The Mineralogical and Geochemical Analysis of The Cigar Lake Shear Zone, Northwestern Ontario, Canada

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Abstract

A combination of field mapping, petrographic and geochemical data was used to create a lithogeochemical map of a representative section of the Cigar Lake Shear Zone. The Cigar Lake Shear Zone shows evidence of hydrothermal alteration, local sulphide mineralization and is of potential exploration interest because of its close proximity to the Musselwhite Gold Mine. The Musselwhite Mine represents a banded-iron formation gold deposit hosted in amphibolite facies rocks that is located on the southern shore of the Opapimiskan Lake in northwestern Ontario. The ultramafic to mafic metavolcanic rocks found within the Cigar Lake Shear Zone are situated within the highly deformed Opapimiskan-Markop metavolcanic suite of Archean age (U-Pb age of ~2716Ma), and are a part of the North Caribou greenstone belt. Using geographic information systems (GIS) a lithogeochemical map was produced using spatially oriented whole-rock geochemical data. The lithogeochemical map helps distinguish the distribution of the major lithologies within the Cigar Lake Shear Zone, and geological factors and features that are likely to have controlled the distribution of hydrothermal fluid activity and sulphide mineralization, regardless of the intensity of deformation and/or metamorphism. Electron microprobe analysis and optical microscopy have provided mineral-chemical data to help establish the composition of the major rock types and mineral assemblages typically associated with hydrothermal alteration. The findings so far have revealed the presence of komatiitic rocks (showing relict olivine) and tholeiitic basalts within the representative section of the Cigar Lake Shear Zone. Evidence supporting hydrothermal alteration includes the presence of sulphide mineralization, varying degrees of quartz veining, and characteristic hydrothermal alteration minerals such as prehnite, chlorite, serpentine, calcite, and talc.