Vanadoandrosite-(Ce)  
\[ \text{Mn}^{2+}\text{Ce}^{3+}\text{AlMn}^{2+}\text{Si}_2\text{O}_5\text{SiO}_4\text{(OH)} \]

**Crystal Data:** Monoclinic. \( \text{Point Group: } 2/m \). 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.  
\( \text{D(meas.) = n.d.} \)  
\( \text{D(calc.) = 4.27} \)

Luster: Vitreous to adamantine.  
Optical Class: Biaxial.  
\( a > 1.74 \)  
\( n(\text{calc.}) = 1.82 \)  
\( 2V(\text{meas.}) = \text{n.d.} \)  
\( 2V(\text{calc.}) = \text{n.d.} \)  

**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. \([\text{calculated pattern}]\)  
2.8890 (100), 2.6124 (54), 3.5004 (43), 2.8645 (41), 2.7023 (34), 2.7114 (31), 2.5916 (26)

**Chemistry:**
<table>
<thead>
<tr>
<th>Formula</th>
<th>Empirical</th>
<th>(1)</th>
<th>(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{SiO}_2 )</td>
<td>28.81</td>
<td>CaO</td>
<td>2.57</td>
</tr>
<tr>
<td>( \text{Al}_2\text{O}_3 )</td>
<td>9.65</td>
<td>( \text{Ce}_2\text{O}_3 )</td>
<td>16.14</td>
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<tr>
<td>( \text{TiO}_2 )</td>
<td>0.06</td>
<td>( \text{La}_2\text{O}_3 )</td>
<td>8.29</td>
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<tr>
<td>( \text{Fe}_2\text{O}_3 )</td>
<td>2.18</td>
<td>( \text{Nd}_2\text{O}_3 )</td>
<td>0.84</td>
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<tr>
<td>( \text{MnO} )</td>
<td>17.78</td>
<td>( \text{Sm}_2\text{O}_3 )</td>
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<tr>
<td>( \text{Mn}_2\text{O}_3 )</td>
<td>1.75</td>
<td>F</td>
<td>0.57</td>
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<td>( \text{V}_2\text{O}_5 )</td>
<td>5.30</td>
<td>( \text{H}_2\text{O} )</td>
<td>[1.44]</td>
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<tr>
<td>( \text{MgO} )</td>
<td>1.22</td>
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<tr>
<td>( \text{SrO} )</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) Vielle Aure village, central Pyrénées, France; average of 4 electron microprobe analyses, \( \text{H}_2\text{O} \) calculated from stoichiometry; corresponding to \([\text{Mn}^{2+0.62}\text{Ca}_{0.38}]_{2-1.00}\) \([\text{Ce}_{2.39}\text{La}_{0.15}\text{Nd}_{0.10}\text{Sm}_{0.02}]_{2-0.66}\) \([\text{Ca}_{0.22}\text{Sr}_{0.11}]_{2-0.98}\) \([\text{V}^{3+0.89}\text{Al}_{0.16}\text{Mg}_{0.03}\text{Ti}_{0.01}]_{2-1.00}\) \([\text{Al}_{1.00}\text{Mn}^{2+0.36}\text{V}^{3+0.3}\text{Fe}^{2+0.23}\text{Fe}^{3+0.10}]_{2-1.00}\) \([\text{Si}_2\text{O}_5\text{SiO}_4\text{OH}] \).

**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 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:**  