Cuatrocapaite-(NH_4) $(NH_4)_3NaMg\square(As_{12}O_{18})Cl_6\cdot16H_2O$

Crystal Data: Hexagonal. *Point Group*: $\bar{3}$ 2/*m*. As hexagonal tablets, flattened on {00*1} and bounded by {10*0} to ~0.3 mm or as massive aggregates; sometimes in vermiform stacks or in satin-spar-like vein fillings.

Physical Properties: *Cleavage*: Perfect on {00*1}. *Tenacity*: Somewhat flexible, but not elastic. *Fracture*: Irregular. Hardness = ~2.5 D(meas.) = 2.65(2) D(calc.) = 2.667

Optical Properties: Transparent. *Color*: Colorless. *Streak*: White. *Luster*: Vitreous to pearly; silky (vein fillings).
Optical Class: Uniaxial (-). ω = 1.779(3) ε = 1.541(3) Non-pleochroic.

Cell Data: *Space Group: R*$\bar{3}$ *m*. *a* = 5.2532(2) *c* = 46.688(2) Z = 1

X-Ray Diffraction Pattern: Torrecillas mine, Iquique Province, Tarapacá Region, Chile.
15.68 (100), 2.625 (71), 5.20 (56), 2.349 (47), 3.256 (42), 2.490 (41), 4.518 (35)

Chemistry:

	(1)	(2)
$(NH_4)_2$	3.61	3.47
Na_2O	2.85	1.73
K_2O	0.23	
MgO	1.94	2.25
As_2O_3	65.79	66.34
Cl	11.55	11.89
H_2O	16.11	16.11
-O = Cl	2.61	2.68
Total	99.47	100.00

(1) Torrecillas mine, Iquique Province, Chile; average electron microprobe and IR spectroscopic analyses, NH_4 by gas chromatography; corresponds to $(NH_4)_{2.48}Na_{1.66}Mg_{0.87}K_{0.09}(As_{12}O_{18.05})Cl_{5.88}\cdot16.02H_2O$. (2) $(NH_4)NaMg\square(As_{12}O_{18})Cl_6\cdot16H_2O$.

Polymorphism & Series: Series with cuatrocapaite-(K).

Occurrence: A secondary alteration phase formed under hyperarid conditions from the oxidation of native arsenic, and possibly other As-bearing primary phases, coupled with reaction with underground brines rich in mobile cations such as K^+ , Na^+ , NH^{4+}, Ca^{2+} and Mg^{2+}.

Association: Lavendulan, magnesiokoritnigite, torrecillasite, native arsenic, arsenolite, pyrite.

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

Name: An allusion to the structure, which consists of four (*cuatro* in Spanish) different types of layers (*capa* in Spanish): (1) $[As_2O_3]$; (2) $[(NH_4),K]$; (3) $[Cl_6]$; and (4) $[(Na, Mg,)_3(H_2O)_{16}]$. The suffix indicates the dominant cation in the large-cation layer, (2).

Type Material: Natural History Museum of Los Angeles County, Los Angeles, California, USA (66984, 66985 and 66986) and the A.E. Fersman Mineralogical Museum, Russian Academy of Sciences, Moscow, Russia (5255/1).

References: (1) Kampf, A.R., N.V. Chukanov, G. Möhn, M. Dini, A.A. Molina Donoso, and H. Friis (2019) Cuatrocapaite-(NH_4) and cuatrocapaite-(K), two new minerals from the Torrecillas mine, Iquique Province, Chile, related to lucabindiite and gajardoite. Mineral. Mag., 83, 741-748.