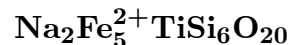


# Aenigmatite



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**Crystal Data:** Triclinic, pseudomonoclinic. *Point Group:*  $\bar{1}$ . Crystals poorly developed, prismatic, to 8 cm; as irregular segregations. *Twinning:* By rotation  $\perp$  (011) or about [010] of the pseudomonoclinic cell; polysynthetic.

**Physical Properties:** *Cleavage:* Good on {010}, {100}. *Fracture:* Uneven. *Tenacity:* Brittle. Hardness = 5.5 D(meas.) = 3.81 D(calc.) = [3.84]

**Optical Properties:** Translucent to opaque. *Color:* Velvet-black; in thin section, reddish brown to black. *Streak:* Reddish brown. *Luster:* Vitreous to greasy. *Optical Class:* Biaxial (+). *Pleochroism:* X = yellow brown; Y = red-brown; Z = dark brown to black. *Orientation:* Y = b; Z  $\wedge$  c = 45°. *Dispersion:* r < v, very strong.  $\alpha = 1.793\text{--}1.81$   $\beta = 1.804\text{--}1.82$   $\gamma = 1.87\text{--}1.90$  2V(meas.) = 30°–50°

**Cell Data:** *Space Group:*  $P\bar{1}$ . a = 10.406(13) b = 10.813(14) c = 8.926(6)  $\alpha = 104^\circ 56(9)'$   $\beta = 96^\circ 52(11)'$   $\gamma = 125^\circ 19(6)'$  Z = 2

**X-ray Powder Pattern:** Kola Peninsula, Russia. 8.09 (vs), 3.145 (vs), 2.706 (s), 2.547 (s), 2.937 (ms), 2.119 (ms), 2.414 (m)

<b>Chemistry:</b>	(1)	(2)	(3)		(1)	(2)	(3)
SiO <sub>2</sub>	39.62	38.3	41.84	MgO	1.65	0.82	
TiO <sub>2</sub>	9.66	8.37	9.27	CaO	0.44	1.42	
Al <sub>2</sub> O <sub>3</sub>	0.64	2.56		Na <sub>2</sub> O	7.20	6.35	7.19
Fe <sub>2</sub> O <sub>3</sub>	4.64			K <sub>2</sub> O	0.04	0.02	
FeO	33.92	40.2	41.70	Cl	0.02		
MnO	2.46	1.93		H <sub>2</sub> O <sup>+</sup>	0.05		
				<hr/>			
				Total	100.34	99.97	100.00

(1) Khibinite quarry, Kirovsk, Kola Peninsula, Russia. (2) Motzfeldt centre, Greenland; by electron microprobe. (3) Na<sub>2</sub>Fe<sub>5</sub>TiSi<sub>6</sub>O<sub>20</sub>.

**Polymorphism & Series:** Forms a series with wilkinsonite.

**Mineral Group:** Aenigmatite group.

**Occurrence:** A primary constituent in sodium-rich alkalic volcanics, pegmatites, and other silica-poor igneous rocks.

**Association:** Aegirine, augite, riebeckite, arfvedsonite, hedenbergite, fayalite, ilmenite.

**Distribution:** Notable studied occurrences include: at Naujakasik, near the Tunugdliarfik Fjord, and on the Kangerdluarssuk Plateau, in the Ilímaussaq intrusion; from Narssárssuk; and elsewhere in Greenland. In the Khibiny and Lovozero massifs, Kola Peninsula, Russia. At Sandefjord, Norway. From Cuddua Mida, Sicily, Italy. In the USA, from Granite Mountain, near Little Rock, Pulaski Co., Arkansas, and Santa Rosa, Sonoma Co., California. In Australia, from Warrumbungle volcano, Nandewar volcano, and the Mt. Warning complex, New South Wales; and the Peak Range Province, Queensland. From Logan Point quarry, Dunedin volcano, New Zealand.

**Name:** From the Greek for *riddle*, apparently an allusion to its (formerly) uncertain chemical composition.

**Type Material:** Mining Academy, Freiberg, Germany, 29166.

**References:** (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 403–404. (2) Deer, W.A., R.A. Howie, and J. Zussman (1978) Rock-forming minerals, (2nd edition), v. 2A, single-chain silicates, 640–654. (3) Thompson, R.N. and J.E. Chisholm (1969) Synthesis of aenigmatite. Mineral. Mag., 37, 253–255. (4) Jones, A.P. (1984) Mafic silicates from the nepheline syenites of the Motzfeldt centre, South Greenland. Mineral. Mag., 48, 1–12.

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