

**Conichalcite****CaCu(AsO<sub>4</sub>)(OH)**

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**Crystal Data:** Orthorhombic. *Point Group:* 222. Rarely as euhedral crystals, equant to short prismatic along [010], to 3 mm, terminated by many forms, both left- and right-handed; typically in radial fibrous aggregates, as botryoidal to reniform crusts, massive. *Twinning:* Rare on {001}.

**Physical Properties:** *Fracture:* Uneven. *Tenacity:* Brittle. Hardness = 4.5  
D(meas.) = 4.33 D(calc.) = 4.29

**Optical Properties:** Subtranslucent. *Color:* Grass-green to yellowish green, pistachio-green, emerald-green; in transmitted light, pale green to yellowish green, commonly zoned. *Streak:* Green. *Luster:* Vitreous to somewhat greasy.

*Optical Class:* Biaxial (+), may be biaxial (-), commonly zoned. *Pleochroism:* X = colorless to green; Y = pale greenish to yellow-green; Z = pale bluish to blue-green. *Orientation:* X = c; Y = b; Z = a. *Dispersion:* r > v, strong, to r < v, moderate.  $\alpha = 1.778\text{--}1.800$   $\beta = 1.795\text{--}1.831$   $\gamma = 1.801\text{--}1.846$  2V(meas.) = 0°–90°

**Cell Data:** *Space Group:* P2<sub>1</sub>2<sub>1</sub>2<sub>1</sub>. a = 7.38–7.40 b = 9.21–9.24 c = 5.82–5.84 Z = 4

**X-ray Powder Pattern:** Higgins mine, Bisbee, Arizona, USA.  
2.84 (10), 2.59 (10), 3.14 (9), 1.609 (7), 1.720 (6), 4.10 (5), 2.56 (5)

<b>Chemistry:</b>	(1)	(2)	(3)	(1)	(2)	(3)
P <sub>2</sub> O <sub>5</sub>	8.81	1.4		ZnO	0.7	
As <sub>2</sub> O <sub>5</sub>	30.68	42.6	44.27	CaO	21.36	21.6
V <sub>2</sub> O <sub>5</sub>	1.78			H <sub>2</sub> O	5.61	[3.6]
CuO	31.76	30.1	30.65	Total	100.00	[100.0]
						100.00

(1) Hinojosa de Córdoba, Spain. (2) Higgins mine, Bisbee, Arizona, USA; by electron microprobe, H<sub>2</sub>O by difference. (3) CaCu(AsO<sub>4</sub>)(OH).

**Polymorphism & Series:** Forms three series; with austinite, with cobaltaustinite, and with tangeite.

**Mineral Group:** Adelite group.

**Occurrence:** An uncommon secondary mineral in the oxidized zone of copper deposits, typically an alteration product of enargite.

**Association:** Austinite, olivenite, clinoclase, libethenite, chenevixite, brochantite, malachite, azurite, jarosite, “limonite”.

**Distribution:** Many minor occurrences. Some providing good specimens include: from Hinojosa de Córdoba, Andalusia, Spain. In England, at Wheal Kendall, St. Hilary, and the Hingston Down quarry, Calstock, Cornwall; from Caldbeck Fells, Cumbria. In the USA, at the American Eagle and a number of other mines in the Tintic district, Juab Co., and in the Gold Hill mine, Tooele Co., Utah; from Bisbee, Cochise Co., Arizona; in the Bristol mine, Lincoln Co., and the Empire-Nevada mine, Yerington, Lyon Co., Nevada. From the Ojuela mine, Mapimí, Durango, Mexico. At Collahuasi, Tarapacá, Chile. From the Guchab mine, near Otavi, and at Tsumeb, Namibia.

**Name:** From the Greek for *lime* and *copper*, as both elements are essential to the composition.

**Type Material:** Mining Academy, Freiberg, Germany, 21297.

**References:** (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 806–809. (2) Berry, L.G. (1951) Observations on conichalcite, cornwallite euchroite lironite and olivenite. *Amer. Mineral.*, 36, 484–503. (3) Qurashi, M.M. and W.H. Barnes (1954) The structures of the minerals of the descloizite and adelite groups: I – descloizite and conichalcite (part 1). *Amer. Mineral.*, 39, 416–435. (4) Radcliffe, D. and W.B. Simmons, Jr. (1971) Austinite: chemical and physical properties in relation to conichalcite. *Amer. Mineral.*, 56, 1359–1365.

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