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Georgeericksenite, $Na_6CaMg(IO_3)_6(CrO_4)_2(H_2O)_{12}$, a new mineral from Oficina Chacabuco, Chile: Description and crystal structure

Mark A. Cooper,[1] Frank C. Hawthorne,[1] Andrew C. Roberts,[2] Joel D. Grice,[3] John A.R. Stirling,[2] and Elizabeth A. Moffatt[4]

[1]Department of Geological Sciences, University of Manitoba, Winnipeg, Manitoba R3T 2N2, Canada
[2]Geological Survey of Canada, 601 Booth Street, Ottawa, Ontario, K1A 0E8, Canada
[3]Research Division, Canadian Museum of Nature, P.O. Box 3443, Station D, Ottawa, Ontario K1P 6P4, Canada
[4]Canadian Conservation Institute, 1030 Innes Road, Ottawa, Ontario K1A 0C8, Canada

Abstract

Georgeericksenite, $Na_6CaMg(IO_3)_6[(Cr_{0.84}S_{0.16})O_4]_2(H_2O)_{12}$, space group $C2/c$, a = 23.645(2), b = 10.918(1), c = 15.768(1) Å, β = 114.42(6)°, V = 3707.3(6) Å^3, 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. Georgeericksenite crystals average 30 × 5 × 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 {$\bar{2}$33} 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^3, and the mineral is extremely soluble in cold H_2O. The optical properties of georgeericksenite are biaxial (+) with α = 1.647(2), β = 1.674(2), γ = 1.704(2), 2V_{calc} = +88.4° and the orientation is $Z \approx c$. Pleochroism is slight with X = very pale yellow and Z = distinct yellow-green.

The crystal structure of georgeericksenite has been solved by direct methods and refined to an R index of 3.5% using 2019 observed reflections measured with Mo$K\alpha$ X-radiation. There is one unique Cr site occupied by 0.84 Cr^{6+} + 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_2O 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_2O) 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 $Na_6CaMg(IO_3)_6[(Cr_{0.84}S_{0.16})O_4]_2(H_2O)_{12}$. Crystals of georgeericksenite 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.