

**Tokkoite****K<sub>2</sub>Ca<sub>4</sub>Si<sub>7</sub>O<sub>17</sub>(O, OH, F)<sub>4</sub>**

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**Crystal Data:** Triclinic. *Point Group:*  $\bar{1}$ . As compact aggregates of columnar or radiating crystals, up to several cm long.

**Physical Properties:** *Cleavage:* Perfect on {010}, less perfect on {110}. *Fracture:* Splintery. Hardness = 4–5 D(meas.) = 2.761 D(calc.) = 2.77

**Optical Properties:** Transparent. *Color:* Light brown to pale yellow; colorless in transmitted light. *Luster:* Vitreous.

*Optical Class:* Biaxial (+). *Orientation:*  $Z \wedge c = 0^\circ\text{--}15^\circ$ . *Dispersion:*  $r < v$ , weak.  $\alpha = 1.570(2)$   $\beta = \text{n.d.}$   $\gamma = 1.577(2)$   $2V(\text{meas.}) = 38(5)^\circ$

**Cell Data:** *Space Group:*  $P\bar{1}$ .  $a = 10.438(3)$   $b = 12.511(3)$   $c = 7.112(2)$   $\alpha = 89.92(2)^\circ$   $\beta = 99.75(2)^\circ$   $\gamma = 92.89(2)^\circ$   $Z = 2$

**X-ray Powder Pattern:** Murun massif, Russia.

3.15 (100), 3.044 (91b), 3.32 (85), 3.125 (85), 3.075 (62), 3.34 (55), 3.26 (49)

**Chemistry:**

	(1)	(2)
SiO <sub>2</sub>	55.65	54.17
TiO <sub>2</sub>	1.42	1.18
Fe <sub>2</sub> O <sub>3</sub>	1.58	1.57
MnO	0.70	0.54
MgO	0.30	0.98
CaO	25.10	24.15
Na <sub>2</sub> O	0.60	0.41
K <sub>2</sub> O	11.33	12.95
F	1.50	1.50
H <sub>2</sub> O	2.40	2.40
–O = F <sub>2</sub>	0.63	0.63
Total	99.95	99.22

(1) Murun massif, Russia; corresponds to  $\text{K}_{1.85}(\text{Ca}_{3.45}\text{Fe}_{0.15}\text{Na}_{0.15}\text{Ti}_{0.13}\text{Mn}_{0.08}\text{Mg}_{0.06})_{\Sigma=4.02}\text{Si}_{7.13}\text{O}_{17}[(\text{OH})_{2.02}\text{O}_{1.63}\text{F}_{0.61}]_{\Sigma=4.26}$ . (2) Do.; by electron microprobe, average of two analyses; corresponds to  $\text{K}_{2.09}(\text{Ca}_{3.32}\text{Mg}_{0.19}\text{Fe}_{0.15}\text{Na}_{0.13}\text{Ti}_{0.11}\text{Mn}_{0.06})_{\Sigma=3.96}\text{Si}_{6.95}\text{O}_{17}[(\text{OH})_{2.05}\text{O}_{1.39}\text{F}_{0.61}]_{\Sigma=4.05}$ .

**Occurrence:** In nearly monomineralic segregations in an alkalic massif.

**Association:** Charoite, tinaksite, miserite, aegirine, potassic feldspar.

**Distribution:** From the Magistral'nyi area, right bank of the Davan Stream, between the Chara and Tokko Rivers, in the Murun massif, southwest of Olekminsk, Yakutia, Russia.

**Name:** For the Tokko River, nearby the type locality in Russia.

**Type Material:** Institute of Geology and Geophysics, Siberian Division, Academy of Sciences, Novosibirsk; Geological Museum, Yakutsk Scientific Center, Academy of Sciences, Yakutsk, Russia.

**References:** (1) Lazebnik, K.A., L.V. Nikishova, and Y.D. Lazebnik (1986) Tokkoite – a new mineral of charoitites. *Mineral. Zhurnal*, 8(3), 85–89 (in Russian). (2) (1988) *Amer. Mineral.*, 73, 196 (abs. ref. 1). (3) Rozhdestvenskaya, I.V. (1989) The crystal structure of tokkoite and its relation to the structure of tinaksite. *Zeits. Krist.*, 189, 195–204.