GEOCHEMICAL ASSOCIATIONS AND ALTERATION HALOS OF TUNGSTEN AND COPPER SKARNS IN THE RAILROAD MINING DISTRICT, NEVADA

by

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Zoned garnet-pyroxene skarns at Railroad surround weakly-altered quartz monzonite. The skarns and pluton predate mid-Oligocene rhyolitic porphyries and Ag-Pb-Zn-Cu replacement ores. A metasomatic aureole extends 1000 feet above the tungsten-bearing Grey Eagle exoskarn. An upper zone of $Si\text{-}Fe^{+3}$ -B-F-Cu metasomatism in limey dolomite includes diopside-andradite veins with associated magnesium borates. In the deep zone diopside-andradite veins with sparse scheelite cut calcite-brucite marble. Significant tungsten, as yellow-fluorescing scheelite (3-25 mole % Mo) is confined to the sulfide-poor, Grey Eagle brown garnet-pyroxene zone. Blue-fluorescing scheelite ($<$ 3 mole % Mo) is found in late, sulfide-rich veins and skarn. The Delmas skarn, mined for Cu-Ag, is stratigraphically and structurally higher than and petrographically distinct from the Grey Eagle skarn. The Delmas skarn is characterized by its abundance of sulfides and green andradite garnet. Sulfides are later than the silicates, with sphalerite concentrated in the hedenbergite zone and bornite only in the green garnet zone. Oxygen fugacity, buffered initially by the original sediments and magma, subsequently by the skarn silicates, and finally by the sulfide-bearing hydrothermal fluids, was a critical control on localization of the ore minerals. Contrasts between the Delmas and Grey Eagle exoskarns and between the shallow and deep zones of the Grey Eagle aureole mimic major differences between copper and tungsten skarns. As Cu-B and W-Mo-F associations are not commonly found in the same geological environment, the unusual polymetallic mineralization at Railroad may reflect high boron and fluorine contents in the melt.