Lusernaite-(Y) $Y_4Al(CO_3)_2(OH,F)_{11}\cdot 6H_2O$

Crystal Data: Orthorhombic. *Point Group*: 2/*m* 2/*m* 2/*m*. As thin, roughly six-sided platelets flattened on {010} and elongated along [100] to 1 mm, as radial aggregates.

Physical Properties: *Cleavage*: Perfect on {010}, less perfect on {100}. *Fracture*: n.d. *Tenacity*: Brittle. Hardness = n.d. D(meas.) = n.d. D(calc.) = 2.810

Optical Properties: Transparent. *Color*: Colorless. *Streak*: White. *Luster*: Pearly. *Optical Class*: Biaxial (+). α = n.d. β = 1.566(2) γ = 1.577(2) 2V(meas.) = low. *Orientation*: $Z = a$, $X = b$, $Y = c$. Positive elongation along [100] and parallel extinction.

Cell Data: *Space Group*: *Pnma*. a = 7.8412(3) b = 11.0313(5) c = 11.3870(4) Z = 2

X-ray Powder Pattern: Luserna Valley, Piedmont, Italy.
11.02 (100), 7.90 (49), 4.258 (33), 3.195 (27), 5.66 (25), 5.06 (24), 3.095 (21)

Chemistry:	(1)	(2)
Al_2O_3	6.11	6.39
Y_2O_3	43.52	56.61
La_2O_3	0.02	
Ce_2O_3	0.04	
Nd_2O_3	0.03	
Sm_2O_3	0.16	
Gd_2O_3	1.39	
Dy_2O_3	3.46	
Er_2O_3	3.15	
Yb_2O_3	2.09	
CaO	0.33	
PbO	0.37	
H_2O	[22.76]	25.97
CO_2	[9.95]	11.03
F	1.40	
$- O=F_2$	0.59	
Total	94.19	100.00

(1) Luserna Valley, Piedmont, Italy; average of 18 electron microprobe analyses, supplemented by Raman spectroscopy, H_2O and CO_2 calculated from structure; corresponds to $(Y_{3.41}Dy_{0.16}Er_{0.15}Yb_{0.09}Gd_{0.07}Ca_{0.05}Pb_{0.02}Sm_{0.01})_{\Sigma=3.96}Al_{1.06}(CO_3)_{2.00}[(OH)_{10.35}F_{0.65}]_{\Sigma=11.00}\cdot 6H_2O$.
(2) $Y_4Al(CO_3)_2(OH)_{11}\cdot 6H_2O$.

Occurrence: A late-stage hydrothermal mineral in fractures in regionally metamorphosed gneiss.

Association: Aeschynite-(Y), albite, "chlorite," hematite, pyrite, quartz, titanite.

Distribution: From the Seccarezze quarries, Luserna San Giovanni, Torino, Piedmont, Italy.

Name: Named for the Luserna valley in which the first specimens were collected and a suffix of the chemical symbol of the dominant rare earth element.

Type Material: Natural History Museum, University of Pisa, Italy (19445) and the Regional Natural Science Museum, Torino, Italy (M/15901).

References: (1) Biagioni, C., E. Bonaccorsi, F. Cámara, M. Cadoni, M.E. Ciriotti, D. Bersani, and U. Kolitsch (2013) Lusernaite-(Y), $Y_4Al(CO_3)_2(OH,F)_{11}\cdot 6H_2O$, a new mineral species from Luserna Valley, Piedmont, Italy: Description and crystal structure. Amer. Mineral., 98, 1322-1329.