

**Manganflurlite****ZnMn<sup>2+</sup><sub>3</sub>Fe<sup>3+</sup>(PO<sub>4</sub>)<sub>3</sub>(OH)<sub>2</sub>(H<sub>2</sub>O)<sub>7</sub>·2H<sub>2</sub>O**

**Crystal Data:** Monoclinic. *Point Group:* 2/m. As random “jackstraw” aggregates or divergent fans of long, very thin, rectangular laths, to 0.5 mm. Laths are elongated along [100], flattened on {001}, and exhibit {100}, {010}, and {001}.

**Physical Properties:** *Cleavage:* Perfect on {001}, good on {100} and {010}. *Tenacity:* Flexible and elastic. *Fracture:* Irregular. Hardness = ~2.5 D(meas.) = 2.73(2) D(calc.) = 2.737 Dissolves rapidly in dilute HCl.

**Optical Properties:** Transparent. *Color:* Orange-brown. *Streak:* Buff. *Luster:* Vitreous iridescent. *Optical Class:* Biaxial (-).  $\alpha = 1.623(\text{calc})$   $\beta = 1.649(2)$   $\gamma = 1.673(2)$   $2V(\text{meas.}) = 86(1)^\circ$  *Orientation:*  $X = c$ ,  $Y = b$ ,  $Z = a$ . *Dispersion:*  $r > v$ , slight. *Pleochroism:*  $X = \text{pale yellow brown}$ ,  $Y = \text{orange-brown}$ ,  $Z = \text{light yellow brown}$ . *Absorption:*  $Y > Z > X$ .

**Cell Data:** *Space Group:*  $P2_1/m$ .  $a = 6.4546(8)$   $b = 11.1502(9)$   $c = 13.1630(10)$   $\beta = 99.829(5)^\circ$   $Z = 2$

**X-ray Powder Pattern:** Hagendorf-Süd pegmatite, Oberpfalz, Bavaria, Germany. 12.89 (100), 2.776 (95), 8.43 (38), 3.206 (29), 5.57 (28), 2.713 (27), 4.241 (26)

<b>Chemistry:</b>	(1)	(2)
MgO	0.39	0.28
CaO	0.02	0.04
MnO	13.54	14.20
ZnO	17.29	13.68
FeO	[6.26]	[9.78]
Fe <sub>2</sub> O <sub>3</sub>	[9.57]	[10.05]
Al <sub>2</sub> O <sub>3</sub>	0.32	0.20
P <sub>2</sub> O <sub>5</sub>	26.85	27.61
H <sub>2</sub> O	[22.79]	[23.48]
Total	97.03	99.32

(1) Hagendorf-Süd pegmatite, Oberpfalz, Bavaria, Germany; average electron microprobe analysis, H<sub>2</sub>O calculated from structure, total iron as Fe<sub>2</sub>O<sub>3</sub> (16.52) apportioned from structural data; corresponds to Zn(Mn<sup>2+</sup><sub>1.51</sub>Fe<sup>2+</sup><sub>0.69</sub>Zn<sub>0.68</sub>Mg<sub>0.08</sub>) $\Sigma=2.96$ (Fe<sup>3+</sup><sub>0.95</sub>Al<sub>0.05</sub>) $\Sigma=1.00$ (PO<sub>4</sub>)<sub>3</sub>(OH)<sub>1.92</sub>(H<sub>2</sub>O)<sub>9.08</sub>.

(2) Do.; average electron microprobe analysis, H<sub>2</sub>O calculated from structure, total iron as Fe<sub>2</sub>O<sub>3</sub> (20.92) apportioned from structural data; corresponds to Zn(Mn<sup>2+</sup><sub>1.54</sub>Fe<sup>2+</sup><sub>1.05</sub>Zn<sub>0.30</sub>Mg<sub>0.05</sub>) $\Sigma=2.95$ (Fe<sup>3+</sup><sub>0.97</sub>Al<sub>0.03</sub>) $\Sigma=1.00$ (PO<sub>4</sub>)<sub>3</sub>(OH)<sub>1.88</sub>(H<sub>2</sub>O)<sub>9.12</sub>.

**Occurrence:** A late-stage, relatively low-temperature, secondary hydrothermal mineral in a zoned granitic pegmatite.

**Association:** Phosphophyllite, hydroxylapatite, jahnsite-(CaMnFe), apatite, mitridatite Zn-bearing rockbridgeite.

**Distribution:** On two specimens of phosphophyllite from the Hagendorf-Süd pegmatite, Oberpfalz, Bavaria, Germany.

**Name:** The prefix, *mangan*, indicates the Mn-analog of *flurlite*.

**Type Material:** Natural History Museum of Los Angeles County, Los Angeles, California, USA (66682 and 66731).

**References:** (1) Kampf, A.R., I.E. Grey, C.M. Macrae, and E. Keck (2019) Manganflurlite, ZnMn<sup>2+</sup><sub>3</sub>Fe<sup>3+</sup>(PO<sub>4</sub>)<sub>3</sub>(OH)<sub>2</sub>(H<sub>2</sub>O)<sub>7</sub>·2H<sub>2</sub>O, a new schoonerite-related mineral from the Hagendorf-Süd pegmatite. Eur. J. Mineral., 31(1), 127-134. (2) (2021) Amer. Mineral., 106, 1360-1361 (abs. ref. 1).