

Kobellite

$\text{Cu}_2\text{Pb}_{10}(\text{Bi}, \text{Sb})_{16}\text{S}_{35}$

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Crystal Data: Orthorhombic. *Point Group:* $2/m\ 2/m\ 2/m$. Bladed, to 2 mm; commonly fibrous, massive, granular.

Physical Properties: *Cleavage:* Good on {010}. *Hardness* = 2.5–3 VHN = n.d.
D(meas.) = 6.48 D(calc.) = 6.51

Optical Properties: Opaque. *Color:* Blackish lead-gray to steel-gray; in polished section, white. *Streak:* Black. *Luster:* Metallic. *Pleochroism:* Weak. *Anisotropism:* Distinct.
 R_1 – R_2 : (400) 48.6–51.8, (420) 48.0–51.1, (440) 47.5–50.5, (460) 47.0–49.9, (480) 46.6–49.3, (500) 46.1–48.7, (520) 45.6–48.1, (540) 45.0–47.5, (560) 44.6–46.9, (580) 44.1–46.4, (600) 43.8–45.9, (620) 43.5–45.7, (640) 43.3–45.5, (660) 43.1–45.4, (680) 42.9–45.3, (700) 42.7–45.2

Cell Data: *Space Group:* $Pn\bar{m}$ or $Pnmm$. $a = 22.62$ $b = 34.08$ $c = 4.02$ $Z = 2$

X-ray Powder Pattern: Vena mines, Sweden.
3.54 (100), 3.41 (90), 2.72 (50), 3.98 (40), 3.27 (40), 2.85 (20), 2.150 (20)

Chemistry:	(1)	(2)	(1)	(2)	
Pb	33.2	38.0	Bi	37.6	28.5
Cu	1.0		Sb	9.6	15.0
Ag	0.5		S	18.6	18.0
Fe	0.6		Total	101.1	99.5

(1) Vena mines, Sweden; by electron microprobe; corresponds to $\text{Cu}_{0.96}\text{Pb}_{9.80}\text{Fe}_{0.66}\text{Ag}_{0.28}(\text{Bi}_{11.00}\text{Sb}_{4.82})_{\Sigma=15.82}\text{S}_{35.00}$. (2) Raleigh, North Carolina, USA; by electron microprobe, corresponds to $\text{Pb}_{11.44}(\text{Bi}_{8.56}\text{Sb}_{7.73})_{\Sigma=16.29}\text{S}_{35.00}$.

Polymorphism & Series: Forms a series with tintinaite.

Occurrence: A high-temperature hydrothermal mineral.

Association: Cobaltite, arsenopyrite, chalcopyrite (Vena mines, Sweden); bismuthinite, jamesonite, tetrahedrite (Raleigh, North Carolina, USA).

Distribution: In Sweden, from the Vena mines, near Askersund, Örebro [TL], and at Boliden, Västerbotten. From the Srednegolgotaiskoe gold deposit, Transbaikalia, Siberia, Russia. In the Ustarasai bismuth deposit, near Brichmulla village, Pskem Range, south Tien Shan, northeastern Uzbekistan. At the Salsigne mine, 15 km north of Carcassone, Aude, France. In the Aljustrel deposit, Portugal. From Smolotely, near Příbram, Czech Republic. At St. Andreasberg, Harz Mountains, Germany. From Ciclova, Romania. At Zeehan, Tasmania, Australia. In the USA, from the Superior stone quarry, Raleigh, Wake Co., North Carolina; in the Cofer deposit, near Mineral, Louisa Co., Virginia; at the Silver Bell mine, Red Mountain district, Ouray Co., Colorado. In Canada, from the Deer Park mine, in the Rossland area, and in the Dodger tungsten mine, Salmo, British Columbia; at the Tintina silver mines, Watson Lake, Yukon Territory.

Name: In honor of Wolfgang Franz von Kobell (1803–1882), German mineralogist.

References: (1) Palache, C., H. Berman, and C. Frondel (1944) Dana's system of mineralogy, (7th edition), v. I, 447–448. (2) Harris, D.C., J.L. Jambor, G.R. Lachance, and R.I. Thorpe (1968) Tintinaite, the antimony analogue of kobellite. *Can. Mineral.*, 9, 371–382. (3) Mieke, G. (1971) The crystal structure of kobellite. *Nature, Phys. Sci.*, 231, 133–134. (4) Moëlo, Y., J.L. Jambor, and D.C. Harris (1984) Tintinaïte et sulfosels associés de Tintina (Yukon): la cristallographie de la série de la kobellite. *Can. Mineral.*, 22, 219–226 (in French with English abs.). (5) Zakrzewski, M.A. and E. Makovicky (1986) Izoklakeite from Vena, Sweden, and the kobellite homologous series. *Can. Mineral.*, 24, 7–18. (6) Makovicky, E. and W.G. Mumme (1986) The crystal structure of izoklakeite, $\text{Pb}_{51.3}\text{Sb}_{20.4}\text{Bi}_{19.5}\text{Ag}_{1.2}\text{Cu}_{2.9}\text{Fe}_{0.7}\text{S}_{114}$. The kobellite homologous series and its derivatives. *Neues Jahrb. Mineral., Abh.*, 153, 121–145. (7) Criddle, A.J. and C.J. Stanley, Eds. (1993) Quantitative data file for ore minerals, 3rd ed. Chapman & Hall, London, 291.

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