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VARISCAN ACID MAGMATISM AND RELEVANT PORPHYRY TYPE MINERALISATION IN THE CRACOW-LUBLINIEC TECTONIC ZONE (SOUTHERN POLAND)

INTRODUCTION

Manifestations of the Late Carboniferous magmatism and relevant mineralisation of porphyry type are observed in the area situated between Myszków and Mrzygłód within Cracow-Lubliniec tectonic zone.

The magmatism, mainly of granitoid type, was recognized in the border zone of Małopolska Block (Myszków-Mrzygłód, Zawiercie, Pilica, Będkowska Valley). These intrusives may represent small individual bodies localized along the tectonic zone or the apical zones of the deep situated batholith. The plutonic rocks are commonly associated with subvolcanic dacites and rhyolites.

The granitoids and dacites are altered to varying degree by autometasomatic and hydrothermal processes (J.Markiewicz, 2002). The spatial relationships between potassium metasomatism (feldspathisation, biotitisation, and sericitisation) and ore mineralisation are observed. The main ore minerals are: molybdenite, scheelite, chalkopyrite and pyrite.

METHODS

Chemical analyses of 502 rock samples were carried out for 54 variables in the Central Chemical Laboratory of the PGI in Warsaw and the US Geological Survey Laboratory in Denver (by XRF, AAS, ICP-AES method). About 180 samples from 7 boreholes were analyzed by optical microscopy. Electron microprobe and spectral laser analyses were used to identify crystalline phases in the inclusions.

RESULTS

Granitoids are medium grained, semi-automorphic, and usually porphyritic. Fine grained matrix constitutes 10-30% by volume of a typical rock. In some specimens, the matrix makes up higher percentage of the rock, and in others it is completely absent, producing eugranitic texture.

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Plagioclase, quartz, and biotite are the main mineral components of the granitoids; apatite, zircon, magnetite, rutile, and sphene, are common accessory minerals found in the rocks.

Granitoids of Myszków-Mrzygłód area have peraluminous to metaluminous compositions (A/CNK = 0.85-1.23), and might have been formed due to the anatectic differentiaton after melting of the clayey or sandy rocks at P-T conditions of the low-pressure amplibolite facies. According to W.Ryka (1989) the partial pressure of water, present in the weakly metamorphosed rocks, lowered the melting temperature and increased the rate of magma formation.

The results of chemical analyses have been recalculated using the formula of de La Roche et al. (1980). The position of the granitoids on a R_1-R_2 diagram classifies them mostly as granodiorites, and more rarely as granites.

The distribution of major and trace elements is similar in granitoids and dacites samples. The contents of REE (Fig. 1) are low (REE < 150 ppm). LREE are moderately enriched relative to HREE $(La/Yb)_n$ = 11-23. The REE normalized concentration patterns show small negative Eu anomaly (Eu/Eu^* = 0.71-0.96).

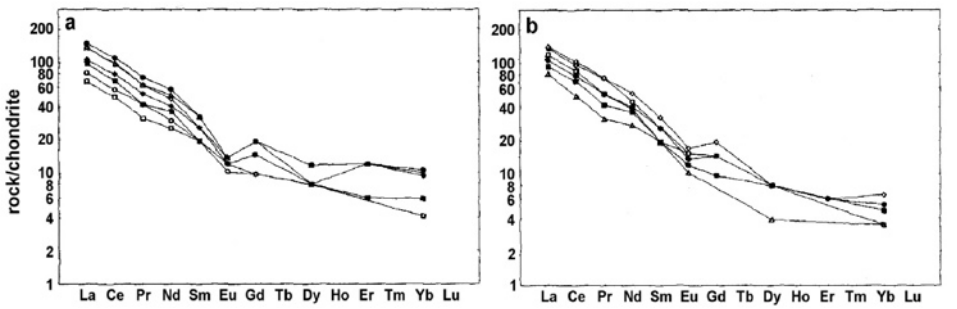

Fig. 1. REE distribution pattern (chondrite normalized) for granodiorite (a) and dacite (b).

Relicts of melt magmatic inclusions in zircon, apatite and quartz allowed to determined the initial crystalisation temperatures of:

- 1360°C-1260°C for zircon, apatite
- 1260°C-1220°C for quartz

The main crystallization of quartz occurred at the temperature between 1160°C-860°C. Crystallisation temperatures of matrix in the dacite porphyries ranged from 900°C to 800°C.

Silica-rich melt and chloride-rich melt inclusions were indentified in magmatic, quartzes. These latter inclusions may indicate the separation of a chloride-rich fluid from the silica-rich fluid. However, it is also possible that those inclusions could have been partly filled at a later time with highly saturated, chloride-rich brines. The presence of chloride phase is the main indicator of development of postmagmatic fluids responsible for ore mineralisation.

The Myszków deposit is the only one completely drilled-out and well-investigated manifestation of magmatism and mineralisation within Cracow-Lubliniec tectonic zone.

The geochemical studies allow to define the Myszków deposit as:

- stockwork molybdenite deposit related to granodiorite (according to F.Mutschler`s et al., 1981 classification);
- stock type of calc-alkaline molybdenum stockwork deposits (according to G.Westra`s and S.Keith`s, 1981 classification) or
- fluorine-defiecient porphyry molybdenum deposit (according to T.Theodore`s and W.Menzie`s, 1984 classification).

Geochemical investigations of Myszków mineralisation suggest that the following pathfinders, listed in increasing distance from the center, may be used in the search for concealed porphyry deposit: W, Mo, Cu (Ag), K, Be?, F, Sb, Hg, Au, Pb, Ba, As, Ag, Zn (Cd), Bi and Te.

The location of magmatic rocks along the Kraków-Lubliniec zone suggests the economic mineral deposit potential of whole this area.

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