Manganotychite $Na_6(Mn^{2+},Fe^{2+},Mg)_2(SO_4)(CO_3)_4$

Crystal Data: Cubic. *Point Group:* $2/m\ \overline{3}$. As irregular grains, to 1 cm, and in massive aggregates.

Physical Properties: *Fracture:* Conchoidal. Hardness = 4 D(meas.) = 2.70(5) D(calc.) = 2.79 Weakly magnetic; slightly soluble in H_2O, forming a brown coating.

Optical Properties: Semitransparent. *Color:* Pale pink, white. *Luster:* Vitreous to dull. *Optical Class:* Isotropic. $n = 1.544(2)$

Cell Data: *Space Group:* $Fd3$. $a = 13.9951(8)$ Z = 8

X-ray Powder Pattern: Mt. Alluaiv, Kola Peninsula, Russia.
2.695 (100), 4.22 (76), 2.474 (70), 1.959 (28), 1.616 (28), 2.366 (27), 1.605 (25)

Chemistry:

	(1)	(2)
SO_3	14.13	13.71
CO_2	30.68	30.15
FeO	6.00	
MnO	15.00	24.30
MgO	1.98	
Na_2O	32.21	31.84
Total	[100.00]	100.00

(1) Mt. Alluaiv, Kola Peninsula, Russia; $(CO_3)^{2-}$ and $(SO_4)^{2-}$ confirmed by IR, recalculated to 100% from an original total of 99.34%, after deduction of CO_2 1.65%, CaO 1.49%, Na_2O 0.77% as shortite $[Na_2Ca_2(CO_3)_3]$, corresponds to $Na_{5.99}(Mn^{2+}_{1.22}Fe^{2+}_{0.48}Mg_{0.28})_{\Sigma=1.98}(SO_4)_{1.04}(CO_3)_{4.02}$.
(2) $Na_6Mn_2(SO_4)(CO_3)_4$.

Occurrence: An uncommon mineral formed in pegmatite veins in a differentiated alkalic massif (Mt. Alluaiv, Kola Peninsula, Russia).

Association: Shortite, pirssonite, sidorenkite, kogarkoite, many other species (Mt. Alluaiv, Kola Peninsula, Russia); trona, shortite, petersenite-(Y), reederite-(Y), catapleiite, analcime (Mont Saint-Hilaire, Canada).

Distribution: On Mt. Alluaiv, Lovozero massif, Kola Peninsula, Russia. At Mont Saint-Hilaire, Quebec, Canada.

Name: As the *manganese* analog of *tychite*.

Type Material: Mining Institute, St. Petersburg, 2023/1; Geology Museum, Kola Branch, Academy of Sciences, Apatity; A.E. Fersman Mineralogical Museum, Academy of Sciences, Moscow, Russia, p545/2.

References: (1) Khomyakov, A.P., A.Y. Bakhchisaraitsev, A.V. Martynova, and T.M. Parashchenko (1990) Manganotychite $Na_6Mn_2(SO_4)(CO_3)_4$ – a new mineral. Zap. Vses. Mineral. Obshch., 119(5), 46–49 (in Russian). (2) (1992) Amer. Mineral., 77, 448 (abs. ref. 1).