Manganocolumbite $(Mn^{2+}, Fe^{2+})(Nb, Ta)_2O_6$

Crystal Data: Orthorhombic. *Point Group:* $2/m\ 2/m\ 2/m$. [Crystals short prismatic or equant, also tabular; in groups of parallel or subparallel crystals; massive] (by analogy to ferrocolumbite). *Twinning:* [on {021} and {023}, may produce pseudohexagonal trillings.]

Physical Properties: *Cleavage:* [Distinct on {100}, less distinct on {010}.] *Fracture:* [Subconchoidal to uneven.] *Tenacity:* [Brittle.] Hardness = [6] D(meas.) = 5.20–6.65 D(calc.) = [5.30]

Optical Properties: Opaque, translucent through thin edges. *Color:* Black to brownish black; reddish brown in transmitted light; in reflected light, grayish white with a brownish tint, with reddish brown internal reflections. *Streak:* Dark red to black. *Luster:* Submetallic to vitreous. *Optical Class:* Biaxial (–). *Pleochroism:* Strong; red, red-brown, and orange. *Orientation:* $X = b$; $Y = a$; $Z = c$. *Dispersion:* $r < v$. *Absorption:* Strong; $Z > X$. α = n.d. β = n.d. γ = n.d. 2V(meas.) = n.d.
R_1–R_2: n.d.

Cell Data: *Space Group: Pbcn* (synthetic). $a = 14.433(2)$ $b = 5.7637(7)$ $c = 5.0832(8)$ $Z = 4$

X-ray Powder Pattern: n.d.

Chemistry:

	(1)	(2)	(3)
Nb_2O_5	68.00	46.8	78.93
Ta_2O_5	9.88	31.2	
TiO_2	0.53	1.9	
$SnO_2 + WO_3$	0.88	0.4	
FeO	5.45	8.6	
MnO	14.79	9.4	21.07
Na_2O		0.02	
Total	99.53	98.32	100.00

(1) Old Mike mine, South Dakota, USA. (2) Herbb #2 pegmatite, Virginia, USA; by electron microprobe, total Fe as Fe^{2+}, total Mn as MnO; corresponding to $(Mn_{0.52}Fe_{0.47})_{\Sigma=0.99}(Nb_{1.37}Ta_{0.55}Ti_{0.09}Sn_{0.01})_{\Sigma=2.02}O_6$. (3) $MnNb_2O_6$.

Polymorphism & Series: Forms two series, with ferrocolumbite, and with manganotantalite.

Occurrence: As an accessory and primary constituent of granite pegmatites; detrital in placers.

Association: [Albite, microcline, beryl, lepidolite, muscovite, tourmaline, spodumene, lithiophilite, triphylite, amblygonite, triplite, apatite, samarskite, microlite, cassiterite.]

Distribution: Analyzed material from: in the USA, the Globe and Harding pegmatites, Taos Co., New Mexico; near Cañon City, Fremont Co., Colorado; at Elk Creek, Pennington Co., and the Old Mike mine, six km north-northwest of Custer, Custer Co., South Dakota; from Mineral Hill, Delaware Co., Pennsylvania; at the Herbb #2 pegmatite, six km northeast of Flat Rock, Powhatan Co., Virginia. In the Tanco pegmatite, Bernic Lake, Manitoba, Canada. From the Varuträsk pegmatite, 15 km north of Skellefteå, Västerbotten, and from Utö, Stockholm, Skärgård, Sweden. Around Okehampton, Devon, England. Occurs at San Piero in Campo, Elba, Italy.

Name: For its dominant MANGANese content and its relation to ferroCOLUMBITE.

References: (1) Palache, C., H. Berman, and C. Frondel (1944) Dana's system of mineralogy, (7th edition), v. I, 780–787. (2) Wise, M.A. and P. Černý (1984) First U.S. occurrence of wodginite from Powhatan County, Virginia. Amer. Mineral., 69, 807–809. (3) Wise, M.A., A.C. Turnock, and P. Černý (1985) Improved unit cell dimensions for ordered columbite-tantalite end members. Neues Jahrb. Mineral., Monatsh., 372–378.