

# Metallogenic model for porphyry systems in the Central Andes

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Porphyry ore deposits are characterized by pervasive hydrothermal overprint and their bulk rock chemistry allows only limited conclusions on their magmatic evolution. However, melt inclusions can largely preserve early information on the magmatic system and major- and trace-element microanalysis (electron, proton, and ion microprobe) allows important insight into the magmatic evolution of porphyry ore deposits.

Melt inclusions in quartz phenocrysts of Bolivian tin porphyry systems have a highly fractionated composition, distinctly different from the dacitic bulk-rock chemistry, and point to magma mixing in an upper crustal reservoir. Systematic enrichment/depletion trends of incompatible/compatible components are suggestive of fractional crystallization processes in a zoned magma chamber. The scatter distribution of very high copper (X 1000 ppm Cu) and silver abundances (10-100 ppm Ag) suggests early volatile input into apical melt portions from deeper levels of the magma chamber.

The roots of the Bolivian porphyries are geochemically similar to those of Chilean copper porphyry systems and are the source of early copper- and silver-rich magmatic vapor phases. Magmatic mixing of primitive basaltic to andesitic and highly evolved rhyolitic melt portions induced catastrophic volatile release and established the hybrid nature of the Bolivian tin-silver porphyry systems.