

**Crystal Data:** Tetragonal. *Point Group:* 4/m 2/m 2/m. Rarely as isolated single crystals of pseudo-octahedral or pseudocubo-octahedral habit; more commonly as oriented overgrowths on cube faces of crystals of boleite and pseudoboleite, in groupings which mimic twins, to 8 cm.

**Physical Properties:** *Cleavage:* {101}, good; {110}, distinct; {001}, poor. Hardness = 2.5  
D(meas.) = 4.656 D(calc.) = 4.66

**Optical Properties:** Translucent. *Color:* Indigo blue. *Streak:* Sky-blue. *Luster:* Weakly vitreous to adamantine.

*Optical Class:* Uniaxial (-).  $\omega = 2.026-2.041$   $\varepsilon = 1.926-1.965$  *Pleochroism:* *O* = dark blue with greenish tint; *E* = blue.

**Cell Data:** *Space Group:* I4/mmm.  $a = 15.1007(2)$   $c = 24.4940(4)$   $Z = 2$

**X-ray Powder Pattern:** Boleo, Mexico.

2.392 (vs), 2.673 (s), 2.019 (s), 4.90 (ms), 3.76 (ms), 2.190 (ms), 1.888 (ms)

<b>Chemistry:</b>	(1)
PbO	58.68
CuO	20.27
Cl	19.03
H <sub>2</sub> O	5.90
- O = Cl	4.29
Total	99.59

(1) Boleo, Mexico, recalculated analysis; corresponds to Cu<sub>20.14</sub>Pb<sub>20.78</sub>Cl<sub>42.41</sub>(OH)<sub>39.43</sub>·6.16H<sub>2</sub>O.

**Occurrence:** A secondary mineral formed through reaction of chloride ions with primary sulfides in the oxidized zone of some Pb-Cu deposits; in smelter slag immersed in and leached by sea water. Of exhalative origin near a volcanic fumarole.

**Association:** Boleite, pseudoboleite, atacamite, anglesite, cerussite, phosgenite, gypsum (Mexico); tenorite, gypsum, cotunnite (Vesuvius).

**Distribution:** In Mexico, exceptional crystals and groups from the Amelia mine, Boleo, near Santa Rosalía, Baja California. From Laurium, Greece, in slag. Along Baratti Beach, Tuscany (in slag) and at Vesuvius (near a fumarole), Italy. In England, in Cornwall, from Tolcarne Beach, Great Western Beach, and Watergate Bay, Newquay; Newport Beach, Falmouth; in the Porthilly mine, St. Minver; at Daymer Bay, near Polzeath; Trerubies Cove, near Delabole; Gunver Head, near Padstow Consols; and Loe Warren zawn, 0.75 km west of Botallack, St. Just. In Germany, from the Christian-Levin mine, near Essen, North Rhine-Westphalia. In Australia, at the Anticline prospect, 11 km west-southwest of Ashburton Downs homestead, Capricorn Range, Western Australia, and at Broken Hill, New South Wales.

**Name:** For Edouard *Cumenge* (1828-1902), French mining engineer at Boleo, Mexico, who found the first specimens.

**Type Material:** n.d.

**References:** (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 79-80 [cumengite]. (2) Winchell, R.E. and R.C. Rouse (1974) The mineralogy of the boleite group. *Mineral. Record*, 5, 280-287. (3) Dean, A.C., R.F. Symes, J.H. Thomas, and P.A. Williams (1983) Cumengéite from Cornwall. *Mineral. Mag.*, 47, 235-236. (4) Cruciani, G., P. Orlandi, M. Pasero, and M. Russo (2005) First Italian occurrence of cumengéite from Vesuvius: crystal structure refinement and revision of the chemical formula. *Mineral. Mag.*, 69, 1037-1045. (5) Hawthorne, F.C. and L.A. Groat (1986) The crystal structure and chemical composition of cumengéite. *Mineral. Mag.*, 50, 157-162.