

Narsarsukite

Na₂(Ti, Fe³⁺)Si₄(O, F)₁₁

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Crystal Data: Tetragonal. *Point Group:* 4/*m*. Crystals, commonly flat tabular to equant, rarely prismatic, striated || [001], to 3 cm. In divergent, radiating groups; as fine-grained segregations, massive.

Physical Properties: *Cleavage:* {100} and {110}, good. *Fracture:* Uneven to subconchoidal. *Tenacity:* Brittle. Hardness = 5.5–7 D(meas.) = 2.64–2.83 D(calc.) = 2.78–2.84

Optical Properties: Transparent to translucent. *Color:* Honey-yellow to lemon-yellow, reddish brown, brownish gray, tan, pink, may be zoned; green from inclusions. *Streak:* White. *Luster:* Vitreous, pearly on {110}.

Optical Class: Uniaxial (+). *Pleochroism:* Weak; *O* = colorless to yellow; *E* = colorless to honey-yellow. $\omega = 1.601\text{--}1.614$ $\epsilon = 1.632\text{--}1.655$

Cell Data: *Space Group:* I4/*m*. *a* = 10.61–10.76 *c* = 7.89–7.99 *Z* = 4

X-ray Powder Pattern: Sweetgrass Hills, Montana, USA.
5.365 (100), 3.394 (80), 3.260 (80), 2.579 (60), 2.524 (60), 3.976 (50), 7.609 (30)

Chemistry:	(1)	(2)		(1)	(2)
SiO ₂	61.63	63.74	MgO	0.24	
TiO ₂	14.00	13.74	Na ₂ O	16.12	15.48
ZrO ₂		0.64	K ₂ O		0.13
Al ₂ O ₃	0.28	0.53	F	0.71	1.38
Fe ₂ O ₃	6.30	5.55	H ₂ O	0.29	
MnO	0.47	0.20	–O = F ₂	0.30	0.58
			Total	99.74	100.81

(1) Narssârssuk, Greenland. (2) Do.; by electron microprobe, total Fe as Fe₂O₃; corresponds to (Na_{1.92}K_{0.01})_{Σ=1.93}(Ti_{0.66}Fe_{0.27}³⁺Zr_{0.02}Mn_{0.01})_{Σ=0.96}(Si_{4.07}Al_{0.04})_{Σ=4.11}(O_{10.72}F_{0.28})_{Σ=11.00}.

Occurrence: In pegmatite (Narssârssuk, Greenland); in quartz veins in syenite intruding limestone (Sweetgrass Hills, Montana, USA); in hornfels, igneous breccia, and marble xenoliths in an intrusive alkalic gabbro-syenite complex (Mont Saint-Hilaire, Canada).

Association: Aegirine, microcline, albite, elpidite, epididymite, taeniolite, quartz (Narssârssuk, Greenland); aegirine, pectolite, calcite, feldspar, galena, quartz (Sweetgrass Hills, Montana, USA).

Distribution: From Narssârssuk; on the Island of Igdlutalik, in the Ilímaussaq intrusion; and in the Werner Berge complex, Greenland. On Mt. Flora, Lovozero massif, Kola Peninsula; in the Murun massif, southwest of Olekminsk, Yakutia; and other less-well-defined localities in Russia. In the Oslofjord, Norway. At the Bellerberg volcano, two km north of Mayen, Eifel district, Germany. From near Whitlash, Sweetgrass Hills, Sweetgrass Co., Montana; in the Diamond Jo quarry, Magnet Cove, Hot Spring Co., and from Granite Mountain, near Little Rock, Pulaski Co., Arkansas, USA. At Mont Saint-Hilaire, Quebec, Canada. From Gouré, Damagaram, Niger. In the Sirwa massif, north of Ouarzazate, Morocco.

Name: For the Greenland locality at Narssârssuk (Narsarsuk).

Type Material: University of Copenhagen, Copenhagen, Denmark.

References: (1) Dana, E.S. and W.E. Ford (1909) Dana's system of mineralogy, (6th edition), app. II, 73. (2) Stewart, D.B. (1959) Narsarsukite from Sage Creek, Sweetgrass Hills, Montana. *Amer. Mineral.*, 44, 265–273. (3) Peacor, D.R. and M.J. Buerger (1962) The determination and refinement of the structure of narsarsukite, Na₂TiO₂Si₄O₁₀. *Amer. Mineral.*, 47, 539–556. (4) Mandarino, J.A. and V. Anderson (1989) *Monteregian treasures*. Cambridge Univ. Press, 149. (5) Wagner, C., G.C. Parodi, M. Semet, J.-L. Robert, M. Berrahma, and D. Velde (1991) Crystal chemistry of narsarsukite. *Eur. J. Mineral.*, 3, 575–585.

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