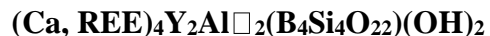


Hellandite-(Y)

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

Physical Properties: *Cleavage:* Poor on {100}, {010}. Hardness = 4.5-6.5 D(meas.) = 2.95-3.63 D(calc.) = 3.161-4.06

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

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

Cell Data: *Space Group:* P2/a. $a = 18.99(1)$ $b = 4.715(5)$ $c = 10.30(1)$ $\beta = 111.4(1)^\circ$ $Z = 2$

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)	(4)
SiO ₂	26.65	25.57	24.41	24.35
TiO ₂	0.39	< 0.2	< 0.02	
ThO ₂	1.46		0.57	0.09
B ₂ O ₃	10.5	[14.85]	8.47	15.32
Al ₂ O ₃	2.58	3.04	4.59	4.85
Y ₂ O ₃	21.68	18.07	26.53	31.60
RE ₂ O ₃	15.63	16.0	19.19	5.96
Fe ₂ O ₃	3.07	3.77	2.29	0.62
FeO	0.07			
MnO	0.41	0.70	0.58	7.71
MgO	0.60			
CaO	11.51	15.22	9.28	7.65
H ₂ O ⁺	3.75	[4.50]	5.3	
H ₂ O ⁻	1.89		2.0	[1.83]
Total	100.19	[101.92]	103.23	99.98

(1) Kragerö, Norway. (2) Predazzo, Italy; total Fe as Fe₂O₃; B₂O₃ and H₂O from stoichiometry. (3) Evans-Lou quarry, Canada. (4) Heftetjern pegmatite, Tørdal, Norway; electron microprobe analysis, H₂O calculated; corresponds to Ca_{1.34}Mn_{1.07}Y_{2.75}Yb_{0.38}Al_{0.92}Fe_{0.08}Si₄B₄O_{21.21}(OH)_{2.79}.

Mineral Group: Hellandite group.

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

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

Distribution: At the Lindvikskollen pegmatite, near Kragerö and the Heftetjern pegmatite, Tørdal, Telemark, 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. The suffix indicates the dominant REE at the Y site.

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