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Lunov Ye.S.[1], Lunova I.M.[1], Chernysh D.S.[1], Nissen J.[2]

(1) Institute of Geochemistry, Mineralogy and Ore Formation of the National Academy of Sciences of Ukraine, Kyiv, Ukraine. E-mail: lunoeugen145@gmail.com
(2) Zentraleinrichtung Elektronenmikroskopie (ZELMI), Technische Universität Berlin, Germany

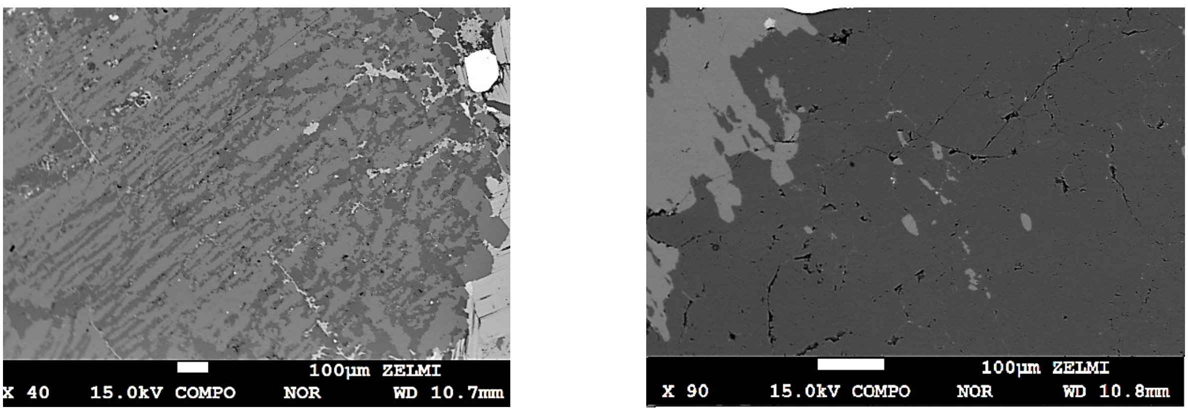
EVOLUTION OF FELDSPARS DURING ALBITIZATION (ON THE EXAMPLE OF THE PERGA DEPOSIT, NW UKRAINE)

Perga beryllium deposit is located in the NW of the Ukrainian Shield (Zhytomyr region). It is situated within the Proterozoic Perga complex, which is connected with the intersection of several deep faults [1]. Geologically it is the part of the Sushchano-Perga zone (SPz). The SPz is composed of various rocks of different ages. Among them, the most widespread are quartzites, disthenic quartzites, greisens, syenites, alkaline syenites, alkaline metasomatites, granites, granite-porphyries, and subalkaline granites [3].

The main ore mineralization of the SPz, including unique beryllium (genthelvite type) deposit, is associated with Perga granites. The ore field is characterized by extensive development of alkaline metasomatites, represented by quartz-feldspar, albite-K-feldspar and biotite-K-feldspar rocks [3]. Since alkaline feldspars are the main forming minerals of ore-bearing rocks and ores, our goal is to investigate the evolution of their composition and structure in the processes of polymetasomatism and the characteristic crystal chemical features of feldspars at different stages of ore formation.

The feldspars from a representative series of 17 samples of metasomatites, mostly from shaft No. 2, were investigated by means of EMPA, XRD, µ-XRF and optical microscopy. Quantitative EMPA were obtained on carbon-coated uncovered thin sections with a field emission electron microprobe JEOL JXA-8530F at ZELMI (TU Berlin). Parameters of the crystal structures of the feldspars were determined using Rigaku SmartLab high-resolution XRD system at TU Berlin. Optical microscopic study of the thin sections was carried out at IGMOF (Kyiv).

Most of the ore-bearing rocks contain two feldspars. K-feldspar, during the process of metasomatism, is replaced by albite with the formation of perthites and further progressive albitization [3]. This transformation with appearance of substitution perthites and their gradual growth into albitites with rare inclusions of resorbed orthoclase grains was studied in details and documented using EMPA and µ-XRF visualization. Both stages of albitization can be observed in Figure 1: the early phase with massive formation of perthites (Fig. 1, a) and the nearly complete replacement of K-feldspar by albite in the late stage (Fig. 1, b).



a b

Fig.1. Early (a) and late (b) stages of albitization of K-feldspar in Perga alkali metasomatites

The content of K_2O and CaO in albite varies from 0.02 to 3.8 % and from 0.001 to 0.006 %, respectively. The content of Na_2O in orthoclase ranges from 0.02 to 1.3 %.

According to K. Mehnert [2] the exsolution of primary K-Na-feldspars can occur at solvus temperatures (660-715°C), while crosshatched twinning of microcline formed as a result of rearrangement of earlier monoclinic orthoclase, at temperature not lower than 500°C.

In feldspar-quartz metasomatites formed during albitization, the ZnO content in albite increases sharply from 0.003 to 0.77 % near contacts or in inclusions within dissolved genthelvite crystals. This indicates the replacement of genthelvite by albite, as in the case of simultaneous crystallization of these minerals, all Zn would have been absorbed by genthelvite (Fig. 2).

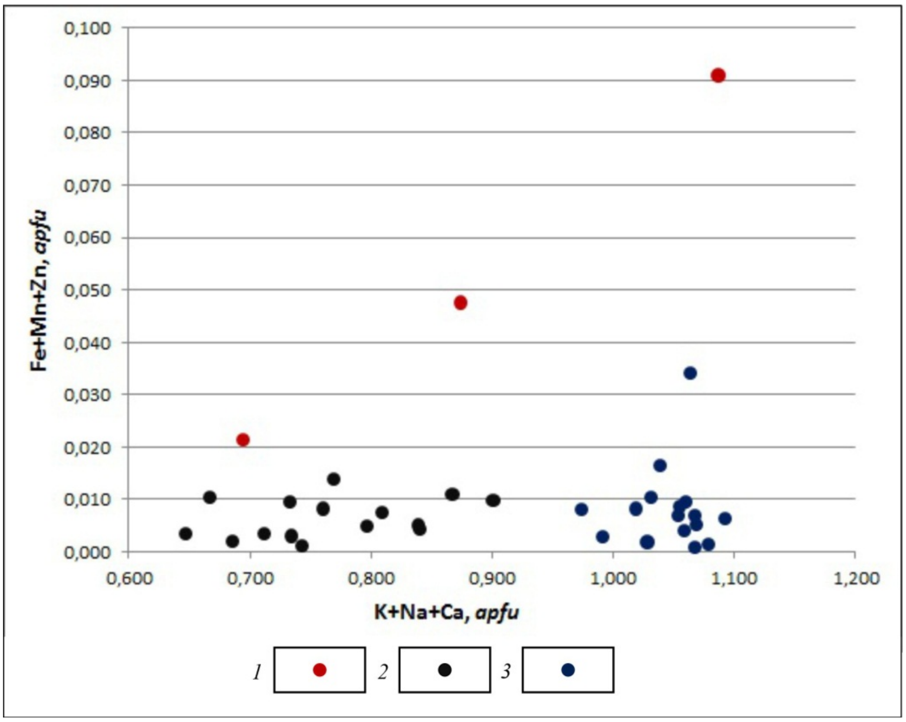


Fig. 2. Crystal chemical features of albite from metasomatites in early and late stages of albitization: relations between K+Na+Ca and Fe+Mn+Zn.
1 – inclusions and near contacts with genthelvite; *2* – two-feldspar metasomatites (early); *3* – quartz-feldspar metasomatites (late).

The content of FeO in albite varies from 0,003 to 0,96 %, whereas in orthoclase − from 0.005 to 0.44 %. Bright blue amazonite with an elevated Pb content (0.03-0.08 % PbO) is characteristic of the late low-temperature stage of silicification.

Contrary to the previous works [3], our data revealed very insignificant amount of Rb in feldspars. Instead, increased concentrations of Rb were found in micas.

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