Kuzmenkoite-Mn $K_2MnTi_4(Si_4O_{12})_2(OH)_4 \cdot 5\text{-}6H_2O$

Crystal Data: Monoclinic. *Point Group*: 2/*m*. Crystals, to 1.5 mm, show {010}, {100}, {001}, {110} and {021}. Also occurs as pseudomorphs of murmanite.

Physical Properties: *Cleavage*: Imperfect cleavages in several unspecified directions.
Tenacity: Brittle. *Fracture*: Uneven. Hardness ≈ 5 D(meas.) = 2.67(2) D(calc.) = 2.63(1)

Optical Properties: Transparent. *Color*: Colorless to yellow to dark orange. Streak: White.
Luster: Vitreous.
Optical Class: Biaxial (+). $\alpha = 1.683(1)$ $\beta = 1.687(2)$ $\gamma = 1.775(2)$ 2V(calc.) = 26(9)°
Dispersion: Moderate, $r > v$. *Pleochroism*: X = colorless, Y = yellow, Z = colorless.

Cell Data: Space Group: $C2/m$. $a = 14.369(3)$ $b = 13.906(3)$ $c = 7.812(1)$ $\beta = 117.09(2)°$ $Z = 1$

X-ray Powder Pattern: Mt. Flora, Lovozero massif, Kola Peninsula, Russia.
3.17 (100), 7.00 (90), 6.33 (80), 4.86 (70), 3.08 (50), 2.58 (40), 2.47 (40)

Chemistry:

	(1)
SiO_2	43.61
TiO_2	25.78
Nb_2O_5	4.82
FeO	1.18
MnO	4.06
MgO	0.31
BaO	1.17
Na_2O	0.64
K_2O	7.33
H_2O	10.93
Total	99.90

(1) Mt. Flora, Lovozero massif, Kola Peninsula, Russia; electron microprobe analysis, LOI presumed to be H_2O; corresponding to $(K_{3.43}Na_{0.46}Ba_{0.17})_{\Sigma=4.06}(Mn_{1.26}Fe_{0.36}Mg_{0.17})_{\Sigma=1.79}(Ti_{7.11}Nb_{0.81})_{\Sigma=7.92}[Si_4O_{12}]_4[(OH)_{7.70}O_{0.30}] \cdot 9.54H_2O$.

Mineral Group: Labuntsovite group, kuzmenkoite subgroup.

Occurrence: A late hydrothermal phase in minute cavities in albitized murmanite-bearing lujavrites.

Association: Natrolite, labuntsovite, calciohilairite, vinogradovite, carbonate-fluorapatite.

Distribution: At Mt. Flora (north ridge of Mt. Selsurt), northern Lovozero massif, Kola Peninsula, Russia.

Name: For Russian geochemist and mineralogist M.V. *Kuzmenko* (1918-1995), the suffix, Mn, for the dominant cation in the D site.

Type Material: A.E. Fersman Mineralogical Museum, Moscow, Russia.

References: (1) Chukanov, N.V., I.V. Pekov, N.I. Golovina, A.E. Zadov, and V.V. Nedel'ko (1999) Kuzmenkoite $K_2(Mn,Fe)(Ti,Nb)_4[Si_4O_{12}]_2(OH)_4 \cdot 5H_2O$ - a new mineral. Zapiski Vseross. Mineral. Obshch., 128(4), 42-50 (in Russian). (2) (2000) Amer. Mineral., 85, 1562 (abs. ref. 1).
(3) Chukanov, N.V., I.V. Pekov, and A.P. Khomyakov (2002) Recommended nomenclature for labuntsovite-group minerals. Eur. J. Mineral., 14, 165-173.