

Crystal Data: Monoclinic. *Point Group:* 2/*m*. As prismatic crystals, to 10 cm. In columnar, radiating, and spherulitic aggregates of fibers and prisms. *Twinning:* Simple and lamellar twinning common on {100}.

Physical Properties: *Cleavage:* Good on {110}, (110) ∧ (1 $\bar{1}$ 0) ~87°; partings on {100}, {001}, and {010}. *Fracture:* Uneven to conchoidal. *Tenacity:* Brittle. Hardness = 6
D(meas.) = 3.27–3.54 D(calc.) = [3.52]

Optical Properties: Translucent to opaque. *Color:* Clove-brown, gray, colorless, blue, green; colorless in thin section.

Optical Class: Biaxial (+). *Orientation:* Y = b; Z ∧ c = –46° to –55°. *Dispersion:* r < v or r > v, weak to moderate. α = 1.699–1.710 β = 1.710–1.719 γ = 1.725–1.738
2V(meas.) = 58°–72°

Cell Data: *Space Group:* C2/c. a = 9.978(9) b = 9.156(9) c = 5.293(5) β = 105°29(2)'
Z = 4

X-ray Powder Pattern: Borieva deposits, Erzebezirk Maden, Bulgaria. (ICDD 18-299).
3.02 (100), 2.547 (80), 2.600 (60), 2.564 (50), 2.243 (50), 1.633 (50), 6.58 (40)

Chemistry:	(1)	(2)		(1)	(2)
SiO ₂	47.62	48.81	CaO	22.18	21.87
TiO ₂		0.01	Na ₂ O		0.07
Al ₂ O ₃	0.91	0.74	K ₂ O		0.02
Fe ₂ O ₃	0.04	0.79	H ₂ O ⁺	0.40	0.32
FeO	0.70	1.54	H ₂ O [–]	0.09	0.35
MnO	27.47	22.58	CO ₂	0.24	
MgO	0.53	2.29	P ₂ O ₅		0.01
			Total	100.18	99.40

(1) Tetela de Ocampo, Mexico; corresponds to (Ca_{0.97}Mg_{0.03})_{Σ=1.00}(Mn_{0.96}²⁺Fe_{0.02}²⁺Al_{0.02})_{Σ=1.00}(Si_{1.97}Al_{0.03})_{Σ=2.00}O₆. (2) Aravaipa district, Arizona, USA; corresponds to (Ca_{0.96}Na_{0.01})_{Σ=0.97}(Mn_{0.78}²⁺Mg_{0.14}²⁺Fe_{0.05}²⁺Al_{0.03}Fe_{0.02}³⁺)_{Σ=1.02}(Si_{1.99}Al_{0.01})_{Σ=2.00}O₆.

Polymorphism & Series: Forms two series, with diopside, and with hedenbergite.

Mineral Group: Pyroxene group.

Occurrence: In metasomatized limestones and manganese skarns; in quartz or calcite veins cutting rhyolite.

Association: Rhodonite, manganese oxides.

Distribution: From Tetela de Ocampo, Puebla, and Pachuca, Hidalgo, Mexico. In the USA, at Franklin, Sussex Co., New Jersey; from the Bohemia district, Lane Co., Oregon; at the Aravaipa district, Graham Co., Arizona; and in the Empire Zinc Co. mine, Hanover, Grant Co., New Mexico. From Schio, Vicenza, and Campiglia, Tuscany, Italy. In the Akatani mine, Niigata Prefecture; the Nakatatsu mine, Fukui Prefecture; the Onagusa mine, Katsuyam, Okayama Prefecture; and elsewhere in Japan. A number of other localities are known.

Name: To honor Professor Albert Johannsen (1871–1962), petrologist, University of Chicago, Chicago, Illinois, USA.

Type Material: National Museum of Natural History, Washington, D.C., USA, R3118, 97484.

References: (1) Schaller, W.T. (1938) Johannsenite, a new manganese pyroxene. *Amer. Mineral.*, 23, 575–582. (2) Deer, W.A., R.A. Howie, and J. Zussman (1978) *Rock-forming minerals*, (2nd edition), v. 2A, single-chain silicates, 415–422. (3) Freed, R.L. and D.R. Peacor (1967) Refinement of the crystal structure of johannsenite. *Amer. Mineral.*, 52, 709–720.

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