Guanacoite $Cu_2Mg_3(OH)_4(AsO_4)_2(H_2O)_4$

Crystal Data: Monoclinic. *Point Group*: 2/*m*. As prismatic to acicular crystals to 0.7 mm elongated along [100]. Crystals show dominant {031} terminated by {120} or dominant {021} terminated by {100}; in subparallel intergrowths or radiating sprays.

Physical Properties: *Cleavage*: Parallel to {010}. *Tenacity*: Brittle. *Fracture*: Uneven to conchoidal. Hardness = 3 D(meas.) = 3.29(2)-3.31(2) D(calc.) = 3.36
Dissolves slowly in cold HCl.

Optical Properties: Transparent. *Color*: Blue to pale blue. *Streak*: White to pale blue. *Luster*: Vitreous.
Optical Class: Biaxial (-). α = 1.663(1) β = 1.691(1) γ = 1.693(1) 2V(meas.) = 31(1)° 2V(calc.) = 42° *Orientation*: $X \sim c$, $Z = b$, $Y \wedge a$ = 10-17° (in obtuse β). *Dispersion*: Strong to weak, $r > v$. *Pleochroism*: Z = greenish blue, X = pale greenish blue, Y = near colorless.
Absorption: $Z >> X > Y$.

Cell Data: *Space Group*: $P2_1/c$. a = 5.482(4) b = 16.84(1) c = 6.911(5) β = 99.98(7)° Z = 2

X-ray Powder Pattern: El Guanaco mine, northern Chile.
8.420 (100), 4.210 (64), 4.322 (21), 3.016 (12), 2.907 (10), 3.577 (9), 2.106 (8)

Chemistry:

	(1)	(2)	(3)
CuO	29.67	27.87	31.19
MgO	17.12	15.55	15.80
CoO		1.16	
As_2O_5	35.67	32.86	36.05
H_2O	18	n.d.	16.96
Total	100.46	77.43	100.00

(1) El Guanaco mine, northern Chile; average electron microprobe analysis of chemically zoned crystals, H_2O from thermal analysis; corresponds to $Cu_{2.32}Mg_{2.64}(OH)_{4.13}(H_2O)_{4.15}(AsO_4)_{1.93}$.
(2) Taghouni (Tarouni), Bou Azzer district, Morocco: average electron microprobe analysis, H_2O not determined. (3) $Cu_2Mg_2(Mg_{0.5}Cu_{0.5})(OH)_4(H_2O)_4(AsO_4)_2$.

Occurrence: A secondary phase in a high sulfidation-type, Au-rich epithermal deposit hosted by felsic rocks (El Guanaco mine), weathered in an arid and Mg-rich environment.

Association: Arhbarite, conichalcite, olivenite, chrysocolla, brochantite, quartz, enargite (Chile); quartz, dolomite, chalcopyrite, chromite, cuprite, malachite, agardite-(Ce) (Morocco).

Distribution: From the El Guanaco mine, ~93 km east of Taltal and 230 km southeast of Antofagasta, 2nd Region, northern Chile and at Taghouni (Tarouni), Bou Azzer district, Morocco.

Name: For the occurrence at El *Guanaco* mine, Chile.

Type Material: Mineralogical Collection, Bergakademie Freiberg, Germany (79704) and the Mineral Sciences Department, Natural History Museum of Los Angeles County, Los Angeles, California, USA (55435, 55436 and 55437).

References: (1) Witzke, T., U. Kolitsch, W. Krause, A. Wiechowski, O. Medenbach, A.R. Kampf, I.M. Steele, and G. Favreau (2006) Guanacoite, $Cu_2Mg_2(Mg_{0.5}Cu_{0.5})(OH)_4(H_2O)_4(AsO_4)_2$, a new arsenate mineral species from the El Guanaco Mine, near Taltal, Chile: Description and crystal structure. Eur. J. Mineral., 18, 813-821. (2) Kyono, A. (2008) Compositional variability and crystal structural features of guanacoite. Amer. Mineral., 93, 501-507.