

Synadelphite $(\text{Mn}^{2+}, \text{Mg}, \text{Ca}, \text{Pb})_9(\text{As}^{3+}\text{O}_3)(\text{As}^{5+}\text{O}_4)_2(\text{OH})_9 \cdot 2\text{H}_2\text{O} (?)$

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Crystal Data: Orthorhombic. *Point Group:* $2/m\ 2/m\ 2/m$. Crystals are short tabular to prismatic [001], with {110} striated || [001], {011}, {121}, {010}, to 3 mm; in reniform crusts.

Twinning: Observed optically.

Physical Properties: *Cleavage:* On {010}, imperfect. *Fracture:* Uneven to conchoidal. *Tenacity:* Brittle. Hardness = 4.5 D(meas.) = 3.57–3.79 D(calc.) = 3.57 Oxidizes readily on exposure to air.

Optical Properties: Transparent if colorless, grading from translucent to opaque.

Color: Colorless internally, externally garnet-red, red-brown, dark brown, nearly black; in transmitted light, colorless to pink, pale brown, may be sectored as well as zoned.

Luster: Vitreous, adamantine to submetallic.

Optical Class: Biaxial (+). *Pleochroism:* X = colorless to light brown; Y = colorless to brown; Z = light brown to dark red-brown. *Orientation:* X = a; Y = b; Z = c.

Dispersion: $r > v$. $\alpha = 1.750\text{--}1.87$ $\beta = 1.751\text{--}1.88$ $\gamma = 1.761\text{--}1.93$ $2V(\text{meas.}) = 37^\circ\text{--}40^\circ$ $2V(\text{calc.}) = 35^\circ 15'\text{--}67^\circ 37'$

Cell Data: *Space Group:* $Pnma$. $a = 10.754(11)$ $b = 18.865(17)$ $c = 9.884(14)$ $Z = 4$

X-ray Powder Pattern: Nordmark, Sweden.

8.72 (10), 2.636 (9), 9.36 (7), 2.091 (7), 1.5996 (7), 5.27 (5), 3.080 (5)

Chemistry:	(1)	(2)	(1)	(2)	
As ₂ O ₅	32.43	21.20	CaO	0.28	
As ₂ O ₃	n.d.	9.12	H ₂ O	11.33	10.80
FeO	0.17		insol.	0.19	
MnO	56.43	58.88	<hr/>		
			Total	100.83	100.00

(1) Långban, Sweden. (2) $\text{Mn}_9(\text{As}^{3+}\text{O}_3)(\text{As}^{5+}\text{O}_4)_2(\text{OH})_9 \cdot 2\text{H}_2\text{O}$.

Occurrence: A rare low-temperature hydrothermal mineral cutting hausmannite ores in dolomitic marble (Moss mine, Sweden).

Association: Pyrochroite, manganite, jacobsonite, allactite, calcite (Moss mine, Sweden); manganon biotite, allactite, hausmannite (Långban, Sweden); kraisslite, allactite (Sterling Hill, New Jersey, USA).

Distribution: Found in the Moss mine, Nordmark, and at Långban, Värmland, Sweden. From Sterling Hill, Ogdensburg, Sussex Co., New Jersey, USA.

Name: From the Greek for *with* and *brother*, as it is commonly associated with several other chemically similar minerals.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 780–782, 919–920 [hemafibrite = synadelphite]. (2) Moore, P.B. (1970) Crystal chemistry of the basic manganese arsenates: IV. Mixed arsenic valences in the crystal structure of synadelphite. Amer. Mineral., 55, 2023–2037.