

Crystal Data: Orthorhombic. *Point Group:* $2/m\ 2/m\ 2/m$. Crystals, to 1 cm, are commonly pseudomorphs after groutite crystals; platy, fibrous, massive.

Physical Properties: *Cleavage:* Prominent, on three pinacoids and a prism. *Tenacity:* Brittle. Hardness = ~ 3 D(meas.) = 4.65–4.83 D(calc.) = 4.84

Optical Properties: Opaque. *Color:* Steel-gray to iron-black; yellowish white in reflected light. *Streak:* Black, may have brownish tint. *Luster:* Brilliant metallic.

Optical Class: Biaxial. *Anisotropism:* Strong; pale yellow. *Bireflectance:* Distinct.

R₁–R₂: n.d.

Cell Data: *Space Group:* $Pbnm$. $a = 4.533(5)$ $b = 9.27(1)$ $c = 2.866(5)$ $Z = 4$

X-ray Powder Pattern: Lake Valley, New Mexico, USA.

4.08 (10), 2.53 (8), 1.60 (7), 1.64 (6), 2.13 (5), 1.88 (5), 1.46 (5)

Chemistry:	(1)	(2)	(1)	(2)
SiO ₂	0.36	0.42	CaO	1.12
MnO ₂	95.02	97.14	BaO	0.00
Al ₂ O ₃	0.72	0.48	Na ₂ O	n.d.
Fe ₂ O ₃	0.22	0.34	K ₂ O	n.d.
MnO	0.00	0.00	H ₂ O ⁺	1.39
ZnO	0.25	n.d.	H ₂ O ⁻	0.05
MgO	0.00	0.12	H ₂ O	1.24
			Total	99.13
				100.46

(1) Locality unknown; type material. (2) Lake Valley, New Mexico, USA.

Polymorphism & Series: Trimorphous with akhtenskite and pyrolusite.

Occurrence: A secondary mineral in manganese deposits, formed by inversion of pyrolusite or oxidative dehydrogenation of groutite.

Association: Pyrolusite, hollandite, cryptomelane, coronadite.

Distribution: Some localities for well-characterized material are: in the USA, from Lake Valley, Sierra Co., New Mexico; in the Artillery Mountains, Mohave Co., and at the Mistake mine, Yavapai Co., Arizona; from the Idarado mine, near Telluride, San Miguel Co., Colorado; in the Monroe-Tener mine, near Chisholm, St. Louis Co., Minnesota. Along the East River, Pictou Co., Nova Scotia, Canada. In Mexico, at Los Gavilanes, Baja California. In India, from Dongari Buzurg, Bhandara, Madhya Pradesh. At the Iron Monarch quarry, Iron Knob, South Australia. From the Otoshibetsu and Tanno mines, Hokkaido, and elsewhere in Japan. At Horni Blatna (Platten), Czech Republic. From Büthen-Adenstadt, Lower Saxony, and the Clara Mine, near Oberwolfach, Black Forest, Germany. At Gebel To Yu, Yoider, and Um Bogna, Egypt. From Hotazel, near Kuruman, Cape Province, South Africa.

Name: For Professor Lewis Stephen Ramsdell (1895–1975), American mineralogist, University of Michigan, Ann Arbor, Michigan, USA.

Type Material: University of Michigan, Ann Arbor, Michigan, USA.

References: (1) Fleischer, M. and W.E. Richmond (1943) The manganese oxide minerals: a preliminary report. *Econ. Geol.*, 38, 269–286, esp. 278. (2) Byström, A.M. (1949) The crystal structure of ramsdellite, an orthorhombic modification of MnO₂. *Acta Chem. Scand.*, 3, 163–173. (3) Fleischer, M., W.E. Richmond, and H.T. Evans, Jr. (1962) Studies of the manganese oxides. V. Ramsdellite, MnO₂, an orthorhombic dimorph of pyrolusite. *Amer. Mineral.*, 47, 47–58. (4) Ramdohr, P. (1980) The ore minerals and their intergrowths, (4th edition), 1026–1027.

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