

Breccia-hosted High-grade Cu-Au Zone, Valeriano Cu-Au-Mo Porphyry Deposit, Chile

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The Valeriano Cu-Au-Mo deposit is located in the northern extent of the El Indio belt in the Frontal Cordillera of Chile. ATEX Resources has completed its sixth drilling campaign in 2026. The deposit is associated with Miocene porphyry and biotite-hornblende granodiorite stocks, hosted by Permian volcanoclastics. A partly eroded lithocap of advanced argillic alteration outcrops up to ~4500 m elevation. The intrusion-hosted porphyry mineralization is overlain by an extensive polyphase, polymictic magmatic-hydrothermal inter-mineral breccia 1. The inter-mineral breccia 1 is overprinted by illite and chlorite-hematite with chalcopyrite-bornite-digenite ± covellite, enriching Cu-Au grades. The white mica overprint underwent a subsequent phase of brecciation (inter-mineral breccia 2) which was locally cemented by siderite plus high-grade Cu-sulfides and altered to high-crystallinity kaolinite. High Cu-Au grades hosted by inter-mineral breccia 2, discovered in 2025 (e.g., ATXD23A, 342 m of 1.05 wt% Cu, 0.47 g/t Au, 1.17 g/t Ag, and 272 g/t Mo, with anomalous Bi, Te and As), are associated with bornite, digenite, chalcocite, luzonite/enargite, covellite and Au-Ag bearing-tellurides; replacing bornite and chalcopyrite of the potassic and white mica stages. Equilibrium ΔS sulfate-sulfide pairs of anhydrite/gypsum and chalcopyrite/pyrite indicate the white mica high-grade overprint occurred between 285-375 °C, with fluid sulfate:sulfide ratio of ~1:1. The mineral assemblages, combined with Ti-in-quartz geothermometry indicate the kaolinite high-grade event formed at $250 \pm 50^\circ\text{C}$. Sulfur isotope data indicate that the high-grade Cu sulfides and siderite formed under less oxidized conditions (fluid sulfate:sulfide ratio as low as ~0.1) than the white mica overprint. Calculated $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ of the hydrothermal fluids from siderite indicate a dominantly magmatic source, consistent with $\delta^{34}\text{S}$. The siderite-cemented high-grade zone is atypical in porphyry deposits, particularly in its less oxidized nature. Similar high-grade zones may be expected to be identified during exploration in the underexplored areas of this portion of the Cordillera.