METASOMATIC TRANSFORMATION OF THE LAMPROPHYRES AT THEIR CONTACTS WITH GRANITES AND MARBLES (BOHEMIAN MASSIF)

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Detailed investigation of mineral chemistry and deformation on the microscale of the interaction between olivine melilitite and granite has been done using electron back-scattered diffraction and microprobe analysis. A swarm of melilitite dykes (polzenites) in the Krkonoše–Jizera Composite Massif occurs along NE–SW cross faults showing interconnection with the "Devil Walls" tectonic structures in the Bohemian Cretaceous Basin [1]. Alkalic and ultraalkalic rocks with melilititic association of upper cretaceous up to paleogene age are of mantle origin and represent products of magmatic activity of Eger rift [2].

One of these olivine-melilititic dykes (approx. 70 cm thick) outcropped in a quarry in Variscan Liberec granite; the dark grey olivine melilitite with porphyric texture consists of olivine, augite, melilite and biotite, magnetite, perovskite and haüyn. This melilite dyke is 61.9 ± 3.0 Ma old according to the K–Ar dating [3]. The polzenite emplacement into the granite is recorded by partial melting, and also by decomposition of biotite to magnetite aggregate, and recrystallization of alkali feldspars. Metasomatic zoning (~5 mm in width) with several clear zones was found at the contact of the olivine melilitite and granite. Si, Al, Na decreased towards the contact, whereas Fe slightly increased in the polzenite dyke.

To compare the character of the metasomatic transformation with the other surrounding rocks, a contact of lamprophyre with marbles has been studied near the town Krumau am Kamp in Lower Austria. This lamprophyre dyke of unknown age was intruded into marbles of the Varied group of the Moldanubian zone. The original mineral assemblage consisting of biotite, K-feldspar, acid plagioclase, quartz is replaced by clinopyroxene, basic plagioclase and titanite. A desilication of the lamprophyre, and strong decrease in K, with increase in Ca, Fe and Mg were revealed in the endocontact zone.

Therefore, alkali metasomatic zonality shows different patterns in these two studied cases. Moreover at the contact with the granites, a zone of partial melting was found, unlike the contact with marble. The mineral composition of the zones varies according to the gradients in composition, temperature and chemical potentials, showing different mobility of the diffusing elements through the fluid during the metasomatic interaction. Phenomenological Onsager diffusion coefficients were calculated to describe the chemical potential gradients in the metasomatic zonality.

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