

Punkaruavite**LiTi₂[Si₄O₁₁(OH)](OH)₂·H₂O**

Crystal Data: Monoclinic. *Point Group:* 2/m. Crystals bladed, to 3 mm, flattened on {100} and exhibiting forms {100}, {001}, {011}; in sheaflike and divergent aggregates, to 4 mm.

Physical Properties: *Cleavage:* Perfect on {100}. *Fracture:* Step-like. *Tenacity:* Brittle. Hardness = 4.5 D(meas.) = 2.60(5) D(calc.) = 2.55

Optical Properties: Transparent to translucent. *Color:* Yellowish brown to colorless; brownish yellow in transmitted light. *Streak:* White. *Luster:* Vitreous. *Optical Class:* Biaxial (-). $\alpha = 1.658(2)$ $\beta = 1.696(2)$ $\gamma = 1.726(5)$ $2V(\text{meas.}) = 85(5)^\circ$ $2V(\text{calc.}) = 82^\circ$ *Orientation:* $X = b$; $Y \wedge c = 12^\circ$. *Pleochroism:* Weak; Y = light brownish yellow; X = brownish yellow.

Cell Data: *Space Group:* C2/c. $a = 26.688(2)$ $b = 8.7568(7)$ $c = 5.2188(5)$
 $\beta = 91.189(2)^\circ$ $Z = 4$

X-ray Powder Pattern: Mt. Punkaruav, Kola Peninsula, Russia.
13.3 (100), 6.23 (80), 3.50 (80), 3.01 (70), 2.81 (70), 4.38 (60), 4.16 (40)

Chemistry:

| | |
|--------------------------------|--------------|
| | (1) |
| Li ₂ O | 3.22 |
| Na ₂ O | 0.29 |
| K ₂ O | 0.14 |
| CaO | 0.01 |
| MnO | 0.31 |
| FeO | 0.21 |
| Al ₂ O ₃ | 0.05 |
| SiO ₂ | 51.35 |
| TiO ₂ | 32.50 |
| Nb ₂ O ₅ | 1.06 |
| <u>H₂O</u> | <u>10.50</u> |
| Total | 99.64 |

(1) Mt. Punkaruav, Kola Peninsula, Russia; average of 5 electron microprobe and flame photometric analyses, IR confirms OH, and H₂O, corresponding to
(Li_{1.02}Na_{0.04}K_{0.01})_{Σ=1.07}(Ti_{1.92}Nb_{0.04}Mn_{0.02}Fe³⁺_{0.01})_{Σ=1.99}(OH)_{2.00}[Si_{4.03}O_{11.03}(OH)_{0.97}]·1.26H₂O.

Occurrence: A hydrothermal vein mineral in a ussingite-aegirine-microcline bearing pegmatite in nepheline syenite (Mt. Punkaruav); in natrolite-microcline foyalite (Mt. Eveslogschorr).

Association: Belovite-(Ce), chlakovite, ferronordite-(Ce), gmelenite-Ca, manganoneptunite, manganonordite-(Ce), sphalerite, ussingite (Mt. Punkaruav); belovite-(La), chivruaiite, kuzmenkoite-Mn, monazite-(La), murmanite, natrolite (Mt. Eveslogschorr).

Distribution: Mt. Punkaruav, Lovozero massif and Mt. Eveslogschorr, Khibiny massif, Kola Peninsula, Russia.

Name: For Mt. Punkaruav, Kola Peninsula, Russia, one of the first described localities.

Type Material: Mineralogical Museum, St. Petersburg State University, Russia; Geological and Mineralogical Museum of the Geological Institute of the Kola Science Centre of the Russian Academy of Sciences, Apatity, Russia (no. 6441).

References: (1) Yakovenchuk, V.N., G.Y. Ivanyuk, Y.A. Pakhomovsky, E.A. Selivanova, Y.P. Men'Shikov, J.A. Korchak, S.V. Krivovichev, D.V. Spiridonova, and O.A. Zalkind (2010) Punkaruavite, LiTi₂[Si₄O₁₁(OH)](OH)₂·H₂O, a new mineral species from hydrothermal assemblages, Khibiny and Lovozero alkaline massifs, Kola Peninsula, Russia. *Can. Mineral.*, 48, 41–50. (2) (2010) *Amer. Mineral.*, 95, 1599–1600 (abs. ref. 1).