Regional Extension of Hydrothermal Veins – Result of an Important Deformation Event in the Moravosilesian Paleozoic

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Numerous hydrothermal veins occur in the eastern part of the Moravosilesian Paleozoic (the Nízký Jeseník Mts). They are concentrated in historical mining districts, where silver and lead were mined (Losert, 1957). Other veins are disseminated in quarries and outcrops throughout the area. Greywackes, siltstones, conglomerates and shales of the Moravice and Hradec-Kyjovice formations are typical host-rocks of the mineralization.

Hydrothermal veins have polymetallic nature with absence of complex sulphides and Ag-minerals. Most frequent minerals are galena, sphalerite, chalcopyrite, pyrite and marcasite. Quartz, Mg, Fe-carbonates, calcite and barite represent gangue minerals. The veins have mostly massive, brecciated, deformational and drusy structures. Thickness of veins ranges between 0.00X to 0.4 m. The mineralization is investigated in context of the post-Variscan mineralization processes of the Moravosilesian Paleozoic (Grant Agency of the Czech Republic, Grant No. 205/00/0356) (Slobodník, 2000; Slobodník et al., 2001).

Hydrothermal veins, which penetrate greywackes, conglomerates and siltstones, show directions from N-S to NNE-SSW, NW-SE, to lesser extent E-W strike. Veins have mainly steep inclinations of 60°–90°, rarely up to 30°. Their strikes follow the main fracture systems of the particular locality. Some fracture systems are not mineralized (NE-SW to ENE-WSW). Typical structural position of thin, mainly carbonate-bearing veins, is perpendicular to the bedding planes, but their origin is not linked with the Variscan folding. Major quartz and carbonate veins are associated with normal or thrust faults dipping 50°–80°. There is possible to distinguish deformation structures of lenticular veins with isolated nodules of galena with quartz, mylonite zones and brecciated structures in which fragments of rocks, in places also fragments of older phase of quartz, are cemented by carbonate hydrothermal minerals. These large veins are rich in sulphide mineralization that is rare in small veins.

Hydrotermal veins located in shales follow mainly these directions: E-W, NNE-SSW, NE-SW and less WNW-ESE and N-S. Their dip is commonly between 70°–90°. Some veins filled subhorizontal fractures. The thickness of veins in shales ranges between several milimeters and five centimetres and hence they are thinner than veins in greywackes. The thickest veins show also brecciated structures. From structural point of view they also fill the extensional structures oriented perpendicularly to the bedding planes. Slightly different strike of veins in greywackes and in shales may reflect differences in rheologic nature of the host-rock types and local stress fields.

The NW-SE and NE-SW faults apparently represent the main migration pathways for hydrothermal fluids also with respect to their directional position to the West Carpathian arc (NE-SW). Older faults of the above-mentioned directions were reactivated during the Alpine tectogenesis. That relationship is supported by some geological evidences in the region of the Nizký Jeseník Mts. (Gruntorád and Lhotská, 1973; Havíř, 2001). Regional distribution of the studied hydrothermal mineralization point to more extensive migration of fluids along fractures originated in consequence with regional stress field, perhaps developed by movement of large crustal blocks during certain phase of the Alpine tectogenesis (Slobodník et al., 2001).

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Spatial Relations between Metamorphic and Sedimentary Rock Complexes in the Cieszów Unit Area (Sudetes, SW Poland) – Geophysical Implications

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The border zone of the Świebodzice Depression and Kaczawa complex (Sudetes, SW Poland) is characterized by occurrences of metamorphic rock complexes among sedimentary infill of the basin, accumulated between the Late Devonian and Early Carboniferous. There are two opposite concepts of the tectonic position of those crystalline rocks. They are interpreted either as the outcropping basement of the basin (Dathe and Zimmermann, 1912; Bederke, 1929) or as nappes thrust over the sedimentary rocks from the north (Teisseyre, 1956). The latter concept is supported by the local presence of rock units termed as cataclasites at the boundary of metamorphic and sedimentary complexes. This ambiguity results from poor exposure of contacts between all the three lithological groups. To overcome this difficulty a geophysical method based on ground resistivity was applied over the area of the Cieszów Unit, where all three rock groups commonly occur.

The Cieszów Unit is composed of metavolcanic and metasedimentary complexes of Early Paleozoic age (Baranowski et al., 1990), which are surrounded at the surface level by Late Devonian to Early Carboniferous sedimentary rocks (fine- to coarse-grain clastic rocks) but separated from them by a rim of cataclasites. The cataclasites have varying texture and structure, however, most commonly they show constant composition: albite, quartz, chlorite, epidote and muscovite (sericite) which are cemented with silica. Both the layering and foliation, respectively for the rock types, are steeply inclined in the studied unit.

The area of the Cieszów Unit was surveyed over with the EM31 Terrain Conductivity Meter (manufactured by Geonics Ltd., Canada) which has an effective depth penetration of about 6 m. As the resistivity of metamorphic, sedimentary and cataclastic rocks varies, the continuous measurements of that physical property allow to interprete the rock boundaries and their general inclination. A set of 50 traverses perpendicular to the lithological boundaries around the Cieszów Unit was made. Their length ranged from 0.2 to 1 km and the conductivity measurements were made every 20 m along the traverses. Soil cover along the analysed traverses was relatively thin, therefore the results of surveying are reliable for the mother-rock boundary interpretation.

The obtained conductivity profiles show very good agreement with the mapped pattern of rock distribution and the outlined faults. Most often slopes of highs or lows appear at the rock boundaries. However, shifts between the highs and lows vary: they rise and drop either abruptly or gradually on lithological boundaries. The first case is interpreted to indicate steeply inclined rock boundaries (usually high-angle faults), the latter contacts at a more gentle angle. Based on the profiles, the supposed high- and low-angle boundaries around the Cieszów Unit were mapped. Generally, steeper contacts are observed on the boundary of sedimentary rocks with cataclasites or metamorphic rocks, while at the border of metamorphic rocks and cataclasites they are both steeply or gently inclined. Additionally, the conductivity profiles show that not only sedimentary complexes are internally not uniform, but also the cataclasites posses spatial variation in composition.

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Vertical Facies Variability of the Building Sandstone (Słupiec Formation, Intrasudetic Basin) on Example of the Selected Fragments of the Profile from the Vicinity of Nowa Ruda

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A 400-m thick Building Sandstone Member forms the lower part of the Słupiec Formation (upper Autunian). It is underlain by fine-grained sediments known as the Upper Anthracosia Shale (Krajanów Formation) and passes upwards into the Walchia Shale, the upper part of the Słupiec Formation. Both shales are regarded to be of lacustrine origin.

The Building Sandstone Member consists predominantly of arkosic or subarkosic arenites and wackes and minor polymictic conglomerates or fine-grained sediments such as arkosic mudstones with various amount of fine-grained sand. Reddish colour is characteristic of all the textural varieties (Nemec et al., 1982).

The deposits form structurally diversified facies set of fluvial origin. Coarse-grained facies (compare Miall, 1985) are represented by matrix-supported conglomerates (Gms), massive conglomerates (Gm), channel pavement horizons (Gc) and, rarely, conglomerates with trough crossbeds (Gt). Among sandstones, which predominate in this part of the Słupiec Formation, massive sandstones (Sm) and horizontally laminated sandstones (Sh) are most abundant. Minor components are sandstones with trough crossbeds (St) or ripple crossbeds (Sr). Fine-grained deposits are usually interbedded sandstones and mudstones (Sr/Fl) with complex cross, wavy, lenticular, flaser lamination and rarely horizontally laminated mudstones (Fl). Short characteristics of the Building Sandstone lithofacies set and the interpretation of the deposition environment are shown in Tab. 1.

The aim of the work is to present a model of vertical facies variability of the Building Sandstone based on the analysis of a chosen part of its profile. Out of numerous occurrences of