

# Paramelaconite



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**Crystal Data:** Tetragonal. *Point Group:*  $4/m\ 2/m\ 2/m$ . Crystals, to 7.5 cm, prismatic || [001], showing {010} heavily striated || [001], {011}, and {001}; massive.

**Physical Properties:** *Fracture:* Flat conchoidal. *Tenacity:* Brittle. Hardness = 4.5  
D(meas.) = 6.04–6.11 D(calc.) = 5.93

**Optical Properties:** Opaque. *Color:* Black to purplish black, pitch-black on fractures; white with pinkish brown tint in reflected light. *Streak:* Brownish black. *Luster:* Brilliant metallic to adamantine.

*Optical Class:* Uniaxial. *Pleochroism:* Weak. *Anisotropism:* Strong.

$R_1$ – $R_2$ : n.d.

**Cell Data:** *Space Group:*  $I4_1/amd$ .  $a = 5.837$   $c = 9.932$   $Z = 4$

**X-ray Powder Pattern:** Bisbee, Arizona, USA.

2.490 (vs), 1.575 (s), 1.251 (s), 2.050 (m), 1.449 (m), 1.430 (m), 2.888 (w)

**Chemistry:**

	(1)	(2)
Cu	81.80	84.12
O		15.88
Total		100.00

(1) Bisbee, Arizona, USA; by electrolytic determination of total Cu. (2)  $\text{Cu}_2^{1+}\text{Cu}_2^{2+}\text{O}_3$ .

**Occurrence:** A very rare secondary mineral in hydrothermal copper deposits.

**Association:** Cuprite, tenorite, connellite, malachite, goethite (Bisbee, Arizona, USA); cuprite, tenorite, chrysocolla, malachite, plancheite, diopside, atacamite (Algomah mine, Michigan, USA).

**Distribution:** From the Copper Queen mine, Bisbee, Cochise Co., Arizona, and at the Algomah mine, Ontonagon Co., Michigan, USA.

**Name:** From the Greek for *near* and *melaconite*, which in turn was named for *black* and *dust*, now a synonym for tenorite.

**Type Material:** Seaman Mineral Museum, Michigan Technical University, Houghton, Michigan, 13396; American Museum of Natural History, New York City, New York, 4630; Harvard University, Cambridge, Massachusetts, 97919; National Museum of Natural History, Washington, D.C., USA, 112878; The Natural History Museum, London, England, 1967,37.

**References:** (1) Palache, C., H. Berman, and C. Frondel (1944) Dana's system of mineralogy, (7th edition), v. I, 510–511. (2) Frondel, C. (1941) Paramelaconite: a tetragonal oxide of copper. *Amer. Mineral.*, 26, 657–672. (3) Williams, S.A. (1962) Paramelaconite and associated minerals from the Algomah mine, Ontonagon County, Michigan. *Amer. Mineral.*, 47, 778–779. (4) O'Keeffe, M. and J.-O. Bovin (1978) The crystal structure of paramelaconite,  $\text{Cu}_4\text{O}_3$ . *Amer. Mineral.*, 63, 180–185. (5) Morgan, P.E.D., D.E. Partin, B.L. Chamberland, and M. O'Keeffe (1996) Synthesis of paramelaconite:  $\text{Cu}_4\text{O}_3$ . *J. Solid State Chem*, 121, 33–37.