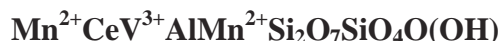


Vanadoandrosite-(Ce)

Crystal Data: Monoclinic. *Point Group:* 2/m. As isolated, stout prismatic grains, to tens of micrometers, or as radiating aggregates.

Physical Properties: *Cleavage:* None. *Fracture:* n.d. *Tenacity:* Brittle.
Hardness = n.d. D(meas.) = n.d. D(calc.) = 4.27

Optical Properties: Transparent. *Color:* Very dark brown to black. *Streak:* Brown.
Luster: Vitreous to adamantine.

Optical Class: Biaxial. $\alpha > 1.74$ $n(\text{calc.}) = 1.82$ $2V(\text{meas.}) = \text{n.d.}$ $2V(\text{calc.}) = \text{n.d.}$
Orientation: n.d. *Pleochroism:* Strong; yellow-brown, red-brown, dark greenish brown.

Cell Data: *Space Group:* $P2_1/m$. $a = 8.856(3)$ $b = 5.729(2)$ $c = 10.038(4)$ $\beta = 113.088(4)^\circ$
 $Z = 2$

X-ray Powder Pattern: Vielle Aure village, central Pyrénées, France. [calculated pattern]
2.8890 (100), 2.6124 (54), 3.5004 (43), 2.8645 (41), 2.7023 (34), 2.7114 (31), 2.5916 (26)

Chemistry:	(1)		(1)
SiO ₂	28.81	CaO	2.57
Al ₂ O ₃	9.65	Ce ₂ O ₃	16.14
TiO ₂	0.06	La ₂ O ₃	8.29
Fe ₂ O ₃	2.18	Nd ₂ O ₃	0.84
MnO	17.78	Sm ₂ O ₃	0
Mn ₂ O ₃	1.75	F	0.57
V ₂ O ₃	5.30	<u>H₂O</u>	<u>[1.44]</u>
MgO	1.22	Total	96.36
SrO	0		

(1) Vielle Aure village, central Pyrénées, France; average of 4 electron microprobe analyses, H₂O calculated from stoichiometry; corresponding to $[\text{Mn}^{2+}_{0.62}\text{Ca}_{0.38}]_{\Sigma=1.00}$
 $[(\text{Ce}_{0.39}\text{La}_{0.15}\text{Nd}_{0.10}\text{Sm}_{0.02})_{\Sigma\text{REE}=0.66}\text{Ca}_{0.21}\text{Sr}_{0.11}]_{\Sigma=0.98}[\text{V}^{3+}_{0.80}\text{Al}_{0.16}\text{Mg}_{0.03}\text{Ti}_{0.01}]_{\Sigma=1.00}\text{Al}_{1.00}$
 $[\text{Mn}^{2+}_{0.36}\text{V}^{3+}_{0.31}\text{Fe}^{2+}_{0.23}\text{Fe}^{3+}_{0.10}]_{\Sigma=1.00}\text{Si}_2\text{O}_7\text{SiO}_4\text{O}(\text{OH})$.

Mineral Group: Epidote group, allanite subgroup.

Occurrence: In quartz-rhodochrosite-sulfide veins cross-cutting massive rhodochrosite ore, as well as in the ore itself, in quartz grains rimmed by chalcopyrite.

Association: Quartz, vuorelainenite, rhodochrosite, chalcopyrite, vanadian spessartine, friedelite.

Distribution: From the mine above Vielle Aure village, central Pyrénées, France.

Name: An epidote-group mineral in which Ce³⁺ is dominant in A2, Mn²⁺ in A1, V³⁺ 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, (73952).

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).