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Relationship of Fluid Inclusion Geochemistry to Wall-Rock Alteration and Lithogeochemical Zonation at the Hollinger-McIntyre Gold Deposit, Porcupine District, Canada

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Gas chromatographic analyses of fluid inclusions in quartz-carbonate veins from the Hollinger-McIntyre gold deposit indicate that the mineralizing fluid was a H_2O-CO_2 mixture. Locally, CH_4-rich fluid inclusions are associated with veins that occur in graphitic and/or carbonaceous wall rocks. Fluid inclusions in ore-bearing veins have higher CO_2 contents than those in non-ore veins. Extensive sampling and analyses of veins from a 1×2 km area surrounding the deposit reveals a well developed zonation of CO_2 contents about the main zone of mineralization. Low CO_2 levels (1–2 mole%) in veins are peripheral to the deposit and increase to over 12 mole % in mineralized zones.

Wall-rock alteration patterns are also well developed around the ore zone. Carbonate alteration assemblages in the mafic metavolcanic host rocks, proceeding inward from background greenschist facies rocks to alteration envelopes enclosing individual veins, consist of: (1) quartz-albite-chlorite-epidote-actinolite-(calcite); to (2) quartz-albite-chlorite-calcite-epidote to (3) quartz-albite-chlorite-ankerite; and to (4) quartz-albite-ankerite-sericite. These assemblages resulted from the addition of CO_2 to the wall rock, which is consistent with the observed zoning of CO_2 in the fluid inclusions. Lithogeochemical zoning is observed as variations in whole-rock abundances of As, Au, Ba, Rb, and Sb. The most useful zoning patterns are provided by As and Ba, which outline individual ore zones as well as broader trends of mineralization.

The results of this study indicate that fluid-inclusion gas haloes are at least as large as the broadest elemental haloes that surround the Hollinger-McIntyre deposit. Gas haloes such as these should be useful in evaluating areas with scattered outcrops containing veins of unknown potential, particularly in view of the fact that the gas content of the inclusions will be much more homogeneously distributed throughout the veins than will be Au values.

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