Jahnsite-(MnMnZn) $Mn^{2+}Mn^{2+}Zn_2Fe^{3+}{}_2(PO_4)_4(OH)_2\cdot 8H_2O$

Crystal Data: Monoclinic. *Point Group*: 2/*m.* As sub-parallel bundles of prisms or thick blades to 0.3 mm elongated along [001] with shallow pyramidal terminations. *Twinning*: Presumably by reflection on {001}.

Physical Properties: *Cleavage*: Good on {001}. Tenacity: Brittle. *Fracture*: Irregular, splintery. Hardness = ~4 D(meas.) = 2.89(2) D(calc.) = 2.898 Rapidly soluble in dilute HCl.

Optical Properties: Transparent. *Color*: Light golden brown. *Streak*: White.
Luster: Vitreous to silky.
Optical Class: Biaxial (+). $\alpha = 1.655(2)$ $\beta = 1.662(2)$ $\gamma = 1.673(2)$ 2V(calc.) = 78(1)°
Orientation: n.d. *Pleochroism*: X = nearly colorless, $Y = Z$ = beige. *Dispersion*: n.d.
Absorption: $X < Y \approx Z$.

Cell Data: *Space Group*: $P2/a$. $a = 15.222(6)$ $b = 7.187(6)$ $c = 10.028(5)$ $\beta = 111.746(16)°$ $Z = 2$

X-ray Powder Pattern: Herdade dos Pendões mine, 5 km north of Odemira, Beja district, Portugal. 2.842 (100), 9.25 (63), 3.509 (41), 5.00 (40), 1.9984 (37), 4.648 (33), 1.5853 (33)

Chemistry:

	(1)	(2)
Na_2O	0.54	
CaO	0.63	
MgO	0.47	
MnO	19.15	15.58
ZnO	9.25	17.88
Fe_2O_3	[18.39]	17.54
FeO	[1.70]	
Al_2O_3	0.03	
P_2O_5	32.72	31.18
H_2O	[18.49]	17.81
Total	101.37	100.00

(1) Herdade dos Pendões mine, Beja district, Portugal; average electron microprobe analysis supplemented by Raman spectroscopy, H_2O by stoichiometry, total iron apportioned to Fe_2O_3 and FeO for charge balance; corresponds to $(Mn^{2+}{}_{0.71}Na_{0.15}Ca_{0.10})_{\Sigma=0.96}Mn^{2+}{}_{1.00}(Zn_{1.00}Mn^{2+}{}_{0.66}Fe^{2+}{}_{0.21}Mg_{0.10}Fe^{3+}{}_{0.03})_{\Sigma=2.00}(Fe^{3+}{}_{1.99}Al_{0.01})_{\Sigma=2.00}(P_{1.01}O_4)_4(OH)_2\cdot 8H_2O$. (2) $MnMnZn_2Fe^{3+}{}_2(PO_4)_4(OH)_2\cdot 8H_2O$.

Mineral Group: Jahnsite group, jahnsite subgroup; $Fe^{3+} >$ Al in the M(3) structural site.

Occurrence: In highly altered (leached and silicified) gossan of an iron-manganese deposit.

Association: Zn-bearing libethenite, quartz, rhodochrosite, santabarbaraite.

Distribution: At the Herdade dos Pendões manganese and iron mine, 5 km north of Odemira, Beja district, Portugal.

Name: Root name, *jahnsite*, indicates a member of the group with M(3) = Fe^{3+}; the suffix indicates sequentially the dominant atom in the X, M(1), and M(2) structural positions.

Type Material: Natural History Museum of Los Angeles County, Los Angeles, California, USA (67277).

References: (1) Kampf, A.R., P. Alves, A. Kasatkin, and R. Škoda (2019) Jahnsite-(MnMnZn), a new jahnsite-group mineral, and formal approval of the jahnsite group. Eur. J. Mineral., 31(1), 167-172. (2) (2021) Amer. Mineral., 106, 1364 (abs. ref. 1).