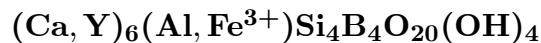


Hellandite



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Crystal Data: Monoclinic. *Point Group:* $2/m$. Crystals prismatic \parallel [001], tabular \parallel [010], to 30 cm. *Twinning:* Contact and polysynthetic, \parallel {001} and {100}.

Physical Properties: *Cleavage:* Poor on {100}, {010}. *Hardness* = 4.5–6.5
D(meas.) = 2.95–3.63 D(calc.) = 3.161

Optical Properties: Semitransparent. *Color:* Nut-brown, brownish red; black, gray, green, yellow, cream. *Luster:* Vitreous to dull.

Optical Class: Biaxial (+). *Orientation:* $X = b$; $Z \wedge c = 44^\circ\text{--}53^\circ$. $\alpha = 1.652\text{--}1.656$
 $\beta = 1.657\text{--}1.712$ $\gamma = 1.662\text{--}1.668$ $2V(\text{meas.}) = 48^\circ\text{--}86^\circ$

Cell Data: *Space Group:* $P2/a$. $a = 18.99(1)$ $b = 4.715(5)$ $c = 10.30(1)$ $\beta = 111.4(1)^\circ$
 $Z = 4$

X-ray Powder Pattern: Kragerö, Norway.

2.812 (100), 4.69 (80), 2.635 (80), 2.603 (80), 3.436 (70), 3.198 (70), 3.068 (70)

Chemistry:

	(1)	(2)	(3)
SiO ₂	26.65	25.57	24.41
TiO ₂	0.39	< 0.2	< 0.02
ThO ₂	1.46		0.57
B ₂ O ₃	10.5	[14.85]	8.47
Al ₂ O ₃	2.58	3.04	4.59
Y ₂ O ₃	21.68	18.07	26.53
RE ₂ O ₃	15.63	16.0	19.19
Fe ₂ O ₃	3.07	3.77	2.29
FeO	0.07		
MnO	0.41	0.70	0.58
MgO	0.60		
CaO	11.51	15.22	9.28
H ₂ O ⁺	3.75	[4.50]	5.3
H ₂ O ⁻	1.89		2.0
Total	100.19	[101.92]	103.23

- (1) Kragerö, Norway. (2) Predazzo, Italy; total Fe as Fe₂O₃, B₂O₃ and H₂O from stoichiometry.
(3) Evans-Lou quarry, Canada; total Fe as Fe₂O₃.

Occurrence: In granite pegmatite (Kragerö, Norway; Wakefield Lake, Canada).

Association: Tourmaline, thorite, allanite, apatite, phenakite, zircon, titanite (Kragerö, Norway); quartz, chlorite, fergusonite, kainosite-(Y), tengerite, xenotime, wakefieldite, thorongummite (Evans-Lou quarry, Canada); microcline, albite, schorl, monazite, zircon (Crestmore, California, USA).

Distribution: From the Lindvikskollen pegmatite dike, near Kragerö, Norway. At Predazzo, Trentino-Alto Adige; Lago Vico, Viterbo, and near Vetralla, Lazio, Italy. In the Trimouns talc deposit, six km northeast of Luzenac, Ariège, France. At Crestmore, Riverside Co., California, USA. In the Evans-Lou quarry, near Wakefield Lake, Quebec, Canada.

Name: For geologist Amund Theodor Helland (1846–1918), of Oslo, Norway.

Type Material: n.d.

References: (1) Dana, E.S. and W.E. Ford (1909) Dana's system of mineralogy, (6th edition), app. II, 50–51. (2) Oftedal, I. (1965) Über den Hellandit. *Tschermaks Mineral. Petrog. Mitt.*, 10, 125–129 (in German with English abs.). (3) Hogarth, D.D., G.Y. Chao, and D.C. Harris (1972) New data on hellandite. *Can. Mineral.*, 11, 760–776. (4) Mellini, M. and S. Merlino (1977) Hellandite: a new type of silicoborate chain. *Amer. Mineral.*, 62, 89–99.

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