

Natrotitanite**(Na_{0.5}Y_{0.5})Ti(SiO₄)O**

Crystal Data: Monoclinic. *Point Group:* 2/m. As chemically and optically distinct thin rims on prismatic crystals of (Na,Y,REE)-bearing titanite.

Physical Properties: *Cleavage:* None. *Fracture:* n.d. *Tenacity:* Brittle. *Hardness* = n.d. D(meas.) = n.d. D(calc.) = 3.833

Optical Properties: Transparent to translucent. *Color:* Milky white to yellowish grey.

Streak: White. *Luster:* Vitreous.

Optical Class: Biaxial (n.d.). $\alpha = 1.904(2)$ $\beta = \text{n.d.}$ $\gamma = 2.030(2)$ $2V = \text{n.d.}$

Cell Data: *Space Group:* C2/m. $a = 6.5691(2)$ $b = 8.6869(3)$ $c = 7.0924(2)$ $\beta = 114.1269(4)^\circ$ $Z = 4$

X-ray Powder Pattern: Verkhnee Espe REE deposit, Kazakhstan.

2.597 (100), 3.248 (80), 2.994 (60), 3.253 (40), 1.641 (40), 4.941 (30), 1.498 (30)

Chemistry:	(1)		(2)
Nb ₂ O ₅	1.28	Ho ₂ O ₃	0.16
SiO ₂	27.83	Er ₂ O ₃	2.24
TiO ₂	35.00	Tm ₂ O ₃	0.50
SnO ₂	0.57	Yb ₂ O ₃	2.53
V ₂ O ₃	0.36	Nd ₂ O ₃	0.35
Fe ₂ O ₃	0.23	Lu ₂ O ₃	0.28
Y ₂ O ₃	7.87	MnO	0.33
Ce ₂ O ₃	0.83	CaO	8.16
Sm ₂ O ₃	0.26	Na ₂ O	5.55
Gd ₂ O ₃	0.46	F	1.52
Tb ₂ O ₃	0.17	-O=F	0.64
Dy ₂ O ₃	2.45	Total	98.71

(1) Verkhnee Espe REE deposit, Kazakhstan; average electron microprobe analysis; corresponds to (Na_{0.39}Ca_{0.32}Y_{0.15}Dy_{0.03}Yb_{0.03}Er_{0.03}Ce_{0.01}Ho_{0.01}Tm_{0.01}Gd_{0.01}Nd_{0.01}) $\Sigma=1.00$ (Ti_{0.95}Nb_{0.02}Sn_{0.01}Fe³⁺_{0.01}Mn_{0.01}V_{0.01}) $\Sigma=1.01$ Si_{1.01}O_{4.00}(O_{0.83}F_{0.17}).

Occurrence: In the wall rock zone of an alkaline granite associated with a granitic massif.

Association: Yttrium-bearing fluorite, microcline, albite, quartz, riebeckite, aegirine, biotite, astrophyllite, rutile, zircon, elpidite.

Distribution: From the Verkhnee Espe REE deposit, northern margin of the Akjailyautuas granite massif, Kazakhstan.

Name: For a *titanite* structure with Na(Y,REE)-dominant in the *Ca* site.

Type Material: Geological Scientific Museum, K.I. Satpaev Institute of Geological Sciences, Almaty, Kazakstan (3010).

References: (1) Stepanov, A.V., G.K. Bekenova, V.L. Levin, and F.C. Hawthorne (2012) Natrotitanite, ideally (Na_{0.5}Y_{0.5})Ti(SiO₄)O, a new mineral from the Verkhnee Espe deposit, Akjailyautas mountains, Eastern Kazakhstan district, Kazakhstan: description and crystal structure. Mineral. Mag., 76, 37-44. (2) (2012) Amer. Mineral., 97, 1529 (abs. ref. 1).