

**Lukrahnite****CaCuFe<sup>3+</sup>(AsO<sub>4</sub>)<sub>2</sub>(OH, H<sub>2</sub>O)<sub>2</sub>**

**Crystal Data:** Triclinic. *Point Group:*  $\bar{1}$ . As grains to 30  $\mu\text{m}$  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)

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

(1) Tsumeb mine, Namibia; average electron microprobe analysis, H<sub>2</sub>O calculated; corresponding to Ca<sub>0.98</sub>Pb<sub>0.02</sub>Σ=1.00(Cu<sub>0.60</sub>Zn<sub>0.37</sub>Co<sub>0.01</sub>)Σ=0.98(Fe<sub>0.83</sub>Zn<sub>0.11</sub>Al<sub>0.04</sub>)Σ=0.98[(AsO<sub>4</sub>)<sub>1.99</sub>(PO<sub>4</sub>)<sub>0.01</sub>(SO<sub>4</sub>)<sub>0.01</sub>]Σ=2.01 [(H<sub>2</sub>O)<sub>1.22</sub>(OH)<sub>0.74</sub>]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, CaCuFe<sup>3+</sup>(AsO<sub>4</sub>)<sub>2</sub>[(H<sub>2</sub>O)(OH)], the calcium analogue of gartrellite. *Neues Jahrb. Mineral., Mon.*, 481-492. (2) (2002) *Amer. Mineral.*, 87, 766 (abs. ref. 1).