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Distribution of Ag in Cu-sulfides in Kupferschiefer deposit, SW Poland

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The Cu-Ag Kupferschiefer deposit located at the Fore-Sudetic Monocline (SW Poland) is a world class deposit of stratabound type. The Cu-Ag mineralization in the deposit occurs in the Permian sedimentary rocks (Rotliegend and Zechstein) in three lithological types of ore: the dolomite, the black shale and the sandstone.

Silver, next to copper, is the most important element in the Kupferschiefer deposit (Salamon 1979; Piestrzyński 2007; Pieczonka 2011). Although occurrence of the Ag-minerals such as native silver, silver amalgams, stromeyerite, jalpaite and mckinstryite, silver is mainly present in the deposit due to isomorphic substitutions in Cu-minerals such as chalcocite, bornite, tennantite, covellite and chalcopyrite. The aim of the study was to define distribution of silver in Cu-minerals and correlate occurrence of Ag-enriched Cu-sulfides with native silver and silver amalgams. Identification of minerals and textural observation were performed using field emission scanning electron microscope. Analyzes of chemical composition of Cu-sulfides were performed utilizing electron microprobe.

Silver concentration in Cu sulfides ranges from 0.1 to 10.4 wt.% in chalcocite, 0.2-15.8 wt.% in bornite, 0.1-2.9 wt.% in tennantite, 0.05-0.3 wt.% in chalcopyrite and ca. 0.4 wt.% in covellite. In general, distribution of silver in Cu-minerals is irregular, as indicated by high variations of Ag concentration in each mineral. Content of Ag in Cu-sulphides, in samples where native silver and silver amalgams are not found, is lower than in samples, where native silver and silver amalgams are noted. The chemical analyzes of Ag-bearing Cu-minerals indicate decrease of Cu content in minerals with high Ag concentration. In such case, decrease of Fe content is also noted in bornite.

Lack of micro-inclusions of the native silver or silver amalgams in the Cu-minerals indicates that presence of Ag is mainly related to the isomorphic substitutions. This is in agreement with previous reports on high Ag content reaching 49 wt.% Ag in bornite and 1.8 wt.% Ag in chalcocite occurring due to Ag substitution in Cu-minerals without modification of their crystallographic structure (Salamon 1979; Banaś et al 2007; Kucha 2007; Piestrzyński 2007, Pieczonka 2011).

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