

**Crystal Data:** Cubic, typically with a tetragonal supercell. *Point Group:* n.d. Rarely as minute octahedral crystals, or acicular overgrowths; commonly as coatings on or replacements of magnetite; massive.

**Physical Properties:** Hardness = 5 VHN = 920 D(meas.) = n.d. D(calc.) = 4.860 (synthetic). Strongly magnetic.

**Optical Properties:** Opaque, transparent in thin fragments. *Color:* Brown, bluish black; brown to yellow in transmitted light; white to bluish gray in reflected light. *Streak:* Brown. *Optical Class:* Isotropic.  
R: (400) 31.5, (420) 30.2, (440) 25.8, (460) 27.6, (480) 26.6, (500) 26.0, (520) 25.5, (540) 24.8, (560) 24.0, (580) 23.2, (600) 22.4, (620) 22.0, (640) 21.6, (660) 21.2, (680) 20.8, (700) 20.4

**Cell Data:** *Space Group:*  $P4_132$  or  $P4_332$  (synthetic), with  $a = 8.3515(22)$   $Z = 8$  (for Fe<sub>2.67</sub>O<sub>4</sub>), or *Space Group:*  $P4_1$  or  $P4_3$  (synthetic), with  $a = 8.35$   $c = 24.99$   $Z = 32$

**X-ray Powder Pattern:** Synthetic; cubic.  
2.5177 (100), 2.953 (35), 1.4758 (34), 1.6073 (24), 2.0886 (16), 1.7045 (10), 1.0872 (7)

**Chemistry:**

	(1)
SiO <sub>2</sub>	0.3
TiO <sub>2</sub>	13.0
MnO <sub>2</sub>	0.9
Al <sub>2</sub> O <sub>3</sub>	1.8
Fe <sub>2</sub> O <sub>3</sub>	74.6
MgO	8.4
Total	99.0

(1) Patos de Minas, Brazil; by electron microprobe, average of 28 analyses on 16 grains, total Fe as Fe<sub>2</sub>O<sub>3</sub>, total Mn as MnO<sub>2</sub>; stated to correspond to (Fe<sub>0.88</sub>Mg<sub>0.11</sub>Si<sub>0.01</sub>)<sub>Σ=1.00</sub>(Fe<sub>0.96</sub>Ti<sub>0.32</sub>Mg<sub>0.30</sub>Al<sub>0.07</sub>[Cr<sub>0.03</sub>Mn<sub>0.02</sub>])<sub>Σ=1.70</sub>O<sub>4</sub>.

**Polymorphism & Series:** Dimorphous with hematite.

**Occurrence:** Formed by weathering or low-temperature oxidation of spinels containing ferrous iron, commonly magnetite or titanian magnetite. A widespread yellow pigment in continental sediments, rocks, and soils.

**Association:** Magnetite, ilmenite, anatase, pyrite, marcasite, lepidocrocite, goethite.

**Distribution:** Studied material from: the Bushveld complex, Transvaal, South Africa. In the USA, at the Iron Mountain mine, near Redding, Shasta Co., California. In Canada, from the Wabush Iron Formation, Labrador City, Labrador, Newfoundland; in the Steep Rock Lake iron deposits, Ontario; at the Baffinland Iron Mines, northern Baffin Island; and elsewhere. From north of Patos de Minas, Minas Gerais, Brazil. In the Hatrurim Formation, Israel. On the Katzenbuckel, Odenwald, Baden-Württemberg, Germany. In Japan, from the Takanokura mine, Fukushima Prefecture; the Ohinata mine, Nagano Prefecture; and the Kumano mine, Yamaguchi Prefecture. Much more widespread than these localities indicate.

**Name:** From MAGnetite and HEMatite, in allusion to the mineral's magnetism and composition.

**Type Material:** n.d.

**References:** (1) Palache, C., H. Berman, and C. Frondel (1944) Dana's system of mineralogy, (7th edition), v. I, 708–709. (2) McLeod, C.R. (1970) Some Canadian occurrences of maghemite. Geol. Surv. Canada, Paper 70-7, 13 pp. (3) Collyer, S., N.W. Grimes, D.J. Vaughan, and G. Longworth (1988) Studies of the crystal structure and crystal chemistry of titanomaghemite. Amer. Mineral., 73, 153–160. (4) Schulz, D.L. and G.J. McCarthy (1988) X-ray powder data for an industrial maghemite ( $\gamma$ -Fe<sub>2</sub>O<sub>3</sub>). Powder Diffraction, 3, 104–105. (5) Fabris, J.D., J.M.D. Coey, Q. Qi, and W.N. Mussel (1995) Characterization of Mg-rich maghemite from tuffite. Amer. Mineral., 80, 664–669.

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