

# Metallogenic Features of the La Tapada and Tia Maria Porphyry Copper Deposits, Peru

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The Tía María and La Tapada porphyry deposits are located in the Coastal Cordillera of southern Peru. The geology of the region mainly comprises the coastal basal complex (granulites, migmatites, amphibolites, and granitic rocks) overlain by sedimentary rocks assigned to the Cabanillas Formation of Paleozoic age and volcanosedimentary rocks assigned to the Chocolate Formation of Early Jurassic age. These units are all cut by plutons and subvolcanic stocks of diorite, microdiorite, quartz monzonite, granodiorite, and tonalite belonging to the Middle Jurassic magmatic arc, to which the porphyry copper mineralization at La Tapada and Tía María is related.

Major and trace element geochemistry indicates that the Chocolate (190–170 Ma) and Río Grande (170–130 Ma) magmatic arcs have a tholeiitic affinity that evolved to potassic calc-alkaline compositions. The latter are related to the economic Fe oxide and Cu-Au-Co mineralization at the Tía María and La Tapada porphyry copper deposits. The petrography and geochemistry of the igneous rocks show that the plutonic and volcanic (basaltic andesite to andesite) rocks are intermediate to mafic in composition (5% alkalis).

The Jurassic to Early Cretaceous magmatic arc formed in an extensional setting characterized by NW-SE normal faults and basin formation; other faults are oriented northeast-southwest. These fault systems characterize the Coastal Cordillera from Ica and Marcona in the north to northern Chile and are closely related to economic copper deposits.

Copper shows primary dispersion patterns that are related to these fault systems. Major copper anomalies occur in premineral gneissic rocks, granites, and diorites. The mineralization is hosted by quartz veins containing copper and gold, along with specularite and magnetite; veins are mainly oriented northwest-southeast and east-west and range from 3 to 50 cm wide. Within the porphyry copper deposits, stockworks comprise A-type veinlets in association with biotite-quartz-magnetite-orthoclase alteration and D-type veinlets cutting chlorite-epidote-clay-calcite alteration.

Tía María is a characteristic porphyry copper deposit (0.25–0.68% CuT), containing appreciable gold (0.38 g/t). The Tía María deposit contains a reserve of 193 million tonnes averaging 0.302% Cu whereas the La Tapada reserve is 445 million tonnes at 0.434% Cu. Feasibility studies project a production of ~125,000 tonnes of copper cathodes per year.