

2014 GSA Annual Meeting in Vancouver, British Columbia (19–22 October 2014)

Paper No. 114-3

Presentation Time: 9:00 AM-6:30 PM

U-PB GEOCHRONOLOGY AND HF ISOTOPE COMPOSITION OF ZIRCON FROM THE WOLVERINE POLYMETALLIC VOLCANIC HOSTED MASS SULFIDE DEPOSIT, YUKON, CANADA

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The Wolverine polymetallic volcanic hosted mass sulfide deposit (VHMS), located in the Finlayson Lake District, Yukon, Canada, contains 6,237,000 tonnes of precious metals that includes 12.66% Zn, 1.33% Cu, 1.55% Pb, 370.9 g/t Ag, and 1.76 g/t Au. The deposit is preferentially associated with ~352 Ma quartz-feldspar porphyry (QFP) and ~347 Ma feldspar porphyry (FP) intrusions, that underlie the massive sulfide lens. Whole rock geochemical data, and in particular REE and HFSE illustrate the FP suite contains higher HFSE and REE and higher Nb/Ta ratios relative to the QFP suite. These have been interpreted to represent varying crustal and mantle contributions within an evolving Mississippian continental back-arc basin. New in situ LA-Q-ICPMS U–Pb and LA-MC-ICPMS Lu–Hf isotopic data from zircon from the two porphyries suggests the presence of a deep crustal source. Inherited zircon cores identified in both the QFP and FP suite have ages ranging between 1.0 Ga to 2.0 Ga. The Lu–Hf analyses, that were done directly on top of the U–Pb analyses in the zircon grains, in the QFP averaged an ϵ_{Hf} value of -12.4, compared to the FP which have an average ϵ_{Hf} value of -6.7. These inherited zircon cores were either derived locally from recycled basement sources that have Neoproterozoic crust, and/or regionally with material from the Wopmay Orogen to Paleoproterozoic ages from the North American cratonic basement; which could make up the underlying basement rock of the Finlayson Lake District. The zircon Hf data for both porphyries have negative ϵ_{Hf} values indicating a crustal source, but with the FP containing a higher ϵ_{Hf} value suggesting a greater interaction with the mantle when comparing it to the QFP. This supports the evolving back-arc basin model for the Finlayson Lake District, with the regional extensional tectonics generating mafic magma at the base of the crust. This mantle driven heat would have melted the overlying crust, generating first the QFP, which were derived predominantly from crustal sources and had more negative ϵ_{Hf} . With continued basin opening, mantle upwelling, and crust-mantle mixing, there was a decrease in the amount of crustal material and an increased mantle component leading to a higher ϵ_{Hf} in the FP suite. These results are consistent with mantle heat and basaltic upwelling being important in the generation of VMS.

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Session No. 114--Booth# 3

[Recent Advances in Economic Geology \(Posters\)](#)

Vancouver Convention Center-West: Exhibition Hall C

9:00 AM-6:30 PM, Monday, 20 October 2014

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