

Mineralization and Petrogenesis of the Pánuco Porphyry Copper, Coahuila, Mexico

Edith Fuentes,^{1*} Antoni Camprubí,¹ and Juan Carlos Escalante²

¹Universidad Nacional Autónoma de México, México City 04510

²Grupo Minero Pánuco, Monterrey, Nuevo León, México 66220

*E-mail, edithfuentesg@gmail.com

The study area is located in the central eastern portion of the state of Coahuila, within the Candela-Monclova intrusive belt. It is part of the Eastern Mexican Alkaline Province, which has a different metalliferous potential compared to the rest of Cenozoic metallogenic provinces in Mexico.

At Pánuco, the mineralized structures are veins and breccia pipes hosted by Paleocene intrusive rocks. These include andesitic porphyries, syenites, diorites, and granodiorites, andesitic dikes, pegmatites, and later felsic intrusives. Native copper mineralization was found in andesitic porphyries, whereas syenite, diorite, and granodiorite are chalcopyrite rich.

The emplacement of ore-bearing assemblages was controlled by high-angle faults and fractures that strike N55° to 75°E (dipping SE), which were reactivated after ore formation. Where these structures intersect N20°W striking faults locates the Pánuco breccia pipe. The paragenetic sequence can be divided into (1) magmatic, (2) hydrothermal, and (3) supergene associations. Hydrothermal associations consist of chalcopyrite, pyrite, sphalerite, bornite, molybdenite, magnetite, hematite, covellite, galena, quartz, plagioclase, potassium feldspar, calcite, epidote, chlorite, sericite, muscovite, pyroxene, biotite, actinolite, feldspathoid, titanite, rutile, apatite, and zircon. Supergene mineralization includes Fe oxyhydroxides, native copper, copper sulfates, and unidentified molybdates.

Intrusive rocks associated with porphyry Cu mineralization have calc-alkaline to alkaline affinities, and their general enrichment in LREE is typical for upper crust sources. Also, La/Yb vs. Yb compositions suggest adakitic affinities. Nd, Sr, and Pb isotope ratios ($^{143}\text{Nd}/^{144}\text{Nd} = 0.512744$ to 0.512905 , $^{87}\text{Sr}/^{86}\text{Sr} = 0.703819$ to 0.705070 , $^{206}\text{Pb}/^{204}\text{Pb} = 18.6844$ to 19.3825 , $^{207}\text{Pb}/^{204}\text{Pb} = 15.5807$ to 15.6432 , and $^{208}\text{Pb}/^{204}\text{Pb} = 38.4260$ to 39.1664) indicate dominantly continental crust sources for the ore-forming magmas.