BIODEGRADATION OF GOLD-BEARING SULPHIDE MINERALS OF THE TATRIKUM UNIT (WESTERN CARPATHIANS, SLOVAKIA)

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The gold-bearing disseminated sulphidic ores from the Sb-Au deposits of Pezinok, Trojárová (Malé Karpaty Mts), Dúbrava and Vyšná Boca (Nízke Tatry Mts) forms impregnations of fine grained euhedral arsenopyrite and arsenian pyrite. The gold content in arsenopyrites range from zero up to 0.6 wt% in some crystals from the Trojárová deposit. Gold content in pyrite is lower (0–100 ppm). Most of the invisible gold incorporated in sulphide minerals is chemically bound (ANDRÁŠ *et al.*, 1995).

Arsenopyrite and arsenian pyrite exhibit strong zonation patterns. Generally two extreme types of growth zones can be distinguished, both with different compositional trends. The first one has high Sb and low As content and the second one high As and low Sb content. Progressive enrichment in As is generally in correlation with a decrease in S and Sb content. As and S are strongly negatively correlated. The As rich zone is considered to be the carrier of the substantial majority of chemically bound gold. At the deposits of Pezinok and Trojárová the rims of the gold-bearing crystals are rich in Au-As and at Dúbrava and Vyšná Boca the situation is the opposite: the crystal cores are rich in Au-As.

From environmental aspects it is very difficult to find convenient technology for gold production from ores with invisible gold. The most often used biochemical oxidation of these ores is satisfactory from an environmental viewpoint but very tedious. Sty of polished surfaces of investigated sulphides submitted to biological chemical oxydation by the culture *Thiobacillus ferrooxidans* and *Thiobacillus thiooxidans* give the following results:

– The process of bacterial oxidation is a selective one, with preferential oxydation of arsenopyrite in As (Au) enriched zones.

– Process of biodegradation is followed by dissolution of As (Au) enriched zones of pyrite crystals preferentially along cracks, veins and growth zones of crystals.

– Biochemical leaching of investigated sulphides is also influenced by the galvanic interaction of parts with different As content.

– In the process various tunnels and depressions are formed. Their space orientation are directly related to the orientation of different crystal faces.

– The preferential biochemical solving of arsenopyrites, which contain about 80 wt% of the gold, and the preferential oxydation of arsenopyrite and pyrite As rich zones, which contain about 90 wt% of the gold in each grain, substantially speed up the technological process of gold leaching and enable the use of the tedious biological-chemical technology for gold production from arsenopyrite-pyrite ores containing refractory gold, convenient from an environmental point of view.

References

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