

The Paleoproterozoic Lalor Auriferous VMS Deposit, Snow Lake, Manitoba: an Update on the Geology and Geochemistry of the Host Rocks and Hydrothermal Alteration Zones

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Abstract

Lalor is a recently discovered Au-Zn-rich volcanogenic massive sulphide (VMS) deposit located in the Paleoproterozoic Snow Lake arc assemblage in northern Manitoba. The Snow Lake camp is host to numerous past producing Cu-Zn, Zn-Cu and Au-Zn-Cu VMS deposits. Lalor is the largest VMS deposit of the Snow Lake camp with reserves of 15.1 Mt at 7.2% Zn, 0.6% Cu, 1.9 g/t Au and 23.3 g/t Ag and resources of 12 Mt at 2.6% Zn, 0.9% Cu, 4.0 g/t Au and 27.8 g/t Ag. The major gold endowment (approximately 2.6 Moz Au) and the unique geologic characteristics of the Lalor deposit represent an ideal case to document and better understand gold enrichment processes in the VMS environment. The deposit consists of highly-strained, stacked massive to semi-massive Zn-Cu±Au, Au-Cu and Au zones that are hosted in highly altered volcanic and intrusive rocks. Most primary features in the footwall succession were obliterated by superimposed hydrothermal and tectonometamorphic events. However, using mineral assemblages, extensive whole-rock, isotopic and mineral geochemistry accompanied with detailed structural analysis of sections and underground maps, it is possible to precisely map the lithological units and the nature and distribution of hydrothermal alteration zones. This should allow for a well-constrained 3D representation the deposit's current and primary architecture. Preliminary results indicate that several distinct mafic to felsic units of tholeiitic to calc-alkaline affinities are present in the host succession. These units were subjected to multiphase hydrothermal events responsible for the complexity of the zoned Mg-, Fe-, K- and Ca-bearing hydrothermal alterations and later Ca metasomatism.