Hellandite-(Ce) $(Ca, REE)_4Ce_2Al\square_2(B_4Si_4O_{22})(OH)_2$

Crystal Data: Monoclinic. *Point Group*: 2/*m*. [Crystals prismatic || [001], tabular || [010] to 0.4mm.] *Twinning*: [Contact and polysynthetic, || {001} and {100}.]

Physical Properties: *Cleavage*: [Poor on {100}, {010}.] Hardness = n.d. D(meas.) = n.d. D(calc.) = n.d.

Optical Properties: Transparent. *Color*: Light green. *Luster*: [Vitreous to dull.] *Optical Class*: Biaxial.

Cell Data: *Space Group*: *P*2/*a*. a = 19.068(8) b = 4.745(2) c = 10.289(3) β = 111.18(3)° Z = 2

X-ray Powder Pattern: n.d.

Chemistry:

	(1)		(1)
SiO_2	22.78	Mn_2O_3	0.202
TiO_2	1.52	MgO	0.247
ThO_2	9.52	CaO	21.52
UO_2	1.40	BaO	0.02
B_2O_3	12.99	Li_2O	0.34
BeO	1.14	H_2O	0.43
Al_2O_3	1.97	F	0.87
Ce_2O_3	10.01	- O = F	0.366
RE_2O_3	12.00	Total	99.033
Fe_2O_3	2.44		

(1) Latium, Italy; electron microprobe and SIMS analyses; corresponds to $(Ca_{4.102}Ba_{0.001})_{\Sigma=4.103}(Ce_{0.652}Y_{0.127}Th_{0.385}U_{0.055}REE_{0.682})_{\Sigma=1.901}(Al_{0.413}Fe^{3+}_{0.327}Ti_{0.203}Mg_{0.066}Mn^{3+}_{0.009})_{\Sigma=1.019}(B_{3.988}Si_{4.053}Be_{0.488}Li_{0.243})_{\Sigma=8.772}O_{22}[F_{0.490}(OH)_{0.511}]_{\Sigma=1.001}$.

Mineral Group: Hellandite group.

Occurrence: Inside miarolitic cavities in alkali-syenite volcanic ejecta in an ignimbrite.

Association: Vonsenite, helvite, baddeleyite, vicanite, britholite.

Distribution: From near Capranica, Tre Croci and Vetralla, Vico volcanic province, Latium, Italy.

Name: For geologist Amund Theodor *Helland* (1846-1918), of Oslo, Norway. The suffix indicates the dominant REE at the Y site.

References: (1) Oberti, R., L. Ottolini, F. Camara, and G. Della Ventura (1999) Crystal structure of non-metamict Th-rich hellandite-(Ce) from Latium (Italy) and crystal chemistry of the hellandite-group minerals. Amer. Mineral., 84, 913-921. (2) Oberti, R., G. Della Ventura, L. Ottolini, F.C. Hawthorne, and P. Bonazzi (2002) Re-definition, nomenclature and crystal-chemistry of the hellandite group. Amer. Mineral., 87, 745-752. (3) CNMNC Newsletter No. 37 (2017) Eur. J. Mineral., 29, 533.