Testing Chlorite Geochemistry as a Vector to Mineralization: A Case Study from the LaRonde Penna Deposit

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Site Background

The Au-rich LaRonde Penna Volcanogenic Massive Sulphide (VMS) deposit is located in the Abitibi Greenstone Belt (2703-2964 MA) of Northern Ontario and Quebec. It is contained within the Hebecourt and Bousquet formations of the Blake River Group. These formations consist of tholeiitic mafic rocks, including basalt and gabbro sills, and calc-alkaline rocks, which have undergone two distinct metamorphic events. The first consisted of prograde metamorphism to upper greenschist-lower amphibolite facies, and the second consisted of retrograde metamorphism to greenschist facies.

Method and Expected Outcome

Chlorites in VMS deposits have been found to have a series of indicator elements that distinguish them from chlorites formed in metamorphic systems. Element ratios from VMS chlorites have shown them to be depleted in Al, Fe, and Li and enriched in Ca, Sr, and Si in comparison to their metamorphic counterparts. Metamorphic chlorite has been found to possess discriminatory element ratios including enriched Ti ratios and depleted Mg, Zn, Sb, As, Ag, and U ratios. While these elements can point to a metamorphic formation environment, they are not as reliably indicative of origin as in chlorites from VMS deposits. This study investigates chlorite using petrographic and electron microprobe analysis to determine the indicator element ratio of chlorite from the LaRonde Penna Deposit. The major and minor element ratios of chlorite were compared to literature values to determine if they were applicable to this deposit. This study is a pilot study to test the potential of chlorite chemistry as a vector to the mineralization lenses in the LaRonde Penna deposit. Before this technique could be applied on an industrial scale, it would have to be further tested on cores from a greater range around the deposit.