

**Whiteite-(MnMnMn)**

**Crystal Data:** Monoclinic. *Point Group:* 2/m. As sugary aggregates of bladed crystals to 0.1 mm, flattened on {001} and elongated along [010], and epitaxial on whiteite-(CaMnMn).

**Physical Properties:** *Cleavage:* Poor on {001}. *Tenacity:* n.d. *Fracture:* n.d. *Hardness* = n.d. *D(meas.)* = n.d. *D(calc.)* = 2.82

**Optical Properties:** Transparent. *Color:* Colorless to very pale brown *Streak:* White.

*Luster:* Vitreous.

*Optical Class:* Biaxial (-).  $\alpha = 1.599(2)$   $\beta = 1.605(2)$   $\gamma = 1.609(2)$   $2V(\text{calc.}) = 78.2^\circ$

No dispersion or pleochroism. *Orientation:*  $X = b$ .

**Cell Data:** *Space Group:*  $P2_1/a$ .  $a = 15.024(3)$   $b = 6.947(1)$   $c = 9.999(2)$   $\beta = 110.71(3)^\circ$   $Z = 2$

**X-Ray Diffraction Pattern:** Foote Lithium Company mine (East dump), Kings Mountain district, Cleveland Co., North Carolina, USA.

2.801 (100), 4.92 (66), 9.40 (49), 3.513 (42), 4.70 (37), 1.568 (28), 1.950 (26)

Chemistry:	(1)	(2)
CaO	2.58	
Na <sub>2</sub> O	0.11	
MnO	22.8	34.12
ZnO	1.62	
MgO	0.40	
Al <sub>2</sub> O <sub>3</sub>	12.7	12.26
Fe <sub>2</sub> O <sub>3</sub> (total)	7.98	
FeO	2.05	
Fe <sub>2</sub> O <sub>3</sub>	5.70	
P <sub>2</sub> O <sub>5</sub>	33.7	34.13
H <sub>2</sub> O	[19.5]	19.49
Total	101.16	100.00

(1) Foote Lithium Company mine (East dump), Kings Mountain district, Cleveland Co., North Carolina, USA; average electron microprobe analysis, H<sub>2</sub>O and Fe<sup>2+</sup>/Fe<sup>3+</sup> determined from the structure analysis; corresponds to  $(\text{Mn}^{2+}_{0.59}\text{Ca}_{0.38}\text{Na}_{0.03})_{\Sigma=1.00}\text{Mn}_{1.00}(\text{Mn}^{2+}_{1.04}\text{Fe}^{3+}_{0.58}\text{Fe}^{2+}_{0.23}\text{Zn}_{0.16}\text{Mg}_{0.08})_{\Sigma=2.09}\text{Al}_{2.04}(\text{PO}_4)_{3.89}(\text{OH})_{3.18}(\text{H}_2\text{O})_{7.26}$ . (2)  $\text{Mn}^{2+}\text{Mn}^{2+}\text{Mn}^{2+}_2\text{Al}_2(\text{PO}_4)_4(\text{OH})_2 \cdot 8\text{H}_2\text{O}$ .

**Mineral Group:** Jahnsite group, whiteite subgroup.

**Occurrence:** In tertiary phosphate mineralisation formed in cavities left behind by leached primary fluorapatite, in partially oxidized pegmatite.

**Association:** Eosphorite, hureaulite, fairfieldite, mangangordonite, whiteite-(CaMnMn), jasonsmithite.

**Distribution:** From the Foote Lithium Company mine (East dump), Kings Mountain district, Cleveland Co., North Carolina, USA.

**Name:** Base name *whiteite* indicates a member of the jahnsite supergroup with  $M3 = \text{Al}^{3+}$  and a suffix with the dominant cation in the  $X$ ,  $M1$  and  $M2$  site respectively.

**Type Material:** Natural History Museum of Los Angeles County, Los Angeles, California, USA (74374, 76149, 76150, and 76151).

**References:** (1) Grey, I.E., J.B. Smith, A.R. Kampf, W.G. Mumme, C.M. MacRae, A. Riboldi-Tunnicliffe, S. Boer, A.M. Glenn, and R.W. Gable (2021) Whiteite-(MnMnMn), a new jahnsite-group mineral species from the Foote mine, North Carolina, USA, and chemical pressure effects in jahnsite-group minerals. *Mineral. Mag.*, 85, 862-867.