

Tuliokite

Na₆BaTh(CO₃)₆•6H₂O

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Crystal Data: Hexagonal. *Point Group:* $\bar{3}$. As prismatic to rhombohedral crystals, to 4 mm, dominated by {10 $\bar{1}$ 0} and {10 $\bar{1}$ 1}.

Physical Properties: *Tenacity:* Brittle. Hardness = 3–4 D(meas.) = 3.15(1)
D(calc.) = 3.25 Radioactive.

Optical Properties: Translucent. *Color:* Pale to dark gray, due to included organic matter; colorless in transmitted light. *Streak:* White. *Luster:* Vitreous.
Optical Class: Uniaxial (+). $\omega = 1.574(2)$ $\epsilon = 1.587(2)$

Cell Data: *Space Group:* $R\bar{3}$. $a = 14.175(7)$ $c = 8.605(4)$ $Z = 3$

X-ray Powder Pattern: Khibiny massif, Russia.
2.354 (100), 2.674 (90), 7.03 (85), 3.15 (80), 1.959 (65), 4.07 (60), 2.039 (60)

Chemistry:	(1)	(2)
CO ₂	[25.5]	27.07
ThO ₂	24.3	27.07
Fe ₂ O ₃	0.4	
CaO	0.1	
BaO	14.6	15.72
Na ₂ O	17.9	19.06
H ₂ O	14.0	11.08
Total	[96.8]	100.00

(1) Khibiny massif, Russia; by electron microprobe, total Fe as Fe₂O₃, CO₂ calculated from stoichiometry, H₂O by coulometry, crystal-structure analysis indicates 6H₂O; presence of CO₂ and H₂O confirmed by IR; then corresponds to Na_{5.99}(Ba_{0.99}Ca_{0.02})_{Σ=1.01}(Th_{0.95}Fe_{0.05})_{Σ=1.00}(CO₃)_{6.01}•8.06H₂O. (2) Na₆BaTh(CO₃)₆•6H₂O.

Occurrence: In hydrothermal veins in nepheline syenite pegmatite.

Association: Sidorenkite, vinogradovite, villiaumite, microcline (vein 1); pirssonite, shortite, trona, thermonatrite, natron, villiaumite, natrolite, aegirine, microcline (vein 2).

Distribution: From the Kirov apatite mine, Mt. Kukisvumchorr, Khibiny massif, Kola Peninsula, Russia.

Name: For the Tuliok River, Kola Peninsula, Russia, near where the mineral was first found.

Type Material: Geology Museum, Kola Branch, Academy of Sciences, Apatity, 5947; Mining Institute, St. Petersburg, 2024/1; A.E. Fersman Mineralogical Museum, Academy of Sciences, Moscow, Russia, r430/2.

References: (1) Yakovenchuk, V.N., Y.A. Pakhomovskii, A.V. Voloshin, A.N. Bogdanova, N.A. Yamnova, and D.Y. Pushcharovskiy (1990) Tuliokite Na₆BaTh(CO₃)₆•6H₂O – a new hydrous carbonate of sodium, barium, and thorium from alkalic pegmatites of the Khibiny massif (Kola Peninsula). *Mineral. Zhurnal*, 12, 74–78 (in Russian with English abs.). (2) (1992) *Amer. Mineral.*, 77, 209 (abs. ref. 1). (3) Yanova, N.A., D.Y. Pushcharovskiy, and A.V. Voloshin (1990) Crystal structure of tuliokite – a new sodium, barium, thorium carbonate. *Doklady Acad. Nauk SSSR*, 310, 99–102 (in Russian). (4) Pekov, I.V. (1998) Minerals first discovered on the territory of the former Soviet Union. *Ocean Pictures*, Moscow, 217.