Sinnerite $Cu_6As_4S_9$

Crystal Data: Triclinic, pseudocubic. *Point Group*: 1. Flattened to columnar crystals, typically corroded, to about 1.2 cm. *Twinning*: Complexly twinned on twin planes {010} and {110}.

Physical Properties: *Fracture*: Irregular. *Tenacity*: Brittle. Hardness = ~4 VHN = 373. D(meas.) = 5.2(3) D(calc.) = [4.46] (synthetic).

Optical Properties: Opaque. *Color*: Steel-gray. *Streak*: Gray-black. *Luster*: Metallic. R_1-R_2: n.d.

Cell Data: *Space Group*: *P*1. a = 9.103(2) b = 9.860(3) c = 9.111(2) α = 90.27(2)° β = 109.53(2)° γ = 107.58(2)° Z = 2

X-ray Powder Pattern: Binntal, Switzerland.
3.02 (100), 1.852 (80), 1.581 (70), 1.205 (30), 3.34 (20), 1.556 (20), 1.312 (20)

Chemistry:

	(1)	(2)	(3)
Cu	41.3	39.1	39.32
As	29.2	29.7	30.91
S	29.8	28.7	29.77
Total	100.3	97.5	100.00

(1) Binntal, Switzerland; by electron microprobe, corresponding to $Cu_{6.29}As_{3.77}S_{9.00}$. (2) Do.; by electron microprobe, corresponding to $Cu_{6.19}As_{3.99}S_{9.00}$. (3) $Cu_6As_4S_9$.

Occurrence: On sulfides in crystalline dolostone.

Association: Realgar, coloradoite, tennantite, galena, sphalerite.

Distribution: From the Lengenbach quarry, Binntal, Valais, Switzerland [TL].

Name: Honors Rudolph von Sinner (1890-1960), President of the Commission of the Natural History Museum, Bern, Switzerland.

Type Material: Mineralogical-Petrographical Institute, University of Bern, Bern, Switzerland, L2120-62; University of Copenhagen, Copenhagen, Denmark.

References: (1) Nowacki, W., F. Marumo, and Y. Takéuchi (1964) Untersuchungen an Sulfiden aus dem Binnatal (Kt. Wallis, Schweiz). Schweiz. Mineral. Petrog. Mitt., 44, 5-9 (in German). (2) (1975) Mineral. Abs., 17, 74 (abs. ref. 1). (3) Bindi, L., E. Makovicky, F. Nestola, and L. De Battisti (2013) Sinnerite, $Cu_6As_4S_9$, from the Lengenbach quarry Binn Valley, Switzerland: description and re-investigation on the crystal structure. Can. Mineral., 51(6), 851-860. (4) (2014) Amer. Mineral., 99(11-12), 2244 (abs. ref. 3). (5) Marumo, F. and W. Nowacki (1964) The crystal structure of lautite and of sinnerite, a new mineral from the Lengenbach Quarry. Schweiz. Mineral. Petrog. Mitt., 44, 439-454. (6) (1965) Amer. Mineral., 50, 1504 (abs. ref. 5). (7) Makovicky, E. and B.J. Skinner (1972) Studies of the sulfosalts of copper. II. The crystallography and composition of sinnerite, $Cu_6As_4S_9$. Amer. Mineral., 57, 824-834. (8) Makovicky, E. and B.J. Skinner (1975) Studies of the sulfosalts of copper. IV. Structure and twinning of sinnerite, $Cu_6As_4S_9$. Amer. Mineral., 60, 998-1012.