Spionkopite $Cu_{39}S_{28}$

Crystal Data: Hexagonal. *Point Group:* $\overline{3}\,2/m$, $3m$, or 32. Massive.

Physical Properties: *Cleavage:* {0001}. Hardness = n.d. VHN = 63–93 (15 g load); 120–162 (10 g load). D(meas.) = n.d. D(calc.) = 5.13

Optical Properties: Opaque. *Color:* Blue. *Luster:* Metallic. *Pleochroism:* Blue to pale blue; formerly called "blaubleibender Covellit" (blue-remaining covellite) for this reason. *Anisotropism:* Orange.
R_1–R_2: (400) 26.1–33.4, (420) 25.8–32.9, (440) 25.1–32.3, (460) 24.2–31.4, (480) 23.0–30.5, (500) 21.8–29.5, (520) 20.5–28.5, (540) 19.0–27.4, (560) 17.6–26.4, (580) 16.3–25.4, (600) 14.9–24.4, (620) 13.6–23.8, (640) 12.4–23.8, (660) 11.2–24.3, (680) 10.0–24.6, (700) 9.06–24.3

Cell Data: *Space Group:* $P\overline{3}m1$, $P3m1$, $P31m$, or $P321$. $a = 22.962$ $c = 41.429$ $Z = 18$

X-ray Powder Pattern: Spionkop Creek, Canada.
1.910 (100), 3.076 (85), 2.777 (30), 1.820 (30), 2.297 (25), 3.681 (20), 2.849 (20)

Chemistry:

	(1)	(2)	(3)	(4)
Cu	67.1	70.8	67.2	73.41
Fe			7.8	
Zn			0.7	
S	25.8	27.2	24.5	26.59
Total	92.9	98.0	100.2	100.00

(1–2) Yarrow and Spionkop Creeks, Canada; by electron microprobe. (3) Eretria, Greece; by electron microprobe. (4) $Cu_{39}S_{28}$.

Occurrence: As weathering-produced lamellar replacements of anilite and djurleite in stratabound red-bed copper deposits (Spionkop Creek, Canada); in a serpentine-hosted magnetite-chromite deposit (Eretria, Greece).

Association: Anilite, djurleite, yarrowite, tennantite (Yarrow and Spionkop Creeks, Canada); geerite, chalcopyrite, cobalt pentlandite, magnetite, chromite, andradite, chlorite, diopside (Eretria, Greece).

Distribution: From the Upper Grinnell Formation, Spionkop Creek and Yarrow Creek areas of southwestern Alberta, Canada [TL]. In the USA, at the Campbell mine, Bisbee, Cochise Co., Arizona; in the Lone Tree mine, Buffalo Mountain district, Humboldt Co., Nevada; from Dekalb Township, St. Lawrence Co., New York; and at Washington Pass, Okanogan Co., Washington. From near Eretria, Greece. At Schulenberg, near Clausthal, Harz Mountains, and in the Clara mine, near Oberwolfach, Black Forest, Germany. From the Lubin and Rudna copper mines, near Legnica, Zechstein copper district, Lower Silesia, Poland. In the West Carbery district, Co. Cork, Ireland.

Name: For the locality at Spionkop Creek, Canada.

Type Material: Canadian Geological Survey, Ottawa; Queen's University, Kingston, Ontario, Canada; Harvard University, Cambridge, Massachusetts, 122290; National Museum of Natural History, Washington, D.C., USA, 149430, 149431.

References: (1) Goble, R.J. (1980) Copper sulfides from Alberta: yarrowite, Cu_9S_8, and spionkopite, $Cu_{39}S_{28}$. Can. Mineral., 18, 511–518. (2) (1981) Amer. Mineral., 66, 1279 (abs. ref. 1). (3) Economou, M.I. (1981) A second occurrence of the copper sulfides geerite and spionkopite in Eretria area, central Greece. Neues Jahrb. Mineral., Monatsh., 489–494. (4) Goble, R.J. (1985) The relationship between crystal structure, bonding and cell dimensions in the copper sulfides. Can. Mineral., 23, 61–76. (5) Criddle, A.J. and C.J. Stanley, Eds. (1993) Quantitative data file for ore minerals, 3rd ed. Chapman & Hall, London, 529.