Cayalsite-(Y) $CaY_6Al_2Si_4O_{18}F_6$

Crystal Data: Orthorhombic (1*O* polytype) or monoclinic (1*M* polytype).
Point Group: 2/*m* 2/*m* 2/*m* or 2/*m*. As prismatic crystals, to 1.2 mm, that display {011}, {012}, {110}, {210}, {201}, {221}, {312}, {100}, {010}, and {001}; in radiating aggregates.

Physical Properties: *Cleavage*: None. *Fracture*: Uneven. *Tenacity*: Brittle.
Hardness = ~ 6.5 D(meas.) = n.d. D(calc.) = 4.81-4.86

Optical Properties: Transparent. *Color*: Colorless to faintly pink. *Streak*: White.
Luster: Vitreous.
Optical Class: Biaxial (+). α = 1.730(5) β = 1.740(5) γ = 1.760(5) 2V(meas.) = 56(5)°
2V(calc.) = 71.2° *Orientation*: *X* = *c*, *Y* = *b*, *Z* = *a*. (1*O* polytype)

Cell Data: *Space Group*: *Pban*. *a* = 15.993(1) *b* = 5.5306(3) *c* = 9.6590(7) Z = 2 (1*O* polytype)
*Space Group: P*2/*c*. *a* = 11.0602(7) *b* = 5.5280(2) *c* = 16.0195(9) β = 118.925(3)° Z = 2 (1*M*)

X-ray Powder Pattern: Stetind, Tysfjord, Norway. (mixed 1*M*/1*O* crystal)
3.002 (100, 1*M* and 1*O*), 3.562 (67, 1*M* and 1*O*), 4.914 (53, 1*M*), 5.133 (51, 1*M*), 5.221 (43, 1*O*), 2.756 (41, 1*M* and 1*O*), 2.662 (41, 1*M*), 3.873 (33, 1*M*)

Chemistry:	(1)	(2)		(1)	(2)
CaO	4.46	4.49	Dy_2O_3	4.93	6.68
Na_2O	n.d.	0.08	Er_2O_3	3.74	5.19
Y_2O_3	37.90	38.66	Yb_2O_3	4.00	4.44
Ce_2O_3	0.46	n.d.	Al_2O_3	7.31	8.01
Nd_2O_3	1.84	0.43	SiO_2	18.70	19.05
Sm_2O_3	2.16	0.82	F	9.26	9.40
Gd_2O_3	5.79	2.79	$-O = F_2$	3.90	3.96
Tb_2O_3	n.d.	0.74	Total	96.65	96.83

(1) Stetind, Tysfjord, Norway; average of 13 electron microprobe analyses supplemented by FTIR spectroscopy, 1*M* polytype; corresponding to $Ca_{1.03}(Y_{4.35}Ce_{0.04}Nd_{0.14}Sm_{0.16}Gd_{0.41}Dy_{0.34}Er_{0.25}Yb_{0.26})_{\Sigma=5.75}Al_{1.86}Si_{4.03}(F_{6.32}O_{17.68})_{\Sigma=24}$. (2) Øvre Lapplægeret, Tysfjord, Norway; average of 11 electron microprobe analyses supplemented by FTIR spectroscopy, 1*O* polytype; corresponding to $Ca_{1.02}Na_{0.03}(Y_{4.37}Nd_{0.03}Sm_{0.06}Gd_{0.20}Tb_{0.05}Dy_{0.46}Er_{0.35}Yb_{0.29})_{\Sigma=5.81}Al_{2.00}Si_{4.05}(F_{6.32}O_{17.68})_{\Sigma=24}$.

Polymorphism & Series: Polytypes 1*M* and 1*O*.

Occurrence: A late-stage mineral in cavities in yttrian fluorite in granitic NYF-pegmatite.

Association: Bastnäsite-(Ce), hematite, vyuntspakhkite-(Y), hundholmenite-(Y).

Distribution: From Stetind and Øvre Lapplægeret, Tysfjord, Nordland, Norway.

Name: From the chemical symbols for the essential elements in the mineral (*Ca*-*Y*-*Al*-*Si*) and a suffex for the dominant rare-earth element.

Type Material: The Mineralogical Museum, University of Hamburg, Germany (NO-002B/08 -1*O* polytype and NO-002/08 -1*M* polytype).

References: (1) Malcherek, T., J. Schlüter, M. Cooper, N. Ball, and T. Husdal (2015) Cayalsite-(Y), a new rare-earth calcium aluminium fluorosilicate with OD character. Eur. J. Mineral., 27(5), 683-694. (2) (2016) Amer. Mineral., 101, 1920 (abs. ref. 1).