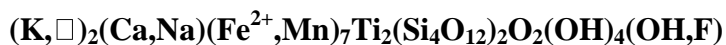


Tarbagataite

Crystal Data: Triclinic. *Point Group:* $\bar{1}$. As lamellar intergrowths with astrophyllite to 0.2 mm.

Physical Properties: *Cleavage:* Perfect on {001}, moderate on {010}. *Fracture:* n.d.

Tenacity: Elastic. *Hardness* = 3 *D(meas.)* = n.d. *D(calc.)* = 3.263

Optical Properties: Transparent. *Color:* Brown to pale golden brown. *Streak:* Colorless to pale yellow. *Luster:* Vitreous to pearly.

Optical Class: Biaxial (+). $\alpha = 1.710(3)$ $\beta = 1.715(3)$ $\gamma = 1.745(3)$ $2V(\text{meas.}) = 37(3)^\circ$

$2V(\text{calc.}) = 45^\circ$ *Pleochroism:* X = yellow-brown, Y = orange-red, Z = yellow-orange.

Absorption: X < Z < Y. *Orientation:*

	a	b	c
X	89.5°	165.6°	58.5°
Y	94.8°	95.4°	147.0°
Z	4.8°	103.3°	98.9°

Cell Data: *Space Group:* $P\bar{1}$. $a = 5.3868(6)$ $b = 11.9141(6)$ $c = 11.7171(2)$

$\alpha = 112.978(2)^\circ$ $\beta = 94.641(2)^\circ$ $\gamma = 103.189(2)^\circ$ $Z = 1$

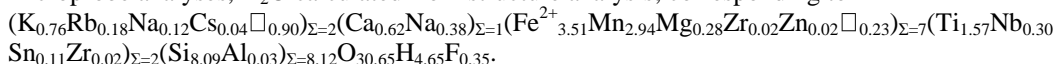
X-ray Powder Pattern: Verkhnee Espe deposit, Tarbagatai mountain range, Kazakhstan.

3.258 (100), 4.095 (80), 2.858 (80), 2.761 (70), 3.497 (50), 2.560 (50), 3.735 (30)

Chemistry:

	(1)		(1)		(1)
Nb ₂ O ₅	2.98	ZnO	0.12	Cs ₂ O	0.38
SnO ₂	1.20	FeO	18.71	Rb ₂ O	1.28
ZrO ₂	0.32	MnO	15.48	Na ₂ O	1.14
TiO ₂	9.29	MgO	0.83	F	0.49
SiO ₂	36.11	CaO	2.58	-O=F ₂	0.21
Al ₂ O ₃	0.12	K ₂ O	2.67	<u>H₂O</u>	<u>3.11</u>
				Total	96.60

(1) Verkhnee Espe deposit, Tarbagatai mountain range, Kazakhstan; average of multiple electron microprobe analyses, H₂O calculated from structure analysis; corresponding to



Mineral Group: Astrophyllite group.

Occurrence: In pegmatite veins and fenite associated with alkaline granitic massifs.

Association: Astrophyllite, microcline, albite, quartz, aegirine, kupletskite, zircon, thorite, xenotime, fergusonite, fersmite, euxenite-(Y), ilmenite, columbite-(Mn), zinc pyrophanite, keiviite, thalenite-(Y), cappelenite-(Y), eudialyte, jinshajiangite, milarite, helvite, bertrandite, bavenite.

Distribution: From the Verkhnee Espe deposit, northern part of the Tarbagatai mountain range, Akjailyautas Mountains, Kazakhstan.

Name: For the Tarbagatai mountain range where the Verkhnee Espe deposit that produced the first specimens is located.

Type Material: Geological Museum, Satpaev Institute of Geological Sciences, Almaty, Kazakhstan (# 3009/2010).

References: (1) Stepanov, A.V., G.K. Bekenova, V.L. Levin, E. Sokolova, F.C. Hawthorne, and E.A. Dobrovolskaya (2012) Tarbagataite, $(K, \square)_2(Ca, Na)(Fe^{2+}, Mn)_7Ti_2(Si_4O_{12})_2O_2(OH)_4(OH, F)$, a new astrophyllite-group mineral species from the Verkhnee Espe deposit, Akjailyautas Mountains, Kazakhstan: Description and crystal structure. *Can. Mineral.*, 50(1), 159-168. (2) (2014) *Amer. Mineral.*, 99, 2156-2157 (abs. ref. 1).