

# Mckinstryite

# (Ag, Cu)<sub>2</sub>S

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**Crystal Data:** Orthorhombic. *Point Group:*  $2/m\ 2/m\ 2/m$  or  $mm2$ . As granular aggregates of interlocked crystals, to 3 mm.

**Physical Properties:** *Cleavage:* One, poorly developed. *Fracture:* Subconchoidal. Hardness = n.d. VHN = 43–45 (25 g load).  $D(\text{meas.}) = 6.61$   $D(\text{calc.}) = 6.57$

**Optical Properties:** Opaque. *Color:* Steel-gray on fresh surface, becoming dark gray to black on long exposure; in polished section, pale grayish white. *Streak:* Dark steel-gray.

*Anisotropism:* Strong, in gray, pale grayish blue, and pale tan.

$R_1$ – $R_2$ : (400) 34.0–40.1, (420) 34.0–39.5, (440) 33.9–39.8, (460) 33.7–37.8, (480) 32.9–36.6, (500) 31.9–35.3, (520) 31.0–34.2, (540) 30.2–33.3, (560) 29.6–32.4, (580) 29.1–31.7, (600) 28.7–31.1, (620) 28.5–30.5, (640) 28.2–30.1, (660) 27.9–29.4, (680) 27.6–28.8, (700) 27.4–28.4

**Cell Data:** *Space Group:*  $Pnam$  or  $Pna2_1$ .  $a = 14.043$   $b = 15.677$   $c = 7.803$   $Z = 32$

**X-ray Powder Pattern:** Foster mine, Cobalt, Canada.

2.606 (100), 2.070 (70), 3.51 (60), 3.06 (60), 2.862 (60), 1.948 (50), 2.567 (40)

## Chemistry:

	(1)	(2)
Ag	60.0	60.7
Cu	24.9	24.8
S	15.1	14.8
Total	100.0	100.3

(1) Foster mine, Canada; by electron microprobe, corresponding to  $(\text{Ag}_{1.18}\text{Cu}_{0.83})_{\Sigma=2.01}\text{S}_{1.00}$ .

(2) Godejord, Norway; by electron microprobe, corresponding to  $(\text{Ag}_{1.22}\text{Cu}_{0.84})_{\Sigma=2.06}\text{S}_{1.00}$ .

**Occurrence:** Of hydrothermal or supergene origin; probably formed below 94.4 °C, the upper stability limit for mckinstryite.

**Association:** Silver, arsenopyrite, stromeyerite, actinolite, calcite (Foster mine, Canada); bornite, chalcocite, chalcopyrite, djurleite, digenite, tennantite, stromeyerite, wittichenite, bismuth, rammelsbergite, balkanite, mercurian silver, cinnabar, pyrite, calcite, barite, aragonite (Sedmochislenitsi mine, Bulgaria).

**Distribution:** In Canada, from the Foster mine, Coleman Township, about two km southeast of Cobalt, Ontario [TL], and from the Echo Bay mine, Great Bear Lake, Northwest Territories. In the USA, at the Colorado Central mine, Georgetown district, Clear Creek Co., and the Bulldog Mountain mine, Creede district, Mineral Co., Colorado; at Mogollon, Catron Co., New Mexico; and in the Homestake deposit, near Cooke City, Park Co., Montana. From Jalpa, Zacatecas, Mexico. At Godejord, Grong area, and in the Bleikvassli Zn–Pb–Cu deposit, Nordland, Norway. From the Vrancice deposit, near Příbram, Czech Republic. At the Sedmochislenitsi mine, Vratsa district, western part of the Stara Planina (Balkan Mountains), Bulgaria. From the Um Samiuki Zn–Cu–Pb–Ag volcanogenic deposits, Eastern Desert, Egypt. In the Tort Kudak Au–Ag deposit and the Sarbayskoye iron ore deposit, Kazakhstan. From Broken Hill, New South Wales, Australia. In the Sado mine, Niigata Prefecture; the Shakanai mine, Akita Prefecture; and the Koryu mine, Hokkaido, Japan.

**Name:** In honor of Hugh Exton McKinstry (1896–1961), Professor of Geology at Harvard University, Cambridge, Massachusetts, USA.

**Type Material:** Canadian Geological Survey, Ottawa, Canada, 12136; Harvard University, Cambridge, Massachusetts, 108804; National Museum of Natural History, Washington, D.C., USA, 120056.

**References:** (1) Skinner, B.J., J.L. Jambor, and M. Ross (1966) Mckinstryite, a new copper–silver sulfide. *Econ. Geol.*, 61, 1383–1389. (2) (1967) *Amer. Mineral.*, 52, 1253 (abs. ref. 1). (3) Criddle, A.J. and C.J. Stanley, Eds. (1993) Quantitative data file for ore minerals, 3rd ed. Chapman & Hall, London, 361.

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