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Unidirectional Solidification Textures from Two Andean Intrusion-Related Cu-Au Prospects

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Unidirectional Solidification Textures (USTs) are rhythmic bands of magmatic quartz formed in felsic cupolas where there are over-pressured volatiles and fluids. Two Andean examples are Pijilí, a newly-discovered Oligocene calc-alkaline Cu-Au-(Mo) porphyry system close to the Miocene Chaucha deposit in southern Ecuador, and San Lorenzo, an intrusion-related Cu prospect located near La Serena in the Cretaceous Coastal Belt in Central Chile. At Pijilí, USTs were found in artisanal mining stopes and host the highest grades (> 1% Cu-eq). In San Lorenzo, USTs are associated with unmineralized monzodiorite cupolas.

USTs from Pijilí show a heterogranular rhythmic distribution of cm-scale contorted quartz- and feldspar-rich bands and atoll textures. Thin (<1 cm) sinuous-straight quartz veins overprint the USTs and represent the magmatic to hydrothermal transition. Chalcopyrite and pyrite mineralization is more abundant in quartz bands and veins. These textural observations suggest syn- and post-sulfide mineralization with respect to UST formation.

USTs from San Lorenzo are mainly defined by irregularly-stacked, heterogranular, sub-parallel, contorted multilayers of quartz, K-feldspar, and magnetite. Magnetite defines narrow bands hanging from quartz layers into K-feldspar-rich layers indicating oxidized magmatic conditions. Individual magnetite crystals are 1 to 2 mm in size and show oscillatory compositional zoning in terms of Ti and V. Sulfide mineralization while present in sheeted fracture zones, has not been detected in the UST samples from San Lorenzo.