

**Tetrahedrite****(Cu, Fe, Ag, Zn)<sub>12</sub>Sb<sub>4</sub>S<sub>13</sub>**

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**Crystal Data:** Cubic. *Point Group:*  $\bar{4}3m$ . Crystals are tetrahedral, to 15 cm; common as groups of parallel crystals; massive, coarse or fine and granular to compact. *Twinning:* On {111} around [111] as twin axis; contact and penetration twins, commonly repeated.

**Physical Properties:** *Fracture:* Subconchoidal. *Tenacity:* Somewhat brittle. Hardness = 3–4.5 VHN = 312–351 (100 g load). D(meas.) = 4.97 D(calc.) = 4.99

**Optical Properties:** Opaque, except in very thin fragments. *Color:* Flint-gray to iron-black to dull black, cherry-red in transmitted light; in polished section, gray inclining to olive-brown. *Streak:* Black to brown. *Luster:* Metallic, commonly splendent. *Optical Class:* Isotropic.  $n = > 2.72$  (Li).

R: (400) 32.1, (420) 31.8, (440) 31.7, (460) 31.7, (480) 31.8, (500) 32.0, (520) 32.2, (540) 32.4, (560) 32.4, (580) 32.3, (600) 32.0, (620) 31.5, (640) 31.0, (660) 30.6, (680) 30.2, (700) 29.8

**Cell Data:** *Space Group:*  $I\bar{4}3m$ .  $a = 10.23$ – $10.55$   $Z = 2$

**X-ray Powder Pattern:** Neuglück mine, Wittichen, Black Forest, Germany. 3.00 (100), 1.831 (60), 1.563 (30), 2.61 (20), 1.056 (20), 3.69 (10), 2.46 (10)

<b>Chemistry:</b>	(1)	(2)	(3)		(1)	(2)	(3)
Cu	45.39	37.7	45.77	Fe	1.32	5.5	
Ag		0.4		Sb	28.85	29.3	29.22
Pb	0.11			As	trace	0.8	
Zn		1.8		S	24.48	24.9	25.01
				Total	100.15	100.4	100.00

(1) Bourg d'Oisans, France. (2) Val del Frigido, Tuscany, Italy; by electron microprobe. (3) Cu<sub>12</sub>Sb<sub>4</sub>S<sub>13</sub>.

**Polymorphism & Series:** Forms a series with tennantite and freibergite.

**Mineral Group:** Tetrahedrite group.

**Occurrence:** Typically in hydrothermal veins or contact metamorphic deposits of low to medium temperature of formation.

**Association:** Chalcopyrite, galena, sphalerite, pyrite, bornite, acanthite, calcite, dolomite, siderite, barite, fluorite, quartz.

**Distribution:** One of the most common of the sulfosalts. Only a few localities which have produced well-crystallized material can be mentioned. In Germany, from Freiberg, Saxony, and in the Harz Mountains, at Clausthal and Horhausen. From near Brixlegg, Tirol, Austria. At Botés, near Zlatna, and Cavnic (Kapnikbánya), Romania. In France, at Irazein, Ariège, France, a few exceptionally large crystals, and from Sainte-Marie-aux-Mines, Haut-Rhin. In Cornwall, England, at the Herodsfoot mine. In Algeria, from near Tenés and Mouzaía. In Bolivia, at the San José mine, Oruro. In Peru, from Casapalca, Junin, in the Huallanca and Quiruvilca districts, and at many other places. From the Noche Buena mine, Mazapil, and at the El Cobre mine, Concepción del Oro, Zacatecas, Mexico. In the USA, in the Daly-Judge and other mines, Park City district, Summit Co., Utah. From the Nanisivik mine, Baffin Island, Nunavut, Canada.

**Name:** In allusion to the tetrahedral crystal shape.

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**References:** (1) Palache, C., H. Berman, and C. Frondel (1944) Dana's system of mineralogy, (7th edition), v. I, 374–384. (2) Johnson, N.E., J.R. Craig, and J.D. Rimstidt (1988) Crystal chemistry of tetrahedrite. *Amer. Mineral.*, 73, 389–397. (3) Peterson, R.C. and I. Miller (1986) Crystal structure and cation distribution in freibergite and tetrahedrite. *Mineral. Mag.*, 50, 717–721. (4) Berry, L.G. and R.M. Thompson (1962) X-ray powder data for the ore minerals. *Geol. Soc. Amer. Mem.* 85, 53–54. (5) Criddle, A.J. and C.J. Stanley, Eds. (1993) Quantitative data file for ore minerals, 3rd ed. Chapman & Hall, London, 566.