

# Manganpyrosmalite



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**Crystal Data:** Hexagonal. *Point Group:*  $\bar{3}2/m$ . As thick prismatic hexagonal crystals, to 4 cm, in subparallel groups. In granular aggregates showing schistose or foliated structure; massive.

**Physical Properties:** *Cleavage:* Perfect on {0001}, {10 $\bar{1}$ 0} less perfect. *Hardness* = 4–4.5  
D(meas.) = 3.06–3.19 D(calc.) = 3.14

**Optical Properties:** Translucent. *Color:* Blackish green, pistachio-green, liver-brown, brown, gray. *Luster:* Pearly on {0001}.

*Optical Class:* Uniaxial (-). *Pleochroism:* *O* = greenish yellow; *E* = colorless.  $\omega = 1.669$ – $1.670$   
 $\epsilon = 1.631$

**Cell Data:** *Space Group:*  $P\bar{3}m1$ .  $a = 13.422(5)$   $c = 7.165(2)$   $Z = 2$

**X-ray Powder Pattern:** Sterling Hill, New Jersey, USA.

7.16 (100), 2.683 (90), 3.583 (80), 2.251 (70), 1.672 (50), 1.523 (50), 3.419 (40)

Chemistry:	(1)	(2)	(1)	(2)	
SiO <sub>2</sub>	34.13	33.42	CaO	0.00	1.29
As <sub>2</sub> O <sub>5</sub>	0.13		Cl	3.80	3.78
FeO	12.43	17.05	H <sub>2</sub> O <sup>+</sup>	8.18	9.36
MnO	39.09	32.96	H <sub>2</sub> O <sup>-</sup>		0.07
ZnO	1.94	1.92	-O = Cl <sub>2</sub>	0.86	0.85
MgO	0.74	trace	Total	99.58	99.00

(1) Sterling Hill, New Jersey, USA; corresponds to  $(\text{Mn}_{5.76}\text{Fe}_{1.84}\text{Mg}_{0.16}\text{Zn}_{0.24})_{\Sigma=8.00}\text{Si}_6\text{O}_{15}(\text{OH}, \text{Cl})_{10}$ . (2) Broken Hill, Australia; corresponds to  $(\text{Mn}_{4.96}\text{Fe}_{2.56}\text{Zn}_{0.24}\text{Ca}_{0.24})_{\Sigma=8.00}\text{Si}_6\text{O}_{15}(\text{OH}, \text{Cl})_{10}$ .

**Polymorphism & Series:** Dimorphous with brokenhillite; forms a series with ferropyrosmalite.

**Occurrence:** As veinlets in the franklinite ore of a metamorphosed stratiform zinc deposit (Sterling Hill, New Jersey, USA).

**Association:** Friedelite, bementite, willemite (Sterling Hill, New Jersey, USA); spessartine, manganoan tremolite, quartz (Takanosu mine, Japan); rhodonite, manganoan fayalite, bustamite, manganoan hedenbergite, galena (Broken Hill, Australia).

**Distribution:** At Sterling Hill, Ogdensburg, Sussex Co., New Jersey, USA. In the Kyurazawa mine, Ashio, Tochigi Prefecture, Japan. Large composite crystals from Broken Hill, New South Wales, Australia. Pyrosmalite series minerals (with Mn:Fe around one) occur at: Nordmark, Värmland, and Dannemora, Kopparberg, Sweden. In the Takanosu mine, Takarazawa, Tochigi Prefecture, Japan. From Nant Fracon, Wales. In the Treburland mine, Altarnun, Cornwall, England. At Port Radium, Northwest Territories, Canada. In the Lar mine, Tierra Amarilla, Copiapó, Chile.

**Name:** For its high *manganese* content and relation to ferropyrosmalite; *pyrosmalite* from the Greek for *fire* and *odor*, for the odor when heated.

**Type Material:** Harvard University, Cambridge, Massachusetts, 104214, 104215; National Museum of Natural History, Washington, D.C., USA, C6216.

**References:** (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 465–466. (2) Frondel, C. and L.H. Bauer (1953) Manganpyrosmalite and its polymorphic relation to friedelite and schallerite. *Amer. Mineral.*, 38, 755–760. (3) Stillwell, F.L. and J. McAndrew (1957) Pyrosmalite in the Broken Hill lode, New South Wales. *Mineral. Mag.*, 31, 371–380. (4) Kato, T. and Y. Takéuchi (1983) The pyrosmalite group of minerals: I. Structure refinement of manganpyrosmalite. *Can. Mineral.*, 21, 1–6.

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