

Abstract ID: 80

**Title: GIANT HIGH SULPHIDATION DEPOSITS IN LATIN AMERICA:
SIMILARITIES AND DIFFERENCES**

Student: No

Topic: Economic Geology

Medium: Invited Oral Presentation

Author 1 (CONTACT AUTHOR)

Name: Craig McEwan

Org: Barrick Gold Corporation

Country: Chile

Keywords: High sulphidation epithermal, Latin America

Abstract: High sulphidation (HS) Au-Ag systems are widely distributed in volcanic arcs worldwide. Deposits range from structurally controlled and deeper seated examples to shallow host-rock or breccia controlled examples. HS deposits are important exploration targets due to their potential for large size and favourable metallurgy. The regional settings and characteristic local features of giant (>250 t Au) HS deposits are reviewed. Regionally, giant HS systems lie within calc-alkaline volcanic arcs, dominated by andesitic volcanism and form in the upper parts of Cu (Au, Mo) porphyry systems. Giant HS systems tend to cluster in longitudinally restricted segments of these volcanic arcs, which may be indicative of regional-scale Au favourability from inherited crustal scale anomalies. The giant HS deposits of northern Peru and the central Andes of Argentina and Chile are all mid-Miocene in age, and are inferred to have formed above flat or flattening subduction zones, and temporally coincident with compression and shortening. As with porphyry systems, the giant HS systems appear to be localized at intersections of crustal scale structures.

Locally, giant HS systems are associated with felsic subvolcanic or volcanic rocks often within igneous centres showing prolonged activity. They can be hosted either in volcanic rocks or in their basement, the latter case reflecting compression-driven uplift. The HS deposits lie within large volumes of advanced argillic alteration formed through the mixing of acidic magmatic vapours and groundwater above mineralised porphyry intrusives. Typically these advanced argillic alteration zones show characteristic zoning from proximal vuggy silica through advanced argillic assemblages containing alunite, pyrophyllite, dickite and kaolinite to distal argillic alteration. The central siliceous alteration zones are the main hosts to ore. The nature of the host rock can produce variations from these typical alteration assemblages and zoning patterns.

HS deposits comprise pyrite-rich sulphide mineralisation including high sulphidation-state minerals like enargite, luzonite and covellite. The giant systems comprise disseminated Au-Ag mineralisation often in mushroom-shaped ore bodies with narrower structural roots. Permeability contrasts between aquitards and permeable lithologies can be important controls on the distribution of Au. Additionally, breccias are usually abundant and host ore in some systems. Phreatomagmatic breccias are present in all giant HS deposits underlining the genetic connection with underlying porphyry systems.

Mineralisation can occur over vertical intervals of 100s of metres below the paleosurface,

from disseminated Au-Ag immediately below surficial steam-heated alteration to deeper structurally controlled Au-enargite at depth. Supergene oxidation, often to considerable depths in permeable silicified rock, generates oxide Au mineralization amenable to recovery by cyanide leaching.