

Crystal Data: Orthorhombic. *Point Group:* $2/m\ 2/m\ 2/m$. Short prismatic crystals, crude and lacking terminations, with {010}, {110}, {120}, {140}, {160}; in radial fibrous, fanlike to felted aggregates, to 2 cm; granular, massive.

Physical Properties: *Tenacity:* Brittle, tough if fibrous. Hardness = 5 D(meas.) = 4.21 D(calc.) = [4.80]

Optical Properties: Opaque. *Color:* Coal-black to greenish black. *Streak:* Brownish black. *Luster:* Metallic to submetallic, silky if fibrous.

Optical Class: Biaxial (+).

R_1 – R_2 : (400) 14.2–14.9, (420) 13.8–14.7, (440) 13.4–14.6, (460) 13.1–14.4, (480) 12.9–14.4, (500) 12.6–14.2, (520) 12.4–14.3, (540) 12.2–14.5, (560) 12.0–14.5, (580) 11.9–14.6, (600) 11.4–14.6, (620) 11.3–14.7, (640) 10.7–14.5, (660) 10.4–14.3, (680) 9.66–14.1, (700) 9.71–14.4

Cell Data: *Space Group:* $Pbam$ (synthetic). $a = 9.463(1)$ $b = 12.305(1)$ $c = 3.0727(6)$
 $Z = 4$

X-ray Powder Pattern: Burguillos, Spain.

2.575 (100), 5.152 (30), 1.536 (17), 1.042 (15), 1.937 (12), 2.842 (9), 4.725 (8)

Chemistry:

	(1)	(2)
B_2O_3	12.40	13.48
Al_2O_3	0.22	
Fe_2O_3	29.51	30.90
FeO	54.14	55.62
CoO	0.05	
MnO	0.20	
MgO	0.28	
Total	96.80	100.00

(1) Burguillos, Spain; Al_2O_3 , MnO, MgO, CoO by electron microprobe; corresponds to $(\text{Fe}_{2.03}^{2+}\text{Mg}_{0.02}\text{Mn}_{0.01})_{\Sigma=2.06}(\text{Fe}_{0.99}^{3+}\text{Al}_{0.01})_{\Sigma=1.00}\text{B}_{0.96}\text{O}_5$. (2) $\text{Fe}_2^{2+}\text{Fe}^{3+}\text{BO}_5$.

Polymorphism & Series: Forms a series with ludwigite.

Mineral Group: Ludwigite group.

Occurrence: Uncommon in boron-rich skarns.

Association: Magnetite, pyroxene, pyrrhotite.

Distribution: In the USA, from the Old City quarry, Riverside, Riverside Co., California; at the Jayville magnetite mine, Stevens Co., New York; on the northwest flank of Brooks Mountain, Seward Peninsula, Alaska. In Japan, in the Kamaishi mine, Iwate Prefecture, and at the Sengendera mine, Miyazaki Prefecture. From the Dading tin-iron deposits, Guizhou Province, China. In Italy, from near Cura di Vetralla, and at Montalto di Castro, Lazio; on Vesuvius, Campania; from Vulcano, Lipari Islands. At the St. Christophe mine, Breitenbrunn, Saxony, Germany. From the Monchi mine, Burguillos del Cerro, Badajoz Province, Spain.

Name: Honors Magnus Vonsen (1879–1954), amateur mineralogist and mineral collector of Petaluma, California, USA, who discovered the mineral.

Type Material: n.d.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 322–324 [paugeite, part]. (2) Bonazzi, P. and S. Menchetti (1989) Contribution to the crystal chemistry of the minerals of the ludwigite-vonsenite series. Neues Jahrb. Mineral., Monatsh., 69–83. (3) Swinnea, J.S. and H. Steinfink (1983) Crystal structure and Mössbauer spectrum of vonsenite, $2\text{FeO}\cdot\text{FeBO}_3$. Amer. Mineral., 68, 827–832. (4) Ruiz, J.L. and P.S. Salvador (1971) Chemical and crystallographic data for vonsenite from Burguillos del Cerro, Badajoz, Spain. Amer. Mineral., 56, 2149–2151.

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