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GEOLOGY
and
TRACE ELEMENT GEOCHEMISTRY
of a part of the
GUNNISON GOLD BELT, COLORADO

by

Peter A. Drobeck

1979

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SUBMITTAL SHEET

A thesis submitted to the Faculty and the Board of Trustees of the Colorado School of Mines in partial fulfillment of the requirements for the degree of Master of Science; Geology.

Golden, Colorado

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ABSTRACT

The Gunnison Gold Belt, in Gunnison and Saguache Counties, Colorado, is a series of precious and base metal deposits that lie within a Proterozoic terrane here termed the Dubois volcano-tectonic belt. The Dubois consists of immature greywacke siltstone and sandstone, mafic to felsic pyroclastic and flow volcanic rocks, and syntectonic granites which have been metamorphosed to lower amphibolite facies. Within the metasedimentary and metavolcanic rocks are base metal massive sulfide deposits consisting chiefly of sphalerite and pyrite, lesser amounts of chalcopyrite, and traces of pyrrhotite and galena. There is also evidence that one area (Vulcan mine) has been subjected to a mid or late Tertiary hydrothermal event which overprinted earlier syngenetic mineralization. Two of the massive sulfide deposits are in metavolcanic rocks and have exhalative carbonate and calcite alteration associated with them. A deposit in metasedimentary rocks has potassic alteration in the footwall. The alteration at the Vulcan mine is chloritic and sericitic and distinctly different from the other alterations.

Lithogeochemical samples from selected areas in the belt were analyzed for Cu, Pb, Zn, Ag, Au, Se, and Te using a new leach and partial extraction method that measures concentrations of these elements not in silicates. The work shows that copper forms a footwall enrichment in the syngenetic massive

sulfides studied and that zinc and lead are concentrated at the most intensely mineralized horizon, inferred to be the seawater interface at the time of mineralization. Silver and gold are also concentrated at this horizon, but selenium and tellurium have irregular spatial distributions. The pattern is very similar to that for syngenetic seafloor-fumarolic volcanogenic massive sulfides worldwide. The elements selenium and tellurium can be used to distinguish between the syngenetic and epigenetic styles of mineralization in that Te is highly enriched relative to Se in the epigenetic deposit but not nearly so in the syngenetic deposits. Te also forms a distinct regional halo in the vicinity of the epigenetic deposit. The elements Cu, Zn, Se, and Te are the most useful of those studied for mineral exploration in this belt.

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