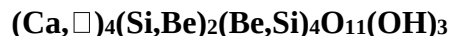


Hydroxylgugiaite

Crystal Data: Tetragonal. *Point Group:* $\bar{4}2m$. As flattened dipyrramids {111} to 50 μm or as stacked elongated tetragonal prisms to 100 μm .

Physical Properties: *Cleavage:* None. *Tenacity:* Brittle. *Fracture:* n.d. *Hardness* = ~ 5
D(meas.) = n.d. D(calc.) = 2.79

Optical Properties: Transparent to translucent. *Color:* Colorless, white to pale gray. *Streak:* White. *Luster:* Vitreous.

Optical Class: Uniaxial (+). $\omega = 1.622(2)$ $\epsilon = 1.632(2)$ *Pleochroism:* None.

Cell Data: *Space Group:* $P\bar{4}2_1m$. $a = 7.4151(2)$ $c = 4.9652(1)$ $Z = 1$

X-ray Powder Pattern: Saga I quarry, Mørje, Porsgrunn, Telemark, Norway.
2.755 (100), 2.971 (34), 3.604 (27), 2.318 (26), 2.212 (26), 1.7056 (22), 1.9866 (19)

Chemistry:	(1)	(2)	(3)		(1)	(2)	(3)
SiO ₂	42.03	44.06	44.71	BeO	[12.51]	13.47	[13.30]
Al ₂ O ₃	1.39	0.74	0.34	H ₂ O	[5.32]	[4.93]	[5.20]
FeO	1.12	0.22	0.10	F	0.43	1.74	1.22
MnO	1.10	0.74	0.41	$\frac{-\text{O}=\text{F}}{\text{Total}}$	0.18	0.73	0.51
MgO	0.02	0	0		96.57	100.10	100.14
CaO	32.35	32.90	34.56				
Na ₂ O	0.47	2.04	0.81				

(1) Blåfjell, Norway; average of 9 electron microprobe analyses supplemented by Raman and FTIR spectroscopy, H₂O calculated so that (OH)+F = 3 pfu, BeO calculated so that Si+Be+Al = 6 pfu; corresponds to (Ca_{2.82}Mn_{0.08}Fe_{0.08}Na_{0.07}Mg_{0.00}) $\Sigma=3.05$ (Si_{3.42}Be_{2.45}Al_{0.13}) $\Sigma=6$ O₁₁[(OH)_{2.89}F_{0.11}] $\Sigma=3$.

(2) Saga I quarry, Norway; average of 8 electron microprobe analyses supplemented by Raman and FTIR spectroscopy, BeO by LA-ICP-MS; corresponds to (Ca_{2.76}Na_{0.31}Mn_{0.05}Fe_{0.01}) $\Sigma=3.13$ (Si_{3.45}Be_{2.53}Al_{0.07}) $\Sigma=6.05$ O₁₁[(OH)_{2.57}F_{0.43}] $\Sigma=3$. (3) Mount Nakkaalaaq, Greenland; average of 9 electron microprobe analyses supplemented by Raman and FTIR spectroscopy, H₂O calculated so that (OH)+F = 3 pfu, BeO calculated so that Si+Be+Al = 6 pfu; corresponds to (Ca_{2.88}Na_{0.12}Mn_{0.02}) $\Sigma=3.02$ (Si_{3.48}Be_{2.49}Al_{0.03}) $\Sigma=6$ O₁₁[(OH)_{2.70}F_{0.30}] $\Sigma=3$.

Mineral Group: Melilite group.

Occurrence: A replacement of Be silicate minerals in hydrothermally-altered syenite pegmatite.

Association: Microcline, albite, biotite, zircon, pyrochlore, fayalite, magnetite, ferrochiavennite, gadolinite-(Ce), aegirine, analcime, pyrophanite, nepheline, calcite, natrolite, pyrite, molybdenite, galena, sphalerite, thomsonite-Ca, hambergite, chlorite (Blåfjell); aegirine, eudidymite, bertrandite, helvine, gibbsite, calcite, chlorite, annite, fluorite, montmorillonite (Saga I quarry); bavenite, barylite, behoite, bertrandite, epididymite, genthelvite, helvine, leucophanite, odintsovit, a meliphanite-like mineral (Mount Nakkaalaaq).

Distribution: From the Larvik plutonic complex, at Blåfjell, Langangen and at the Saga I quarry, Mørje, Porsgrunn, Telemark, southern Norway, and on top of Mount Nakkaalaaq, Ilímaussaq alkaline complex, southern Greenland.

Name: As the *hydroxyl*-bearing analog of *gugiaite*.

Type Material: Natural History Museum, University of Oslo, Norway (43673 and 43675-6) and the Canadian Museum of Nature, Ottawa, Canada (CMNMC 86555).

References: (1) Grice, J.D., R. Kristiansen, H. Friis, R. Rowe, M.A. Cooper, G.G. Poirier, P. Yang, and M.T. Weller (2017) Hydroxylgugiaite: A new beryllium silicate mineral from the Larvik plutonic complex, southern Norway and the Ilímaussaq alkaline complex, south Greenland; the first member of the melilite group to incorporate a hydrogen atom. *Can. Mineral.*, 55(2), 219-232. (2) (2018) *Amer. Mineral.*, 103, 2527-2528 (abs. ref. 1).