Jahnsite-(NaFeMg) $NaFe^{3+}Mg_2Fe^{3+}_2(PO_4)_4(OH)_2\cdot 8H_2O$

Crystal Data: Monoclinic. *Point Group*: 2/*m*. As six-sided pseudo-orthorhombic twinned prisms, to 1 mm, with shallow wedge-like terminations and striations parallel to [010], both as isolated twinned crystals and in subparallel to divergent intergrowths. Typical crystals have as many as five chemical zones from base to termination corresponding to jahnsite-(NaMnMg), jahnsite-(NaFeMg), jahnsite-(CaMnMg), jahnsite-(NaFeMg), and jahnsite-(CaMgMg). *Twinning*: Ubiquitous, both simple contact and polysynthetic by reflection on {001}.

Physical Properties: *Cleavage*: Good on {001}. *Tenacity*: Brittle. *Fracture*: Splintery. Hardness = 4 D(meas.) = 2.58(2) D(calc.) = 2.608 Slowly dissolves in cold dilute HCl.

Optical Properties: Transparent. *Color*: Yellow with orange-red bands near the terminations. *Streak*: White. *Luster*: Vitreous.
Optical Class: Biaxial (–). α = 1.632(1) β = 1.669(1) γ = 1.671(1) 2V(meas.) = 25(5)° 2V(calc.) = 26° *Dispersion*: $r > v$, very strong. *Orientation*: $Y = b$, $Z \wedge a = +28°$ (in β obtuse). *Pleochroism*: Noticeable, X = colorless, Y and Z = beige. *Absorption*: $Y = Z > X$.

Cell Data: *Space Group*: $P2/a$. a = 15.0811(16) b = 7.1403(8) c = 9.8299(11) β = 110.445(1)° Z = 2

X-ray Powder Pattern: Tip Top mine, Custer County, South Dakota, USA.
9.218 (100), 2.819 (70), 4.884 (25), 3.537 (25), 2.973 (25), 2.854 (20), 1.933 (20)

Chemistry:

	(1)	(2)
Na_2O	2.82	3.89
CaO	0.34	
MnO	0.32	
MgO	10.27	10.11
Fe_2O_3	27.35	30.35
P_2O_5	35.93	35.61
H_2O	[21.58]	20.34
Total	98.61	100.00

(1) Tip Top mine, Custer County, South Dakota, USA; average of 3 electron microprobe analyses, H_2O calculated from the crystal structure and for charge balance; corresponding to $(Na_{0.72}Ca_{0.05}Mn^{2+}_{0.04})(Fe^{3+}_{0.72}Mg_{0.01})Mg_{2.00}Fe^{3+}_{2.00}(PO_{3.77}OH_{0.23})_4(OH)_2\cdot 8H_2O$.
(2) $NaFe^{3+}Mg_2Fe^{3+}_2(PO_4)_4(OH)_2\cdot 8H_2O$.

Mineral Group: Whiteite-jahnsite group.

Occurrence: A late-stage hydrothermal decomposition product of triphylite in a complex granitic pegmatite.

Association: Heterosite, leucophosphite, dufrénite, barbosalite, rockbridgeite, mitridatite, ushkovite.

Distribution: At the Tip Top mine, Custer County, South Dakota, USA.

Name: Root name, *Jahnsite*, indicates a member of the group with $M3 = Fe^{3+}$; suffixes indicate cations in X, $M1$, and $M2$.

Type Material: Natural History Museum of Los Angeles County, Los Angeles, California, USA (58590, 58591, and 58592).

References: (1) Kampf, A.R., I.M. Steele, and T.A. Loomis (2008) Jahnsite-(NaFeMg), a new mineral from the Tip Top mine, Custer County, South Dakota: Description and crystal structure. Amer. Mineral., 93, 940-945.