Magnesiocanutite $NaMnMg_2[AsO_4]_2[AsO_2(OH)_2]$

Crystal Data: Monoclinic. *Point Group*: 2/*m*. As tablets, slightly elongated on [20 $\bar{1}$] and flattened on {102}, resembling a lozenge-shape, to ~ 0.5 mm; crystals display {110} and {102}. Tablets are often grouped in tightly intergrown aggregates.

Physical Properties: *Cleavage*: Perfect on {010} and {101}. *Tenacity*: Brittle. *Fracture*: Splintery. Hardness = 2.5 D(meas.) = n.d. D(calc.) = 3.957 (formula for analysis 1) Slight solubility in dilute HCl.

Optical Properties: Transparent. *Color*: Pale brownish pink to rose-pink. *Streak*: White to very pale pink. *Luster*: Vitreous.
Optical Class: Biaxial (+). α = 1.689(2) β = 1.700(2) γ = 1.730(2) 2V(meas.) = 64.3(4)° 2V(calc.) = 63.3° *Orientation*: $Z = b$; $X \wedge a = 15°$ in the obtuse angle β. *Dispersion*: Slight, $r < v$. *Pleochroism*: Imperceptible.

Cell Data: *Space Group*: *C*2/*c*. a = 12.2514(8) b = 12.4980(9) c = 6.8345(5) β = 113.167(8)° Z = 4

X-ray Powder Pattern: Torrecillas mine, Iquique Province, Chile.
2.718 (100), 3.262 (96), 2.787 (93), 3.120 (59), 3.566 (43), 1.5026 (43), 6.25 (42)

Chemistry:

	(1)	(2)
Na_2O	5.44	5.68
CaO	0.26	
MgO	8.84	14.78
MnO	18.45	13.01
CoO	1.47	
CuO	2.13	
As_2O_5	59.51	63.22
H_2O	[2.86]	3.30
Total	98.96	100.00

(1) Torrecillas mine, Iquique Province, Chile; average of 9 electron microprobe analyses, H_2O calculated on the basis of As = 3 apfu, charge balance and O = 12 apfu); corresponds to $(Na_{1.02}Ca_{0.03}Mn_{1.51}Mg_{1.27}Cu_{0.16}Co_{0.11})_{\Sigma=4.10}As_3O_{12}H_{1.84}$ or structurally $Na(Mn_{0.78}Mg_{0.22})_{\Sigma=1.00}(Mg_{1.04}Mn_{0.70}Cu_{0.15}Co_{0.11})_{\Sigma=2.00}[AsO_4]_2[AsO_2(OH)_2]$. (2) $NaMnMg_2[AsO_4]_2[AsO_2(OH)_2]$.

Mineral Group: Alluaudite Group.

Occurrence: From the oxidation of native arsenic and other As-bearing primary phases, followed by later alteration by saline fluids derived from evaporating meteoric water under hyperarid conditions.

Association: Anhydrite, canutite, halite, lavendulan, magnesiokoritnigite.

Distribution: From the Torrecillas mine, northern Atacama Desert, Iquique Province, Tarapacá Region, Chile.

Name: As the Mg analogue of *canutite* with Mg rather than Mn dominant in the M2 site.

Type Material: Natural History Museum of Los Angeles County, Los Angeles, California, USA (66273 and 66274).

References: (1) Kampf, A.R., B.P. Nash, D. Maurizio, and A.A. Molina Donoso (2017) Magnesiocanutite, $NaMnMg_2[AsO_4]_2[AsO_2(OH)_2]$, a new protonated alluaudite-group mineral from the Torrecillas mine, Iquique Province, Chile. Mineral. Mag., 81(6), 1523-1531. (2) (2018) Amer. Mineral., 103, 833-834 (abs. ref. 1).