Germanite $Cu_{13}Fe_2Ge_2S_{16}$

Crystal Data: Cubic. *Point Group:* $\bar{4}3m$. Cubic crystals, rarely to 3 cm [check 3 cm in Gebhardt??!!formerly "tiny"]; commonly massive, intergrown with reniérite.

Physical Properties: *Tenacity:* Brittle. Hardness = 4 VHN = n.d. D(meas.) = 4.46–4.59 D(calc.) = 4.30

Optical Properties: Opaque. *Color:* Reddish gray, tarnishes to a dull brown; in polished section, pinkish gray. *Streak:* Dark gray to black. *Luster:* Metallic, dull.
R: (400) 21.9, (420) 21.5, (440) 21.1, (460) 20.6, (480) 20.0, (500) 19.6, (520) 19.7, (540) 20.2, (560) 21.0, (580) 21.9, (600) 22.8, (620) 23.8, (640) 24.7, (660) 25.5, (680) 26.2, (700) 26.8

Cell Data: *Space Group:* $F\bar{4}3n$. $a = 10.5862(5)$ $Z = 2$

X-ray Powder Pattern: Tsumeb, Namibia.
3.054 (100), 1.870 (72), 1.5954 (40), 1.0802 (20), 1.2141 (16), 2.645 (12), 1.3229 (10)

Chemistry:	(1)	(2)	(3)		(1)	(2)	(3)
Cu	45.5	45.06	51.76	V	0.0	0.12	
Fe	6.8	8.14	7.00	Ge	9.6	9.61	9.10
Zn	1.2	1.51		Ga	0.0	0.65	
Mo	0.5	0.26		As	3.3	2.97	
W	0.0	0.33		S	31.6	31.96	32.14
				Total	98.5	100.21	100.00

(1) Tsumeb, Namibia; by electron microprobe, corresponds to $(Cu_{11.63}Zn_{0.30})_{\Sigma=11.93}Fe^{3+}_{1.98}(Ge_{2.15}As_{0.72}Mo_{0.08})_{\Sigma=2.95}S_{16.00}$. (2) Do.; by electron microprobe, average of 30 analyses; corresponds to $(Cu_{11.38}Zn_{0.37}Fe^{2+}_{0.34})_{\Sigma=12.09}Fe^{3+}_{2.00}(Ge_{2.12}As_{0.64}Ga_{0.06}Mo_{0.04}V_{0.04}W_{0.03})_{\Sigma=2.93}S_{16.00}$. (3) $Cu^{1+}_8Cu^{2+}_5Fe^{3+}_2Ge^{4+}_2S_{16}$; Mo-, V-, and W-rich varities are known.

Mineral Group: Colusite group.

Occurrence: In primary Cu–Pb–Zn ores in a dolostone-hosted hydrothermal polymetallic ore deposit (Tsumeb, Namibia).

Association: Reniérite, pyrite, tennantite, enargite, galena, sphalerite, digenite, bornite, chalcopyrite.

Distribution: From Tsumeb, Namibia [TL]. At M'Passa, 150 km west of Brazzaville, Congo Republic. From Kipushi, 28 km southwest of Lubumbashi, Katanga Province, Congo (Shaba Province, Zaire). In the USA, at the Inexco #1 mine, Jamestown, Boulder Co., Colorado; and in the Ruby Creek deposit, Brooks Range, near Bornite, Alaska. In Cuba, from Pinar del Rio Province. In Bulgaria, at the Radka deposit, Pazardzhik. From Dastakert, Armenia. At Bor, Serbia. From the Bancairoun mine, Alpes-Maritimes, France. At Weisloch, ??, Germany. In Russia, from Vaygach, Arkhangel'sk, and in the Noril'sk region, western Siberia; at the Vaigach and Sibai deposits, Ural Mountains. In the Shakanai mine, Akita Prefecture, Japan.

Name: For the *germanium* content of the mineral.

Type Material: The Natural History Museum, London, England, 1922,1180.

References: (1) Palache, C., H. Berman, and C. Frondel (1944) Dana's system of mineralogy, (7th edition), v. I, 385–386. (2) Sclar, C.B. and B.H. Geier (1954) The paragenetic relationships of germanite and reniérite from Tsumeb, South West Africa. Econ. Geol., 52, 612–631. (3) Springer, G. (1969) Microanalytical investigations into germanite, renierite, briartite, and gallite. Neues Jahrb. Mineral., Monatsh., 435–441. (4) Geier, B.H. and J. Otteman (1970) New secondary tin-germanium and primary tungsten-(molybdenum-, vanadium-) germanium minerals from the Tsumeb ore deposit. Neues Jahrb. Mineral., Abh., 114, 89–107. (5) Tettenhorst, R.T. and C.E. Corbató (1984) Crystal structure of germanite, $Cu_{26}Ge_4Fe_4S_{32}$, determined by x-ray powder diffraction. Amer. Mineral., 69, 943–947. (6) Spiridonov, E.M. (1987) On the composition of germanite. Doklady Acad. Nauk SSSR, 295, 477–481 (in Russian). (7) Criddle, A.J. and C.J. Stanley, Eds. (1993) Quantitative data file for ore minerals, 3rd ed. Chapman & Hall, London, 193.