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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.

Through TGI5 (2015-2020), five of Canada's major ore systems were studied, including an important project on gold. Two complementary research themes define the *Gold project*: 1) system controls on gold through space and time (source to trap); and 2) tectonic influences on gold (tectonic drivers and conduits). These two subprojects are divided into a series of thematic and/or regional activities in many of the gold-bearing Canadian geological provinces (Mercier-Langevin et al., 2017a).

Summary

This report releases 576 runs of whole-rock geochemical and assay results of 574 samples from the gold-bearing mineralized zones of the Amaruq orogenic gold deposit (Kivalliq, Nunavut, Canada). Most samples were collected during the 2016, 2017 and 2018 field seasons as part of a PhD study by the senior author (Valette, 2018) at the Université du Québec à Montréal. Some samples collected prior to the senior author study were provided by P. Mercier-Langevin. Analytical results from previous work done at the GSC is also included in this open file. Research on gold-bearing mineralized zones of the Amaruq deposit was conducted under the *Gold project* under the *System Controls on Gold Through Space and Time (source to trap)* theme. The geochemical data is presented in a format easily importable in a geographic information system (GIS). Samples were collected from drill core, outcrops and mine workings to document host units, the alteration zones, and the ore. Preliminary interpretations of the deposit are presented in Grondin LeBlanc et al. (2017), Lauzon et al. (2017, 2020), Mercier-Langevin et al. (2017b, 2018), and Valette et al. (2017, 2018, 2019, 2020). Sample information and geochemical results are presented in Appendices 1 and 2 (worksheet "Results") respectively. The results worksheet combines 8 reports produced between 2015 and 2018.

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" while method abbreviations appear in *italic* below.

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; *FUS-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; *FUS-MS*) and inductively coupled plasma atomic emission spectrometry (ICP-OES; *FUS-ICP*). FeO was determined by titration using a cold acid digestion (ammonium metavanadate and hydrofluoric acid) in an open system (*TITR*).

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

Boron was determined by gamma neutron activation analysis (*PGNAA*).

Gold and silver were measured by a combination of atomic absorption (*FA-AA*), fire assay, and gravimetry (*FA-GRAV*). High-grade ore zone samples were re-analyzed with a combination of fire assay and gravimetric methods for gold and silver (*FA-GRAV*) and aqua regia dissolution (*ICP-OES*) or sodium peroxide fusion (*FUS-Na2O2*) with ICP-OES depending on the analyte.

CO_2 and Total (S) were determined by combustion infrared analysis (*IR*).

Fluorine was determined by lithium metaborate and tetraborate fusion and fluoride ion electrode analysis (*FUS-ISE*). Chlorine was determined by instrumental neutron activation analysis (*INAA*). Mercury was determined by cold vapour flow injection (*FIMS*) 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 Fe2O3. This adjusted value of LOI is LOI2. Total1 is the total of all major oxides using Fe2O3(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 deviations (2σ) of the mean standard value and 3 standard deviation (3σ) for analysis near the detection limit for most elements except for Sb_AR_-ICPMS in certificate A18-15902 that gave values slightly higher (>mean +2σ) than expected, although at relatively low concentrations. Limitations include insufficient material for analysis of some standards. Blank sample analyses show minimal contamination between samples except in blank analysis respectively for MN_TD-ICPMS and Cr_TD_ICPMS in certificates A16-12025, A17-10641, A17-13613, A18-13820 and A18-15902.

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