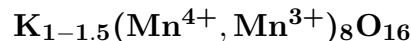


Cryptomelane



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Crystal Data: Monoclinic. *Point Group:* $2/m$. Rarely in subhedral crystals, to 2 mm; commonly as compact fine-grained masses, banded colloform, botryoidal, or radial fibrous aggregates, all in the same specimen; massive cleavable. *Twinning:* Typically on (010) and $(10\bar{1})$, producing a pseudotetragonal unit cell.

Physical Properties: *Fracture:* Conchoidal. *Tenacity:* Brittle. Hardness = 6–6.5, compact. $D(\text{meas.}) = 4.17\text{--}4.41$ $D(\text{calc.}) = [4.44]$

Optical Properties: Opaque. *Color:* Steel-gray to bluish gray when fresh; tarnishes to dull grayish black; light tan or gray in reflected light. *Streak:* Brownish black. *Luster:* Metallic to dull.

Optical Class: Isotropic, nearly.
R: n.d.

Cell Data: *Space Group:* $I2/m$. $a = 9.956(3)$ $b = 2.8705(9)$ $c = 9.706(4)$ $\beta = 90.95(3)^\circ$
 $Z = [1]$

X-ray Powder Pattern: Philipsburg, Montana, USA.
2.39 (10), 6.90 (9), 4.90 (8), 3.10 (8), 2.15 (6), 1.83 (6), 1.54 (6)

Chemistry:	(1)	(2)	(3)		(1)	(2)	(3)
SiO ₂	0.58	0.18		MgO	0.05	0.07	0.15
TiO ₂	0.01	0.00		CaO	0.27	0.00	
MnO ₂	83.13	87.09	84.41	SrO	0.00	0.00	1.75
Al ₂ O ₃	0.37	0.39	0.99	BaO	0.13	0.00	1.97
Fe ₂ O ₃	0.46	0.19	3.03	Na ₂ O	0.44	0.48	1.02
MnO	2.08	2.49		K ₂ O	3.50	3.10	5.78
CoO	0.00	0.08		H ₂ O ⁺	2.58	3.58	
NiO	0.00	0.00		H ₂ O ⁻	0.81	0.60	
CuO	0.12	0.00		P ₂ O ₅	0.07	0.00	
ZnO	5.23	1.69		Total	99.83	99.94	[99.10]

(1) Tombstone, Arizona, USA; Mn⁴⁺ from “available O”. (2) Philipsburg, Montana, USA; Mn⁴⁺ from “available O”. (3) Chindwara, India; by electron microprobe, Mn⁴⁺:Mn³⁺ from charge balance, original total given as 99.18%; corresponding to $(\text{K}_{0.94}\text{Na}_{0.25}\text{Sr}_{0.13}\text{Ba}_{0.10}\text{Mg}_{0.03})_{\Sigma=1.45}(\text{Mn}_{6.33}^{4+}\text{Mn}_{1.20}^{3+}\text{Fe}_{0.30}^{3+}\text{Al}_{0.15})_{\Sigma=7.98}(\text{O}, \text{OH})_{16}$.

Mineral Group: Cryptomelane group.

Occurrence: Widespread in oxidized manganese deposits as open-space fillings or replacing primary manganese-bearing minerals; commonly replaced by other secondary manganese minerals.

Association: Pyrolusite, nsutite, braunite, chalcophanite, manganite, other manganese oxides.

Distribution: Some localities for well-studied and pure material include: in the USA, from the Oregon-Prompter mine, Tombstone, Cochise Co., in the Hardshell and Mowry mines, Santa Cruz Co., and the Artillery Mountains, Mohave Co., Arizona; at Lake Valley, Sierra Co., New Mexico; from the Silver Cliff district, Custer Co., Colorado; at Philipsburg, Granite Co., Montana. From Urucum, Mato Grosso, Brazil. In Oriente Province, Cuba. From Nsuta, Ghana. At Sitapar, Chindwara district, Central Provinces, India. On Groote Eylandt, Northern Territory, Australia.

Name: From the Greek for *hidden* and *black*, alluding to the mineral’s obscure identity as one of several black mineral species in “psilomelane”, the collective term for hard manganese oxides.

Type Material: n.d.

References: (1) Richmond, W.E. and M. Fleischer (1942) Cryptomelane, a new name for the commonest of the “psilomelane” minerals. *Amer. Mineral.*, 27, 607–610. (2) Larson, L.T. (1964) Geology and mineralogy of certain manganese oxide deposits. *Econ. Geol.*, 59, 54–78. (3) Post, J.E., R.B. Von Dreele, and P.R. Buseck (1982) Symmetry and cation displacements in hollandites: structure refinements of hollandite, cryptomelane, and priderite. *Acta Cryst.*, 38, 1056–1065.

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