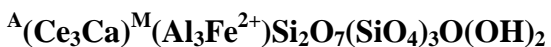


Perbøeite-(Ce)

Crystal Data: Monoclinic. *Point Group:* 2/m. As chemically-zoned prismatic crystals elongated along [010], to 400 μm , and displaying {101}, {100} and {001}.

Physical Properties: *Cleavage:* Good on {100}, imperfect on {001}. *Fracture:* Irregular. *Tenacity:* Brittle. *Hardness:* = 6-7 *D(meas.):* = n.d. *D(calc.):* = 4.474

Optical Properties: Transparent. *Color:* Pale grayish green. *Streak:* White. *Luster:* Vitreous. *Optical Class:* Biaxial (+). $\alpha = 1.788(2)$ $\beta = 1.793(2)$ $\gamma = 1.820(5)$ $2V(\text{meas.}) = 30.0(5)^\circ$ *Pleochroism:* Weak, X = colorless, Y = grayish blue, Z = colorless. *Dispersion:* Very weak, inclined. *Orientation:* $Z \wedge (001) = 17(1)^\circ$

Cell Data: *Space Group:* $P2_1/m$. $a = 8.9110(4)$ $b = 5.6866(2)$ $c = 17.5252(7)$ $\beta = 116.300(5)^\circ$ $Z = 4$

X-ray Powder Pattern: Calculated pattern.

2.9805 (100), 15.7111 (91), 2.6190 (58), 2.8433 (48), 3.5014 (44), 4.6327 (33), 2.7503 (31)

Chemistry:	(1)	(2)		(1)	(2)
Na ₂ O	0.22		Ho ₂ O ₃	0.00	
CaO	5.00	5.14	Er ₂ O ₃	0.18	
MnO	0.20		Yb ₂ O ₃	0.03	
BaO	0.04		Y ₂ O ₃	0.60	
La ₂ O ₃	7.43		ThO ₂	0.17	
Ce ₂ O ₃	19.07	45.10	MgO	0.01	
Pr ₂ O ₃	2.43		FeO	5.05	6.58
Nd ₂ O ₃	9.41		Al ₂ O ₃	14.67	14.01
Sm ₂ O ₃	1.62		SiO ₂	26.95	27.52
Gd ₂ O ₃	0.91		<u>H₂O</u>	n.d.	1.65
Dy ₂ O ₃	0.49		Total	94.48	100.00

(1) Tysfjord granite, Norway; average of 5 electron microprobe analyses; corresponds to $(\text{Ca}_{1.00}\text{Mn}_{0.03}\text{Na}_{0.08}\text{La}_{0.51}\text{Ce}_{1.30}\text{Pr}_{0.16}\text{Nd}_{0.62}\text{Sm}_{0.10}\text{Gd}_{0.06}\text{Dy}_{0.03}\text{Er}_{0.01}\text{Y}_{0.06}\text{Th}_{0.01})_{\Sigma=3.97}(\text{Al}_{3.21}\text{Fe}^{2+}_{0.79})_{\Sigma=4.00}\text{Si}_{5.01}\text{O}_{20}(\text{OH})_2$. (2) ${}^A(\text{Ce}_3\text{Ca})^M(\text{Al}_3\text{Fe}^{2+})\text{Si}_2\text{O}_7(\text{SiO}_4)_3\text{O}(\text{OH})_2$.

Polymorphism & Series: Continuous solid solution with alnaperbøeite-(Ce).

Mineral Group: Epidote supergroup.

Occurrence: A late primary phase in REE-bearing quartz-microcline pegmatite.

Association: Yttrian fluorite, törnebohmite-(Ce), allanite-(Ce), bastnäsite-(Ce).

Distribution: From the Hundholmen, Stetind, and Nedre Eivollen pegmatites in the Tysfjord granite, Norway.

Name: Honors Per Bøe (b. 1937), a Norwegian geologist and Curator at the Tromsø Museum, who initiated the project that led to the discovery of this species. The root name *perbøeite* applies to any ET polysome with the E module deserving the root name allanite (sites M3 = Fe²⁺ and A1 = Ca).

Type Material: Natural History Museum, University of Florence, Italy (3110/I).

References: (1) Bonazzi I, P., G.O. Lepore, L. Bindi, C. Chopin, T.A. Husdal, and O. Medenbach (2014) Perbøeite-(Ce) and alnaperbøeite-(Ce), two new members of the epidote-törnebohmite polysomatic series: Chemistry, structure, dehydrogenation, and clue for a sodian epidote end-member. *Amer. Mineral.*, 99, 157-169.