

## **Hypogene and Exotic Copper Mineralization at the Mercedario Porphyry Copper Prospect, Central Andes, Argentina**

Alan Wilson\*

Antofagasta Minerals Australia Pty Ltd, PO Box 409, Cleveland, QLD 4163, Australia

\*E-mail, [awilson@aminerals.cl](mailto:awilson@aminerals.cl)

The Mercedario porphyry copper prospect is partially exposed between 4,800- and 6,000-m elevation on the eastern flank of Cerro Mercedario, San Juan province, Argentina. Located within the world-class, late Miocene to early Pliocene porphyry copper belt of central Chile-Argentina, this little explored prospect was discovered in the mid 1970s by Fabricaciones Militares (Argentine government exploration organization) during a regional drainage and rock chip sampling program. Due to extensive ice and moraine cover, exploration to date has been limited to surface geologic mapping, development of a 350-m-long exploration adit at an elevation of 4,850 m, and completion of a 162-m-long, horizontal drill hole from the end of the adit, attempting to target the center of the porphyry system.

Regionally, Mercedario lies within the Frontal Cordillera, a zone of Neogene thick-skinned contractional deformation, where the basement was uplifted to 6,770 m a.s.l at Cerro Mercedario as a consequence of deformation events that occurred at 19 to 16 and 8 to 5 Ma during progressive shallowing of the subducting Nazca plate. The volcanic basement to the Mercedario area is dacitic to rhyolitic lavas and pyroclastic rocks of the Permo-Triassic Choiyoi Group, into which a tonalite to quartz monzonite pluton of probable middle Miocene age was emplaced. Limited geologic mapping suggests this N-trending pluton is  $\sim 12 \times 3$  km in size, with the Mercedario prospect located at its southern end.

A concentric pattern of hydrothermal alteration typical of porphyry deposits was defined on the exposed, eastern flank of Cerro Mercedario. A central zone of biotite and K-feldspar-rich potassic alteration, approximately 1 km in diameter and centered on a quartz diorite porphyry stock, gives way easterly to a 500- to 1,000-m-wide zone of intense quartz-sericite-pyrite (QSP) alteration, which, in turn, transitions to propylitic alteration, extending up to 3 km from the potassic zone. Disseminated chalcopyrite and molybdenite, with minor bornite, occur with a well-developed stockwork of EB, A, and B veins. Pyrite-rich D veins are common within the QSP halo. Surface rock samples from the potassic-altered quartz diorite porphyry return grades of up to 0.4% Cu, 400 ppm Mo, and 0.6 g/t Au, while tunnel and drill core samples showed increasing copper grades from 300 ppm in the QSP zone to 0.2% to 0.5% Cu in the potassic zone. Dating of molybdenite conducted as part of this study returned an Re-Os age of  $11.67 \pm 0.05$  Ma, slightly younger than a previously published K-Ar age of  $13.0 \pm 0.3$  Ma for hydrothermal biotite from the Mercedario porphyry.

Supergene effects on copper mineralization are minor, as would be expected in an area still undergoing active glaciation. Nonetheless, minor supergene chalcocite locally replaced chalcopyrite, and superficially malachite- and azurite-stained cliffs and boulders are common in the prospect area. Approximately 3 km east of the porphyry system, runoff from a glacial moraine largely composed of material eroded from the contact zone between the QSP and potassic zones is actively depositing colloidal hydrous copper silicates as a cement to cobbles and pebbles in glacial river channels.