Vanadoandrosite-(Ce) $Mn^{2+}CeV^{3+}AlMn^{2+}Si_2O_7SiO_4O(OH)$

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(calc.) = 1.82 2V(meas.) = n.d. 2V(calc.) = n.d.
Orientation: n.d. *Pleochroism:* Strong; yellow-brown, red-brown, dark greenish brown.

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

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_2O_3	9.65	Ce_2O_3	16.14
TiO_2	0.06	La_2O_3	8.29
Fe_2O_3	2.18	Nd_2O_3	0.84
MnO	17.78	Sm_2O_3	0
Mn_2O_3	1.75	F	0.57
V_2O_3	5.30	H_2O	[1.44]
MgO	1.22	Total	96.36
SrO	0		

(1) Vielle Aure village, central Pyrénées, France; average of 4 electron microprobe analyses, H_2O calculated from stoichiometry; corresponding to $[Mn^{2+}_{0.62}Ca_{0.38}]_{\Sigma=1.00}$ $[(Ce_{0.39}La_{0.15}Nd_{0.10}Sm_{0.02})_{\Sigma REE=0.66}Ca_{0.21}Sr_{0.11}]_{\Sigma=0.98}[V^{3+}_{0.80}Al_{0.16}Mg_{0.03}Ti_{0.01}]_{\Sigma=1.00}Al_{1.00}$ $[Mn^{2+}_{0.36}V^{3+}_{0.31}Fe^{2+}_{0.23}Fe^{3+}_{0.10}]_{\Sigma=1.00}Si_2O_7SiO_4O(OH)$.

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 Ce^{3+} is dominant in A2, Mn^{2+} in A1, V^{3+} in M1, Al in M2, and in which Mn^{2+} is the dominant charge-compensating (*i.e.* divalent) cation in M3.

Type Material: Mineral Museum, School of Mines, Paris, France, (73952).

References: (1) Cenki-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).