Whiteite-(CaFeMg) $Ca(Fe^{2+},Mn^{2+})Mg_2Al_2(PO_4)_4(OH)_2 \cdot 8H_2O$

Crystal Data: Monoclinic. *Point Group:* $2/m$. Crystals are warped, canoe-shaped, showing only $\{\bar{1}11\}$, {001}, to 2.3 cm. *Twinning:* By reflection on {001}, common, giving a pseudo-orthorhombic outline.

Physical Properties: *Cleavage:* On {001}, good to perfect. Hardness = 3–4
D(meas.) = 2.58(1) D(calc.) = 2.51

Optical Properties: Semitransparent. *Color:* Pale tan to gray; colorless in thin fragments. *Optical Class:* Biaxial (+), may be biaxial (–). *Orientation:* $X = b$; $Y = a$. $\alpha = 1.580(3)$ $\beta = 1.585(3)$ $\gamma = 1.590(3)$ 2V(meas.) = 40°–50°

Cell Data: *Space Group:* $P2_1/a$. $a = 14.85$–14.90 $b = 6.92$–6.98 $c = 10.13$ $\beta = 112°30'$–$113°7'$ Z = 2

X-ray Powder Pattern: Lavra da Ilha pegmatite, Brazil; close to other whiteites.
9.304 (100), 2.789 (65), 4.660 (30), 4.849 (20), 2.946 (20), 2.542 (20), 1.936 (20)

Chemistry:

	(1)	(2)
P_2O_5	36.0	37.68
Al_2O_3	12.0	11.54
Fe_2O_3		0.25
FeO	6.1	9.57
MnO	3.1	0.45
MgO	10.5	12.55
CaO	6.0	5.98
Na_2O		0.17
H_2O^+		11.21
H_2O^-		10.35
H_2O	n.d.	
Total		99.75

(1) Lavra da Ilha pegmatite, Brazil; by electron probe, partial analysis, total Fe as FeO, total Mn as MnO; corresponding approximately to $(Ca_{0.84}Mn^{2+}_{0.16})_{\Sigma=1.00}(Fe^{2+}_{0.67}Mn^{2+}_{0.18})_{\Sigma=0.85}Mg_{2.05}Al_{1.86}(PO_4)_4(OH)_2 \cdot 8H_2O$. (2) Blow River, Canada; corresponds to $(Ca_{0.53}Fe^{2+}_{0.34}Na_{0.08}Mn^{2+}_{0.03})_{\Sigma=0.98}Fe^{2+}_{1.00}Mg_{2.00}(Al_{1.70}Mg_{0.28}Fe^{3+}_{0.02})_{\Sigma=2.00}(PO_4)_4(OH)_2 \cdot 8H_2O$.

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

Occurrence: In a complex zoned granite pegmatite (Lavra da Ilha pegmatite, Brazil); in an iron-formation (Blow River, Canada).

Association: Eosphorite, zanazziite, wardite, albite, quartz (Lavra da Ilha pegmatite, Brazil); siderite, lazulite, arrojadite, quartz (Blow River, Canada).

Distribution: From the Lavra da Ilha pegmatite, in the Jequitinhonha River, three km north of Taquaral, and at the Énio pegmatite mine, northeast of Galiléia, Minas Gerais, Brazil. Large crystals from the Blow River area, Yukon Territory, Canada.

Name: Honoring John Sampson White, Jr. (1933–), Associate Curator of Mineralogy, Department of Mineral Sciences, Smithsonian Institution, Washington, D.C., USA; the suffix indicates sequentially the dominant atom in the X, M(1), and M(2) structural positions.

Type Material: National School of Mines, Paris, France; National Museum of Natural History, Washington, D.C., USA, 123013.

References: (1) Moore, P.B. and J. Ito (1978) I. Whiteite, a new species, and a proposed nomenclature for the jahnsite-whiteite complex series. II. New data on xanthoxenite. III. Salmonsite discredited. Mineral. Mag., 42, 309–323. (2) (1979) Amer. Mineral., 64, 465–466 (abs. ref. 1).