Batisite  

$$(\text{Na}, \text{K})_2\text{BaTi}_2(\text{Si}_2\text{O}_7)_2$$

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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 $\sim 6$  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.  $\alpha = 1.730(1)$  $\beta = 1.735(1)$  $\gamma = 1.791(1)$  $2V(\text{meas.}) = 7^\circ$

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

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:

<table>
<thead>
<tr>
<th></th>
<th>SiO$_2$</th>
<th>TiO$_2$</th>
<th>ZrO$_2$</th>
<th>Al$_2$O$_3$</th>
<th>Fe$_2$O$_3$</th>
<th>Nb$_2$O$_5$</th>
<th>MnO</th>
<th>MgO</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>39.00</td>
<td>22.00</td>
<td>1.90</td>
<td>0.90</td>
<td>1.80</td>
<td>0.36</td>
<td>0.09</td>
<td>trace</td>
<td>99.95</td>
</tr>
</tbody>
</table>

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

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 Olekminsk, Yakutia; and on Mt. Rasvunchor, 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.