



El Dorado Au-Cu deposit (La Serena, Chile): a preliminary mineralogical and geochemical study

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In the Coastal Range, at La Serena ($\approx 29^{\circ}47'S$ Lat., Chile), an extensive zone of hydrothermal alteration has developed over Upper Cretaceous andesites of the "Los Elquinos" formation. Associated with this quartz-illite-kaolinite alteration, there are quartz-sulfide veins of economic potential. The main minerals in the deposit are pyrite, chalcopyrite and fahlore, with electrum, sphalerite, galena, bournonite-seligmanite, marcasite, pyrrhotite being accessory phases. Gangue is dominated by coarse quartz with minor amounts of chemically zoned ankerite and fine-grained mica of fengite-illite composition. The potentially economic minerals are chalcopyrite and electrum. Electrum, with a fineness between 753 – 781, occurs interstitial to pyrite aggregates or in pyrite fractures. Pyrite commonly exhibits chemical zonation (patched or concentric), mainly As enrichment (up to 1.96 at. %). Co and Ni enrichment are more rare with concentrations below 0.1 at. %. It is notable that electrum grains are related only to chemically pure pyrite. EPMA analyses of pyrite do not show appreciable amounts of "invisible gold", even in the more As-rich zones. In addition, fahlore exhibits a complex concentric zonation with a composition from almost pure tetrahedite to tenantite, with low Ag contents (up to 0.44 at. %). Fluid inclusion microthermometry shows salinities between 1.6 and 6.9 eq% NaCl and Th between 130 and 352°C. These data are compatible with mixing processes. Isotope data in quartz and dolomite from the veins and phyllosilicates from the hydrothermal alteration suggests $\delta^{18}\text{O}$ and δD for the hydrothermal fluids could range between 3 to 10‰, and between -95

to -85%, respectively. These results suggest mineralizing fluids could be related to mixing of meteoric and magmatic waters. Our preliminary studies therefore suggest a meteoric-magmatic hydrothermal model, with characteristics, although not well established yet, consistent with a high and intermediate sulfidation epithermal deposit. Thus, we propose this Cu-Au association is related to well developed hydrothermal systems produced by the Eocene granodiorite-tonalite intrusions in Upper Cretaceous sequences. We highlight the economic potential of this area due to the extensive nature of the alteration zones and the presence of frequent Cu-Au-bearing veins. @