

Age and petrochemistry of rocks from the Aucoin gold prospect (NTS 13N/6) Hopedale block, Labrador: Late Archean, alkali monzodiorite-syenite hosts Proterozoic orogenic Au-Ag-Te mineralization

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The Aucoin gold prospect is located 70 km west of the community of Hopedale in the southwest Archean Nain craton of Labrador (NTS 13N/6), near the southern extremity of the Torngat orogen. Mineralization consists of anastomosing, discontinuous, NE- and NW-trending orogenic quartz veins (typically <20 cm wide) proximal to and within the ≤5 m thick, SE-trending shear zone associated with chlorite-ankerite-epidote-talc ± phengite alteration. Elevated gold correlates with silver and tellurium, reflected by argentiferous electrum and petzite (Ag₃AuTe₂) occurring as inclusions in sulphides and in rutile replacing ilmenite. Alteration and mineralization is hosted in four rock types. The oldest is massive to weakly foliated, medium-grained, alkalic clinopyroxene-hornblende syenite that is strongly enriched in incompatible elements. The syenite is intruded by sinuous, non-chilled dykes of medium-grained, silica-undersaturated, clinopyroxene-hornblende monzodiorite that has ocean island basalt (OIB) affinity. These rocks are intruded by a ≤50 m thick, irregular sill of medium-grained, silica-undersaturated, hornblende-porphyritic monzogabbro. The youngest rocks are thin (≤5 m), epidote altered and quartz-veined, northwest-trending diabase dykes tentatively assigned to the ca. 2235 Ma Kikkertavak swarm.

U-Pb Shrimp zircon geochronology indicates that the syenite intruded the Mesoarchean Maggo Gneiss at 2567 ± 4 Ma. This is contemporaneous with granulite facies metamorphism and granitic magmatism reported in the Hopedale Block, corresponding with an interval interpreted to record late Archean reworking along the Saglek- Hopedale boundary zone subsequent to amalgamation of the Nain craton. ⁴⁰Ar/³⁹Ar step-heating analysis of phengite from altered syenite yielded a plateau age of 1873 ± 6 Ma, broadly corresponding with early orogenic events in Torngat orogen and collision of the southeast Churchill Province core zone with Nain Province (ca. 1870–1850 Ma). This Paleoproterozoic interval is widely recognized as a global, “gold fertile” metallogenetic time and highlights the potential for comparable mineralization along the Torngat orogenic front.