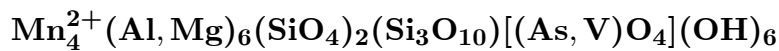


Ardennite

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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 $D(\text{meas.}) = 3.69\text{--}3.75$ $D(\text{calc.}) = 3.74$

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

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)

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

(1) Salmchâteau, Belgium. (2) Haute-Maurienne, France; by electron microprobe, confirmed by XRF and wet analysis, H₂O 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) Si₃O₁₀ 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.