

Sampleite**NaCaCu₅(PO₄)₄Cl·5H₂O**

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Crystal Data: Orthorhombic, pseudotetragonal. *Point Group:* 2/m 2/m 2/m. Crystals are very thin, lathlike, flattened on {010}, elongated along [001], to 1 cm; in rosettes, usually aggregated into crusts.

Physical Properties: *Cleavage:* {010}, perfect; {100}, {001}, good. *Hardness* = ~4
D(meas.) = 3.20 D(calc.) = 3.26

Optical Properties: Transparent. *Color:* Light blue to blue-green; blue in transmitted light.
Luster: Pearly on {010}.

Optical Class: Biaxial (-). *Pleochroism:* X = deep blue, blue-green; Y = light blue, turquoise-blue; Z = turquoise-blue, colorless. *Orientation:* X = b; Y = a; Z = c. *Dispersion:* r > v.
Absorption: Z = Y > X. $\alpha = 1.629(1)$ $\beta = 1.677(1)$ $\gamma = 1.679(1)$ $2V(\text{meas.}) = 5^\circ\text{--}23^\circ$

Cell Data: *Space Group:* n.d. a = 9.70 b = 38.40 c = 9.65 Z = 8

X-ray Powder Pattern: Chuquicamata, Chile.

9.60 (10), 3.04 (10), 4.30 (8), 1.71 (8), 6.85 (7), 3.89 (7), 1.79 (7)

Chemistry:

	(1)	(2)
P ₂ O ₅	32.10	32.03
CuO	44.12	44.88
MgO	0.52	
CaO	5.83	6.33
Na ₂ O	3.11	3.50
K ₂ O	1.49	
Cl	4.00	4.00
H ₂ O	9.74	10.16
-O = Cl ₂	0.91	0.90
Total	100.00	100.00

(1) Chuquicamata, Chile; recalculated to 100% after deduction of insoluble 1.48%; corresponds to (Na_{0.88}K_{0.27})_{Σ=1.15}(Ca_{0.91}Mg_{0.10})_{Σ=1.01}Cu_{4.83}(PO₄)_{3.94}Cl_{0.98}·4.71H₂O.
(2) NaCaCu₅(PO₄)₄Cl·5H₂O.

Occurrence: A rare mineral in the oxidized zone of copper deposits in arid climates; in caves, derived from copper sulfides in the cave walls and phosphate from bat guano.

Association: Atacamite, libethenite, pseudomalachite, torbernite, chrysocolla, gypsum, calcite, jarosite.

Distribution: In Chile, in Antofagasta, from Chuquicamata; at the Fortuna mine, east of Baquedano; as large crystals from Mantos Blancos; at the Santa Catalina mine, Sierra Gorda district; and from the El Guanaco mine, near Taltal. In Australia, from the Lake Boga granite quarry, near Swan Hill, Victoria, at the Spring Creek mine, near Wilmington, South Australia, from Mooloo Station, 12 km east of the homestead, Murchison, and in the Jingemia Cave, 6 km northwest of Watheroo, Western Australia. From the Tsaobismund pegmatite, 60 km south of Karibib, Namibia. In the Mbobbo Mkulu Cave, near Ngodwana, eastern Transvaal, South Africa.

Name: In honor of Mat Sample, Mine Superintendent, Chuquicamata, Chile.

Type Material: Harvard University, Cambridge, Massachusetts, 95023, 95024; National Museum of Natural History, Washington, D.C., USA, 137298.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 945–946. (2) Hurlbut, C.S., Jr. (1942) Sampleite, a new mineral from Chuquicamata, Chile. *Amer. Mineral.*, 27, 586–589. (3) Guillemin, C. (1956) Contribution a la minéralogie des arsénates, phosphates et vanadates de cuivre: phosphates et vanadates de cuivre. II. Phosphates et vanadates de cuivre. *Bull. Soc. fr. Minéral.*, 79, 219–275, esp. 226–229 (in French).

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