American Mineralogist, Volume 86, pages 1087–1093, 2001

Sicherite, $TlAg_2(As,Sb)_3S_6$, a new sulfosalt mineral from Lengenbach (Binntal, Switzerland): Description and structure determination

STEFAN GRAESER,[1,*] PETER BERLEPSCH,[2] EMIL MAKOVICKY,[2] AND TONČI BALIĆ-ZUNIĆ[2]

[1]Mineralogisch-Petrographisches Institut, Universität Basel, Bernoullistrasse 30, CH-4056 Basel, and Natural History Museum, CH-4001 Basel, Switzerland

[2]Department of Mineralogy, Institute of Geology, University of Copenhagen, Øster Voldgade 10, DK-1350 Copenhagen K, Denmark

ABSTRACT

Sicherite, $TlAg_2(As,Sb)_3S_6$, is a new mineral species from the famous sulfosalt locality at Lengenbach, Binntal, Switzerland. It occurs in small cavities in a dolomitic rock of Triassic age, associated with abundant realgar, and various other sulfosalts, mainly Tl-bearing species such as hutchinsonite, hatchite, and jentschite. Sicherite is orthorhombic, space group *Pmnb*, $Z = 4$, $a = 12.479(3)$, $b = 15.522(4)$, $c = 5.719(4)$ Å; $V = 1107.8(6)$ Å^3. The strongest powder diffraction lines [d_{obs} (Å), (*hkl*), I/I_0] are as follows: 2.822, (340, 331, 012), 100; 3.363, (301), 50; 3.118, (141), 27; 3.210 (041), 26; 3.29, (240, 311), 23; 2.540, (341), 17. Sicherite is dark metallic grey, with metallic luster, and appears completely opaque. Individual crystals reach approximately 0.4 mm, but aggregates may exceed 1–2 mm. The streak is dark brown-red, no cleavage was observed, fracture is uneven to conchoidal. Microhardness $VHN_{10} = 57–59$ kg/mm^2, corresponding to a Mohs hardness of about 3. $D_{calc} = 5.26$ g/cm^3. In polished section the mineral appears pure white, with extremely weak anisotropy. Sicherite, as well as the other Tl-minerals in Lengenbach, presumably represent products of a late stage activity of Tl-As-bearing hydrothermal solutions during Alpine metamorphism.The crystal structure of sicherite was solved and refined to $R_1 = 4.62\%$. It is composed of slices of an SnS-like structure cut out parallel to $(101)_{SnS}$ and $(10\bar{1})_{SnS}$ which are related by unit-cell twinning. This is similar to, but more complex than, the simpler case of emplectite. The slices are parallel to (010) of the unit cell of sicherite. They are limited by zigzag surfaces composed of short portions of $\approx (001)_{SnS}$, and $(301)_{SnS}$ and $(30\bar{1})_{SnS}$ planes, respectively. Adjacent slices are related by *n*-glide planes parallel to (010) of sicherite and interconnected via coordination polyhedra of Tl and Ag which form a very distorted PbS-like array.