Kazakovite $Na_6Mn^{2+}TiSi_6O_{18}$

Crystal Data: Hexagonal. *Point Group:* $\bar{3}\ 2/m$. Crystals, to 2 mm, show the forms $\{11\bar{2}1\}$ and $\{11\bar{2}4\}$; as disseminated grains. *Twinning:* Twinning axis normal to $\{11\bar{2}4\}$; simple, complex, and polysynthetic twins.

Physical Properties: *Fracture:* Uneven to subconchoidal. Hardness = 4 D(meas.) = 2.84–2.90 D(calc.) = 2.97

Optical Properties: Semitransparent. *Color:* Yellow; pale yellow in thin section.
Luster: Vitreous to greasy.
Optical Class: Uniaxial (–). $\omega = 1.648$–1.650 $\epsilon = 1.625$–1.638

Cell Data: *Space Group:* $R\bar{3}m$. $a = 10.174$ $c = 13.053$ $Z = 3$

X-ray Powder Pattern: Mt. Karnasurt, Russia.
2.60 (10), 2.52 (8), 1.816 (8), 3.60 (7), 1.480 (7), 3.28 (6), 3.17 (6)

Chemistry:

	(1)
SiO_2	52.44
TiO_2	7.62
Al_2O_3	0.84
Fe_2O_3	2.30
Nb_2O_5	1.40
MnO	4.40
MgO	0.10
CaO	0.40
Na_2O	25.50
K_2O	0.47
H_2O^+	3.66
H_2O^-	0.14
P_2O_5	0.70
Total	99.97

(1) Mt. Karnasurt, Russia; corresponds to $(Na_{5.51}K_{0.07}Ca_{0.05})_{\Sigma=5.63}Mn^{2+}_{0.42}(Ti_{0.64}Fe_{0.20}Nb_{0.07}Mg_{0.02}Al_{0.02})_{\Sigma=0.95}(Si_{5.84}Al_{0.09}P_{0.07})_{\Sigma=6.00}O_{18}$.

Mineral Group: Lovozerite group.

Occurrence: In sodalite-rich syenites in an alkalic massif (Lovozero massif, Russia).

Association: Nordite, belovite, vuonnemite, alkalic feldspars, ussingite (Lovozero massif, Russia); villiaumite, delhayelite, lamprophyllite, lomonosovite, feldspars, nepheline, aegirine (Khibiny massif, Russia).

Distribution: On Mts. Karnasurt and Alluaiv, Lovozero massif, and in the Khibiny massif, Kola Peninsula, Russia.

Name: For Mariya Efimovna Kazakova (1913–1982), Institute of Mineralogy and Geochemistry of Rare Elements, Moscow, Russia, analytical chemist who provided the mineral's analysis.

Type Material: Mining Institute, St. Petersburg, 1081/2; A.E. Fersman Mineralogical Museum, Academy of Sciences, Moscow, Russia, 75513, 76106, vis3466.

References: (1) Khomyakov, A.P., E.I. Semenov, E.M. Es'kova, and A.A. Voronkov (1974) Kazakovite – a new mineral of the lovozerite group. Zap. Vses. Mineral. Obshch., 103, 342–345 (in Russian). (2) (1975) Amer. Mineral., 60, 161–162 (abs. ref. 1). (3) (1975) Mineral. Abs., 26, 126 (abs. ref. 1). (4) Povarennykh, A.S. and Y.P. Men'shikov (1977) Kazakovite from the Khibiny Mountains and IR spectra of some titano- and zirconosilicates. Geol. Zh., 37, 115–120 (in Russian). (5) (1977) Chem. Abs., 87, 41912 (abs. ref. 4). (6) Voronkov, A.A., Z.V. Pudovkina, V.A. Blinov, V.V. Ilyukhin, and Y.A. Pyatenko (1979) Crystal structure of kazakovite $Na_6Mn\{Ti[Si_6O_{18}]\}$. Doklady Acad. Nauk SSSR, 245, 106–109 (in Russian).