

The Onaman Prospect, Ontario: An Unusual Occurrence of Cu-bearing Au Mineralization in a Shear Zone

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Abstract

The Onaman prospect is an unusual example of mesothermal gold mineralization in which native gold, electrum, and minor chalcopyrite are disseminated in metavolcaniclastic rocks in shear zones or concentrated in felsite dikes that intrude the metavolcaniclastic rocks. Mineralization was contemporaneous with carbonatization and involved early replacement of iron-bearing minerals in the wall rock by ankerite and pyrite and later replacement of pyrite by arsenopyrite, pyrrhotite, chalcopyrite, electrum, and native gold. Oxygen isotope ratios of ankerite suggest a metamorphic origin for the fluid, and carbon isotope ratios are similar to those of large mesothermal gold deposits in the Superior province for which a mantle origin has been proposed. Sulfur isotope ratios correlate positively with gold grades and may reflect decreasing f_{O_2} during mineralization.

A model is proposed in which deformation of the volcanic pile led to the formation of a shear zone and created dilational zones allowing dike intrusion. Metamorphic fluids rose along the shear zones and the dikes. Pyritization of the host rock was the major control on gold and chalcopyrite deposition, reducing a_{H_2S} and destabilizing the bisulfide complexes of Au and Cu. The Onaman occurrences provide an uncommon example of a mesothermal system in which pH was relatively low, and the correspondingly low solubility of copper allowed the fluid to saturate with and deposit chalcopyrite. In most other mesothermal gold systems, copper is too soluble to saturate the fluid with a copper mineral and is therefore flushed through the system.

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