DESCRIPTIVE MODEL OF PORPHYRY Cu-Mo

By Dennis P. Cox

DESCRIPTION Stockwork veinlets of quartz, chalcopyrite, and molybdenite in or near a porphyritic intrusion. Ratio of Au (in ppm) to Mo (in percent) less than 3 (See fig. 82).

GENERAL REFERENCE Titley (1982).

GEOLOGICAL ENVIRONMENT

Rock Types Tonalite to monzogranite stocks and breccia pipes intrusive *into* batholithic, volcanic, or sedimentary rocks.

Textures Intrusions contemporaneous with ore commonly are porphyrins with fine- to medium-grained aplitic groundmass. Porphyry texture may be restricted to small dikes in some deposits (Brenda).

Age Range Mainly Mesozoic to Tertiary, but can be any age.

Depositional Environment High-level intrusive porphyry contemporaneous with abundant dikes, faults, and breccia pipes. Cupolas of batholiths.

Tectonic Setting(s) Numerous faults in subduction-related volcanic plutonic arcs. Mainly along continental margins but also in oceanic convergent plate boundaries.

Associated Deposit Types Cu, Zn, or Fe skarns may be rich in gold, gold + base-metal sulfosalts in veins, gold placers. Volcanic-hosted massive replacement and polymetallic replacement.

DEPOSIT DESCRIPTION

Mineralogy Chalcopyrite + pyrite + molybdenite. Peripheral vein or replacement deposits with chalcopyrite + sphalerite + galena + gold. Outermost zone may have veins of Cu-Ag-Sb-sulfides, barite, and gold.

Texture/Structure Veinlets and disseminations or massive replacement of favorable country rocks.

Alteration Quartz + K-feldspar + biotite (chlorite) ± anhydrite (potassic alteration) grading outward to propylitic. Late white mica + clay (phyllic) alteration may form capping or outer zone or may affect the entire deposit. High-alumina alteration assemblages may be present in upper levels of the system (see table 3).

Ore Controls Ore grade is, in general, positively correlated with spacing of veinlets and mineralized fractures. Country rocks favorable for mineralization are calcareous sediments; diabase, tonalite, or diorite.

Weathering Intense leaching of surface; wide areas of iron oxide stain. Fractures coated with hematitic limonite. Supergene copper as chalcocite may form blanket below leached zone. Residual soils may contain anomalous amounts of rutile.

Geochemical Signature Cu+Mo+Ag+W±B±Sr center; Pb, Zn, Au, As, Sb, Se, Te, Mn, Co, Ba, and Rb in outer zone. Locally Bi and Sn form distal anomalies. High S in all zones. Ratio of Au (ppm): Mo (percent)<3. Magnetic 1ow.

EXAMPLES

Brenda, CNBC	(Soregaroli and Whitford, 1976)
Sierrita Esperanza, USAZ	(West and Aiken, 1982)

Model 21a--Con.

GRADE AND TONNAGE MODEL OF PORPHYRY

BY Donald A. Singer, Dennis P. Cox, and Dan L. Mosier

COMMENTS These deposits are a subset of porphyry Cu-Mo deposits for which a Cu, Mo and Au grade were available. See figs. 83-87.

DEPOSITS

Name	Country	Name	Country
Berg	CNBC	Inspiration	USNM
Bethlehem	CNBC	Lornex	CNBC
Brenda	CNBC	Morenci	USAZ
Gambier Island	CNBC	Ray	USAZ
Gaspe	CNQU	Sierrita-Esperanza	USAZ
Gibraltar	CNBC	Tyrone	USNM
Highmont	CNBC	Twin Buttes	USAZ
Huckleberry	CNBC	Valley Copper	CNBC

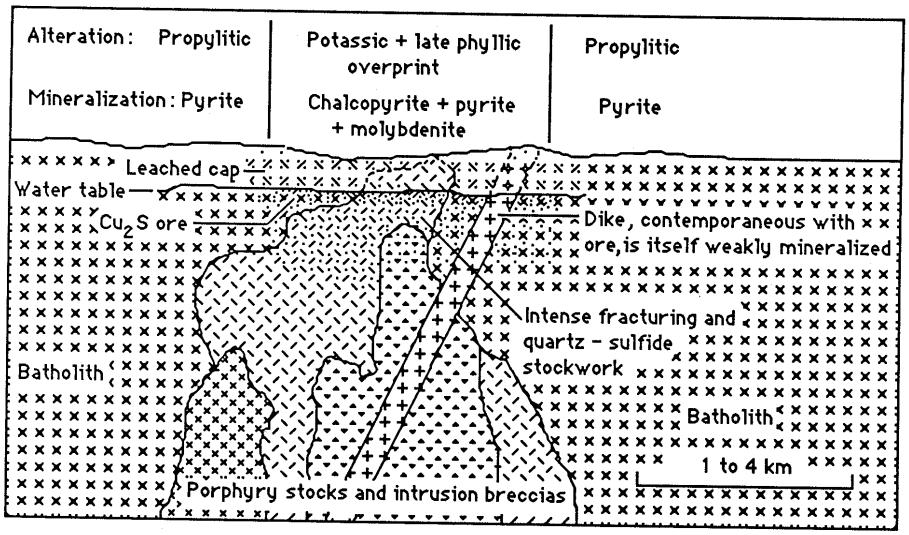

Figure 82. Cartoon cross section of porphyry Cu-Mo deposit showing relationship between mineral- and alteration-zoning and igneous intrusion.

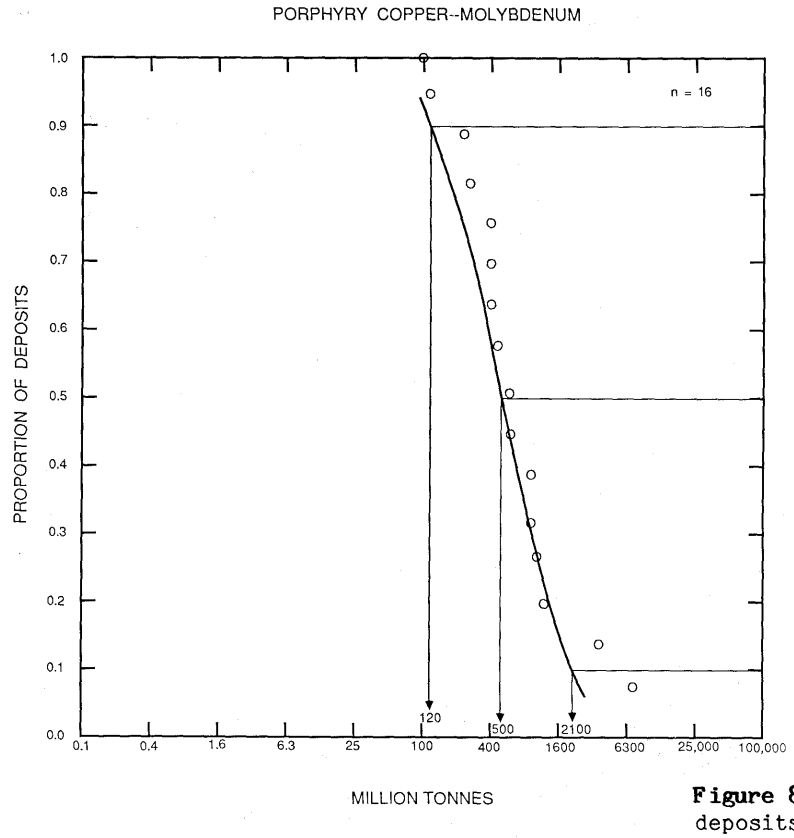

Figure 83. Tonnages of porphyry Cu-Mo deposits.

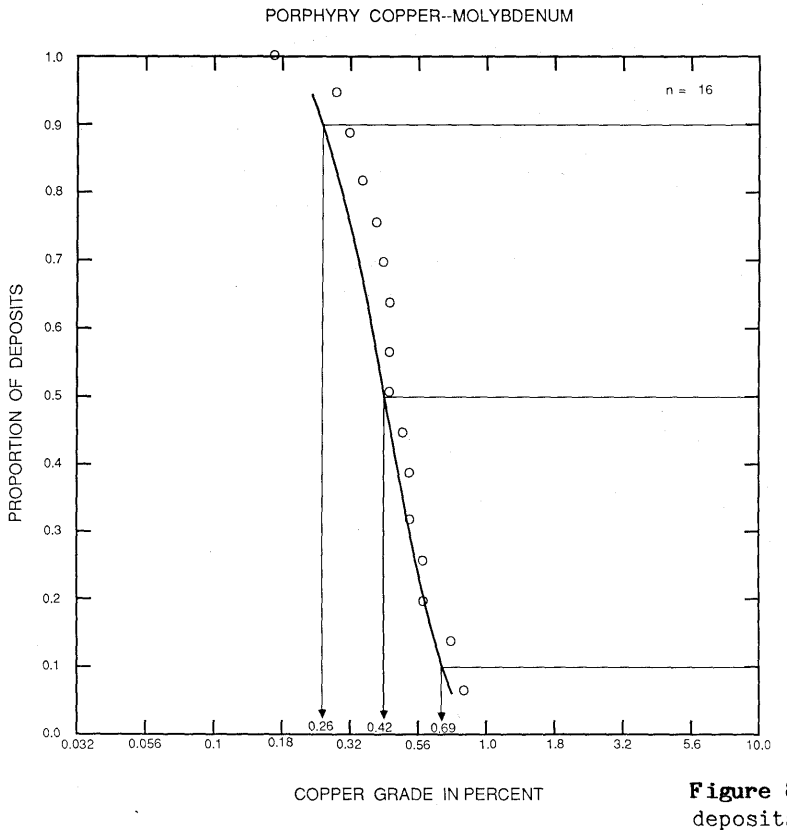

Figure 84. Copper grades of porphyry Cu-Mo deposits.

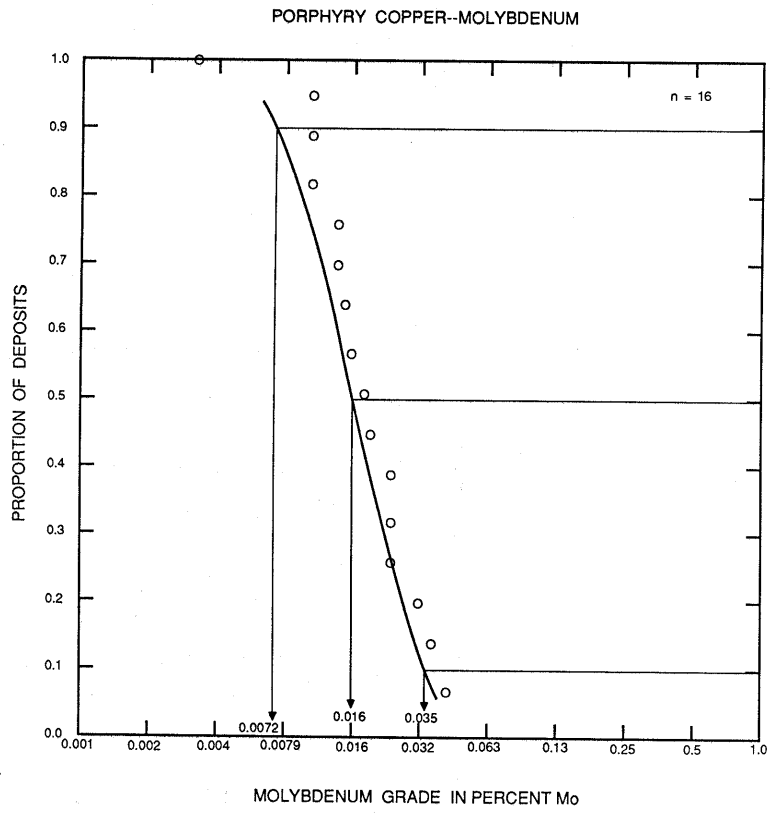

Figure 85. Molybdenum grades of porphyry Cu-Mo deposits.

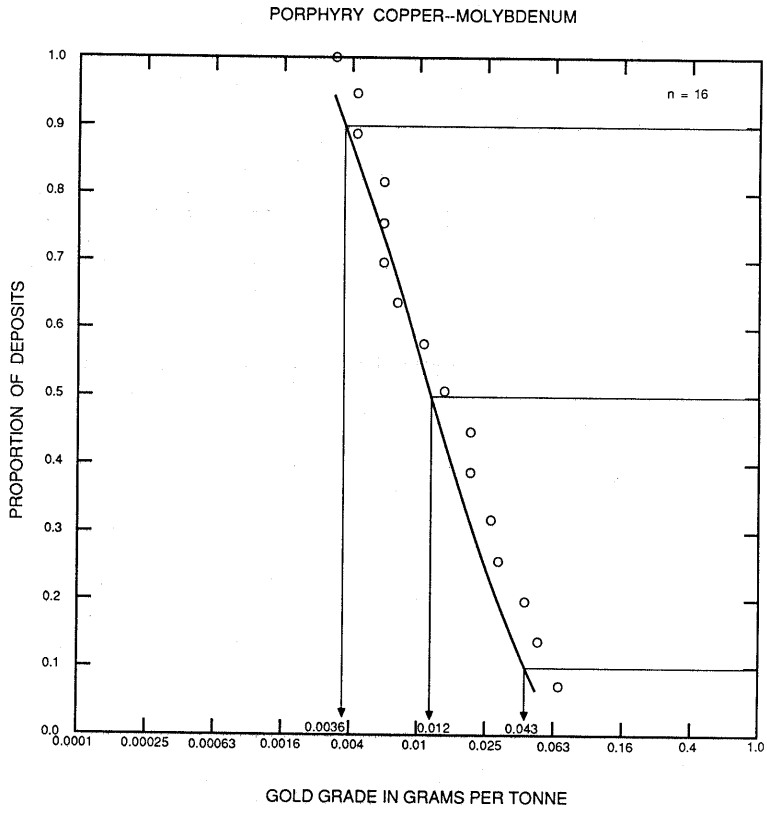

Figure 86. Gold grades of porphyry Cu-Mo deposits.

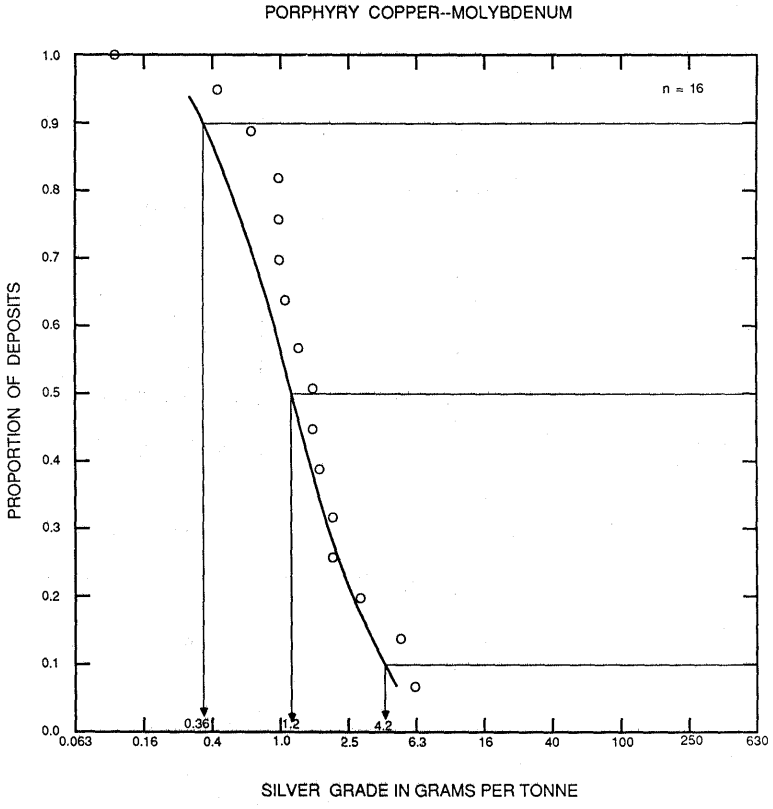

Figure 87. Silver grades of porphyry Cu-Mo deposits.