

## Geogericksenite, $\text{Na}_6\text{CaMg}(\text{IO}_3)_6(\text{CrO}_4)_2(\text{H}_2\text{O})_{12}$ , a new mineral from Oficina Chacabuco, Chile: Description and crystal structure

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### ABSTRACT

Geogericksenite,  $\text{Na}_6\text{CaMg}(\text{IO}_3)_6[(\text{Cr}_{0.84}\text{S}_{0.16})\text{O}_4]_2(\text{H}_2\text{O})_{12}$ , space group  $C2/c$ ,  $a = 23.645(2)$ ,  $b = 10.918(1)$ ,  $c = 15.768(1)$  Å,  $\beta = 114.42(6)^\circ$ ,  $V = 3707.3(6)$  Å<sup>3</sup>,  $Z = 4$ , is a new mineral on a museum specimen labeled as originating from Oficina Chacabuco, Chile. It occurs both as isolated and groupings of 0.2 mm sized bright lemon-yellow micronodules of crystals on a host rock principally composed of halite, nitratine, and niter. Associated minerals include plagioclase, clinopyroxene, and an undefined hydrated Ca-K-Ti-iodate-chromate-chloride. Geogericksenite crystals average  $30 \times 5 \times 5$  μm in size and are prismatic to acicular, elongate along [001] and somewhat flattened on {110}, and they have a length-to-width ratio of 6:1. Forms observed are {100}, {110} major, and {233} minor. Crystals are pale yellow, possess a pale-yellow streak, are transparent, brittle, and vitreous, and do not fluoresce under ultraviolet light. The estimated Mohs hardness is between 3 and 4, the calculated density is 3.035 g/cm<sup>3</sup>, and the mineral is extremely soluble in cold H<sub>2</sub>O. The optical properties of geogericksenite are biaxial (+) with  $\alpha = 1.647(2)$ ,  $\beta = 1.674(2)$ ,  $\gamma = 1.704(2)$ ,  $2V_{\text{calc}} = +88.4^\circ$  and the orientation is  $Z \approx c$ . Pleochroism is slight with  $X =$  very pale yellow and  $Z =$  distinct yellow-green.

The crystal structure of geogericksenite has been solved by direct methods and refined to an  $R$  index of 3.5% using 2019 observed reflections measured with  $\text{MoK}\alpha$  X-radiation. There is one unique Cr site occupied by 0.84 Cr<sup>6+</sup> + 0.16 S and tetrahedrally coordinated by four O atoms, one unique Mg site octahedrally coordinated by O atoms, three unique I sites octahedrally coordinated by O atoms and H<sub>2</sub>O groups, three unique Na sites with octahedral, augmented octahedral and triangular dodecahedral coordinations, one unique Ca site with square antiprismatic coordination, and six unique (H<sub>2</sub>O) groups. The cation polyhedra link by corner-, edge-, and face-sharing to form dense heteropolyhedral slabs parallel to (100); these slabs are linked by hydrogen bonding. The formula derived from the crystal-structure refinement is  $\text{Na}_6\text{CaMg}(\text{IO}_3)_6[(\text{Cr}_{0.84}\text{S}_{0.16})\text{O}_4]_2(\text{H}_2\text{O})_{12}$ . Crystals of geogericksenite are extremely unstable under the electron beam during electron microprobe analysis, and the analyzed amounts of all elements fluctuate strongly as a function of time and crystallographic orientation relative to the electron beam. However, extrapolation of the chemical composition to zero time yields values that are in reasonable accord with the chemical formula derived from crystal structure analysis.