

Murmanite

 $\text{Na}_2(\text{Ti, Nb})_2\text{Si}_2\text{O}_9 \cdot n\text{H}_2\text{O}$

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Crystal Data: Triclinic. *Point Group:* 1. Rarely in well-formed crystals, to 2 cm. As flaky and lamellar segregations and radial and fine-grained aggregations.

Physical Properties: *Cleavage:* {001}, perfect. *Tenacity:* Brittle. *Hardness* = 2–3
D(meas.) = 2.76–2.84 D(calc.) = 3.00

Optical Properties: Translucent to opaque. *Color:* Lilac to bright pink when fresh; yellow, brown, cinnamon-brown to black when altered; in thin section, light pink, brownish, or dull gray. *Luster:* Vitreous on cleavages, greasy on fractures.

Optical Class: Biaxial (-). *Pleochroism:* X = light pink; Y = light brown; Z = pinkish brown to dark brown. *Orientation:* X \perp (100); Z = b. *Dispersion:* r > v, distinct. *Absorption:* Z > X > Y. $\alpha = 1.682\text{--}1.735$ $\beta = 1.765\text{--}1.770$ $\gamma = 1.807\text{--}1.839$ 2V(meas.) = 57°–64°

Cell Data: *Space Group:* P1. a = 10.535(5) b = 13.884(4) c = 11.688(14)
 $\alpha = 94.31(6)^\circ$ $\beta = 98.62(8)^\circ$ $\gamma = 89.81(3)^\circ$ Z = [4]

X-ray Powder Pattern: Lovozero massif, Russia.

4.220 (10), 2.867 (10), 11.56 (9), 5.810 (9), 3.762 (6), 2.640 (4), 2.485 (4)

Chemistry:	(1)	(2)	(3)		(1)	(2)	(3)
SiO ₂	30.06	31.24	30.83	MgO	0.35	0.64	0.33
TiO ₂	38.24	30.40	33.48	CaO	2.56	3.16	5.40
ZrO ₂	2.08	1.62		Na ₂ O	10.38	8.64	10.58
Fe ₂ O ₃	2.33	2.96	0.48	K ₂ O	0.83	0.62	0.19
Nb ₂ O ₅		6.56	4.78	H ₂ O ⁺	4.17	5.37	[8.62]
Ta ₂ O ₅		0.56		H ₂ O ⁻	6.03	6.13	
FeO	0.30		1.73	P ₂ O ₅			2.66
MnO	2.30	2.38	0.75	Total	99.63	100.28	[99.83]

(1) Chinglusuai Valley, Russia. (2) Sengischorr cirque, Lovozero massif, Russia. (3) Ilímaussaq intrusion, Greenland; by electron microprobe, XRF, and DTA, here recalculated to oxides, Fe²⁺ + :Fe³⁺ = 4:1, H₂O estimated from oxygen difference; corresponds to (Na_{0.88}Ca_{0.38}Fe_{0.09}²⁺Mg_{0.03}K_{0.02})_{Σ=1.40}(Ti_{1.63}Nb_{0.14}Mn_{0.04}Fe_{0.03}³⁺)_{Σ=1.84}Si₂O_{8.63}•0.15Na₃PO₄•1.87H₂O.

Occurrence: In pegmatites and associated igneous rocks of alkalic complexes, as a primary magmatic mineral or altered from lomonosovite.

Association: Lomonosovite, aegirine, arfvedsonite, neptunite, microcline, albite, natrolite, analcime, nepheline, sodalite, eudialyte, lorenzenite, lamprophyllite, rinkite, ussingite.

Distribution: In Russia, from the Chinglusuai Valley, on Mts. Flora, Punkaruaiy, and Angvundaschorr, Lovozero massif, and on Mts. Rasvumchorr and Koashva, Khibiny massif, Kola Peninsula. In the Ilímaussaq intrusion, at Kvanefjeld, Steenstrups Fjeld, and Skovfjord, southern Greenland.

Name: For the Murman coast on the northern side of the Kola Peninsula, Russia.

Type Material: A.E. Fersman Mineralogical Museum, Academy of Sciences, Moscow, Russia, 25852–25854, 25862, 25863.

References: (1) Gutkova, N. (1930) Sur un nouveau titanosilicate – la murmanite – de Lujawrurt (Halbinsel Kola). Compt. Rendu Acad. Sci. URSS, 731 (in French). (2) (1936) Fortschr. Mineral., 20, 129–130 (abs. ref. 1, in German). (3) Vlasov, K.A., M.V. Kuz'menko, and E.M. Es'kova (1966) The Lovozero alkali massif. Akad. Nauk SSSR, 347–351 (in English). (4) Karup-Møller, S. (1986) Murmanite from the Ilímaussaq alkaline complex, South Greenland. Neues Jahrb. Mineral., Abh., 155, 67–88. (5) Rastsvetaeva, R.K. and V.I. Andrianov (1986) New data on the crystal structure of murmanite. Kristallografiya (Sov. Phys. Crystal.), 31, 82–87 (in Russian).

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