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Geophysical research for the recognition of polymetallic mineralization in the quarry in Rędziny (Poland)

T. Gołębiowski, A. Pieczka, and B. Gołębiowska

AGH University of Science and Technology, Faculty of Geology, Geophysics and Environmental Protection, Cracow, Poland (tomgoleb@agh.edu.pl)

The results of mineralogical research carried out in the quarry at Rędziny (the eastern metamorphic cover of the Karkonosze granite, Lower Silesia, Poland) suggest a probability of existence of zones with polymetallic mineralization located in the western part of the dolomite lens exploited in the quarry.
Therefore, in the last years complex geophysical, mineralogical and geochemical researches was carried out in order to identify ore mineralization in the quarry and in its nearest surrounding.
This paper presents the selected results of geophysical research carried out in the western and north-western part of the quarry, between granite outcrops and the dolomite lens. The geophysical surveys was conducted in order to: a) identify the main geological boundaries, i.e. granite - metamorphic cover (mylonites, mica-schists and amphibolites) and metamorphic cover - dolomite, b) identify the course of the mineralized zones and outline in these zones the sub-zones with the richest polymetallic mineralization. The geophysical surveys were carried out using selected measurement techniques, described in the further part of the paper.
Constant separation traversing (CST) was applied in order to locate the main geological boundaries, i.e. granite - metamorphic cover and metamorphic cover - dolomite; the research was carried out to the depth of about 50m, i.e. to the lowest exploitation level in the quarry. CST technique also allowed to distinguish a low-resistivity zone, which might be correlated with the region of richest polymetallic concentration.
Vertical electrical sounding (VES) was carried in order to obtain geological cross-section to the depth about of 50m. On the basis of these surveys the course of the boundary between granite and metamorphic cover, and outlining of near-surface weathered material were determined. VES technique also allowed to identify the zone of lowered resistivity which might indicate richest polymetallic mineralization within dolomite.
The sub-zones of higher metal concentration were determined on the basis of the results of self-potential method and for outlining of mineralized zones (veins) the measurements of magnetic component of induced electromagnetic field were carried out. The mineralized zones interpreted from both technique correlated well with such zones exposed in the western wall of the quarry.
The measurements of gradient of potential and difference of potentials for the alternative current were conducted in order to confirm the results indicating the course of mineralized veins. Additionally the results of these surveys were used for correlation with the results obtained from electrical resistivity method. The results of difference of potentials measurements were convergent with the results of the self-potential method, indicating similar location of the mineralized zones. The measurement of gradient of potential confirmed the boundary of the mineralized zone, identified earlier on the basis of electrical resistivity surveys.
The results of geophysical research correlated well with the results of mineralogical and geochemical studies, showing that polymetallic mineralization around this quarry takes rather a form of veins and dispersed form and the presence of massive ore-bodies was excluded.

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