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

Crystal Data: Tetragonal. *Point Group:* $4/m2/m2/m$. Crystals usually well developed, short prismatic or equant, with several forms. *Twinning:* Common on {013}, then distorted along $[0\bar{3}1]$; rarely on {101}.

Physical Properties: *Fracture:* Uneven to subconchoidal. Hardness = n.d. VHN = 885–974 (100 g load). D(meas.) = 7.90(5) D(calc.) = 8.17–8.21

Optical Properties: Opaque, transparent on thin edges. *Color:* Black, may be brownish black on the surface; yellowish to reddish brown in transmitted light. *Streak:* Brown to brownish black. *Luster:* Subadamantine to submetallic, brilliant.
Optical Class: Uniaxial (+). *Pleochroism:* Strong; O = pale yellowish or reddish brown.
$\omega = 2.27(1)$ $\epsilon = 2.42(1)$
R_1–R_2: (400) 17.9–17.1, (420) 17.4–17.0, (440) 16.9–17.2, (460) 16.5–17.5, (480) 16.2–17.6, (500) 15.9–17.6, (520) 15.6–17.5, (540) 15.5–17.4, (560) 15.3–17.2, (580) 15.2–17.1, (600) 15.1–17.0

Cell Data: *Space Group: P4/mnm.* $a = 4.75$–4.76 $c = 9.21$–9.29 $Z = 2$

X-ray Powder Pattern: Synthetic $FeTa_2O_6$. (ICDD 23–1124).
3.36 (100), 2.576 (90), 1.746 (70), 4.22 (30), 2.375 (30), 1.680 (25), 1.407 (25)

Chemistry:

	(1)
Nb_2O_5	1.32
Ta_2O_5	85.21
TiO_2	0.46
SnO_2	0.02
FeO	9.67
MnO	4.17
Total	100.85

(1) Skogböle, Finland; by electron microprobe, total Fe as FeO, total Mn as MnO; corresponds to $(Fe_{0.68}Mn_{0.30})_{\Sigma=0.98}(Ta_{1.94}Nb_{0.05}Ti_{0.02})_{\Sigma=2.01}O_6$.

Polymorphism & Series: Forms a series with manganotapiolite.

Mineral Group: Ferrotapiolite group.

Occurrence: An accessory mineral in zoned granite pegmatites; detrital in placers.

Association: Albite, muscovite, tourmaline, beryl, spodumene, columbite–tantalite, wodginite, cassiterite, triplite, triphylite.

Distribution: Well-characterized material from: in Finland, in the Eräjärvi area, Orivesi; at Sukula and Härkäsaari, Tammela; at Skogböle and the Rosendal pegmatite, Kemiö (Kimito) Island. From Maršíkov, Czech Republic. At Olgiasca, Lombardy, Italy. In France, from Chanteloube, Haute-Vienne. Occurs at Angarf-Nord and elsewhere in the Anti-Atlas Mountains, Morocco. From Greenbushes, Strelley, and Tabba Tabba, Pilbara, Western Australia. In the USA, from Topsham, Sagadahoc Co. and Paris, Oxford Co., Maine; in the Old Mike mine, six km north-northwest of Custer, Custer Co., South Dakota; at Rockford, Coosa Co., Alabama.

Name: For its dominant FERROus iron content and for *Tapio*, ancient Finnish god of the forest, as the mineral was first found in Finland.

References: (1) Palache, C., H. Berman, and C. Frondel (1944) Dana's system of mineralogy, (7th edition), v. I, 775–778 [tapiolite and "mossite"]. (2) Clark, A.M. and E.E. Fejer (1978) Tapiolite, its chemistry and cell dimensions. Mineral. Mag., 42, 477–480. (3) Lahti, S.I., B. Johanson, and M. Virkkunen (1983) Contributions to the chemistry of tapiolite – manganotapiolite, a new mineral [ferrotapiolite]. Bull. Geol. Soc. Finland, 55, 101–109. (4) Wise, M.A. and P. Černý (1996) The crystal chemistry of the tapiolite series. Can. Mineral., 34, 631–647. (5) Criddle, A.J. and C.J. Stanley, Eds. (1993) Quantitative data file for ore minerals, 3rd ed. Chapman & Hall, London, 169.