Copper Cu

Crystal Data: Cubic. *Point Group:* $4/m\ \overline{3}\ 2/m$. As cubes, dodecahedra, and as tetrahexahedra; rarely as octahedra and complex combinations. Commonly flattened on {111}, elongated along [001]. Also as irregular distortions, in twisted, wirelike shapes; filiform, arborescent, massive; as a coarse powder. Masses weighing hundreds of tons have been found; crystals up to 15 cm. *Twinning:* On {111} to produce simple contact and penetration twins and cyclic groups.

Physical Properties: *Fracture:* Hackly. *Tenacity:* Highly malleable and ductile. Hardness = 2.5–3 VHN = 77–99 (100 g load). D(meas.) = 8.95 D(calc.) = 8.93

Optical Properties: Opaque. *Color:* Pale rose on fresh surface, quickly darkens to copper-red, then metallic, shining; in reflected light, pale rose. *Luster:* Metallic.
R: (400) 45.0, (420) 47.9, (440) 51.3, (460) 54.4, (480) 56.9, (500) 58.9, (520) 60.5, (540) 63.0, (560) 70.5, (580) 86.1, (600) 95.9, (620) 98.4, (640) 98.7, (660) 98.7, (680) 98.7, (700) 98.7

Cell Data: *Space Group:* $Fm3m$. a = 3.615 Z = 4

X-ray Powder Pattern: Synthetic.
2.088 (100), 1.808 (46), 1.278 (20), 1.0900 (17), 0.8293 (9), 0.8083 (8), 1.0436 (5)

Chemistry: Copper, typically with only small amounts of other metals.

Occurrence: Commonly associated with porous zones in mafic extrusive rocks, less commonly in sandstones and shales, where the copper was probably of hydrothermal origin, precipitated as the result of oxidizing conditions; in the oxidized zone of large, disseminated copper deposits as a result of secondary processes. A rare mineral in some meteorites.

Association: Silver, chalcocite, bornite, cuprite, malachite, azurite, tenorite, iron oxides, many other minerals.

Distribution: Occurs in many districts world-wide. In the USA, as remarkably large masses and excellent, large crystals in deposits of the Keweenaw Peninsula, Keweenaw and Houghton Cos., Michigan; in several porphyry copper deposits in Arizona including those at the New Cornelia mine, Ajo, Pima Co.; the Copper Queen and other mines at Bisbee, Cochise Co.; and at Ray, Gila Co.; similarly in the Chino mine at Santa Rita, Grant Co., New Mexico. In Namibia, at the Onganja mine, 60 km northeast of Windhoek, and at Tsumeb. In large crystals from the Turinsk copper mine, Bogoslovsk, Ural Mountains, Russia. In Germany, at Rheinbreitbach, North Rhine-Westphalia, and the Friedrichssegen mine, near Bad Ems, Rhineland-Palatinate. In fine specimens from many mines in Cornwall, England. In Australia, at Broken Hill, New South Wales. In Chile, at Andacolla, near Coquimbo. From Bolivia, at Corocoro.

Name: From the Latin *cuprum*, in turn from the Greek *kyprios*, *Cyprus*, from which island the metal was early produced.

References: (1) Palache, C., H. Berman, and C. Frondel (1944) Dana's system of mineralogy, (7th edition), v. I, 99–102. (2) Batchelder, D.N. and R.O. Simmons (1965) X-ray lattice constants of crystals by a rotating-camera method: Al, Ar, Au, CaF_2, Cu, Ge, Ne, Si. J. Appl. Phys., 2864–2868. (3) (1953) NBS Circ. 539, 1, 15. (4) Criddle, A.J. and C.J. Stanley, Eds. (1993) Quantitative data file for ore minerals, 3rd ed. Chapman & Hall, London, 112.