Cumengeite $Pb_{21}Cu_{20}Cl_{42}(OH)_{40}$

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.
Optical Class: Uniaxial (–). *Pleochroism:* O = dark blue with greenish tint; E = blue.
ω = 2.026–2.041 ϵ = 1.926–1.965

Cell Data: *Space Group:* $I4/mmm$. a = 15.065(2) c = 24.436(5) Z = 2

X-ray Powder Pattern: Boleo, Mexico.
2.38 (10), 4.86 (9), 3.73 (6), 7.02 (4), 3.98 (4), 3.08 (4), 2.66 (4)

Chemistry:

	(1)	(2)	(3)
Pb	54.47	54.17	55.85
CuO	20.27	19.93	20.42
Cl	19.03	19.13	19.11
H_2O	5.90	6.19	4.62
insol.	0.19		
Total	99.86	99.42	100.00

(1–2) Boleo, Mexico. (3) $Pb_{21}Cu_{20}Cl_{42}(OH)_{40}$.

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.

Association: Boleite, pseudoboleite, atacamite, anglesite, cerussite, phosgenite, gypsum (Boleo, Mexico).

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, Italy, in slag. In England, in Cornwall, from Tolcarne Beach, Great Western Beach, and Watergate Bay, Newquay; Newporth 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) Hawthorne, F.C. and L.A. Groat (1986) The crystal structure and chemical composition of cumengéite. Mineral. Mag., 50, 157–162. (5) Traill, R.J. and A.P. Sabina (1960) Catalogue of X-ray diffraction patterns and specimen mounts on file at the Geological Survey of Canada. Geol. Sur. of Canada, Paper 60-4, 29.