Phosphohedyphane $Ca_2Pb_3(PO_4)_3Cl$

Crystal Data: Hexagonal. *Point Group*: 6/*m*. As tapering hexagonal prisms to ~0.5 mm, commonly doubly terminated and showing dominant {100} and {101}. In subparallel or irregular clusters.

Physical Properties: *Cleavage*: None. *Tenacity*: Brittle. *Fracture*: Subconchoidal. Hardness = ~4 D(meas.) = n.d. D(calc.) = 5.92 Non-fluorescent.

Optical Properties: Transparent. *Color*: Colorless, greenish yellow, grayish green. *Streak*: White. *Luster*: Vitreous to greasy.
Optical Class: Uniaxial (-). ω = 1.935(2) ε = 1.928(2)

Cell Data: *Space Group*: $P6_3/m$. a = 9.857(1) c = 7.130(2) Z = 2

X-Ray Diffraction Pattern: Capitana mine, Copiapó, Atacama Province, Chile
2.942 (100), 4.054 (60), 2.139 (35), 3.565 (30), 2.882 (30), 1.918 (25), 1.890 (25)

Chemistry:

	(1)	(2)	(3)
CaO	9.24	7.76	10.97
PbO	67.60	69.35	65.51
P_2O_5	18.40	17.00	20.83
As_2O_5	2.73	3.68	
Cl	3.32	3.22	3.47
-O = Cl	0.75	0.73	0.78
Total	100.54	100.28	100.00

(1) Capitana mine, Copiapó, Atacama Province, Chile; average electron microprobe analysis of crystal cores; corresponds to $(Ca_{1.75}Pb_{0.22})Pb_3(P_{0.92}As_{0.08}O_4)_3Cl_{1.00}$. (2) Do., crystal rims; corresponds to $(Ca_{1.53}Pb_{0.44})Pb_3(P_{0.89}As_{0.12}O_4)_3Cl_{1.01}$. (3) $Ca_2Pb_3(PO_4)_3Cl$.

Polymorphism & Series: Complete solid solution among pyromorphite, mimetite, hedyphane, and phosphohedyphane likely.

Mineral Group: Apatite supergroup, hedyphane group.

Occurrence: A secondary mineral in the oxidized zone of a Cu-Pb-Ag quartz-baryte vein deposit.

Association: Quartz, duftite, bayldonite.

Distribution: From the Capitana mine, Copiapó, Atacama Province, Chile [TL]. At the Root mine, Goodsprings district, Clark Co. and the Silver Coin mine, Iron Point district, Humboldt Co., Nevada, USA. Samples previously identified as pyromorphite and are phosphohedyphane; In the USA from the Argentena, Mobile, and Monte Cristo mines, Goodsprings district, Nevada; in Arizona, at the Great Eastern mine, Cochise Co., the Hardshell mine, Patagonia Mts., the Mammoth mine, Tiger, and the Tonopah-Belmont mine, Tonopah. In Australia, at the Broken Hill mine, New South Wales and at Tennant Creek, Northern Territory. At Laurium Attica, Greece and the Berezovskoye mines, Urals, Russia. Many more confirmed localities are analyzed and tabulated in reference (1).

Name: A prefix, *phospho*, indicates the essential phosphorous in a mineral analogous to *hedyphane*. Also see discussion in reference (2).

Type Material: Natural History Museum of Los Angeles County, Los Angeles, California, USA (55429).

References: (1) Kampf, A.R., I.M. Steele, and R.A. Jenkins (2006) Phosphohedyphane, $Ca_2Pb_3(PO_4)_3Cl$, the phosphate analog of hedyphane: Description and crystal structure. Amer. Mineral., 91, 1909-1917. (2) Pasero, M., A.R. Kampf, C. Ferraris, I.V. Pekov, J. Rakovan, and T.J. White (2010) Nomenclature of the apatite supergroup minerals. Eur. J. Mineral., 22, 163-179.