Haycockite $Cu_4Fe_5S_8$

Crystal Data: Orthorhombic, pseudotetragonal. *Point Group:* 222. Observed in polished section as tiny grains, to about 500 μm. *Twinning:* On {103}, polysynthetic, may be visible in polished section.

Physical Properties: Hardness = n.d. VHN = 206–231 (100 g load). D(meas.) = n.d. D(calc.) = 4.33

Optical Properties: Opaque. *Color:* Brass-yellow, much like chalcopyrite; does not tarnish easily. *Anisotropism:* Weak to moderate.
R_1–R_2: (400) 13.9–13.5, (420) 15.5–15.9, (440) 18.3–19.4, (460) 21.7–23.2, (480) 25.1–26.8, (500) 28.2–29.9, (520) 31.0–32.5, (540) 33.3–34.5, (560) 35.1–36.1, (580) 36.6–37.3, (600) 37.8–38.3, (620) 38.6–38.9, (640) 39.2–39.4, (660) 39.6–39.6, (680) 39.8–39.7, (700) 40.0–39.8

Cell Data: *Space Group:* $P222$, $P222_1$, $P2_12_12$, or $P2_12_12_1$. $a = 10.705(5)$ $b = 10.734(5)$ $c = 31.630(15)$ $Z = 12$

X-ray Powder Pattern: Mooihoek mine, South Africa.
3.07 (100), 1.876 (80), 1.889 (60), 1.612 (60), 1.089 (60), 0.937 (60), 1.214 (50)

Chemistry:

	(1)	(2)	(3)
Cu	32.16	31.26	32.18
Fe	35.03	36.12	35.35
Ni	0.40	0.23	
S	32.41	32.86	32.47
Total	100.14	100.46	100.00

(1) Mooihoek mine, South Africa; by electron microprobe, average of fifteen analyses, leading to $Cu_{1.00}Fe_{1.24}Ni_{0.01}S_{2.00}$. (2) Minnesota, USA; by electron microprobe, average of four analyses. (3) $Cu_4Fe_5S_8$.

Occurrence: In a hortonolite dunite (replacement) pegmatite in the Bushveld complex (Mooihoek mine, South Africa).

Association: Mooihoekite, copper, troilite, pentlandite, cubanite, magnetite (Minnesota, USA).

Distribution: In South Africa, in the Bushveld complex, Transvaal, from the Mooihoek mine, Lydenburg district [TL], and in the Townlands ultramafic pipe, Rustenburg. At Krzemianka, Poland. From the Talnakh area, Noril'sk region, western Siberia, Russia. In the USA, in the basal Duluth Gabbro complex, near Hibbing, St. Louis Co., Minnesota. From near Madera, Sonora, Mexico.

Name: To honor Maurice Hall Haycock (1900–?), former Head, Mineralogy Section, Mineral Sciences Division, Department of Energy, Mines, and Resources, Mines Branch, Ottawa, Canada.

Type Material: Canadian Museum of Nature, Ottawa; Royal Ontario Museum, Toronto, Canada, M30992; Princeton University, Princeton, New Jersey; National Museum of Natural History, Washington, D.C., USA, 124965; Heidelberg University, Heidelberg, Germany.

References: (1) Cabri, L.J. and S.R. Hall (1972) Mooihoekite and haycockite, two new copper–iron sulfides and their relationship to chalcopyrite and talnakhite. Amer. Mineral., 57, 689–708. (2) Rowland, J.F. and S.R. Hall (1975) Haycockite, $Cu_4Fe_5S_8$: a superstructure in the chalcopyrite series. Acta Cryst., 31, 2105–2112. (3) Criddle, 225.