

**Batisite****(Na,K)<sub>2</sub>BaTi<sub>2</sub>(Si<sub>2</sub>O<sub>7</sub>)<sub>2</sub>**

©2001 Mineral Data Publishing, version 1.2

**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*.  $a = 10.40\text{--}10.50$   $b = 13.85\text{--}13.91$   $c = 8.08\text{--}8.10$   $Z = 4$

**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 <sub>2</sub>	39.00	CaO	0.27
TiO <sub>2</sub>	22.00	SrO	0.03
ZrO <sub>2</sub>	1.90	BaO	22.00
Al <sub>2</sub> O <sub>3</sub>	0.90	Na <sub>2</sub> O	8.40
Fe <sub>2</sub> O <sub>3</sub>	1.80	K <sub>2</sub> O	2.60
Nb <sub>2</sub> O <sub>5</sub>	0.36	H <sub>2</sub> O <sup>+</sup>	0.50
MnO	0.09	LOI	0.10
MgO	trace	Total	99.95

(1) Inagli massif, Russia; corresponds to  $(\text{Na}_{1.66}\text{K}_{0.34})_{\Sigma=2.00}(\text{Ba}_{0.88}\text{Ca}_{0.03}\text{Mn}_{0.01})_{\Sigma=0.92}$   $(\text{Ti}_{1.68}\text{Fe}^{3+}_{0.14}\text{Al}_{0.11}\text{Zr}_{0.09})_{\Sigma=2.02}\text{Si}_{3.97}[\text{O}_{13.66}(\text{OH})_{0.34}]_{\Sigma=14.00}$ .

**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 Olekmansk, 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.

**References:** (1) Kravchenko, S.M. and E.V. Vlasova (1959) Rare-metal mineralization associated with nepheline syenites of the alkalic province of Central Aldan. Doklady Acad. Nauk SSSR, 128, 1046–1049 (in Russian). (2) (1960) Amer. Mineral., 45, 908–909 (abs. ref. 1). (3) Kravchenko, S.M., E.V. Vlasova, and N.G. Pinevich (1960) Batisite, a new mineral. Doklady Acad. Nauk SSSR, 133, 657–660 (in Russian). (4) (1960) Amer. Mineral., 45, 1317 (abs. ref. 3). (5) Nikitin, A.V. and N.V. Belov (1962) Crystal structure of batisite  $\text{Na}_2\text{BaTi}_2\text{Si}_4\text{O}_{14} = \text{Na}_2\text{BaTi}_2\text{O}_2[\text{Si}_4\text{O}_{12}]$ . Doklady Acad. Nauk SSSR, 146, 1401–1403 (in Russian). (6) (1963) Chem. Abs., 58, 5116 (abs. ref. 5). (7) Schmahl, W., E. Tillmanns, and K. Abraham (1981) Struktur und Kristallchemie von Batisite aus der Westeifel. Fortschr. Mineral., 59(1), 174–176 (in German). (8) Schmahl, W.W. and E. Tillmanns (1987) Isomorphic substitutions, straight Si–O–Si geometry, and disorder of tetrahedral tilting in batisite,  $(\text{Ba}, \text{K})(\text{K}, \text{Na})\text{Na}(\text{Ti}, \text{Fe}, \text{Nb}, \text{Zr})\text{Si}_4\text{O}_{14}$ . Neues Jahrb. Mineral., Monatsh., 107–118.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise without the prior written permission of Mineral Data Publishing.