Elemental associations in the Coeur Rochester Ag-Au mine, Nevada

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Low-grade disseminated and vein-type Ag-Au mineralization in the Coeur-Rochester mine in Nevada occurs within the Rochester Formation and the overlying Weaver Formation of the Koipato Group, and is currently being mined by open-pit methods. Silver ore occurs in quartz-K-feldspar-sericite-sulfide-sulfosalt veins which are localized in fissures formed during high-angle faulting [1]. Sulfide minerals are, in order of approximate abundance [1]: pyrite, sphalerite, argentian tetrahedrite, arsenopyrite, chalcopyrite, galena, covellite, chalcocite, stromeyerite, polybasite, pyrargyrite, acanthite, pyrrhotite, teallite, and owyheeite. Supergene oxidation of these minerals has produced chlorargyrite, embolite, native silver, chalcophanite, jarosite, melanterite, anglesite, manganese oxides, amorphous iron oxides, hematite, goethite, and chalcanthite.

We have analyzed 10-foot composite drill-core samples from three levels within the mine, as well as along three vertical drill holes. A total of 453 samples were analyzed for more than 32 elements, and the data were subjected to statistical analysis, including Pearson correlation coefficients, factor analysis, and multi-dimensional scaling. The high-field strength elements (HFSE) show the highest positive, inter-element correlations, and these also show moderate positive correlations with Al, K, Rb and Ba, suggesting a considerable degree of immobility of these elements. Gold and Ag were found to be most highly correlated with Sb, with weaker correlations with As, Cu, Hg, Pb and Mo.

Factor analysis reveals the existence of several elemental associations. The most robust of these associations are: 1) the protolith elements, Al_2O_3, K_2O, Ba, Hf, LREE, Rb, Sc, Ta, Th, Ti, ± Cs, ± middle REE (e.g., Eu); 2) the precious metal/pathfinder elements, Ag, Au, Cu, Pb, Sb, ± As, ± FeO; 3) Co, W, Zn, ± Cr; and 4) Lu, U, ± Tb. Factor 3 may be related to a supergene Fe-Mn oxide association, and factor 4 probably represents a U- and HREE-rich accessory phase. Although there are some important differences, multi-dimensional scaling, a technique which is not dependent on any assumptions regarding the distribution of the data, reveals generally similar elemental associations. The association of Ag, Au, Cu, Pb, Sb, and As probably reflects Ag and Au hosted primarily in the sulfosalt minerals and co-deposited electrum.

References

[1] Vikre P.G. (1981) *Econ. Geol.* **76**, 580-609.