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Autor(en): **Terzi, S.B. / Sommerauer, J. / Harnik, A.B.**

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Macroscopic Cosalite Crystals from the Pb–Zn Ore Deposit Trepča (Yugoslavia)

By *S. B. Terzić* (Beograd)*, *J. Sommerauer* (Zürich)**
and *A. B. Harnik* (Zürich)***)

With 1 table in the text

Abstract

The first discovered macroscopically visible cosalite crystals in the Trepča Mine (Yugoslavia) are 15–20 mm long and about 1 mm in diameter. Electron microprobe analysis yields the composition $\text{Pb}_{1,88} \text{Bi}_{1,75} \text{Sb}_{0,27} \text{Ag}_{0,007} \text{S}_5$, hence placing the crystals close to the cosalite end-member of the system cosalite-brongniardite, $\text{Pb}_2 \text{Bi}_2 \text{S}_5 - \text{Ag}_2 \text{Pb Sb}_2 \text{S}_5$. X-ray determinations as well as optical properties support this result.

SAMPLE LOCATION AND DESCRIPTION

Cosalite of microscopic size (about 0,1 mm) from the Rudnik Mine (Serbia, Yugoslavia) was described by RAKIĆ (1958). The mineral occurred there in paragenesis with other bismuth-minerals in galena.

Recently one of us (S.B.T.) discovered macroscopic cosalite on the seventh level of the lead-zinc mine Trepča. The crystals were found in a geode which has a size of about $200 \times 150 \times 100$ mm and which has an opening of approx. 80 to 100 mm. This geode is mainly composed of the sulfides pyrrhotite, pyrite and marcasite. Inside and outside it is covered with a layer of pearly calcite, galena, and a few dolomite crystals.

The cosalite crystals are scattered on galena as well as on calcite, but mainly on galena. The hair-like needles are 15 to 20 mm long and about 1 mm

Author's addresses:

*) S. Terzić, Faculty of Mining and Geology, University of Beograd, Yugoslavia.

**) Jürg Sommerauer, dipl. sc. nat., Inst. für Kristallographie und Petrographie, Eidg. Techn. Hochschule, Sonneggstrasse 5, CH-8006 Zürich.

***) Dr. Avo B. Harnik, Lehrstuhl für Materialwissenschaften, Eidg. Techn. Hochschule, Sonneggstrasse 3, CH-8006 Zürich (formerly also **).

in diameter. Their elongation coincides with the c-axis. The color is lead-gray to steel-gray and shows metallic lustre. These crystals represent the first macroscopically visible cosalite crystals in a mineral paragenesis at the Trepča mine as well as in Yugoslavia.

ELECTRON MICROPROBE ANALYSIS

The results of the electron microprobe analysis are given in Table 1.

Table 1. *Electron microprobe analysis of the cosalite crystals from Trepča, Yugoslavia*

Element	Wt.-%	Number of mols normalized to S=5
Bi	38,0	1,75
Pb	40,6	1,88
S	16,7	5
Ag	0,8	0,007
Sb	3,4	0,27
Total	99,5	

The experimental conditions were as follows: acceleration voltage 20 kV, sample current 80 nA, electron beam diameter 5 μ . The standards used were Bi-metal for BiL $_{\alpha}$, Ag-metal for AgL $_{\alpha}$, PbS for PbM $_{\beta}$ and SK $_{\alpha}$, and TbSb for SbL $_{\alpha}$. All intensities were corrected for background, drift and deadtime; corrections for atomic number, absorption and fluorescence were applied by the use of the MAGIC IV computer program.

Besides Bi, Pb, Sb, Ag and S no other elements have been detected. The analysis yields the composition Pb $_{1,88}$ Bi $_{1,75}$ Sb $_{0,27}$ Ag $_{0,007}$ S $_5$. The small amounts of antimony and silver found (see Table 1) indicate that the crystal can be considered as a member of the system cosalite-brongniardite, Pb $_2$ Bi $_2$ S $_5$ –Ag $_2$ PbSb $_2$ S $_5$, described by ANDERSON (1934) but is close to its end-member cosalite.

While STRUNZ (1970) uses the name diaphorite, 4PbS·3Ag $_2$ S·3Sb $_2$ S $_3$, instead of brongniardite, this formula is similar to ANDERSON'S notation. The name cosalite stands for the type locality Cosala Mine in the state Sinaloa in Mexico. GENTH (1868) was the first to describe this mineral to which he attributed the formula (Pb, Ag $_2$) $_2$ Bi $_2$ S $_5$. Later investigations were carried out by KOCH (1890), WALKER (1921), ANDERSON (1934), BERRY (1939), WEITZ and HELLNER (1960) and others.

X-RAY RESULTS

The d-values and relative intensities of the reflections in X-ray powder photographs are in good agreement with the data given by HAYASHI (1961) for 2PbS·Bi $_2$ S $_3$ in the Powder Diffraction File of the American Society for

Testing Materials (ASTM), card no. 13-502. This verifies the identity of the analyzed sample with cosalite.

MICROSCOPICAL CHARACTERISTICS

The reflectivity is slightly higher than that of galena. The colour in air is cream-white but appears cream-white with a trace of cream-green in oil. The pleochroism is very weak; no colour changes were visible. The anisotropy is weak in air but very distinct in oil. The hardness is somewhat higher than that of galena.

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