

Manganiandrosite-(Ce)

Crystal Data: Monoclinic. *Point Group:* 2/m. As elongated grains to 0.1 mm.

Physical Properties: *Cleavage:* None. *Fracture:* n.d. *Tenacity:* Brittle.
Hardness = n.d. D(meas.) = n.d. D(calc.) = 4.21-4.31

Optical Properties: Transparent. *Color:* Dark brown. *Streak:* Reddish brown.

Luster: Vitreous to adamantine.

Optical Class: Biaxial (+). $\alpha > 1.74$ $n(\text{calc.}) = 1.80$ $2V(\text{meas.}) = 80.6(1.5)^\circ$ $2V(\text{calc.}) = \text{n.d.}$

Orientation: n.d. *Pleochroism:* Strong, $X = \text{light yellow}$, $Y = \text{orange-brown}$, $Z = \text{red-brown}$.

Dispersion: None.

Cell Data: *Space Group:* $P2_1/m$. $a = 8.901(2)$ $b = 5.738(1)$ $c = 10.068(2)$ $\beta = 113.425(3)^\circ$
 $Z = 2$

X-ray Powder Pattern: Praborna Mn deposit, Saint-Marcel, Val d'Aosta, Italy. [calculated pattern]
2.8964 (100), 2.6225 (53), 3.5141 (41), 2.7134 (39), 2.7069 (39), 2.8690 (35), 7.8639 (28)

Chemistry:	(1)		(1)
SiO ₂	29.04	CaO	3.82
Al ₂ O ₃	8.20	Ce ₂ O ₃	12.22
TiO ₂	1.26	La ₂ O ₃	6.08
Fe ₂ O ₃	2.98	Nd ₂ O ₃	3.24
MnO	15.01	Sm ₂ O ₃	0.18
Mn ₂ O ₃	11.62	F	0.07
MgO	0.28	<u>H₂O</u>	<u>[1.45]</u>
SrO	1.17	Total	96.59

(1) Praborna Mn deposit, Saint-Marcel, Val d'Aosta, Italy; average of 4 electron microprobe analyses, H₂O calculated from stoichiometry; corresponding to $[\text{Mn}^{2+}_{0.60}\text{Ca}_{0.40}]_{\Sigma=1.00}$
 $[(\text{Ce}_{0.46}\text{La}_{0.23}\text{Nd}_{0.12}\text{Sm}_{0.01})_{\Sigma\text{REE}\geq 0.82}\text{Sr}_{0.07}\text{Ca}_{0.02}]_{\Sigma\geq 0.91}[\text{Mn}^{3+}_{0.63}\text{Fe}^{3+}_{0.23}\text{Ti}_{0.10}\text{Mg}_{0.04}]_{\Sigma=1.00}\text{Al}_{1.00}$
 $[\text{Mn}^{2+}_{0.96}\text{Mn}^{3+}_{0.04}]_{\Sigma=1.00}\text{Si}_2\text{O}_7\text{SiO}_4\text{O}(\text{OH})$.

Mineral Group: Epidote group, allanite subgroup.

Occurrence: In metamorphosed (eclogite facies) lenses near Mn deposits associated with ophiolite.

Association: Tephroite, Mn-pyroxenoid, hematite, calderite; or spessartine, calderite, hematite, pyrophanite.

Distribution: From the dumps of the Praborna Mn deposit, Saint-Marcel, Val d'Aosta, Italy,

Name: The Ce analogue of manganiandrosite-(La). An epidote-group mineral in which Mn²⁺ is dominant in A1, REE are dominant in A2, Mn³⁺ in M1, Al in M2, and in which Mn²⁺ is the dominant charge-compensating (*i.e.* divalent) cation in M3.

Type Material: Mineral Museum, School of Mines, Paris, France, (73951).

References: (1) Cenko-Tok, B., A. Ragu, T. Armbruster, C. Chopin, and O. Medenbach (2006) New Mn- and rare-earth rich epidote-group minerals in metacherts: manganiandrosite-(Ce) and vanadoandrosite-(Ce). *Eur. J. Mineral.*, 18, 569-582. (2) (2007) *Amer. Mineral.*, 92, 704-705 (abs. ref. 1).