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Foreword/Context

The Targeted Geoscience Initiative (TGI) is a Government of Canada led, collaborative geoscience research program directed towards providing next generation knowledge and methods that will facilitate more effective targeting of mineral deposits. The objective of the program is to improve the effectiveness of exploration for Canada's major mineral systems by resolving foundational geoscience problems to constrain the geological processes that liberate metals from their source region, transport ore metals and control their eventual deposition (Mercier-Langevin and Kirkwood, 2024).

The Targeted Geoscience Initiative is a major and long-standing research program by Natural Resources Canada to conduct collaborative, multidisciplinary, thematic, and knowledge-driven ore systems studies aimed at assisting in the discovery of future resources through more effective targeting of buried mineral deposits in Canada's established and emerging mining camps. Most of Canada's major ore systems were studied through phases 1 to 5 of the program and are still being studied through the current phase 6, including a major project on lode gold deposits. Research on gold through TGI comprised numerous site-specific and thematic research activities, covered the entire spectrum of crustal settings for lode gold deposits, including intrusion-related deposits that are formed at shallow crustal levels (~2–5 km) (e.g., Dubé et al., 2015; Mercier-Langevin et al., 2020).

The Doyon deposit study started through the first phase of TGI (TGI-1: 2000-2003) and continued through phase 6 (2020-current) (Galley et al., in prep.), with major phases of sampling in 2000-2002 (Galley and Lafrance, 2007, 2014; Galley and Dubé, 2014) and then in 2008-2012 (data reported in this contribution).

Summary

This report releases 143 whole-rock geochemical and assay results from the gold-bearing mineralized zones 1 and 2 of the Doyon Au(-Cu) deposit, situated in the western part of the Doyon-Bousquet-LaRonde mining camp, Abitibi greenstone belt, Québec, Canada. The deposit and its host rocks have been studied in the past and results were published in papers, government reports and theses (e.g., Filion et al., 1977; Guha et al., 1982; Gaudreau, 1986; Savoie, 1990; Savoie et al., 1986, 1991; Gosselin, 1998; Lafrance et al., 2003; Galley and Dubé, 2014; Galley and Lafrance, 2007, 2014; Mercier-Langevin et al., 2007; McNicoll et al., 2014; Neyedley et al., 2021a, b). Samples were collected during the 2008 and 2010 field seasons and the analyses were done in 2008, 2009 and 2012. The geochemical data is presented in a format easily importable in a geographic information system (GIS). Samples were collected from archive (1970s and 1980s), splitted half drill core. Interpretation of the results are presented in Galley et al. (in preparation). Sample information and geochemical results are presented in Appendices 1 and 2 (worksheet "Results") respectively. The results worksheet combines four laboratory reports produced between 2008 and 2012 (A08-4656, A08-7790, A09-7163, and A12-03934).

Analytical Methods

Whole-rock analyses were performed at Activation Laboratories Ltd. in Ancaster, Ontario, using a combination of their standard preparation and analytical packages, the details of which can be found at https://actlabs.com/geochemistry/lithogeochemistry-and-whole-rock-analyis. Methods and detection limits are reported for oxides and elements in Appendix 2-worksheet "DetectionLimit".

Samples were initially dried (60°C) and crushed to at least 90% (<2mm) in a steel jaw crusher. A mechanically split fraction was pulverized in a chromium-free steel mill until 95% of the sample material passed through a 74 µm mesh. Major elements were determined by lithium metaborate-tetraborate fusion followed by inductively coupled plasma mass spectrometry (ICP-MS). Trace and rare earth elements were determined by a combination of lithium metaborate-tetraborate and total digestion (four acids) followed by inductively coupled plasma mass spectrometry (ICP-MS) and inductively coupled plasma atomic emission spectrometry (ICP-ES). FeO was determined by titration using a cold acid digestion (ammonium metavanadate and hydrofluoric acid) in an open system. CO_2 and Total (S) were determined by combustion infrared analysis.

For chalcophile elements a four-acid digestion ICP-MS method was preferred. Aqua regia digestion coupled with ICP-MS was chosen to analyze As, Sb, Bi, Se and Te.

Boron was determined by gamma neutron activation analysis. Gold and silver were measured by a combination of atomic absorption, fire assay, and gravimetry. High-grade ore zone samples were re-analyzed with a combination of fire assay and gravimetric methods for gold and silver and aqua regia dissolution or sodium peroxide fusion with ICP-ES depending on the analyte.

Fluorine was determined by lithium metaborate and tetraborate fusion and fluoride ion electrode analysis. Chlorine was determined by instrumental neutron activation analysis. Mercury was determined by cold vapour flow injection following aqua regia digestion.

Actlabs reports LOI, LOI2, Total and Total 2. LOI is determined by weighing a small amount of the sample before and after ignition. However, because FeO was measured, it was possible to adjust LOI to take into account the weight gain resulting from oxidation of FeO to Fe_2O_3. This adjusted value of LOI is LOI2. Total1 is the total of all major oxides using $Fe_2O_{3(T)}$ and LOI, whereas Total2 includes LOI2.

Quality assurance and quality control (QA/QC)

Activation Laboratories internal QA/QC system under ISO 17025 or ISO 9001:2008 accreditation, quality control materials (certified standards and duplicates and Blanks) are reported in Appendix 2 in worksheets “Lab_Standards”, “Lab_Duplicates” and “Lab_Blanks”. In addition to these laboratory quality control measures, blind internal standards were also included to monitor analytical reliability.

Precision estimated from internal standards and duplicates are within 2 standard deviation (2σ) of the mean standard value Blank sample analyses show minimal contamination between samples.

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