Nenadkevichite $(Na, Ca, K)(Nb, Ti)Si_2O_6(O, OH) \cdot 2H_2O$

Crystal Data: Orthorhombic. *Point Group:* $2/m\ 2/m\ 2/m$. As equant or bladed pseudohexagonal prisms, to 8 mm; in foliated segregations and lamellar masses.

Physical Properties: *Cleavage:* Poor on {001}. *Fracture:* Uneven. *Tenacity:* Brittle. Hardness = 5 D(meas.) = 2.78–2.885 D(calc.) = 2.70–2.81

Optical Properties: Opaque to translucent, transparent in very small fragments. *Color:* Rose, very pale pink, pale yellow, brown; dark brown due to manganese oxides. *Streak:* White to very pale rose. *Luster:* Vitreous to dull.
Optical Class: Biaxial (+). *Pleochroism:* Slight; X = colorless; Y = pale yellow; Z = pale rose. *Orientation:* $X = a$; $Y = c$; $Z = b$. *Absorption:* $Z > Y > X$. $\alpha = 1.633–1.659$ $\beta = 1.642–1.686$ $\gamma = 1.738–1.785$ $2V(meas.) = 31°–45°$

Cell Data: *Space Group: Pbam*. $a = 7.408(2)$ $b = 14.198(3)$ $c = 7.148(2)$ $Z = 4$

X-ray Powder Pattern: Lovozero massif, Russia.
3.20 (100), 3.10 (100), 1.427 (100), 1.289 (90), 2.49 (80), 2.58 (70), 1.705 (70)

Chemistry:

	(1)	(2)		(1)	(2)
SiO_2	37.15	37.7	CaO	1.75	0.57
TiO_2	12.12	7.45	BaO	1.39	
Al_2O_3	1.15	trace	Na_2O	4.16	11.3
RE_2O_3	0.30		K_2O	2.24	1.10
Fe_2O_3	0.80	0.51	H_2O^+	8.84	
Nb_2O_5	24.61	29.9	H_2O^-	2.00	
MnO	2.90	0.25	H_2O		11.7
MgO	0.52		Total	99.93	100.48

(1) Kola Peninsula, Russia. (2) Mont Saint-Hilaire, Canada; corresponds to $(Na_{0.94}K_{0.06}Ca_{0.03}Mn_{0.01})_{\Sigma=1.04}(Nb_{0.69}Ti_{0.30})_{\Sigma=0.99}Si_{2.00}O_6[O_{0.70}(OH)_{0.30}]_{\Sigma=1.00} \cdot 2H_2O$.

Occurrence: Between crystals of microcline in a natrolite-albite-rich pegmatite in nepheline syenite in a differentiated alkalic massif (Lovozero massif, Russia); in pegmatites, cavities in igneous breccia, hornfels, and marble xenoliths in an intrusive alkalic gabbro-syenite complex (Mont Saint-Hilaire, Canada).

Association: Microcline (Lovozero massif, Russia); microcline, aegirine, catapleiite, ancylite, epididymite, eudialyte, sérandite, pectolite, apophyllite, monteregianite, vesuvianite, many other species (Mont Saint-Hilaire, Canada).

Distribution: On Mts. Karnasurt and Flora, in the Lovozero massif, and in the Vuoriyarvi carbonatite complex, Kola Peninsula, Russia. From Gjerdingen, near Oslo, Norway. At Mont Saint-Hilaire and near Saint-Amable, Quebec, Canada. From the Ilímaussaq intrusion and at Narssârssuk, Greenland.

Name: For Konstantin Avtonomovich Nenadkevich (1880–1963), Russian mineralogist and geochemist, A.E. Fersman Mineralogical Museum, Moscow, Russia.

Type Material: Mining Institute, St. Petersburg, 183a/4; A.E. Fersman Mineralogical Museum, Academy of Sciences, Moscow, Russia, 57260, 59411, vis4521.

References: (1) Kuz'menko, M.V. and M.E. Kazakova (1955) Nenadkevichite – a new mineral. Doklady Acad. Nauk SSSR, 100, 1159–1160 (in Russian). (2) (1955) Amer. Mineral., 40, 1154 (abs. ref. 1). (3) Vlasov, K.A., Ed. (1966) Mineralogy of rare elements, v. II, 547–549. (4) Perrault, G., C. Boucher, and J. Vicat (1973) Structure cristalline du nenadkevichite $(Na, K)_{2-x}(Nb, Ti)(O, OH)Si_2O_6 \cdot 2H_2O$. Acta Cryst., 29, 1432–1438 (in French with English abs.). (5) Mandarino, J.A. and V. Anderson (1989) Monteregian treasures. Cambridge Univ. Press, 155.