

# Botallackite

# Cu<sub>2</sub>Cl(OH)<sub>3</sub>

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**Crystal Data:** Monoclinic. *Point Group:* 2/*m*. As crusts of minute platy interlaced crystals.

**Physical Properties:** *Cleavage:* One direction, good,  $\perp$  Z. Hardness = [Soft.]  
D(meas.) =  $\sim$ 3.6 D(calc.) = [3.60]

**Optical Properties:** Transparent to translucent. *Color:* Mountain-green, bluish green to green; pale bluish green in transmitted light.

*Optical Class:* Biaxial (+). *Pleochroism:* Weak; in shades of bluish green. *Dispersion:*  $r > v$ , strong.  $\alpha = 1.775(3)$   $\beta = 1.800(5)$   $\gamma = 1.846(3)$  2V(meas.) = Moderately large.

**Cell Data:** *Space Group:*  $P2_1/m$ .  $a = 5.717(1)$   $b = 6.126(1)$   $c = 5.636(1)$   
 $\beta = 93.07(1)^\circ$  Z = [2]

**X-ray Powder Pattern:** Botallack mine, England.

5.66 (10), 2.40 (8), 2.57 (7), 2.84 (4), 1.53 (4), 2.68 (3), 1.93 (3)

## Chemistry:

	(1)	(2)
CuO	66.25	74.49
Cl	14.51	16.60
H <sub>2</sub> O	22.60	12.65
—O = Cl <sub>2</sub>	3.27	3.74
Total	100.09	100.00

(1) Botallack mine, England. (2) Cu<sub>2</sub>Cl(OH)<sub>3</sub>.

**Polymorphism & Series:** Polymorphous with atacamite, clinoatacamite, and paratacamite.

**Occurrence:** In copper-bearing deposits, in areas with high chlorine concentrations or weathered while exposed to seawater; a reaction product of slag immersed in seawater; a weathering product of sulfides in subsea black smoker deposits.

**Association:** Atacamite, paratacamite (Botallack mine, Cornwall, England; Bisbee, Arizona, USA); gypsum, brochantite, connellite (Dalbeattie, Scotland).

**Distribution:** In Wheal Cock and West Wheal Owles, the Botallack and Levant mines, St. Just, and a few other places in Cornwall, England. At the Southwick Cliffs, near Dalbeattie, Kirkcudbrightshire, Scotland. From the Castletown mine, Lochgilphead, Scotland. Found in the Dooneen mine, Allihies, Co. Cork, Ireland. From Juliushütte, Aistfeld, Harz Mountains, Germany, in slag. At Laurium, Greece, in slag. In South Africa, from the Argent Pb–Zn mines, about 100 km east of Johannesburg, Transvaal, in slag. From Bisbee, Cochise Co., Arizona, USA. Along the Mid-Atlantic Ridge, in the TAG Hydrothermal Field.

**Name:** For the occurrence in the Botallack mine, Cornwall, England.

**Type Material:** The Natural History Museum, London, England, 36528; Harvard University, Cambridge, Massachusetts, USA, 100805.

**References:** (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 76–77. (2) Frondel, C. (1950) On paratacamite and some related copper chlorides. *Mineral. Mag.*, 29, 34–45. (3) Hawthorne, F.C. (1985) Refinement of the crystal structure of botallackite. *Mineral. Mag.*, 49, 87–89.