Host-rock reactivity in the generation of gabbro-hosted orogenic Au in the Baie Verte Peninsula, Newfoundland, Canada

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Gabbro-hosted orogenic Au is present in three significant localities on Baie Verte's Point Rousse Peninsula, including the Stog'er Tight deposit, the Animal Pond prospect, and the recently discovered Argyle deposit. In all three deposits mineralization is hosted with vari-textured to pegmatoidal gabbro that intrude, but are likely coeval with, parts of the Snooks Arm Group. The gabbros are oxide-apatite-rich with variable amounts of plagioclase, pyroxene, ilmenomagnetite and apatite, and have enriched mid-ocean ridge basalt (E-MORB) to ocean island basalt (OIB) immobile element signatures. The alteration in the gabbros varies in intensity with distal/weak alteration consisting of weak leucoxene, partial albite alteration of feldspars and minor epidote. Proximal to mineralization there is a distinct metre to 10s of metre-scale zonation with an envelope of epidotealbite-(leucoxene-calcite) and proximal to mineralization (i.e., within metres) intense albite-chlorite-ankerite--pyrite-(hematite). With increasing alteration intensity there are enrichments in CO_2-CaO-Na_2O-Fe_2O_3-Mo-W-As-Bi-S with Au.

At the micro- to nano-scale gold is associated with pyrite that shows multiple generations of growth, often with cores that contain relict ilmenite and rutile, and rims that are inclusion poor, but containing gold; gold is also found as free grains in cracks and along grain edges and interpreted to have been remobilized. Additionally, Au is also spatially associated with hydrothermal zircon (overprinting primary baddeleyite), monazite ((CeLa)PO_4) and xenotime (YPO_4). Gold deposition resulted from the reaction of Au- (as $Au(HS)_2^-$) and CO_2-Na-REE-Y-bearing fluids with Fe-Ti-rich host rocks, resulting in wall rock sulfidation and pyrite formation, Au deposition, and the coincident formation of hydrothermal albite, ankerite, zircon (from baddeleyite), and monazite and xenotime (from apatite).

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