Andyrobertsite $KCdCu_5(AsO_4)_4[As(OH)_2O_2]\cdot 2H_2O$

Crystal Data: Monoclinic. *Point Group*: 2/*m*. Crystals have {100} dominant, with {210}, {$10\bar{2}$}, {001}, and {011}. As a crystallographically continuous, lamellar intergrowth with calcioandyrobertsite as plates, to 10 mm, that radiate from the center of an aggregate 1.4 cm long and 1 cm at the base.

Physical Properties: *Cleavage*: Good on (100). *Fracture*: Conchoidal. *Tenacity*: Brittle. Hardness = 3 D(meas.) = n.d. D(calc.) = 4.011

Optical Properties: Transparent. *Color*: Electric blue; greenish blue in transmitted light. *Streak*: Pale blue. *Luster*: Vitreous.
Optical Class: Biaxial (-). α = 1.720(3) β = 1.749(1) γ = 1.757(1) 2V(meas.) = 50(5)° 2V(calc.) = 55° *Orientation*: $X \wedge a = 12°$ (in β obtuse), $Y = b$, $Z = c$. Nonpleochroic. *Dispersion*: Moderate, $r < v$, asymmetric.

Cell Data: *Space Group*: $P2_1/m$. a = 9.8102(9) b = 10.0424(6) c = 9.9788(7) β = 101.686(7)° Z = 2

X-ray Powder Pattern: Tsumeb mine, Namibia.
9.64 (100), 3.145 (50), 4.46 (40), 3.048 (40), 2.698 (40), 7.00 (30), 4.81 (30)

Chemistry

	(1)
K_2O	4.00
CaO	1.36
MnO	0.64
CdO	6.48
ZnO	0.19
CuO	31.72
As_2O_5	47.58
H_2O	[4.44]
Total	96.41

(1) Tsumeb mine, Namibia; electron microprobe analysis supplemented by IR spectroscopy, H_2O calculated from structure analysis; corresponds to $K_{1.03}(Cd_{0.61}Ca_{0.30}Mn_{0.11})_{\Sigma=1.02}(Cu_{4.85}Zn_{0.03})_{\Sigma=4.88}(AsO_4)_{4.04}[As(OH)_2O_2](H_2O)_2$.

Occurrence: On a single specimen from a weathered polymetallic mineral deposit.

Association: Cuprian adamite, zincian olivenite, calcioandyrobertsite, tennantite.

Distribution: From the Tsumeb mine, Namibia.

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Type Material: Royal Ontario Museum, Toronto, Canada (M47022 and M47110) and the Natural Museum of Natural History, Washington, D.C., USA (171487).

References: (1) Cooper, M.A., F.C. Hawthorne, W.W. Pinch, and J.D. Grice (1999) Andyrobertsite and calcioandyrobertsite: two new minerals from the Tsumeb mine, Tsumeb, Namibia. Mineral. Record, 30(3), 181-186. (2) (2000) Amer. Mineral., 85, 1321 (abs. ref. 1). (3) Cooper, M.A. and F.C. Hawthorne (2000) Highly undersaturated anions in the crystal structure of andyrobertsite – calcio-andyrobertsite, a doubly acid arsenate of the form $K(Cd,Ca)[Cu^{2+}_5(AsO_4)_4\{As(OH)_2O_2\}](H_2O)_2$. Can. Mineral., 38(4), 817-830.