Alnaperbøeite-(Ce)  

\[(\text{Ce}_{2.5}\text{CaNa}_{0.5})\text{M}^3(\text{Al}_4)\text{Si}_2\text{O}_7(\text{SiO}_4)\text{}_3\text{O(OH)}_2]

**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\}.  
*Tenacity:* Brittle.  
*Hardness:* 6-7  
*Density (meas.):* n.d.  
*Density (calc.):* 4.308

**Optical Properties:**  
*Color:* Very pale green.  
*Streak:* White.  
*Luster:* Vitreous.  
*Optical Class:* Biaxial (+).  
*α:* 1.778(2)  
*β:* 1.784(2)  
*γ:* 1.810(5)  
*2V* (meas.): 33.5(5)°  
*2V* (calc.): 33.5°

**Cell Data:**  
*Space Group:* P2₁/m.  
*a:* 8.9277(6)  
*b:* 5.6548(6)  
*c:* 17.587(1)  
*β:* 116.475(8)°  
*Z:* 4

**X-ray Powder Pattern:** Calculated pattern.  
2.9831 (100), 15.7426 (92), 2.6188 (56), 2.8274 (47), 3.4986 (42), 2.7509 (32), 4.6160 (30)

**Chemistry:**  
\[\begin{array}{cccc}
\text{Na}_2\text{O} & 0.56 & 1.54 & \text{Ho}_2\text{O}_3 \\
\text{CaO} & 5.74 & 5.58 & \text{Er}_2\text{O}_3 \\
\text{MnO} & 0.18 & & \text{Yb}_2\text{O}_3 \\
\text{BaO} & 0.04 & & \text{Y}_2\text{O}_3 \\
\text{La}_2\text{O}_3 & 6.29 & & \text{Th}_2\text{O}_3 \\
\text{Ce}_2\text{O}_3 & 17.29 & 40.86 & \text{MgO} \\
\text{Pr}_2\text{O}_3 & 2.52 & & \text{FeO} \\
\text{Nd}_2\text{O}_3 & 9.31 & & \text{Al}_2\text{O}_3 \\
\text{Sm}_2\text{O}_3 & 2.02 & & \text{SiO}_2 \\
\text{Gd}_2\text{O}_3 & 1.13 & & \text{H}_2\text{O} \\
\text{Dy}_2\text{O}_3 & 0.56 & & \\
\end{array}\]

(1) Tysfjord granite, Norway; average of 15 electron microprobe analyses; corresponds to \((\text{Ca}_{1.10}\text{Mn}_{0.03}\text{Na}_{0.20}\text{La}_{0.42}\text{Ce}_{1.14}\text{Pr}_{0.16}\text{Nd}_{0.66}\text{Sm}_{0.13}\text{Gd}_{0.07}\text{Dy}_{0.03}\text{Er}_{0.01}\text{Y}_{0.00}\text{Y}_{0.12}\text{Th}_{0.02})_2\text{Fe}_{0.40}\text{Mg}_{0.02}\text{Li}_{3.96}\text{Si}_{4.99}\text{O}_{20}(\text{OH})_2\cdot 2\text{H}_2\text{O}.

**Polymorphism & Series:** Continuous solid solution with perbøeite-(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:** Emphasizes the chemical relationships with perbøeite-(Ce), the dominance of Al in the M3 site and the role of Na to charge balance the dominance of a trivalent cation in the M3 site of the REE-epidote module. The root name alnaperbøeite should apply to any ET polysome composition in which (1) trivalent cations are dominant at the M3 site and aluminum is dominant among them and (2) the charge balance in A sites is dominantly achieved by substitution of Na for REE (rather than \(A^{2+}\) for REE).

**Type Material:** Natural History Museum, University of Florence, Italy (3114/I).

**References:**  