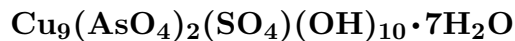


Parnauite



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Crystal Data: Orthorhombic. *Point Group:* $2/m\ 2/m\ 2/m$. Crystals lathlike, elongated \parallel [001], flattened \parallel [010], to 4 mm, forming “bowties”, rosettes, and fans; as scales and compact crusts.

Physical Properties: Hardness = ~ 2 D(meas.) = 3.09(4) D(calc.) = [3.09]

Optical Properties: Semitransparent. *Color:* Pale blue, green, dark green, blue-green, less commonly yellow-green.

Optical Class: Biaxial (-). *Pleochroism:* Weak; X = pale green; Y = yellow-green; Z = blue-green. *Orientation:* X = b; Y = a; Z = c. *Absorption:* $Z > Y > X$. $\alpha = 1.680(3)$
 $\beta = 1.704(3)$ $\gamma = 1.712(3)$ $2V(\text{meas.}) = 60(5)^\circ$

Cell Data: *Space Group:* $P2_122$ (possible). $a = 14.98(1)$ $b = 14.223(8)$ $c = 6.018(8)$
 $Z = [2]$

X-ray Powder Pattern: Majuba Hill, Nevada, USA.

14.3 (100), 4.52 (60), 10.38 (24), 4.00 (21), 2.849 (19), 7.14 (10), 6.42 (8)

Chemistry:

	(1)	(2)
SO ₃	6.33	6.45
P ₂ O ₅	2.56	
As ₂ O ₅	13.69	18.50
CO ₂	0.7	
Al ₂ O ₃	0.42	
CuO	58.10	57.64
H ₂ O	17.7	17.41
Total	99.50	100.00

(1) Majuba Hill, Nevada, USA; by electron microprobe, average of ten spots, H₂O and CO₂ by CHN analyzer; corresponds to Cu_{8.76}Al_{0.10}[(AsO₄)_{1.43}(PO₄)_{0.43}]_{Σ=1.86}(SO₄)_{0.94}(CO₃)_{0.19}(OH)_{9.98}•6.81H₂O. (2) Cu₉(AsO₄)₂(SO₄)(OH)₁₀•7H₂O.

Occurrence: A rare secondary mineral in the oxidized zone of a hydrothermal Cu-Sn orebody in rhyolite porphyries and breccias (Majuba Hill, Nevada, USA).

Association: Spangolite, chalcophyllite, chenevixite, goudeyite, malachite, azurite, brochantite, chrysocolla (Majuba Hill, Nevada, USA); cyanotrichite, brochantite, lavendulan, mansfieldite-scorodite, chalcopyrite, cornubite (Cap Garonne mine, France); chrysocolla, brochantite, malachite, tyrolite, connellite (Gwaithyrafon mine, Wales).

Distribution: In the USA, fine examples from the Majuba Hill mine, Antelope district, Pershing Co., and the Burrus mine, Pyramid district, Washoe Co., Nevada; the Grandview Mine, Grand Canyon, Coconino Co., and the Harquehala mine, Yuma Co., Arizona; the Tucker's tunnel uranium deposit, near Durango, Hinsdale Co., Colorado; and at Gold Hill, Tooele Co., Utah. At the Cap Garonne mine, near le Pradet, Var, France. From Neubulach, Wittichen, and in the Clara mine, near Oberwolfach, Black Forest, Germany. At L'ubietová, near Baňská Bystrica (Libethen, near Neusohl), Slovakia. In the Tynagh mine, near Loughrea, Co. Galway, Ireland. In England, from Cornwall, at Wheals Gorland and Unity, Gwennap; in the Penberthy Croft mine, St. Hilary; from the South Tolcarne mine, Camborne; at the Mulberry Stockworks, Lanivet; in the Marke Valley mine, Linkinhorne. From the Gwaithyrafon mine, Cwmsymlog, Wales. At Tsumeb, Namibia.

Name: To honor John L. Parnau (1906–1990), American mineral collector of Campbell, California, USA, who contributed to knowledge of the type locality at Majuba Hill, Nevada, USA.

Type Material: University of California, Santa Barbara, California, 8090; National Museum of Natural History, Washington, D.C., USA, 144004.

References: (1) Wise, W.S. (1978) Parnauite and goudeyite, two new copper arsenate minerals from the Majuba Hill mine, Pershing County, Nevada. *Amer. Mineral.*, 63, 704–708.

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