

Ore textures and pyrite chemistry of the metamorphosed Haile epithermal deposit, South Carolina

ROBERT K. AMISSAH¹ AND STEFANIE M BRUECKNER²

¹University of Manitoba

²Laurentian University

Presenting Author: amissahr@myumanitoba.ca

The low-sulfidation Haile epithermal deposit located 5 km northeast of Kershaw, SC, forms regionally as part of the Piedmont province of the southern Appalachians. The deposit is hosted within the NE-SW trending, extensively deformed, greenschist metamorphosed Carolina Slate Belt (CSB). Complex geologic events in the CBS has led to serious debates on sources of mineralization in the area. The primary host for mineralization at Haile are Cambrian metavolcanic rocks of the Persimmon Fork Formation with total mineral reserves (gold and silver) estimated at 45.4 Mt with 2.6 Moz Au @ 1.8 g/t and 3.2 Moz Ag @ 2.2 g/t. To constrain the impact of metamorphism and deformation on the Haile deposit, detailed mineralogical, textural and chemical investigations were conducted on the ore phases at Haile.

Micro-analytical studies on pyrite from different ore zones at Haile show pyrite is the major sulfide phase with minor sphalerite, arsenopyrite, galena, chalcopyrite, and pyrrhotite. Three different generations of pyrite have been identified: (1) earlier stage, very fine – medium grained idiomorphic to subhedral pyrite (Py₁) that is concordant with foliation F₂; (2) later medium grain sized pyrite (Py_{2a}) that has a spongy, inclusion rich texture and; (3) latest, coarse, euhedral recrystallized pyrite (Py_{2b}) that usually forms around Py_{2a} and inclusion-free. Electron microprobe analyses of all pyrite generations are relatively homogenous and range from 44.18 wt.% to 47.05 w% and 52.22 wt.% and 55.13 wt.% for Fe and S, respectively. Py_{2a} can have elevated As concentrations up to 2.41 w%. Gold occurs as native gold and with Ag ± Pb tellurides as inclusion in coarse Py_{2a} and interstitially between Py_{2b}, respectively. Native gold has 89.36 wt.% ± 1.56 wt.% and 9.16 ± 1.41 wt.% Ag and concentrations.

The association of gold either as native gold or tellurides, with recrystallized Py₂ as inclusions, along cracks in interstices indicates that Au deposition occurred syngentially with base metal emplacement in the Neo-Proterozoic. However, greenschist metamorphism and deformation, mostly occurring during the Ordovician Taconian orogeny resulted in dynamic recrystallization of pyrite forming Py₂ and coeval liberation followed by remobilization of gold and tellurides.