

# SEG 2023 Conference: Resourcing the Green Transition

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## The Epithermal-Skarn Transition at the La Colorada Deposit, Chalchihuites District, Zacatecas, Mexico

Joshua Ebner<sup>1</sup>, Zhaoshan Chang<sup>1</sup>, Pedro Francisco<sup>1</sup>, Dante Juarez<sup>2</sup>, Patricio Perez<sup>2</sup>, Chris Emerson<sup>2</sup>, Shiqiang Huang<sup>1</sup>, Sidney Hemming<sup>3</sup>, Richard Wendlandt<sup>1</sup>

1. Colorado School of Mines, Golden, CO, USA, 2. Pan American Silver, Chalchihuites, ZAC, Mexico, 3. Columbia University, New York, NY, USA

The La Colorada deposit in the Chalchihuites District of Zacatecas, Mexico, features intermediate sulfidation epithermal (IS), carbonate replacement (CRD), skarn, and porphyry styles of mineralization. IS veins continue from volcanic rocks into underlying carbonates, with combined measured and indicated resources of 5.3 Mt including 33.8 Moz Ag, 26.2 koz Au, 0.04 Mt Pb, and 0.08 Mt Zn (6/30/2022). Drilling since 2018 by Pan American Silver has discovered a Zn-Pb-Ag CRD-skarn with porphyry Cu-Mo mineralization below the eastern part of the IS veins. With 95.9 Mt of indicated resources containing 94.4 Moz Ag, 1.2 Mt Pb, and 2.7 Mt Zn (06/30/2022), the La Colorada skarn has become a major asset for Pan American Silver. This study seeks to identify the relationship between IS and CRD-skarn mineralization to assess if the distal expression of a skarn can be IS veins when volcanic rocks are encountered. If found to be transitional, this study will also identify vectors in the epithermal environment that can lead to the related CRD-skarn.

IS veins in volcanic rocks are found to transition downward into CRD veins in carbonates with the same quartz-calcite-sulfide assemblage, but with more calcite. K-Ar illite geochronology indicates a preliminary age of ~63 Ma for the IS veins, statistically indistinguishable from the U-Pb zircon/garnet and Re-Os molybdenite ages for the skarn-porphyry causative intrusion and mineralization. Illite crystallinities (IC) of altered dacitic volcanic rocks next to major IS veins range from 1.9 to 0.6. Homogenization temperatures of fluid inclusions in sphalerite and quartz from volcanic-hosted IS veins and carbonate-hosted CRD veins range from 325°C to 234°C (14 samples in this study and eight samples from literature). The two data sets spatially overlap, and together indicate two hot centers below the eastern part of the IS veins and a third hot center to the NW.