

Crystal Data: Tetragonal. *Point Group:* 4/m2/m2/m. Crystals are pseudo-octahedral and striated || [100], to 7.5 cm. Commonly granular or massive. *Twinning:* Repeated twins on {112}, producing fivelings or lamellar intergrowths.

Physical Properties: *Cleavage:* {001}, perfect; {112} and {011}, indistinct. *Fracture:* Uneven. *Tenacity:* Brittle. Hardness = 5.5 VHN = 437–572 (100 g load). D(meas.) = 4.84 D(calc.) = 4.84

Optical Properties: Opaque, transparent through thin edges. *Color:* Dark brown to black; deep reddish brown in transmitted light; gray in reflected light, with deep blood-red to reddish brown internal reflections. *Streak:* Dark reddish brown. *Luster:* Submetallic. *Optical Class:* Uniaxial (-). $\omega = 2.46(2)$ $\epsilon = 2.15(2)$ *Anisotropism:* Distinct. *Birefractance:* Weak; *O* = light gray; *E* = dark gray. *R₁–R₂:* (400) 21.5–18.8, (420) 21.2–18.4, (440) 20.9–17.9, (460) 20.7–17.5, (480) 20.5–17.2, (500) 20.4–17.0, (520) 20.4–16.7, (540) 20.3–16.4, (560) 20.1–16.1, (580) 20.1–15.9, (600) 20.0–15.7, (620) 19.9–15.5, (640) 19.9–15.4, (660) 19.8–15.2, (680) 19.8–15.1, (700) 19.7–14.9

Cell Data: *Space Group:* I4₁/amd. *a* = 5.765(1) *c* = 9.442(2) *Z* = 4

X-ray Powder Pattern: Synthetic. 2.487 (100), 2.768 (85), 1.5443 (50), 3.089 (40), 4.924 (30), 1.7988 (25), 1.5762 (25)

Chemistry:	(1)	(2)
MnO	91.38	93.01
MgO	trace	
CaO	trace	
BaO	0.26	
O	7.78	6.99
H ₂ O	0.62	
Total	100.04	100.00

(1) Batesville, Arkansas, USA. (2) Mn²⁺Mn³⁺O₄.

Occurrence: A primary mineral in hydrothermal veins. Also produced by metamorphism of manganese rocks.

Association: Rhodochrosite, pyrolusite, jacobsonite, braunite, andradite, barite.

Distribution: Many localities, some economically important. In Germany, at Ilfeld, Harz Mountains; at Friedrichroda, Elgersburg, and Öhrenstock, near Ilmenau, Thuringia. From Långban, Jakobsberg, and the Harstigen mine, near Persberg, Värmland, and the Sjö mine, near Grythyttan, Örebro, Sweden. At the Tÿ Coch mine, Glamorgan, Wales. In the Wyndham Pit, near Egremont, Cumbria, England. In the USA, in Washington, on the Olympic Peninsula, abundant at a number of small deposits in Clallam, Jefferson, and Mason Cos.; in the Blue Jay mine, Trinity Co., California; from the Batesville district, Independence, Izard, and Stone Cos., Arkansas; in the Cannon mine, Stambaugh, Iron Co., Michigan. At the Magnet Cove mine, Hants, Nova Scotia, Canada. As fine crystals from the Miguel Burnier iron mine, near Ouro Preto, Minas Gerais, Brazil. At the Iron Monarch quarry, Iron Knob, South Australia. Large crystals from the N'Chwaning mine, near Kuruman, Cape Province, South Africa. In the Kombat Cu–Pb–Ag mine, 49 km south of Tsumeb, Namibia.

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References: (1) Palache, C., H. Berman, and C. Frondel (1944) Dana's system of mineralogy, (7th edition), v. I, 712–715. (2) Jarosch, D. (1987) Crystal structure refinement and reflectance measurements of hausmannite, Mn₃O₄. Mineral. Petrol., 37, 15–23. (3) Criddle, A.J. and C.J. Stanley, Eds. (1993) Quantitative data file for ore minerals, 3rd ed. Chapman & Hall, London, 222. (4) (1972) NBS Mono. 25, 10, 38.

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