Belkovite

\[ \text{Ba}_3(\text{Nb}, \text{Ti})_6(\text{Si}_2\text{O}_7)\text{O}_{12} \]

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Crystal Data: Hexagonal. Point Group: \( \bar{6} \text{m} \). As crystals, prismatic to barrel-shaped, with triangular cross section and stepped faces, showing the forms \{11\overline{2}0\} and \{0001\}, to 1 mm.

Physical Properties: Fracture: Uneven. Tenacity: Moderately brittle. Hardness = 6–7 VHN = 900–1030, average 970 (40 g load). \( D(\text{meas.}) = 4.16(3) \quad D(\text{calc.}) = 4.25 \)

Optical Properties: Transparent. Color: Brown to brownish red. Streak: White. Luster: Adamantine. Optical Class: Uniaxial (+); anomalously biaxial. \( \omega = 1.928(2) \quad \epsilon = 2.002(5) \quad 2\upsilon(\text{meas.}) = 0^\circ - 10^\circ \)

Cell Data: Space Group: \( \text{P} \overline{6} \text{m} \). \( a = 8.966(3) \quad c = 7.799(3) \quad Z = 1 \)

X-ray Powder Pattern: Vuoriyarvi complex, Russia.
2.937 (100), 3.888 (51), 7.81 (35), 1.948 (26), 2.750 (25), 3.481 (24), 2.154 (22)

Chemistry:

\[ \begin{align*}
\text{SiO}_2 & \quad 17.80 \\
\text{TiO}_2 & \quad 5.60 \\
\text{ZrO}_2 & \quad 1.20 \\
\text{Al}_2\text{O}_3 & \quad 0.14 \\
\text{Fe}_2\text{O}_3 & \quad 1.78 \\
\text{Nb}_2\text{O}_5 & \quad 42.20 \\
\text{Ta}_2\text{O}_5 & \quad 0.15 \\
\text{CaO} & \quad 0.05 \\
\text{SrO} & \quad 0.00 \\
\text{BaO} & \quad 30.30 \\
\text{Na}_2\text{O} & \quad 0.20 \\
\text{K}_2\text{O} & \quad 0.55 \\
\text{Total} & \quad 99.97
\end{align*} \]

(1) Vuoriyarvi complex, Russia; by electron microprobe, corresponding to \((\text{Ba}_{2.74} \text{K}_{0.16} \text{Na}_{0.09} \text{Ca}_{0.01})\Sigma=3.90(\text{Nb}_{4.41} \text{Ti}_{0.97} \text{Fe}^{3+}_{0.31} \text{Zr}_{0.13} \text{Al}_{0.04} \text{Ta}_{0.01})\Sigma=5.87\text{Si}_{4.12}\text{O}_{24.90}\).

Occurrence: Of secondary origin, formed by alteration of barium-rich pyrochlore during dolomitization of calcite carbonatites in pyroxenites.

Association: Magnetite, pyrochlore, phlogopite, chlorite, pyrite, pyrrhotite, dolomite, carbonate-apatite, barite, alstonite, nemadkevichite.

Distribution: In the Vuoriyarvi carbonatite complex, Kola Peninsula, Russia.

Name: For Igor Vladimirovich Bel’kov (1917–1989), Soviet mineralogist, Director, Kola Scientific Center, Apatity, Russia, who explored the Kola Peninsula.

Type Material: Mining Institute, St. Petersburg, 2036/1; Geology Museum, Kola Branch, Academy of Sciences, Apatity, 6014; A.E. Fersman Mineralogical Museum, Academy of Sciences, Moscow, Russia, p584.