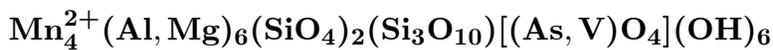


**Ardennite**

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**Crystal Data:** Orthorhombic. *Point Group:*  $2/m\ 2/m\ 2/m$ . Individual crystals rare, prismatic, with prism faces strongly striated and pyramidal faces smooth; as radiating fibrous groups, to 4 cm.

**Physical Properties:** *Cleavage:* Perfect on {010}, distinct on {110}; parting on {001}. *Fracture:* Subconchoidal to uneven. *Tenacity:* Brittle. Hardness = 6–7 D(meas.) = 3.69–3.75 D(calc.) = 3.74

**Optical Properties:** Nearly opaque, translucent in thin fragments. *Color:* Yellow to yellowish brown; in thin section, yellow to brown. *Luster:* Subadamantine.

*Optical Class:* Biaxial (+). *Pleochroism:* Strong; X = dark brownish yellow; Y = golden yellow; Z = pale yellow. *Orientation:* Z = b or c.  $\alpha = \text{n.d.}$   $\beta = 1.74\text{--}1.78$ ; birefringence = 0.15–0.20.  $\gamma = \text{n.d.}$   $2V(\text{meas.}) = 0^\circ\text{--}70^\circ$

**Cell Data:** *Space Group:*  $Pnmm$ .  $a = 8.7126(8)$   $b = 18.5124(11)$   $c = 5.8108(8)$   $Z = 2$

**X-ray Powder Pattern:** Salmchâteau, Belgium.

2.574 (100), 2.911 (70), 4.21 (60), 3.15 (60), 2.871 (60), 1.448 (60), 3.76 (50)

<b>Chemistry:</b>	(1)	(2)		(1)	(2)
SiO <sub>2</sub>	27.85	29.70	MnO	25.70	18.93
TiO <sub>2</sub>		0.04	CuO	0.26	0.01
Al <sub>2</sub> O <sub>3</sub>	23.55	22.99	MgO	2.30	5.49
Fe <sub>2</sub> O <sub>3</sub>	0.86	2.77	CaO	1.17	4.41
As <sub>2</sub> O <sub>5</sub>	13.25	10.11	H <sub>2</sub> O <sup>+</sup>	5.10	5.44
V <sub>2</sub> O <sub>5</sub>	0.89	0.04	H <sub>2</sub> O <sup>-</sup>	0.02	
FeO	0.00		<hr/>		
			Total	100.95	99.93

(1) Salmchâteau, Belgium. (2) Haute-Maurienne, France; by electron microprobe, confirmed by XRF and wet analysis, H<sub>2</sub>O by coulometry; corresponds to  $(\text{Mn}_{2.75}^{2+}\text{Ca}_{0.81}\text{Mg}_{0.43})_{\Sigma=3.99}(\text{Al}_{4.65}\text{Mg}_{0.98}\text{Fe}_{0.36}^{3+})_{\Sigma=5.99}(\text{As}_{0.91}\text{O}_4)\text{Si}_{5.10}\text{O}_{18}(\text{OH})_6$ .

**Occurrence:** In pegmatites and quartz veins in schist (Salmchâteau, Belgium); in highly oxidized Mn, Al-rich metasediments (Andros Island, Greece).

**Association:** Quartz, albite, pyrolusite, piemontite, spessartine, braunite, hematite.

**Distribution:** At Salmchâteau, near Ottré, and at Bihain, Belgium. From Ala, Piedmont, Italy. At Bonneval-sur-Arc, Haute-Maurienne, Isère, France. In the Merehead quarry, Shepton Mallet, Somerset, England. On Evvia and Andros Islands, Cyclades Islands, Greece. At the Kajlidongri manganese mine, Jhabua district, Madhya Pradesh, India. Along the Asemi-gawa River, Kochi Prefecture, Japan.

**Name:** For the initial occurrence at Salmchâteau, in the Ardennes Mountains, Belgium.

**References:** (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 542–543. (2) Moore, P.B. (1965) Cell data of orientite and its relation to ardennite and zoisite. *Can. Mineral.*, 8, 262–265. (3) Donnay, G. and R. Allmann (1968) Si<sub>3</sub>O<sub>10</sub> groups in the crystal structure of ardennite. *Acta Cryst.*, 24, 845–855. (4) Allman, R. and G. Donnay (1971) Structural relations between pumpellyite and ardennite. *Acta Cryst.*, 27, 1871–1875. (5) Pasero, M. and T. Reinecke (1991) Crystal chemistry, HRTEM analysis and polytypic behavior of ardennite. *Eur. J. Mineral.*, 3, 819–830.