Manganokukisvumite $Na_6MnTi_4Si_8O_{28}•4H_2O$

Crystal Data: Orthorhombic. *Point Group:* 2/*m* 2/*m* 2/*m*. As sword-shaped crystals, flattened on {100}, elongate on [001] to 0.5 mm, showing {100}, {010}, and a prism; as fan-shaped to radial groups.

Physical Properties: *Cleavage:* None. *Fracture:* Splintery. *Tenacity:* Sectile and slightly flexible. Hardness = 5.5-6 D(meas.) = 2.86(1) D(calc.) = 2.88

Optical Properties: Transparent. *Color:* Colorless. *Streak:* White. *Luster:* Vitreous. *Optical Class:* Biaxial (-). α(calc.) = 1.657 β = 1.744(3) γ = 1.792(3) 2V(meas.) = 70° *Dispersion*: None. *Orientation: X = a*; *Y = b*; *Z = c*.

Cell Data: *Space Group: Pccn*. a = 29.05(2) b = 8.612(6) c = 5.220(4) Z = 2

X-ray Powder Pattern: Poudrette quarry, Mont Saint-Hilaire, Quebec, Canada.
14.47 (100), 3.025 (40), 6.43 (20), 2.881 (20), 4.83 (10), 3.743 (10), 2.591 (10)

Chemistry:

	(1)		(1)
Na_2O	15.61	Al_2O_3	0.16
K_2O	0.21	Ce_2O_3	0.18
CaO	0.08	TiO_2	26.90
MgO	0.26	SiO_2	41.74
MnO	5.48	Nb_2O_5	0.68
FeO	0.57	H_2O	6.25
ZnO	0.00	Total	98.12

(1) Poudrette quarry, Mont Saint-Hilaire, Quebec, Canada; average of 2 electron microprobe analyses, H_2O confirmed by IR and calculated; corresponding to $(Na_{5.81}K_{0.05}Ca_{0.02}Ce_{0.01})_{\Sigma=5.89}(Mn_{0.89}Fe_{0.09}Mg_{0.01}Al_{0.04})_{\Sigma=1.09}(Ti_{3.88}Nb_{0.06})_{\Sigma=3.94}Si_{8.01}O_{28}\cdot 4H_2O$.

Occurrence: A late mineral formed by hydrothermal dissolution of titanium-bearing minerals in an albite-rich syenite breccia in an intrusive alkaline complex.

Association: Aegirine, microcline, albite, annite, pyrite, pyrrhotite, natrolite, calcite (Canada); kukisvumite (Russia).

Distribution: Poudrette quarry, Mont Saint-Hilaire, Rouville County, Quebec, Canada; from Mount Kukisvumchorr, Khibiny massif, Russia.

Name: As the manganese-dominant analogue of kukisvumite.

Type Material: Canadian Museum of Nature, Ottawa, Ontario, Canada; CMNMC 83392 and CMNMC 83393.

References: (1) Gault, R.A., T.S. Ercit, J.D. Grice, and J. Van Velthuizen (2004) Manganokukisvumite, a new mineral species from Mont Saint-Hilaire, Quebec. Can. Mineral., 42, 781-785. (2) (2005) Amer. Mineral., 90, 520 (abs. ref. 1).