

Freibergite

(Ag, Cu, Fe, Zn)₁₂(Sb, As)₄S₁₃

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Crystal Data: Cubic. *Point Group:* $\bar{4}3m$. Tetrahedral crystals, to 3.5 cm; massive and as inclusions in other sulfides.

Physical Properties: Hardness = n.d. VHN = 263–340 (100 g load). D(meas.) = n.d. D(calc.) = [5.41]

Optical Properties: Opaque. *Color:* Gray to black.

R: (400) 34.1, (420) 34.0, (440) 33.9, (460) 33.7, (480) 33.6, (500) 33.5, (520) 33.3, (540) 33.1, (560) 32.7, (580) 32.2, (600) 31.5, (620) 31.0, (640) 30.4, (660) 30.0, (680) 29.5, (700) 29.0

Cell Data: *Space Group:* $I\bar{4}3m$. $a = 10.474\text{--}10.560$ $Z = 2$

X-ray Powder Pattern: n.d.

Chemistry:	(1)	(2)		(1)	(2)
Ag	36.0	48.9	Sb	25.1	21.0
Cu	12.4	3.2	As	0.5	0.6
Fe	4.1	0.2	Bi		0.1
Zn	0.6	6.1	S	21.8	19.9
Hg		0.1	Total	100.5	100.1

(1) Mt. Isa, Australia; by electron microprobe, corresponding to $(\text{Ag}_{6.37}\text{Cu}_{3.72}\text{Fe}_{1.41}\text{Zn}_{0.18})_{\Sigma=11.68}(\text{Sb}_{3.95}\text{As}_{0.13})_{\Sigma=4.08}\text{S}_{13.00}$. (2) Knappenstube mine, Austria; by electron microprobe, average of analyses on 14 samples; corresponding to $(\text{Ag}_{9.50}\text{Zn}_{1.95}\text{Cu}_{1.06}\text{Fe}_{0.08}\text{Hg}_{0.01})_{\Sigma=12.60}(\text{Sb}_{3.61}\text{As}_{0.17}\text{Bi}_{0.01})_{\Sigma=3.79}\text{S}_{13.00}$.

Polymorphism & Series: Forms a series with tetrahedrite and argentotennantite.

Mineral Group: Tetrahedrite group.

Occurrence: In hydrothermal deposits.

Association: A wide variety of sulfides and sulfosalts, as for tetrahedrite.

Distribution: In Germany, in Saxony, from the Freiberg district [TL], as in the Himmelsfürst mine, Erbsdorf, near Freiberg. From Kutná Hora and the Zlate Hore district, Czech Republic. In Austria, from the Knappenstube mine, Hochtor, Salzburg. From Yuxhondzha, Sakha, Russia. At Slädekärr and in the Vena mines, near Askersund, Örebro, Sweden. From the Bleikvassli Zn–Pb–Cu deposit, Nordland, Norway. In Scotland, at Tyndrum, Perthshire. In the Hi-Ho mine, Cobalt-Gowganda region, Ontario; and the Keno Hill-Galena Hill area, Yukon Territory, Canada. Large crystals from the San José mine, Oruro, Bolivia. In Japan, in the Inakuraishi, Koryu, and Sanru mines, Hokkaido. In Australia, at Mt. Isa and the Cannington Ag–Pb–Zn deposit, Queensland; and in the Meerschaum mine, north of Omeo, Victoria. Additional localities are known.

Name: For the long-known occurrence of silver-rich tetrahedrite at Freiberg, Germany.

References: (1) Palache, C., H. Berman, and C. Frondel (1944) Dana's system of mineralogy, (7th edition), v. I, 374–384 (tetrahedrite–tennantite). (2) Riley, J.F. (1974) The tetrahedrite–freibergite series with reference to the Mount Isa Pb–Zn–Ag orebody. *Mineralium Deposita*, 9, 117–124. (3) Peterson, R.C. and I. Miller (1986) Crystal structure and cation distribution in freibergite and tetrahedrite. *Mineral. Mag.*, 50, 717–721. (4) Paar, W.H., T.T. Chen, and W. Guenther. (1978) Extremely silver-rich freibergite in lead-zinc-copper ores of the “Knappenstube” mine, Hochtor, Salzburg. *Carinthia* 2, 88, 35–42. (5) (1980) *Chem. Abs.*, 93, 189277 (abs. ref. 5). (6) Criddle, A.J. and C.J. Stanley, Eds. (1993) Quantitative data file for ore minerals, 3rd ed. Chapman & Hall, London, 177.

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