

Crystal Data: Cubic. *Point Group:* $4/m\bar{3}2/m$. Octahedral crystals with cube and dodecahedron; commonly granular, cleavable massive, to 10 cm.

Physical Properties: *Cleavage:* {001}, fair; {111}, parting. *Fracture:* Fibrous. Hardness = 5.5 VHN = 317–328 (100 g load). D(meas.) = 5.364 D(calc.) = 5.365

Optical Properties: Transparent. *Color:* Emerald-green, becoming black on exposure; emerald-green in transmitted light; gray in reflected light, with emerald-green internal reflections. *Streak:* Brown. *Luster:* Vitreous to adamantine, dull on exposure.

Optical Class: Isotropic. $n = 2.16\text{--}2.17$

R: (400) 13.8, (420) 14.4, (440) 15.0, (460) 14.8, (480) 14.5, (500) 14.2, (520) 14.0, (540) 13.9, (560) 13.8, (580) 13.6, (600) 13.5, (620) 13.6, (640) 13.6, (660) 13.6, (680) 13.6, (700) 13.6

Cell Data: *Space Group:* $Fm\bar{3}m$. $a = 4.436(2)$ $Z = 4$

X-ray Powder Pattern: Synthetic.

2.223 (100), 2.568 (60), 1.571 (60), 1.340 (18), 0.9938 (18), 0.9074 (16), 1.283 (14)

Chemistry:

	(1)	(2)
FeO + Fe ₂ O ₃	0.42	0.3
MnO	98.04	97.9
ZnO		0.4
MgO	1.71	1.2
CaO	0.16	
Total	100.33	99.8

(1) Långban, Sweden; average of two analyses. (2) Do.; by electron microprobe.

Mineral Group: Periclase group.

Occurrence: An alteration product of rhodochrosite or other manganese minerals, formed during oxygen-deficient metamorphism of manganese-bearing deposits; in marine manganese nodules.

Association: Pyrochroite, manganite, dolomite (Långban, Sweden); pyrochroite, hausmannite, garnet, dolomite (Nordmark, Sweden); franklinite, willemite, zincite (Franklin, New Jersey, USA).

Distribution: From Långban and Nordmark, Värmland, Sweden. From Roughton Gill, Caldbeck Fells, Cumbria, England. In the USA, at Franklin, Sussex Co., New Jersey. In Japan, an ore mineral in the Noda-Tamagawa mine, Iwate Prefecture, and the Hamayokokawa mine, Nagano Prefecture; in the Manako, Oashi, Kaso, and Hikoma mines, Tochigi Prefecture; the Taguchi mine, Aichi Prefecture; the Ioi mine, Shiga Prefecture; and elsewhere. On Inylchek Ridge, Tien Shan, Kyrgyzstan. From near Tambao, Burkina Faso.

Name: As an oxide of *manganese*.

Type Material: Wrocław University, Wrocław, Poland, II-1810.

References: (1) Palache, C., H. Berman, and C. Frondel (1944) Dana's system of mineralogy, (7th edition), v. I, 501–502. (2) Gavarrri, J.-R., J. Arabski, S. Jasienska, J. Janowski, and C. Garell (1985) Structural evolution of manganosite: comparison of properties of nonstoichiometric manganese and iron monoxides. *J. Solid State Chem.*, 58, 56–70. (3) Criddle, A.J. and C.J. Stanley, Eds. (1993) Quantitative data file for ore minerals, 3rd ed. Chapman & Hall, London, 351. (4) (1955) NBS Circ. 539, 5, 45.