

**Alpeite**

**Crystal Data:** Orthorhombic. *Point Group:*  $2/m\ 2/m\ 2/m$ . As intergrown plates to ~0.3 mm, which are flattened on {100} and exhibit {100}, {001}, {012}, and {102}.

**Physical Properties:** *Cleavage:* Perfect on {100}, good on {010} and {001}. *Tenacity:* Brittle. *Fracture:* Curved and stepped. Hardness = 5.5-6 D(meas.) = n.d. D(calc.) = 3.374

**Optical Properties:** Transparent. *Color:* Brownish red. *Streak:* Beige. *Luster:* Vitreous. *Optical Class:* Biaxial (-).  $\alpha = 1.747(3)$   $\beta = 1.785(3)$   $\gamma = 1.808(3)$   $2V(\text{meas.}) = 73(2)^\circ$   $2V(\text{calc.}) = 74.3^\circ$  *Dispersion:*  $r > v$ ; strong. *Orientation:*  $X = a, Y = b, Z = c$ . *Pleochroism:* Shades of reddish brown. *Absorption:*  $Y > Z > X$ .

**Cell Data:** *Space Group:*  $Pnmm$ .  $a = 8.9421(11)$   $b = 6.0534(6)$   $c = 18.9781(6)$   $Z = 2$

**X-ray Powder Pattern:** Monte Alpe mine, Liguria, Italy. 2.673 (100), 3.022 (93), 1.5112 (83), 2.572 (69), 2.095 (53), 4.049 (52), 1.6766 (52)

Chemistry:	(1)	(2)
CaO	20.45	21.39
MgO	2.49	3.84
CoO	1.43	
MnO	[1.08]	
Mn <sub>2</sub> O <sub>3</sub>	[19.70]	22.58
Al <sub>2</sub> O <sub>3</sub>	11.52	9.72
SiO <sub>2</sub>	29.92	28.64
V <sub>2</sub> O <sub>5</sub>	7.36	8.67
H <sub>2</sub> O	[5.13]	5.15
Total	99.08	100.00

(1) Monte Alpe mine, Liguria, Italy; average of 10 electron microprobe analyses, H<sub>2</sub>O calculated for charge balance, Mn<sub>2</sub>O<sub>3</sub> and MnO calculated from total Mn and structural evidence; corresponds to  $(\text{Ca}_{3.84}\text{Mn}^{2+}_{0.16})_{\Sigma=4.00}(\text{Mn}^{3+}_{1.33}\text{Al}_{0.67})_{\Sigma=2.00}(\text{Al}_{1.29}\text{Mn}^{3+}_{0.60}\text{V}^{5+}_{0.10})_{\Sigma=1.99}(\text{Mn}^{3+}_{0.70}\text{Mg}_{0.65}\text{Al}_{0.42}\text{Co}^{2+}_{0.20})_{\Sigma=1.97}(\text{SiO}_4)_2(\text{Si}_3\text{O}_{10})[(\text{V}^{5+}_{0.75}\text{Si}_{0.25}\text{O}_4)](\text{OH})_6$ . (2)  $\text{Ca}_4\text{Mn}^{3+}_2\text{Al}_2(\text{Mn}^{3+}\text{Mg})(\text{SiO}_4)_2(\text{Si}_3\text{O}_{10})(\text{V}^{5+}\text{O}_4)(\text{OH})_6$ .

**Mineral Group:** Ardenite group.

**Occurrence:** A secondary mineral crystallized from V- and Mn-rich hydrothermal fluids along fractures during tectono-metamorphism.

**Association:** Braunite, dolomite, quartz, todorokite, ganophyllite.

**Distribution:** From the Monte Alpe mine (also known as Monte Alpe di Maissana), Liguria, Italy.

**Name:** For the locality, the Monte *Alpe* mine, that produced the first specimens.

**Type Material:** Natural History Museum of Los Angeles County, Los Angeles, California, USA (66288).

**References:** (1) Kampf, A.R., C. Carbone, D. Belmonte, B.P. Nash, L. Chiappino, and F. Castellaro (2017) Alpeite,  $\text{Ca}_4\text{Mn}^{3+}_2\text{Al}_2(\text{Mn}^{3+}\text{Mg})(\text{SiO}_4)_2(\text{Si}_3\text{O}_{10})(\text{V}^{5+}\text{O}_4)(\text{OH})_6$ , a new ardenite-group mineral from Italy. *Eur. J. Mineral.*, 29(5), 907-914. (2) (2018) *Amer. Mineral.*, 103, 2036 (abs. ref. 1).