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Characterization of secondary arsenic minerals associated with bacterial communities in the old mine in Radzimowice (southwestern Poland)

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The work presents the results of mineralogical investigations of secondary iron arsenates occurring in the weathering zone of the Au-As-Cu polymetallic deposit in the Radzimowice (Lover Silesia, southwestern Poland). The research is emphasizing the interrelationship between the crystallization conditions of mineral phases and the assemblages of microorganisms involved in their formation.

Identification of the iron arsenates was carried out using thermal analysis, infrared spectroscopy and scanning electron microscopy imaging. The characteristics of the chemical composition of the secondary minerals was determined by electron microprobe.

In old mine galleries iron arsenates, such as scorodite, kankite, zýkaite, bukovskýite, pitticite were described. These secondary arsenic minerals were created in environment with low pH and high concentration of sulphate and arsenate ions. The significant impact in the formation and subsequent transformation of these arsenic phases have specific bacterial strains, especially a group of metal-reducing bacteria.

The research allowed to describe mineral paragenesis and the connection of particular conditions for the formation of mineralization with microorganisms. Due to opportunity to obtain the information about the use of particular mineral phases in binding and removal of elements harmful to the environment, the presented research has a practical meaning.