

Ilmenorutile

(Ti, Nb, Fe²⁺)O₂

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Crystal Data: Tetragonal. *Point Group:* 4/m 2/m 2/m. As dipyramidal, prismatic crystals, to 10 cm, with striated prism faces. Typically intergrown with unmixed columbite or, more rarely, ilmenite. *Twining:* Common on {101}, rarely on {301}.

Physical Properties: *Cleavage:* {110}, distinct; {100}, imperfect. *Fracture:* Conchoidal. Hardness = 6–6.5 VHN = 860–933 D(meas.) = 4.35–4.92 D(calc.) = [4.73]

Optical Properties: Opaque, translucent through thin edges. *Color:* Black; dark yellow-green to red or reddish brown in transmitted light; pale cream in reflected light. *Streak:* Dark greenish brown to greenish black. *Luster:* Adamantine, resinous. *Optical Class:* Uniaxial (+). *Pleochroism:* Strong; *E* = brown; *O* = dark bluish green or greenish blue. *Absorption:* *E* > *O*. *n* = > 2.6 *Anisotropism:* Strong. *Birefractance:* Weak. R₁–R₂: n.d.

Cell Data: *Space Group:* P4₂/mnm. *a* = 4.62–4.64 *c* = 2.98–3.00 *Z* = 2

X-ray Powder Pattern: Ilmen Mountains, Russia; almost identical to strüverite. 1.695 (10), 3.269 (8), 2.497 (6), 1.626 (6), 1.047 (6), 1.456 (4), 1.386 (4)

Chemistry:

	(1)	(2)
Nb ₂ O ₅	28.75	22.07
Ta ₂ O ₅	1.65	1.50
TiO ₂	59.49	60.31
FeO	9.31	14.62
insol.		~1.
Total	99.20	[99.50]

(1) Věžná, Czech Republic; corresponds to (Ti_{0.71}Nb_{0.20}Fe_{0.12}²⁺)_{Σ=1.03}O₂. (2) Ampangabé, Madagascar; corresponds to (Ti_{0.70}Nb_{0.15}Fe_{0.19}²⁺)_{Σ=1.04}O₂.

Polymorphism & Series: Forms a series with strüverite; Nb:Ta > 1.

Occurrence: A late primary mineral in granite pegmatites; also in carbonatites; in alluvial placers.

Association: Columbite, ilmenite, titanite, pyrochlore, zircon, topaz, albite, microcline.

Distribution: Well-studied material from: Miass, Ilmen Mountains, also in the Vishnev Mountains, Southern Ural Mountains, Russia. Near Iveland, Evje, Tvedestrand, and elsewhere in Norway. From Penikoja, Somero, Finland. At Věžná, near Rožná, and Údraž, near Písek, Czech Republic. On Elba, Italy, at Grotta del Guerrino. In the Gunheath china clay pit, St. Austell, Cornwall, England. From near Salak North, Kuala Kangsar, Perak, Malaya. In Japan, at Teshirogi, and in the Uzi mine, Fukushima Prefecture. From Nampoca, Alto Ligonha, Mozambique. At Ampangabé, Madagascar. Other localities are reported, some of which require modern confirmation.

Name: For the occurrence in the Ilmen Mountains, Russia, and relation to *rutile*.

References: (1) Palache, C., H. Berman, and C. Frondel (1944) Dana's system of mineralogy, (7th edition), v. I, 554–561 [rutile, part]. (2) Vlasov, K.A., Ed. (1966) Mineralogy of rare elements, v. II, 407–412. (3) Černý, P., F. Čech, and P. Povondra (1964) Review of ilmenorutile-strüverite minerals. Neues Jahrb. Mineral., Abh., 101, 142–172. (4) Černý, P., B.J. Paul, F.C. Hawthorne, and R. Chapman (1981) A niobian rutile–disordered columbite intergrowth from the Huron claim pegmatite, southeastern Manitoba. Can. Mineral., 19, 541–548.

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