Johnwalkite $K(Mn^{2+}, Fe^{3+}, Fe^{2+})_2(Nb, Ta)O_2(PO_4)_2(H_2O, OH)_2$

Crystal Data: Orthorhombic. *Point Group:* $mm2$. As prismatic crystals, to 6 mm, elongated along [010] and flattened on {001}; forms include {001}, {100}, {111}, {110}; in radial aggregates.

Physical Properties: *Cleavage:* Good on {001} and {100}; poor on {010}. *Tenacity:* Brittle. Hardness = 4 D(meas.) = 3.40(3) D(calc.) = 3.44

Optical Properties: Opaque, transparent on thin edges. *Color:* Very dark reddish brown. *Streak:* Medium greenish yellow. *Luster:* Vitreous.
Optical Class: Biaxial (+). *Pleochroism:* Very strong; X = blue-green; Y = yellow to pale brown; Z = brown. *Orientation:* $X = c$; $Y = a$; $Z = b$. *Absorption:* $X \gg Z \gg Y$. $\alpha = 1.748(5)$ $\beta = 1.763(5)$ $\gamma = 1.84(1)$ 2V(meas.) = 53(2)°

Cell Data: *Space Group:* $[Pb2_1m]$ (by analogy to olmsteadite). $a = 7.516(4)$ $b = 10.023(8)$ $c = 6.502(4)$ Z = 1

X-ray Powder Pattern: Champion mine, South Dakota, USA.
6.01 (100), 3.005 (80), 3.054 (70), 2.862 (70), 6.51 (40), 2.563 (40), 7.54 (30)

Chemistry:

	(1)
P_2O_5	27.3
Nb_2O_5	21.5
Ta_2O_5	5.1
Fe_2O_3	12.5
FeO	3.3
MnO	14.8
MgO	0.5
K_2O	8.6
H_2O	6.5
Total	100.1

(1) Champion mine, South Dakota, USA; by electron microprobe, oxidation state of Fe determined by titration, total Mn as MnO, H_2O by thermoanalyzer-mass spectrometer; corresponding to $K_{0.92}(Mn_{1.04}Fe^{3+}_{0.71}Fe^{2+}_{0.23}Mg_{0.06})_{\Sigma=2.04}(Nb_{0.81}Ta_{0.12}Fe^{3+}_{0.08})_{\Sigma=1.01}O_2(PO_4)_{1.93}[(H_2O)_{1.42}(OH)_{0.78}]_{\Sigma=2.20}$.

Occurrence: A rare secondary mineral derived from the dissolution of triphylite-lithiophilite and columbite-tantalite in a complex granite pegmatite.

Association: Fluorapatite, childrenite–eosphorite, rockbridgeite–frondelite, huréaulite, fairfieldite, ludlamite, jahnsite–whiteite, goethite, manganese oxides, quartz.

Distribution: In the Expectation pegmatite at the Champion mine, about 2.5 km southeast of Keystone, Pennington Co., South Dakota, USA.

Name: Honoring Richard JOHNson (1936–1998) and Frank WALKup (1943–1993), mineral preparators, National Museum of Natural History, Washington, D.C., USA.

Type Material: National Museum of Natural History, Washington, D.C., USA, 162676.

References: (1) Dunn, P.J., D.R. Peacor, D.B. Sturman, R.A. Ramik, W.L. Roberts, and J.A. Nelen (1986) Johnwalkite, the Mn-analogue of olmsteadite, from South Dakota. Neues Jahrb. Mineral., Monatsh., 115–120. (2) (1987) Amer. Mineral., 72, 223 (abs. ref. 1).