Batisite $(Na,K)_2BaTi_2(Si_2O_7)_2$

Crystal Data: Orthorhombic, pseudohexagonal. *Point Group:* $mm2$ or $2/m\ 2/m\ 2/m$. As complex elongated crystals, to 10 cm.

Physical Properties: *Cleavage:* Fair on {100}, {010}, and {001}; parting on {110}. *Tenacity:* Brittle. Hardness = ∼6 VHN = 764 D(meas.) = 3.432 D(calc.) = 3.49 Some samples are piezoelectric.

Optical Properties: Transparent in thin slivers. *Color:* Dark brown. *Streak:* Rose-brown. *Luster:* Vitreous to slightly oily.
Optical Class: Biaxial (+). *Pleochroism:* X = colorless; Y = yellowish brown; Z = reddish brown. *Orientation:* $X = a$; $Y = b$; $Z = c$. *Dispersion:* $r < v$, strong. $\alpha = 1.730(1)$ $\beta = 1.735(1)$ $\gamma = 1.791(1)$ 2V(meas.) = 7°

Cell Data: *Space Group:* $Ima2$ or $Imam$. a = 10.40–10.50 b = 13.85–13.91 c = 8.08–8.10 Z = 4

X-ray Powder Pattern: Inagli massif, Russia; nearly identical to shcherbakovite.
2.91 (100), 3.39 (50), 2.16 (50), 1.68 (50), 2.09 (40), 3.20 (30), 2.62 (30)

Chemistry:

	(1)		(1)
SiO_2	39.00	CaO	0.27
TiO_2	22.00	SrO	0.03
ZrO_2	1.90	BaO	22.00
Al_2O_3	0.90	Na_2O	8.40
Fe_2O_3	1.80	K_2O	2.60
Nb_2O_5	0.36	H_2O^+	0.50
MnO	0.09	LOI	0.10
MgO	trace	Total	99.95

(1) Inagli massif, Russia; corresponds to $(Na_{1.66}K_{0.34})_{\Sigma=2.00}(Ba_{0.88}Ca_{0.03}Mn_{0.01})_{\Sigma=0.92}(Ti_{1.68}Fe^{3+}_{0.14}Al_{0.11}Zr_{0.09})_{\Sigma=2.02}Si_{3.97}[O_{13.66}(OH)_{0.34}]_{\Sigma=14.00}$.

Occurrence: In aegirine-arfvedsonite-microcline pegmatites in dunites (Inagli massif, Russia).

Association: Microcline, nepheline, aegirine, arfvedsonite, lorenzenite, uranian thorite, eudialyte, apatite, orthoclase (Inagli massif, Russia).

Distribution: From the Inagli massif, 30 km west of Aldan; the Murun massif, southwest of Olekminsk, Yakutia; and on Mt. Rasvumchorr, Khibiny massif, Kola Peninsula, Russia. At Liley, near Üdersdorf, Graulai, and Altburg, Eifel district, Germany.

Name: For *Ba, Ti, Si* in the composition.

Type Material: Institute of Mineralogy and Geochemistry of Rare Elements, Moscow; Moscow Geological Survey Institute, Moscow; Vernadsky State Geological Museum, Moscow, 46244; A.E. Fersman Mineralogical Museum, Academy of Sciences, Moscow, Russia, 61316, vis3299.

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