

Tangdanite**Ca₂Cu₉(AsO₄)₄(SO₄)_{0.5}(OH)₉·9H₂O**

Crystal Data: Monoclinic. *Point Group:* 2/m. Crystals to 0.5 mm, tabular on (100) and elongated along [001], form radiating or foliated aggregates to 3 mm. Crystals display {100}, {010}, {001}, and {013}.

Physical Properties: *Cleavage:* Perfect on {100}. *Fracture:* n.d. *Tenacity:* Sectile. Hardness = 2-2.5 VHN = 42.8 (50 g load). D(meas.) = 3.22 D(calc.) = 3.32

Optical Properties: Translucent. *Color:* Emerald-green to dark green. *Streak:* Light green. *Luster:* Pearly to silky.

Optical Class: Biaxial (-). $\alpha = 1.666$ $\beta = 1.686$ $\gamma = 1.694$ $2V(\text{meas.}) = 65-66^\circ$ $2V(\text{calc.}) = 64^\circ$

Orientation: $Y = b$; $Z \wedge a = 3-4^\circ$, $X \wedge c = 7-8^\circ$. *Pleochroism:* Weak, $Z =$ medium green, $Y =$ yellow-green. *Dispersion:* Weak, both $r > v$ and $r < v$.

Cell Data: *Space Group:* C2/c. $a = 54.490(9)$ $b = 5.5685(9)$ $c = 10.4690(17)$ $\beta = 96.294(3)^\circ$
 $Z = 4$

X-ray Powder Pattern: Tangdan mine, Kunming City Prefecture, Yunnan Province, P. R. China. 4.782 (100), 4.333 (71), 5.263 (54), 3.949 (47), 2.976 (46), 2.631 (41), 2.368 (29)

Chemistry:	(1)	(2)
CaO	7.29	7.14
CuO	45.71	45.57
As ₂ O ₅	29.82	29.26
SO ₃	1.60	2.55
H ₂ O	[15.58]	15.48
Total	100.00	100.00

(1) Tangdan mine, Kunming City Prefecture, Yunnan Province, P. R. China; average of 10 electron microprobe analyses supplemented by Raman spectroscopy, H₂O by difference; corresponding to Ca_{2.05}Cu_{9.08}(As_{1.03}O₄)₄(S_{0.63}O₄)_{0.5}(OH)₉·9H_{2.04}O. (2) Ca₂Cu₉(AsO₄)₄(SO₄)_{0.5}(OH)₉·9H₂O.

Occurrence: A secondary mineral in the oxidized zone of an As-bearing Cu sulfide deposit.

Association: Chalcopyrite, bornite, chalcocite, covellite, tennantite, enargite, cuprite, malachite, azurite, copper, brochantite.

Distribution: From the Tangdan and Nanniping mines, southeast Dongchuan district, Dongchuan County, Kunming City Prefecture, Yunnan Province, P.R. China.

Name: For the *Tangdan* mine, the locality that produced the first specimens.

Type Material: Geological Museum of China, Beijing, P.R. China (M11802) and in the Canadian Museum of Nature, Gatineau, Quebec, Canada (CMNMC 86550).

References: (1) Zhesheng, M., L. Guowu, N.V. Chukanov, G. Poirier, and S. Nicheng (2014) Tangdanite, a new mineral species from the Yunnan Province, China and the discreditation of 'clinotyrolite'. *Mineral. Mag.*, 78(3), 559-569. (2) (2015) *Amer. Mineral.*, 100, 2361-2362 (abs. ref. 1).