Trace elements in the Copper Flat porphyry deposit, Hillsboro mining district, Sierra County, New Mexico

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Copper Flat deposit is a small porphyry copper deposit in the Hillsboro mining district, NM. Copper Flat has proven and probable reserves of 45.5Mt of ore at a reported grade of 0.45% Cu, 0.14g/t Au, 2.3 g/t Ag and 0.0015% Mo. The district consists of Cretaceous andesites surrounded by Paleozoic sedimentary rocks and Quaternary alluvial fan deposits. A quartz monzonite stock (74.93±0.66 Ma) with a breccia pipe is located in the center of the district and a series of latite dikes radiate outwards from the quartz monzonite. The quartz monzonite porphyry and the latite dikes are co-genetic. Replacement deposits, which occur near the porphyry deposit, are also genetically related to porphyry deposit.

The Copper Flat porphyry copper deposit consists of Cu, Au, Mo, and Ag disseminations and quartz veins in the breccia pipe. Propagating outward radially from the Copper Flat porphyry are Laramide veins hosted by many of the latite dikes. Chemical analyses range from 8-64,600 ppb Au, <0.2-590 ppm Ag, 40-57,337 ppm Cu, <1-475 ppm Mo, 57-8906 ppm Pb, and 138-17,026 ppm Zn. Carbonate-hosted replacement deposits are found distal from the center. Chemical analyses range from <5-99 ppb Au, 1-<50 ppm Ag, 131-173 ppm Cu, 2-140 ppm Mo, 30->10,000 ppm Pb, and 123->20,000 ppm Zn. As much as 130 ppm Te and 3400 ppm Bi also are found.

In this study, samples from the Hillsboro district were examined petrographically, and pyrite, chalcopyrite and molybdenite were identified. Samples were then examined by electron microprobe in order to determine the distribution of elements of economic interest. Initial investigation involved qualitative geochemical analysis using wavelength-dispersive scans and chemical maps of 1.5x1.5 cm areas to identify particles with high concentrations of Au, Ag, and Mo. No discrete particles containing Au or Ag were identified, suggesting that either that these elements are present at lower concentrations in other minerals or that particles containing these elements are present at low enough concentrations that they were not present in the scanned area. Following qualitative investigation, quantitative analysis for trace elements was carried out, using long count times in order to obtain detection limits below 100 ppm. The results show detectable Au, Ag, Mo, but Te, Se, Cd, Bi are not detected.

Keywords:
geochemistry, trace elements, copper, igneous rocks, gold, silver, economic geology, metals, quartz monzonite, granitic rocks, petrography, electron microprobe studies, mineralization