Clinotyrolite $Ca_2Cu_9(AsO_4,SO_4)_4(OH)_{10}\cdot 10H_2O$

Crystal Data: Monoclinic. *Point Group:* m or $2/m$. Crystals, flattened parallel to {001}, elongated along [100], in radiated and foliated aggregates, to 3 mm.

Physical Properties: Hardness = n.d. D(meas.) = 3.22 D(calc.) = 3.21

Optical Properties: Semitransparent. *Color:* Emerald-green. *Luster:* Pearly or silky. *Optical Class:* Biaxial (–). *Orientation:* $Y = b$; $Z \wedge a = 3°$–$4°$. $\alpha = 1.666$ $\beta = 1.686$ $\gamma = 1.694$ 2V(meas.) = 65°–66°

Cell Data: *Space Group:* Pa or $P2/a$. $a = 10.513$ $b = 5.56$ $c = 27.61$ $\beta = 94.0°$ Z = 2

X-ray Powder Pattern: Dongchuan mine, China.
2.960 (10), 2.673 (10), 4.81 (9), 4.400 (8), 1.748 (8), 3.670 (7), 3.500 (7)

Chemistry:

	(1)
SO_3	1.28
As_2O_5	28.09
CuO	46.04
CaO	7.24
H_2O	17.63
Total	100.28

(1) Dongchuan mine, China; corresponds to $Ca_{2.01}Cu_{9.01}[(AsO_4)_{3.81}(SO_4)_{0.25}]_{\Sigma=4.06}(OH)_{9.87}\cdot 10.32H_2O$.

Occurrence: In the oxidized zone of a copper mine (Dongchuan mine, China).

Association: Tyrolite (Dongchuan mine, China); tennantite, parnauite (Tynagh mine, Ireland); cuprite, posnjakite, gilmarite, langite, connellite, brochantite, malachite, vésigniéite, cornubite, olivenite, trippkeite, domeykite, djurleite (Roua mines, France).

Distribution: From the Dongchuan copper mine, Yunnan Province, China. In the Tynagh mine, near Loughrea, Co. Galway, Ireland. From the Roua copper mines, about 50 km north of Nice, Alpes Maritimes, France. At Richelsdorf, Hesse, Germany. In the Lovelock mine, Table Mountain district, Churchill Co., Nevada, USA.

Name: For its *monoclinic* crystal system and similarity to *tyrolite*.

Type Material: n.d.

References: (1) Ma Zhesheng, Qian Rongyao, and Peng Zhizhong (1980) Clinotyrolite – a new mineral of the hydrous copper arsenate discovered in Dongchuan, Yunnan. Acta Geol. Sinica, 54, 134–143 (in Chinese with English abs.). (2) (1980) Mineral. Abs., 31, 495 (abs. ref. 1).