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PRELIMINARY DATA OF INTRUSIVE BRECCIA FROM MYŚLÓW
(KRAKÓW - LUBLINIEC TECTONIC ZONE)

Abstract: Occurrence of intrusive breccia, of the approximate thickness of 200 m was found in the Mysłów region in the borehole 20-KW. The breccia was built of magmatic clasts (dacite, microgranodiorite, dolerite and aplite) and the debris of metasedimentary rocks (hornfels, metasandstones, metaconglomerates, metalimestone). Assimilation of small clastic grains causing enrichment of the dacite matrix mainly with biotite occurred in the bottom part of the intrusive breccia.

Keywords: tectonic zone Kraków-Lubliniec, intrusive breccia (pipe-breccia), porphyritic microgranodiorite, dacite, magmatic and metamorphic clasts, biotite

INTRODUCTION

Numerous occurrences of igneous rocks (plutonic, hypabyssal and volcanic rocks), mainly represented by granitoides and older dolerite rocks were found in borehole (20-KW), in the vicinity of the tectonic zone Kraków – Lubliniec (Markiewicz 1998). These rocks has been found in the Mysłów region, in the closest surroundings of the tectonic zone on the side of Upper Silesian Block, where the segments of Upper Silesian and Małopolska Blocks (Fig. 1) are tectonically interfingered. Among them, a rock complex in a form of an intrusive breccia, 200 m thick, was recognised.

GEOLOGICAL SETTING

Three structural horizon can be distinguished in the region of Mysłów: Cainozoic, Mesozoic, and Palaeozoic. The last mentioned horizon is build locally by Carboniferous, Devonian and Ordovician sediments. Palaeozoic rocks, covered by Quaternary and Triassic sediments (approximately 200 m), occur in the borehole 20-KW at the depth of 213.5 m down to 572.0 m. They are represented mainly by a complex of intrusive rocks, among them the most interesting is an intrusive breccia occurring at the depth of 317 – 525 m. It is separated from the ceiling by a porphyry microgranodiorite intrusion approximately 100 m thick. The contact of the mentioned rocks is not sharp, not distinct. Complex of hornfels

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(30 m thick) with a spotty texture has been found in the bottom part of the borehole. The hornfels rocks are determined as Ordovician, while the intrusive ones are Upper Carboniferous, as most of the other accompanying acid rocks in the discussed tectonic zone (Buła 2000). Up to now, formations of an intrusive breccia type have been known from few bore-holes in the Mysłków region but their thickness has never exceeded several meters (Markiewicz 2002).

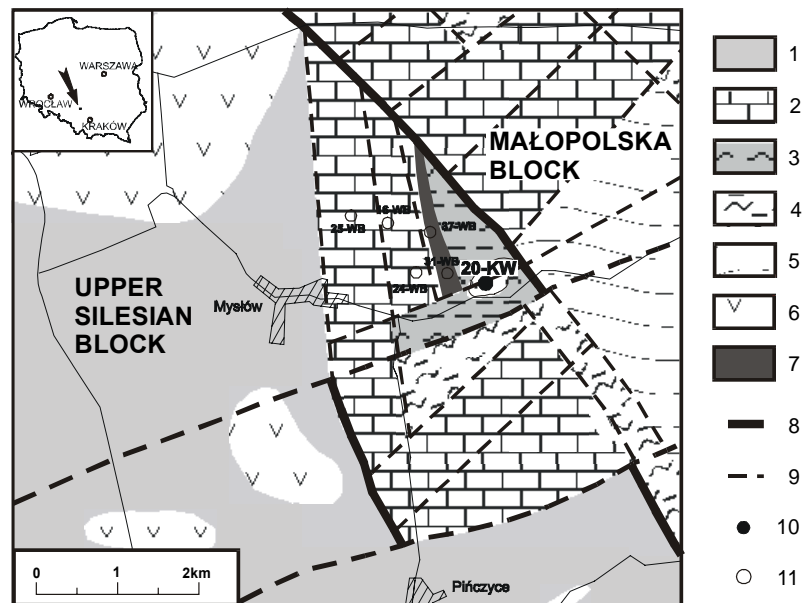


Fig. 1. Geological map without Mesozoic deposit of the Mysłów area after Buła et al. (2002). 1 - clastic sediments (Carboniferous – Viséan and Namurian A); 2 - Carbonate deposits Upper, Middle Devonian; 3 - Ordovician (Bibela Formation); 4 - Ordovician-Silurian complex (Mrzygłód Formation); 5 - Vendian; 6 - porphyries; 7 - dolerites; 8 - Kraków-Lubliniec tectonic zone; 9 - faults; 10 – examined drill; 11 - boreholes.

METHODS

Petrologic investigations have been carried out on the rock samples from the 20-KW core (60 samples), which have been examined by means of an optical microscopy. Detailed examinations of biotite from metamorphic rocks of volcanic origin from the intrusive breccia matrix and banded (pasowe) plagioclase have been carried out by means of an electron microscope CAMECA SX-100, at the Faculty of Geology, Warsaw University.

RESULTS

The intrusive breccia is built of clasts of the primary sedimentary rocks, volcanic and subvolcanic rocks. These clasts were cemented by means of dacite porphyre which matrix has porphyritic structure. The share of the clastic material and its amount increases towards the bottom of the borehole. The intensity of

processes connected with the influence of dacite magma increases in the same direction as the amount of clastic described. The share of the intrusive breccia exceeds 80 vol. % in the bottom part.

Magmatic clasts are represented by dacite, microgranodiorite, less common dolerite and very seldom aplite. No changes have been observed on the contact of the debris and the acid igneous rocks.

The clastic material of sedimentary rocks (probably Ordovician) had been metamorphosed into hornfels, metasandstone, metaconglomerates, and metalimestones. Metamorphosed clasts are often characterised by primary lamination.

Biotite hornfels are the most common among the clasts of sedimentary origin. Chlorite schists occur less frequently. Previously primary clay matrix had been changed into aggregates of fine-flaky biotite in metasandstones and metaconglomerates. Detritic components - quartz and feldspar have not been changed except small reactionary rims. Previously the rocks had been represented by feldspar grauwackes. Small grains of epidote occur sporadically in the matrix of those rocks.

The matrix of intrusive breccia consists of small amount of sharp-edged quartz. Phenocrysts of plagioclase are characterised by the complex constitution; the core and the outer rim of these crystals show oscillatory zoning between oligoclase and andesine. Only ones between these areas occur narrow zone with labradore composition. Microlite of dacite matrix appear only in the external rim with oscillatory zoning. Microlite of biotite of different degrees of chloritisation usually occur in the matrix with feldspar and minor quartz. Their share in the matrix is clearly irregular. The most frequent occurrence of biotite microlite can be observed in those zones of the breccia, which are mostly filled with material of sedimentary origin. Biotite dispersed in the breccia matrix gives it a dark colour. Most of the hornfels and dolerite debris is enriched with pyrite and magnetite layers.

The investigated breccia is intersected by thin veins of microcline, quartz, carbonate-quartz, carbonate and anhydrite composition. Majority of them contain ore minerals such as magnetite, pyrite, chalcopyrite, rare molybdenite, scheelite, galena, Bi-minerals and sphalerite. Fluid inclusions in quartz veins and in igneous quartzes give evidence of multistage influence of highly concentrated Na-K-Cl brines on the rock described. The character of the inclusions filling is typical for copper-porphyry formation, documented in the Myszków region (Karwowski 2001).

Chemical compositions of microgranodiorite and the intrusive breccia with dacite matrix are very similar. The intrusive breccia is slightly richer in SiO_2 (3.5–4.0wt%). TiO_2 (~0.15wt%) and CaO (0.6-0.7wt%) as compared to the microgranodiorite. Analyses of chemical composition of biotite from different types of metamorphic, igneous clasts and dacite matrix have been carried out. Large biotites of igneous origin show characteristic zonation, both in clasts and in the matrix. Their central parts are rich with Ti (4.42-3.80wt% of TiO_2); towards the edges the contents of Ti decrease from 3.19% to 2.58wt% of the TiO_2 . At the end

of the crystallisation process, significant increase of Ba content (0.51-0.62wt% of BaO) can be observed. Hence, it may be assumed that during the crystallisation of the biotite phenocrysts decrease of temperature and oxygen volatility occurred (Puziewicz 1994). Ti content in biotite from dolerite clasts is significantly lower (2.16-2.72wt% of TiO₂), while in metamorphic clasts, the content of Ti varies from 3.34 to 4.37wt% of TiO₂.

A varied content of Ti in biotite has been observed in the dacite matrix. Particular microlite show significantly varied content of Ti in the range of 2.34–4.37wt% of TiO₂, despite their occurrence in close vicinity. Lower content of Ti, in the surroundings of dolerite, can be observed only in aggregates and biotite microlite matrix.

CONCLUSIONS

Petrographic character of the breccia clasts and its large thickness prove multistage intrusion connected with the use of the active tectonic zone by intruding magma. As far as the genetic aspects are concerned the breccia corresponds to a magmatic-tectonic breccia and may create a form similar to a pipe-breccia.

Paragenesis of albite, epidote, biotite may suggest that thermal changes leading to formation of biotite hornfels correspond to the albite-epidote-hornfels facies of the thermal metamorphism according to Winkler's (1967) classification, suggesting temperatures in the range of 500-550°C.

Varied content of titanium in microlite of biotite in hornfels clasts and dacite matrix of the breccia suggest that the finest clastic fractions were included by intruding dacite magma. Repeated thin labradorite zone occurring at the end of crystallisation of plagioclase from the dacite matrix may be connected with assimilation of Ca by the intruding magma.

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