academic institution carrying experimental and theoretical studies of processes in the Earth's interiors. According to principles laid by the founders of the Institute, first and foremost, by Acad. D.S. Korzhinskii and Acad. V.A. Zharikov, the staff of the Institute combines theoretical and experimental research of mineral-forming processes and studies of natural objects, and this enables the researchers to successfully resolve fundamental problems of Earth's sciences. This principle also underlies the papers presented in this issue of *Petrology*.

The issue is opened with the paper "Experimental Study of Amphibole Crystallization from the Highly Magnesian Melt of Shiveluch Volcano" by A.G. Simakin and coauthors. This paper presents results of an experimental study of the crystallization of high-Mg andesite at 300 MPa and 940–980°C. This research was largely based on principles of studying magmatic systems suggested at IEM RAS by Prof. M.B. Epel'baum. The paper publishes newly acquired experimental data on the crystallization of clinopyroxene and amphibole in the hydrous andesitic melt of Shiveluch volcano, Kamchatka. The data were obtained using equipment

for rapid quenching and, in some of the experiments, a regime of temperature variations in the course of crystallization. It was determined that the composition of the amphibole (first of all, the concentration of octahedrally coordinated Al) significantly varied even at insignificant variations of experimental parameters (Fe oxidation state and oxygen fugacity) and melt composition. Analysis of experimental and theoretical data allowed the authors to improve the method of using the mono-amphibole barometer for estimating the depths at which magma starts to crystallize.

The paper by E.S. Persikov "The Relationship of the Relative Abundance of Masses of Granites and Rhyolites in the Earth's Crust with the Regularities of the Rheology of the Granitic Magmas" demonstrates variation patterns of the viscosity of near-liquidus granitoid magmas within broad ranges of $P$–$T$ parameters in the Earth's crust. It is demonstrated that these variation patterns provide a quantitative physicochemical basis for explaining the relative abundance of acid intrusive and volcanic rocks in the Earth's crust. This study is based on an author's original structural–chemical model for reliable predicting and calculating the viscosities of magmas ranging from acid to ultramafic at thermodynamic parameters of the Earth's crust and upper mantle.

The paper by A.L. Perchuk and coauthors "Subduction Sediment–Lherzolite Interaction at 2.9 GPa: Effects of Metasomatism and Partial Melting" reports results of experimental modeling of transformations of suprasubductional mantle under the effect of ascending fluids and melts derived from subducting sediment. These experiments demonstrate that major components are transferred by liquids in regimes of penetrating, focused, and diffuse flows, which control both the degrees of transformations of the mantle rocks and the mineral assemblages. The experimental results show that ascending fluids and melts derived from subducting sediment are not able to remove any significant carbon amounts from the metasedimentary layer to mantle rocks.

The paper "Mineral Indicators of Reactions Involving Fluid Salt Components in the Deep Lithosphere" by O.G. Safonov and coauthors presents a review of extensive experimental and petrological studies conducted at IEM RAS during the five decades. The authors analyze the role of salt components of fluids as principally important agents of mantle metasomatism and partial melting of crustal and upper-mantle rocks. This study is underlain by ideas suggested by Acad. D.S. Korzhinskii and Prof. L.L. Perchuk. The paper discusses petrological examples of mineral assemblages and reaction textures in granulite- and amphibolite-facies lower- and middle-crustal rocks and in upper-mantle peridotites and eclogites that highlight the great diversity of reactions controlled by the presence of salt components in $H_2O$–$CO_2$ fluids.

The role of fluids containing salt components at high-temperature metamorphism is also discussed by L.I. Khodorevskaya in her paper "Granitization and High-Temperature Metasomatism in Mafic Rocks: Comparison of Experimental and Natural Data". The paper presents newly acquired data, which append results of experimental modeling of the processes of granitization and high-temperature metasomatism in mafic rocks, a study launched at IEM RAS in cooperation with Acad. V.A. Zharikov. The paper demonstrates how Fe, Ca, and Mg behave when minerals of the metabasites are decomposed in the presence of $H_2O$ and $H_2O$–salt fluids depending on the concentration of the Na chloride component of the fluids. The experimental results are used in analysis of naturally occurring mineral assemblages of granitized metabasites in high-temperature metamorphic complexes.

The paper "Liquid Immiscibility and Problems of Ore Genesis (According to Experimental Data)" by Yu.B. Shapovalov and colleagues presents results of an experimental study of phase relations and distribution of elements between silicates and salt (carbonate, phosphate, fluoride, and chloride) melts, between two immiscible silicate melts, and also in fluid–magmatic systems in the presence of fluids containing alkali metals at temperatures of 800–1250°C and 100–550 MPa. The study was based on ideas and models suggested by Acad. A.A. Marakushev. The acquired partition coefficients of components between immiscible melts demonstrate that a a great number of elements (Y, REE, Sr, Rb, Cs, Ba, Ti, Nb, Zr, Ta, W, Mo, and Pb) are efficiently extracted at liquid immiscibility, and their extracted amounts are sufficient to produce ore deposits.

Regretfully, the volume of a single issue of the journal is not able to accommodate all papers submitted by researchers working at IEM RAS, and three papers devoted to 50 years of IEM RAS shall be published in *Petrology* no. 6, 2019.

The paper by V.Yu. Chevychelov "Distribution of Volatile Components (Cl, F, and $CO_2$) in $H_2O$-Saturated Fluid–Magma Systems of Various Composition" synthesizes experimental results on the behavior of Cl, F, $CO_2$, and $H_2O$ in fluid–magma systems of silicic, intermediate, mafic, and alkaline composition at pressures of 10–500 MPa and temperatures of 700–1250°C. The paper uncovers dependences of the solubility of these components in melts and the effects of mutual influence of these components on their solubility in melts and demonstrated the processes of hydrolysis when melts interact with chloride fluids. Much attention is focused on the F and Cl distribution between melts, fluids, and crystalline phases and on major components (Ca, Na, K, Fe, Al, and Si) in systems granite melt–$H_2O$–salt fluid. The results of the experiments provide a quantitative basis for understanding the processes of degassing at the evolution of magmas of different composition and make it possible

to quantify the amounts of Cl and F released to the Earth's atmosphere in the course of volcanic activity.

In their paper "Experimental Study of the System Peridotite–Basalt–Fluid: Phase Relations at Supra- and Sepercritical *P–T* Parameters", N.S. Gorbachev and coauthors present experimental results on partial melting of hydrous peridotite and basalt and the peridotite–basalt association in the presence of aqueous–carbonate fluid at pressures up to 4 GPa and temperatures up to 1400°C. Critical relationships between melts and fluids were observed at 3.7–4.0 GPa and 1000–1300°C in hydrous peridotite, at 1000°C and 3.7 GPa in hydrous basalt, and at 4 GPa and 1400°C in the system peridotite–basalt–($H_2O$ + $CO_2$ fluid). Reaction relationships between minerals in the peridotite residue in the experimental products testify to a high chemical activity of the supercritical liquids. Mantle reservoirs with supercritical liquids are sources of magmas enriched in incompatible elements, which induce metasomatism. The latter fertilizes the peridotite via enriching residue minerals in incompatible elements.

The paper by Yu.B. Shapovalov and colleagues "Physicochemical Parameter of the Origin of Rare-Metal Deposits in Fluoride-Bearing Granite Systems: Experimental Data" discusses the origin of rare-metal deposits in granites with regard for quantitative experimental results, which make it possible to place certain constraints on interpretations of the geological materials and the corresponding genetic models. The results discussed in the paper are based on and continue experimental and theoretical study, which were performed in IEM RAS by the authors under ledership and with participation of Prof. G.P. Zaraisky. The paper discusses the role of both magmatic and hydrothermal–metasomatic factors in the production of rare-metal deposits of different types and presents data on Ta and Nb distribution at fluid–magma interaction; on W, Ta, Nb, and Sn distribution at silicate–salt immiscibility; and data on the composition and properties of model magmatic fluid and the solubility of ore Ta–Nb minerals in fluoride, chloride, and carbonate–alkaline hydrothermal fluids.

## CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

O.G. Safonov
Guest managing editor of the issue

*Translated by E. Kurdyukov*