

Crystal Data: Orthorhombic. *Point Group:* $2/m2/m2/m$. As wedge- or lens-shaped crystals with rounded and curved faces, to 1 cm; also as acicular striated prismatic crystals, in radiating groups. *Twining:* Twining by an undescribed law reported.

Physical Properties: *Cleavage:* {010}, perfect; {100}, less perfect. *Tenacity:* Brittle. Hardness = 3.5–4 VHN = 630–711 (100 g load). D(meas.) = 4.144 D(calc.) = 4.172

Optical Properties: Opaque. *Color:* Jet-black. *Streak:* Dark brown. *Luster:* Brilliant submetallic to adamantine.

Optical Class: Biaxial. *Pleochroism:* Very strong; X = very dark brown to black; Y = yellowish brown.

R₁–R₂: (400) 13.7–22.0, (420) 13.4–21.3, (440) 13.3–20.7, (460) 13.1–20.2, (480) 13.0–19.7, (500) 13.0–19.4, (520) 12.9–19.1, (540) 12.9–19.0, (560) 12.8–19.0, (580) 12.7–18.7, (600) 12.7–18.6, (620) 12.7–18.5, (640) 12.6–18.3, (660) 12.5–18.2, (680) 12.4–18.0, (700) 12.4–17.9

Cell Data: *Space Group:* $Pbnm$. $a = 4.560$ $b = 10.700$ $c = 2.870$ $Z = 4$

X-ray Powder Pattern: Sagamore mine, Minnesota, USA. 4.17 (10), 2.798 (6), 2.675 (6), 2.369 (6), 2.303 (5), 1.692 (5), 1.603 (4)

Chemistry:	(1)	(2)
Fe ₂ O ₃	0.02	
MnO	79.97	80.66
O	8.94	9.10
H ₂ O ⁺	10.39	10.24
H ₂ O [−]	0.04	
P ₂ O ₅	0.34	
Total	[99.70]	100.00

(1) Mahnomen mine, Minnesota, USA; after correction for quartz 2.39%, original total given as 99.71% (2) MnO(OH).

Polymorphism & Series: Trimorphous with manganite and feitknechtite.

Occurrence: A secondary mineral lining vugs in weathered banded iron formations (Minnesota, USA); manganiferous talc schists (Talcville, New York, USA); a metamorphosed stratiform zinc orebody (Franklin, New Jersey, USA); and a variety of hydrothermal orebodies (Arizona, USA).

Association: Manganite, hematite, goethite, lepidocrocite, quartz, calcite.

Distribution: In the USA, in significant amounts at several sites in the Cuyuna Iron Range, including the Sagamore, Mahnomen, Robert, and Mangan No. 2 mines, Crow Wing Co., Minnesota; at Franklin, Sussex Co., New Jersey; from the No. Two and One Half mine, Talcville, New York. In Arizona, in the Campbell mine, Bisbee, Cochise Co.; the Magma mine, Superior, and at Malpais Hill, Pinal Co.; the North Star and King of Arizona mines, Yuma Co.; and near Holbrook, Navajo Co. From the Walton mine, Hants Co., Nova Scotia, Canada. At Bülten-Adenstadt, near Peine, Lower Saxony, Germany. From Bleiberg, Carinthia, Austria. At Akdala, Kazakhstan. In the Wessels mine, near Kuruman, Cape Province, South Africa.

Name: Honors Professor Frank Fitch Grout (1880–1958), petrologist, of the University of Minnesota, Minneapolis, Minnesota, USA.

Type Material: The Natural History Museum, London, England, 1948,106; National Museum of Natural History, Washington, D.C., USA, 105004.

References: (1) Gruner, J.W. (1947) Groutite, HMnO₂, a new mineral of the diaspore-goethite group. *Amer. Mineral.*, 32, 654–659. (2) Dent Glasser, L.S. and L. Ingram (1968) Refinement of the crystal structure of groutite, α -MnOOH. *Acta Cryst.*, 24, 1233–1236.

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