Liroconite $Cu_2Al(AsO_4)(OH)_4 \cdot 4H_2O$

Crystal Data: Monoclinic. *Point Group:* $2/m$. Typically as crystals with a flattened octahedral or lenticular aspect, dominated by {110} and {011} and striated parallel to their intersections, also {001}, {010}, {100}, to 3.6 cm, alone and in sub-parallel groups. May be granular, massive.

Physical Properties: *Cleavage:* On {110}, {011}, indistinct. *Fracture:* Uneven to conchoidal. Hardness = 2–2.5 D(meas.) = 2.94–3.01 D(calc.) = [3.03]

Optical Properties: Transparent to translucent. *Color:* Sky-blue, bluish green, verdigris-green, emerald-green; pale blue to pale bluish green in transmitted light. *Streak:* Pale blue to pale green. *Luster:* Vitreous to resinous.
Optical Class: Biaxial (–). *Orientation:* $Y = b$; $Z \wedge a = 25°$. *Dispersion:* $r < v$, moderate.
$\alpha = 1.612(3)$ $\beta = 1.652(3)$ $\gamma = 1.675(3)$ 2V(meas.) = n.d. 2V(calc.) = 72(5)°

Cell Data: *Space Group:* $I2/a$. $a = 12.664(2)$ $b = 7.563(2)$ $c = 9.914(3)$ $\beta = 91.32(2)°$
Z = 4

X-ray Powder Pattern: Cornwall, England.
6.46 (10), 3.01 (10), 5.95 (9), 2.69 (6), 3.92 (5), 2.79 (5), 2.21 (5)

Chemistry:

	(1)	(2)
P_2O_5	3.73	
As_2O_5	23.05	26.54
Al_2O_3	10.85	11.77
Fe_2O_3	0.98	
CuO	36.38	36.73
H_2O	25.01	24.96
Total	100.00	100.00

(1) Cornwall, England. (2) $Cu_2Al(AsO_4)(OH)_4 \cdot 4H_2O$.

Occurrence: A rare secondary mineral in the oxidized zone of some copper deposits.

Association: Olivenite, chalcophyllite, clinoclase, cornwallite, strashimirite, malachite, cuprite, "limonite".

Distribution: In England, in Cornwall, large crystals from Wheals Muttrell and Gorland, also Wheal Unity and the Ting Tang mine, near Gwennap; from Wheal Cock, St. Just. In Germany, in Saxony, from Schwarzenberg; at the Sadisdorf copper mine, near Schmiedeberg; in the Altväter samt Eschig mine, near Sayda; and from Ullersreuth, near Hirschberg, Thuringia. At Špania Dolina (Herrengrund), and at L'ubietová, near Baňská Bystrica (Libethen, near Neusohl), Slovakia. In the Preobrazhensky mine, Beresovsk, near Yekaterinburg (Sverdlovsk), Middle Ural Mountains, Russia. In the USA, from Sterling Hill, Ogdensburg, Sussex Co., New Jersey, and at Bisbee, Cochise Co., Arizona.

Name: From the Greek for *pale* and *powder*, for its pale blue to green streak.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 921–922. (2) Berry, L.G. (1951) Observations on conichalcite, cornwallite, euchroite liroconite and olivenite. Amer. Mineral., 36, 484–503. (3) Burns, P.C., R.K. Eby, and F.C. Hawthorne (1991) Refinement of the structure of liroconite, a heteropolyhedral framework oxysalt mineral. Acta Cryst., C47, 916–919.