Wittichenite Cu_3BiS_3

Crystal Data: Orthorhombic. *Point Group:* 222. Commonly massive. Crystals rare, prismatic parallel to [001]; prisms show striae and are typically blocky in aspect.

Physical Properties: *Fracture:* Conchoidal. *Tenacity:* Brittle. Hardness = 2–3 VHN = 170–187 (100 g load). D(meas.) = 6.01, 6.19 (synthetic). D(calc.) = 6.19

Optical Properties: Opaque. *Color:* Steel-gray to tin-white, tarnishing pale lead-gray or brass-yellow; white to creamy white to grayish white in reflected light. *Streak:* Black. *Luster:* Metallic. *Anisotropism:* Weak, shades of dark brown.

R_1–R_2: (400) 35.0–36.9, (420) 34.1–35.8, (440) 33.2–34.7, (460) 32.7–34.0, (480) 32.6–34.1, (500) 32.9–34.7, (520) 33.2–35.0, (540) 33.5–35.2, (560) 33.6–35.3, (580) 33.5–35.3, (600) 33.2–35.2, (620) 33.0–35.2, (640) 32.8–35.2, (660) 32.4–35.0, (680) 31.7–34.6, (700) 30.8–34.0

Cell Data: *Space Group:* $P2_12_12_1$. $a = 7.723$ $b = 10.395$ $c = 6.716$ Z = 4

X-ray Powder Pattern: Wittichen, Germany.
2.85 (100), 3.08 (80), 4.55 (40), 2.66 (40), 3.83 (30), 3.19 (30), 2.39 (30)

Chemistry:

	(1)	(2)	(3)	(4)
Cu	37.79	38.0	37.7	38.46
Bi	42.56	42.8	43.4	42.15
S	19.13	18.3	18.7	19.39
Total	99.48	99.1	99.8	100.00

(1) Daniel mine, Wittichen, Germany; by electron microprobe. (2) Seathwaite Tarn, England; by electron microprobe. (3) Wittichen, Germany; by electron microprobe. (4) Cu_3BiS_3.

Occurrence: In hydrothermal veins with other bismuth minerals (Wittichen, Germany); with Cu-Fe sulfides (Seathwaite Tarn, England); with secondary uranium minerals and selenides of Cu, Pb, and Bi (Kletno, Poland).

Association: Bornite, chalcocite, chalcopyrite, djurleite, digenite, tennantite, pyrite, stromeyerite, bismuth, emplectite, rammelsbergite, calcite, aragonite, fluorite, barite.

Distribution: In the USA, at Butte, Silver Bow Co., Montana; in the Fairfax quarry, Centreville, Fairfax Co., Virginia; and at Bisbee, Cochise Co., Arizona. In Canada, in the Maid of Erin mine, Rainy Hollow district, British Columbia; and at Cobalt, Ontario. In Germany, in the Schapbachtal, and at the Neuglück, Daniel, and King David mines, near Wittichen, Black Forest. In the Sedmochislenitsi mine, Vratsa district, Bulgaria. At the Colquijirca mine, Junín, Peru. From Seathwaite Tarn, northwest of Coniston, Cumbria, England. At Tjøstulflaten, Norway. In the Kletno mine, Sudetes Mountains, Poland. Additional localities are known.

Name: After the type locality, Wittichen, Germany.

Type Material: Royal Ontario Museum, Toronto, Canada, M23304; Harvard University, Cambridge, Massachusetts, USA, 82408, 82409.

References: (1) Nuffield, E.W. (1947) Studies of mineral sulpho-salts: XI—wittichenite (klaprothite). Econ. Geol., 42, 147–160. (2) Criddle, A.J. and C.J. Stanley (1979) New data on wittichenite. Mineral. Mag., 43, 109–113. (3) Kocman, V. and E.W. Nuffield (1973) The crystal structure of wittichenite, Cu_3BiS_3. Acta Cryst., 29, 2528–2535. (4) Palache, C., H. Berman, and C. Frondel (1944) Dana's system of mineralogy, (7th edition), v. I, 373 (wittichenite) and 418–419 (klaprothite).