Manganberzeliite $NaCa_2(Mn^{2+},Mg)_2(AsO_4)_3$

Crystal Data: Cubic. *Point Group:* $4/m\ \overline{3}\ 2/m$. As rare trapezohedral crystals, {112}, modified by {011}, {012}, {001}, to 9 mm; typically granular or very fine-grained massive.

Physical Properties: *Fracture:* Subconchoidal to uneven. *Tenacity:* Brittle. Hardness = 4.5–5 D(meas.) = 4.21–4.46 D(calc.) = 4.26

Optical Properties: Transparent to translucent. *Color:* Yellow, honey-yellow, yellowish red; colorless to orange in transmitted light. *Streak:* White to yellow-orange. *Luster:* Resinous. *Optical Class:* Isotropic. n = 1.770–1.777

Cell Data: *Space Group: Ia3d.* $a = 12.500(5)$ Z = 8

X-ray Powder Pattern: Synthetic $NaCa_2Mn_2(AsO_4)_3$.
2.800 (100), 2.556 (90), 1.673 (80), 3.129 (50), 5.10 (40), 1.736 (40), 2.666 (35)

Chemistry:

	(1)	(2)	(3)
As_2O_5	52.90	54.52	57.54
V_2O_5	0.24		
SiO_2		0.35	
FeO	0.38	0.41	
MnO	21.41	19.64	11.84
ZnO		0.61	
MgO	0.72	1.01	6.73
CaO	18.34	18.43	18.72
Na_2O	5.05	4.68	5.17
K_2O	0.09		
H_2O	0.40	0.27	
Total	99.53	99.92	100.00

(1) Långban, Sweden. (2) Franklin, New Jersey, USA. (3) $NaCa_2(Mn,Mg)_2(AsO_4)_3$ with Mn:Mg = 1:1.

Polymorphism & Series: Forms a series with berzeliite.

Occurrence: In metamorphosed manganiferous skarns (Sweden); in a metamorphosed stratiform zinc orebody (Franklin, New Jersey, USA).

Association: Hausmannite, rhodonite, tephroite, pyrochroite, bergslagite, caryinite, richterite, hedyphane, sarkinite, eveite, tilasite, barite, calcite (Långban, Sweden); sarkinite, hedyphane, schallerite, franklinite, willemite, calcite (Franklin, New Jersey, USA).

Distribution: In Sweden, from Långban, Värmland, at the Moss mine, near Nordmark, and the Sjö mine, near Grythyttan, Örebro. At Franklin, Sussex Co., New Jersey, USA. In the Gozaisho mine, Iwaki, Fukushima Prefecture, Japan.

Name: For the *manganese* dominant analogue of *berzeliite*.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 681–683. (2) Frondel, C. and J. Ito (1963) Manganberzeliite from Franklin, New Jersey. Amer. Mineral., 48, 663–664. (3) Ito, J. (1968) Synthesis of the berzeliite ($Ca_2NaMg_2As_3O_{22}$[*sic*])−manganese berzeliite ($Ca_2NaMn_2As_3O_{12}$) series (arsenate garnet). Amer. Mineral., 53, 316–319. (4) Dunn, P.J. (1995) Franklin and Sterling Hill, New Jersey. No publisher, n.p., 673.