

Ixiolite

(Ta, Nb, Sn, Fe, Mn)O₂

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Crystal Data: Monoclinic, pseudo-orthorhombic. *Point Group:* $2/m$. As crudely prismatic crystals, to 10 cm; commonly as irregular grains. *Twinning:* On {013}, uncommon.

Physical Properties: *Fracture:* Uneven to subconchoidal. *Tenacity:* Brittle. Hardness = 6–6.5 VHN = 836–967 (100 g load). $D(\text{meas.}) = 6.94\text{--}7.23$ $D(\text{calc.}) = [7.34]$ Significant Sn, along with Mn, Fe, and Ti in its composition, is essential to the definition of this species, the disordered counterpart of wodginite, to which it alters on heating.

Optical Properties: Opaque. *Color:* Blackish gray to steel-gray. *Streak:* Dark brown. *Luster:* Submetallic.

R_1 – R_2 : n.d.

Cell Data: *Space Group:* $P2/c$. $a = 9.481(3)$ $b = 11.494(5)$ $c = 5.158(2)$ $\beta = 90^\circ 8(2)'$ $Z = 16$

X-ray Powder Pattern: Skogböle, Finland; may be confused with columbite.

2.98 (100), 3.65 (32), 1.459 (29), 1.722 (24), 2.51 (20), 1.746 (17), 2.57 (13)

Chemistry:	(1)	(2)	(1)	(2)	(1)	(2)
WO ₃	0.30	1.87	SnO ₂	12.27	MnO	5.40
Nb ₂ O ₅	10.50	6.12	Al ₂ O ₃	0.16	MgO	0.01
Ta ₂ O ₅	61.47	63.79	Sc ₂ O ₃	0.16	CaO	0.11
SiO ₂	0.12		As ₂ O ₃	0.04	H ₂ O ⁺	0.16
TiO ₂	0.38	2.68	Sb ₂ O ₃	0.02	H ₂ O [−]	0.08
ZrO ₂	0.60	0.20	FeO	8.08		
				2.98	Total	99.63
						98.44

(1) Skogböle, Finland; corresponds to (Ta_{0.44}Fe_{0.18}Sn_{0.13}Nb_{0.12}Mn_{0.12}Zr_{0.01}Ti_{0.01})_{Σ=1.01}O₂.

(2) Bradlo, Czech Republic; by electron microprobe, total Fe as FeO, corresponding to

(Ta_{0.46}Mn_{0.21}Sn_{0.12}Nb_{0.07}Fe_{0.07}Ti_{0.05}W_{0.01})_{Σ=0.99}O₂.

Occurrence: An accessory mineral in granite pegmatites.

Association: Microcline, tapiolite, cassiterite, microlite, niobian rutile.

Distribution: Found at Skogböle, Kemiö (Kimito) Island, Finland. From Bradlo, Czech Republic. At the Swanson mine, East Hampton, Middlesex Co., Connecticut, USA. In the Yellowknife district, Northwest Territories, Canada. At Bikita, Zimbabwe. In the Kalbinskiy Range, eastern Kazakhstan. From Wodgina, Pilbara, Western Australia. At an undefined locality in the Xinjiang Uygur Autonomous Region, China.

Name: For *Ixion*, of Greek mythology, who was related to Tantalus, in allusion to the mineral's relation to tantalite.

Type Material: University of Finland, Helsinki, Finland, 1014; Wrocław University, Wrocław, Poland, II-4874; Royal Ontario Museum, Toronto, Canada, M6591.

References: (1) Palache, C., H. Berman, and C. Frondel (1944) Dana's system of mineralogy, (7th edition), v. I, 778. (2) Nickel, E.H., J.F. Rowland, and R.C. McAdam (1963) Ixiolite – a columbite substructure. *Amer. Mineral.*, 48, 961–979. (3) Wise, M.A. and P. Černý (1986) The status of ixiolite. *Int. Mineral. Assoc. General Meeting Abs.*, 265. (4) Černý, P. and D. Němec (1995) Pristine vs. contaminated trends in Nb,Ta-oxide minerals of the Jihlava pegmatite district, Czech Republic. *Mineral. Petrol.*, 55, 117–129.