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FIRST OCCURRENCE OF ILVAITE IN A GOLD SKARN DEPOSIT

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Abstract

Ilvaite occurs in the Fortitude Au skarn deposit, Nevada, the first reported occurrence in a Au skarn deposit. Ilvaite is a mixed-valence calcium and iron silicate known previously as a relatively rare mineral in some Zn(Pb), Fe, and Sn skarns. At Fortitude, ilvaite is present as resinous, black grains with quartz, ferroactinolite, and sulfides (pyrrhotite-arsenopyrite-bismuthinite). It also occurs as a late-phase replacing prograde pyroxene ($Hd_{91–96}$ $Jo_{3–5}$) in magnetite-rich exoskarn near the skarn-marble contact and replacing calcite grains at the marble front.

Electron microprobe analyses show that the ilvaite from the Fortitude Au-skarn is similar in composition to ilvaite from Fe skarns. Both have high iron and low manganese relative to Zn skarns. The high iron content in ilvaite from Fe and Au skarns is consistent with the high-Fe activities and low-f_{O_2} conditions that characterize both skarn types and their associated intrusions. Similarly, the ilvaite from Zn skarns reflects the Mn-rich mineralogy of these deposits. Ilvaite from one Sn skarn occurrence has higher Al_2O_3 and TiO_2 and lower MnO and Fe^{+3} than ilvaite from the other skarn types and FeO totals intermediate between ilvaite from Zn and Fe-Au skarns. The Al_2O_3 and TiO_2 content of ilvaite appears to be inversely proportional to that of the associated intrusions. Although it is a rare mineral in most skarns, these observations suggest that the occurrence and composition of ilvaite can be used to discriminate among different skarn deposit types and to provide information about the geological and geochemical environment of formation.