Goldquarryite $CuCd_2Al_3(PO_4)_4F_3 \cdot 10H_2O$

Crystal Data: Triclinic. *Point Group*: $\bar{1}$. As acicular to bladed crystals elongated along [100] to 1.5 mm, showing {010} and {001}, with {100} terminations in isolated radiating or parallel clusters to 3 mm. *Twinning*: Multiple on {001} by 180° rotation about *c**.

Physical Properties: *Cleavage*: None. *Fracture*: Irregular. *Tenacity*: Brittle. Hardness = 3-4 D(meas.) = 2.78(1) D(calc.) = 2.81

Optical Properties: Transparent to translucent (aggregates). *Color*: Blue to blue-gray. *Streak*: White. *Luster*: Vitreous.
Optical Class: Biaxial (+). $\alpha = 1.570$ $\beta = 1.573$ $\gamma = 1.578$ 2V(meas.) = ~30° 2V(calc.) = 76°
Dispersion: Strong, $r < v$. *Pleochroism*: Deep blue || elongation, pale blue normal to it.

Cell Data: *Space Group*: $P\bar{1}$. $a = 6.787(1)$ $b = 9.082(2)$ $c = 10.113(2)$ $\alpha = 101.40(1)°$ $\beta = 104.27(1)°$ $\gamma = 102.51(1)°$ Z = 1

X-ray Powder Pattern: Gold Quarry mine, near Carlin, Eureka County, Nevada, USA.
9.433 (100), 2.820 (50), 4.726 (30), 3.700 (30), 3.173 (30B), 3.010 (30), 2.896 (30)

Chemistry:

	(1)
K_2O	0.17
CaO	1.25
CuO	5.33
NiO	0.23
ZnO	0.05
CdO	26.24
Al_2O_3	15.22
V_2O_3	0.05
P_2O_5	28.04
F	3.63
H_2O	[22.19]
- O = F	1.53
Total	100.87

(1) Gold Quarry mine, near Carlin, Eureka County, Nevada, USA; average of 4 electron microprobe analyses, H_2O calculated from stoichiometry and presence confirmed by IR and structure analyses; corresponding to $[(Cu_{0.66}Ni_{0.03}Zn_{0.01})_{\Sigma=0.70}\square_{0.30}]_{\Sigma=1.00}(Cd_{2.00}Ca_{0.22}K_{0.04})_{\Sigma=2.26}(Al_{2.92}V_{0.01})_{\Sigma=2.93}(PO_4)_{3.88}F_{1.87} \cdot (H_2O)_{12.06}$.

Occurrence: A supergene product on and between brecciated and hydrothermally rounded jasperoid fragments lightly cemented by late-stage silicification in a Carlin-type gold deposit.

Association: Opal, carbonate-fluorapatite, hewettite.

Distribution: From Gold Quarry open-pit gold mine near Carlin, Eureka County, Nevada, USA.

Name: For the quarry where the first specimens were collected.

Type Material: National Mineral Collection, Geological Survey of Canada, Ottawa, Ontario (68084).

References: (1) Roberts, A.C., M.A. Cooper, F.C. Hawthorne, R.A. Gault, M.C. Jensen, and E.E. Foord (2003) Goldquarryite, a new Cd-bearing phosphate mineral from the Gold Quarry mine, Eureka County, Nevada. Mineral. Record, 34(3), 237-240. (2) (2003) Amer. Mineral., 88(11), 1837 (abs. ref. 1). (3) Cooper, M.A. and F.C. Hawthorne (2004) The crystal structure of goldquarryite, $(Cu^{2+},\square)(Cd,Ca)_2Al_3(PO_4)_4F_2(H_2O)_{10}\{(H_2O),F\}_2$, a secondary phosphate from the Gold Quarry mine, Eureka County, Nevada, U.S.A. Can. Mineral., 42(3), 753-761.