

Crystal Data: Monoclinic. *Point Group:* 2/m. As acicular crystals elongated on [010] to 0.05 mm; as “chains” of spherulites.

Physical Properties: *Cleavage:* Perfect on {001}, imperfect on {100}. *Fracture:* Fibrous. *Tenacity:* Brittle. *Hardness* = 3 *D(meas.)* = 2.98(3) *D(calc.)* = 2.72

Optical Properties: Translucent. *Color:* Cream colored (sometimes with weak pinkish or yellowish tones), light gray to colorless in transmitted light. *Streak:* White. *Luster:* Silky. *Optical Class:* Biaxial (+). $\alpha = 1.668(2)$ $\beta = 1.679(2)$ $\gamma = 1.710(3)$ $2V(\text{meas.}) = 63(5)^\circ$ $2V(\text{calc.}) = 63^\circ$ *Orientation:* $a \approx Y$, $b \approx Z$, $c \approx X$. *Pleochroism:* None.

Cell Data: *Space Group:* $I11b$. $a = 5.552(1)$ $b = 7.179(1)$ $c = 50.94(1)$ $\beta = 91.10(1)^\circ$ $Z = 4$
polytype 1M: $P112/m$ $a = 5.552$ $b = 7.179$ $c = 25.47$ $\gamma = 91.1^\circ$ $Z = 2$
polytype 2M: $I112/m$ $a = 5.552$ $b = 7.179$ $c = 50.94$ $\gamma = 91.1^\circ$ $Z = 4$

X-ray Powder Pattern: Shkatulka pegmatite, Mt. Alluaiv, Kola Peninsula, Russia. 25.5 (100), 3.17 (74), 8.48 (72), 2.763 (20), 12.74 (14), 3.44 (14), 2.110 (14)

Chemistry:	(1)		(1)
Na ₂ O	13.34	SiO ₂	29.05
K ₂ O	0.67	TiO ₂	18.93
CaO	0.20	Nb ₂ O ₅	10.75
SrO	0.66	F	1.40
BaO	13.22	-O = F	0.59
FeO	0.28	<u>H₂O</u>	<u>10.00</u>
MnO	2.22	Total	100.28
Al ₂ O ₃	0.15		

(1) Shkatulka pegmatite vein at Mt. Alluaiv, Kola Peninsula, Russia; average of 5 electron microprobe analyses supplemented by IR spectroscopy; corresponds to $(\text{Ba}_{0.71}\text{Na}_{0.47}\text{K}_{0.12}\text{Sr}_{0.05})_{\Sigma=1.35}(\text{Na}_{3.07}\text{Ti}_{0.61}\text{Mn}_{0.26}\text{Ca}_{0.03}\text{Fe}_{0.03})_{\Sigma=4.00}(\text{Ti}_{1.34}\text{Nb}_{0.66})_{\Sigma=1.00}(\text{Si}_{3.98}\text{Al}_{0.02})\text{O}_{14}[(\text{OH})_{3.13}\text{F}_{0.61}\text{O}_{0.58}]_{\Sigma=4.32}\cdot 3\text{H}_2\text{O}$.

Polymorphism & Series: 1M and 2M polytypes.

Occurrence: In the core of a zoned pegmatite in poikilitic nepheline-sodalite syenite of the central part of an alkaline igneous complex.

Association: Vuonnemite, ussingite, bornemanite.

Distribution: From the the Shkatulka pegmatite vein at Mt. Alluaiv, Lovozero alkaline massif, Kola Peninsula, Russia.

Name: Honors analytical chemist Alexandra Vasilyevna Bykova (1917-2001), who first discovered that bornemanite could be transformed to a synthetic form of bykovaite upon treatment with water.

Type Material: The Museum of the St. Petersburg Mining Institute, Russia (# 2869/2).

References: (1) Khomyakov, A.P., Yu.P. Menshikov, G. Ferraris, P. Nemet, and G.H. Nechelyustov (2005) Bykovaite, $\text{BaNa}\{(\text{Na,Ti})_4[(\text{Ti,Nb})_2(\text{OH},\text{O})_3\text{Si}_4\text{O}_{14}](\text{OH},\text{F})_2\}\cdot 3\text{H}_2\text{O}$, a new heterophyllosilicate from the Lovozero Alkaline Massif, Kola Peninsula, Russia. *Zap. Ross. Mineral. Obsch.*, 134(5), 40-48 (in Russian, English abstract). (2) (2006) *Amer. Mineral.*, 91, 1452 (abs. ref. 1). (3) Németh, P., A.P. Khomyakov, G. Ferraris, and Y.P. Menshikov (2009) Nechelyustovite, a new heterophyllosilicate mineral, and new data on bykovaite: a comparative TEM study. *Eur. J. Mineral.*, 21, 251-260.