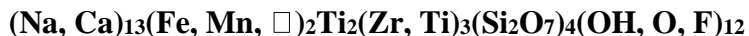


**Chirvinskyite**

**Crystal Data:** Triclinic. *Point Group:*  $\bar{1}$ . Forms sheaf-like radiated aggregates of split fibrous crystals to 6 mm.

**Physical Properties:** *Cleavage:* None. *Tenacity:* Brittle. *Fracture:* Fibrous. Hardness = 5  
D(meas.) = 3.07(2) D(calc.) = 3.41 Nonfluorescent.

**Optical Properties:** Transparent to translucent. *Color:* Pale cream, colorless in thin section.  
*Streak:* White. *Luster:* Silky.  
*Optical Class:* Biaxial (-).  $\alpha = 1.670(2)$   $\beta = 1.690(2)$   $\gamma = 1.705(2)$   $2V(\text{calc.}) = 80.9^\circ$   
*Orientation:*  $Z = b$ ,  $X \wedge c = 14^\circ$ . No pleochroism.

**Cell Data:** *Space Group:*  $P\bar{1}$ .  $a = 7.0477(5)$   $b = 9.8725(5)$   $c = 12.2204(9)$   $\alpha = 77.995(5)^\circ$   
 $\beta = 82.057(6)^\circ$   $\gamma = 89.988(5)^\circ$   $Z = 1$

**X-Ray Diffraction Pattern:** Mt. Takhtarvumchorr, Khibiny massif, Kola Peninsula, Russia.  
2.796 (100), 2.886 (57), 7.00 (34), 3.416 (33), 1.7407 (25), 3.956 (23), 5.907 (17)

<b>Chemistry:</b>	(1)
MgO	0.13
SiO <sub>2</sub>	28.22
K <sub>2</sub> O	0.03
CaO	10.80
TiO <sub>2</sub>	11.46
MnO	2.87
FeO	3.03
ZrO <sub>2</sub>	16.43
Nb <sub>2</sub> O <sub>5</sub>	1.46
F	3.32
H <sub>2</sub> O	[3.14]
<u>-O = F</u>	<u>1.40</u>
Total	97.34

(1) Mt. Takhtarvumchorr, Khibiny alkaline massif, Kola Peninsula, Russia; average electron microprobe analysis supplemented by Raman spectroscopy, H<sub>2</sub>O calculated and confirmed by Penfield method; corresponding to (Na<sub>9.81</sub>Ca<sub>3.28</sub>K<sub>0.01</sub>) $\Sigma=13.10$ (Fe<sub>0.72</sub>Mn<sub>0.69</sub>□<sub>0.54</sub>Mg<sub>0.05</sub>) $\Sigma=2.00$  (Ti<sub>1.81</sub>Nb<sub>0.19</sub>) $\Sigma=2.00$ (Zr<sub>2.27</sub>Ti<sub>0.63</sub>) $\Sigma=2.90$ (Si<sub>2</sub>O<sub>7</sub>)<sub>4</sub>[(OH)<sub>5.94</sub>O<sub>3.09</sub>F<sub>2.97</sub>] $\Sigma=12.00$ .

**Occurrence:** In albitized alkaline pegmatites in a foyaite.

**Association:** Natrolite, albite, fluorapatite, aegirine, parakeldyshite, lorenzenite, fluorcalciopyrochlore.

**Distribution:** From Mt. Takhtarvumchorr, Khibiny alkaline massif, Kola Peninsula, Russia.

**Name:** Honors Petr Nikolaevich *Chirvinsky* (1880-1955), Russian geologist and petrographer, head of the Petrography Department, Perm' State University (1943-1953), for his contributions to mineralogy and petrology, including studies of the Khibiny alkaline massif.

**Type Material:** Mineralogical Museum, St. Petersburg State University (19657) and the Geological and Mineralogical Museum, Geological Institute, Kola Science Centre, Apatity, Russia (GIM 7609).

**References:** (1) Yakovenchuk, V.N., Y.A. Pakhomovsky, T.L. Panikorovskii, A.A. Zolotarev, J.A. Mikhailova, N.V. Bocharov, S.V. Krivovichev, and G.Yu. Ivanyuk (2019) Chirvinskyite, (Na,Ca)<sub>13</sub>(Fe,Mn,□)<sub>2</sub>(Ti,Nb)<sub>2</sub>(Zr,Ti)<sub>3</sub>(Si<sub>2</sub>O<sub>7</sub>)<sub>4</sub>(OH,O,F)<sub>12</sub>, a new mineral with a modular wallpaper structure, from the Khibiny Alkaline Massif (Kola Peninsula, Russia). *Minerals*, 9, 219, 1-15.