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

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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 $Pb_{1,88}$ $Bi_{1,75}$ $Sb_{0,27}$ $Ag_{0,007}$ S_5, hence placing the crystals close to the cosalite end-member of the system cosalite-brongniardite, Pb_2 Bi_2 S_5 – Ag_2 Pb Sb_2 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 occured 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 × 150 × 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

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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 Bi L_α, Ag-metal for Ag L_α, PbS for Pb M_β and S K_α, and TbSb for Sb L_α. All intensities were corrected for background, drift and deadtime; corrections for atomic number, absorbtion 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, $Pb_2Bi_2S_5 - Ag_2PbSb_2S_5$, described by ANDERSON (1934) but is close to it's end-member cosalite.

While STRUNZ (1970) uses the name diaphorite, $4PbS \cdot 3Ag_2S \cdot 3Sb_2S_3$, 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 $2PbS \cdot Bi_2S_3$ 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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