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The Kupferschiefer

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The Kupferschiefer is the Upper Permian, metal bearing, organic-rich shale, from 1 to 1.5 m thick. Occurs over large area of Europe, from England to Poland. The Kupferschiefer overlies red-bed sediments (Rotliegende), sandstone and conglomerate that is the first sediment of Zechstein sea. Hanging wall rocks are composed of Zechstein (Werra) carbonates overlain by anhydrite and salt rock. In Poland the world class Cu-Ag deposit (Kupferschiefer type) is located in the Lubin-Sieroszowice area. Copper-silver mining area is situated close to SW paleomargin of the Polish Zechstein Basin [1]. The deposit currently being mined extends over nearly 600 km², varies in thickness from 0.4 to 26 m, and contains on average about 1.2-1.9 % Cu, depending on the mining field and 40 ppm Ag, 0.2% Pb, as well as anomalous concentrations of Zn, As, Ni, Co, Se, Re, Au and PGMs. The mineral deposits in the district are mainly stratiform, peneconcordant, and locally discordant, but crosscutting veins also occur [1]. In general two different variety of the Kupferschiefer have been recognized [3]

Over 140 ore minerals have already been identified within the copper district. Chalcocite is the dominant ore mineral and locally can constitute up to 90 vol.% of the rock, however the average Copper content in the shale reach 10 wt% [Figure 1]. The copper ores are also characterized by significant amount of bornite, chalcopyrite, digenite, covellite, galena, sphalerite, pyrite, tennantite and tetrahedrite. In the mining district the following types of ore mineralization can be distinguished: dispersed, nests, lenses, ore bands, veinlets, veins, and massive [2].

Adjacent to areas of high grade metal concentrations, the Kupferschiefer deposit is locally barren and oxidized. Au and PGM mineralization has been found proximal to the secondary redox interface located below the Cu-Ag Kupferschiefer orebody [Figure 2]. A transition zone has been recognized between the gold bearing horizon and the copper deposit (Cu <0.2%; Au>0.5 ppm). Ore minerals as: native gold, electrum, mercury-bearing gold, hematite, covellite, chalcopyrite, Pd-arsenides, clausthalite have been identified [3].





Figure 1: Chalcocite and bornite epigenetic vein structures in black Cu-bearing shale (scale bar in centimeters), Rudna Mine .

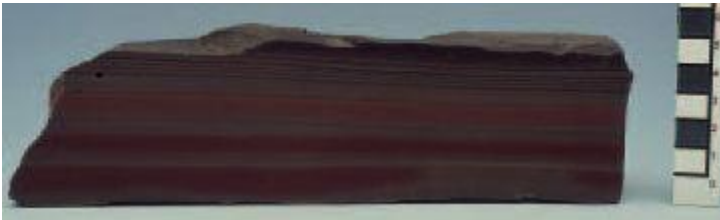


Figure 2: Maroon variety of the Kupferschiefer - noble metals - bearing shale (scale bar in centimeters), West field of Polkowice Mine

The Kupferschiefer is recognized as the important, World class mineral deposit and mineralized system. It is a redox barrier existing also in other part of the World e.g. Mitu formation in Peru.

References:

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