

Crystal Data: Triclinic. *Point Group:* $\bar{1}$. As grains to 30 μm in spherical aggregates, to 0.5 mm.

Physical Properties: *Cleavage:* None. *Tenacity:* Brittle. *Fracture:* n.d. *Hardness* = 5 VHN = 630 (25 g load). *D(meas.)* = n.d. *D(calc.)* = 4.18 Nonfluorescent. Slowly soluble in warm dilute HCl.

Optical Properties: Transparent. *Color:* Yellow. *Streak:* Light yellow. *Luster:* Dull for aggregates to subadamantine on fracture surfaces.

Optical Class: Biaxial (+). $\alpha = 1.83(1)$ $\beta(\text{calc.}) = 1.834$ $\gamma = 1.89(2)$ $2V(\text{meas.}) = 30(5)^\circ$
Pleochroism: Moderate, *X* = yellow, *Y*, *Z* = pale yellow.

Cell Data: Space Group: $P\bar{1}$ (by analogy with gartrellite). $a = 5.457(3)$ $b = 5.539(4)$
 $c = 7.399(6)$ $\alpha = 68.43(5)^\circ$ $\beta = 68.90(4)^\circ$ $\gamma = 69.44(5)^\circ$ $Z = 1$

X-ray Powder Pattern: Tsumeb mine, Namibia.

3.416 (100), 2.927 (64), 3.186 (40), 2.700 (30), 2.533 (30), 2.832 (26), 2.468 (25)

Chemistry:	(1)		(1)
CaO	11.42	Bi ₂ O ₃	<0.05
NiO	0.50	P ₂ O ₅	0.16
CoO	0.15	V ₂ O ₅	<0.05
CuO	10.00	As ₂ O ₅	47.72
ZnO	8.19	SO ₃	0.09
PbO	0.69	H ₂ O	[5.98]
Al ₂ O ₃	0.37	Total	98.57
Fe ₂ O ₃	13.75		

(1) Tsumeb mine, Namibia; average electron microprobe analysis, H₂O calculated; corresponding to Ca_{0.98}Pb_{0.02}Σ=1.00(Cu_{0.60}Zn_{0.37}Co_{0.01})Σ=0.98(Fe_{0.83}Zn_{0.11}Al_{0.04})Σ=0.98[(AsO₄)_{1.99}(PO₄)_{0.01}(SO₄)_{0.01}]Σ=2.01 [(H₂O)_{1.22}(OH)_{0.74}]Σ=1.96.

Mineral Group: Tsumcorite group.

Occurrence: Secondary in the oxidation zone of polymetallic sulfarsenide deposits.

Association: Beudantite, adamite, conichalcite, wulfenite, chalcocite, quartz.

Distribution: At the Tsumeb mine, Namibia. From the Pucher shaft, Schneeberg, Saxony, Germany.

Name: Honors geologist *Ludger Krahn* (b. 1957), who provided the initial specimen for study.

Type Material: Mineralogical Institute, University of Bochum, Germany.

References: (1) Krause, W., G. Blass, H.-J. Bernhardt, and H. Effenberger (2001) Lukrahnite, CaCuFe³⁺(AsO₄)₂[(H₂O)(OH)], the calcium analogue of gartrellite. *Neues Jahrb. Mineral., Mon.*, 481-492. (2) (2002) *Amer. Mineral.*, 87, 766 (abs. ref. 1).