Unravelling the Nature and Origin of Complex Textures and Mineral Chemistry in a Polymetallic (Ag-Zn-Sn-In-Cd-Ge) Epithermal Vein System in the Andean Sn-Ag Belt: The Cortaderas Deposit of Northern Argentina

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Abstract

The Cortaderas Ag-Zn-Sn-rich epithermal vein system is a recently (2010) discovered addition to the currently active Pirquitas Mine in the Puna of northwestern Argentina. This Miocene-age mineralized centre defines the southern limit of the prolific Central Andean Sn-Ag belt, but its details and origin remain undefined. The Cortaderas deposit area contains a combined indicated and inferred resource of ~29.7 Moz of Ag, and ~729 Mlbs of Zn (as of 2012) with a cut-off grade 50 g/t Ag, as well as concentrations of Sn, In, Cd, and Ge. The Cortaderas vein system comprises ores of principally sphalerite, pyrite, arsenopyrite, Ag-Sn-As-Sb-sulfosalts, cassiterite, and galena concentrated in ESE-striking and steeply dipping vein-breccias cutting Ordovician turbiditic metasedimentary rocks. Mineral textures and chemistry suggest variable and often cyclical P-T-X conditions throughout the paragenesis which is exemplified by the extensive development of both colloform and dendritic sulfide textures; the latter suggesting rapid deposition likely facilitated by boiling and/or fluid mixing. Ag and Sn mineralization occur paragentically late as crusts on clasts and in veinlets cross-cutting massive sulfides. Pyrite is zoned with respect to As and Ag, and locally replaces bladed arsenopyrite. Sphalerite contains trace In, Cd, and Ge and is zoned with respect to Fe content. Although wall-rock alteration is generally absent, dickite ± kaolinite is locally abundant in veins and intergrown with late hypogene minerals. The Cortaderas deposit differs from the other vein systems at Pirquitas by having higher Zn/Ag ratios, less Pb and Sn, and spectacular and varied hydrothermal textures (e.g., colloform, dendritic, and cockade) which provide insight into the nature of ore formation. Study of the Cortaderas vein-breccias in the context of the larger hydrothermal center at Pirquitas will provide insight into the origin of the Sn-bearing polymetallic vein deposits in the Central Andean Sn-Ag belt.