Punkaruaivite $LiTi_2[Si_4O_{11}(OH)](OH)_2 \cdot H_2O$

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(meas.) = 85(5)° 2V(calc.) = 82° O*rientation*: $X = b$; $Y \wedge c = 12°$. *Pleochroism*: Weak; Y = light brownish yellow; X = brownish yellow.

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

X-ray Powder Pattern: Mt. Punkaruaiv, 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_2O	3.22
Na_2O	0.29
K_2O	0.14
CaO	0.01
MnO	0.31
FeO	0.21
Al_2O_3	0.05
SiO_2	51.35
TiO_2	32.50
Nb_2O_5	1.06
H_2O	10.50
Total	99.64

(1) Mt. Punkaruaiv, Kola Peninsula, Russia; average of 5 electron microprobe and flame photometric analyses, IR confirms OH, and H_2O, corresponding to $(Li_{1.02}Na_{0.04}K_{0.01})_{\Sigma=1.07}(Ti_{1.92}Nb_{0.04}Mn_{0.02}Fe^{3+}_{0.01})_{\Sigma=1.99}(OH)_{2.00}[Si_{4.03}O_{11.03}(OH)_{0.97}] \cdot 1.26H_2O$.

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

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

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

Name: For Mt. Punkaruaiv, 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. Selivanoya, Y.P. Men'Shikov, J.A. Korchak, S.V. Krivovichev, D.V. Spiridonova, and O.A. Zalkind (2010) Punkaruaivite, $LiTi_2[Si_4O_{11}(OH)](OH)_2 \cdot H_2O$, 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).