The Archean Vickers Gabbroic Complex, Eastern Nunavut, Canada: Integrating Gold Mineralization to Alteration Processes

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Abstract

The Vickers "gabbroic" intrusion (~2690 Ma), located in the Central Hearne supracrustal belt (CHSB) of eastern Nunavut, hosts a recently discovered (2012 by Northquest Ltd.) gold occurrence (e.g., PB-12-09 diamond drill hole intersected 164.41 m @ 5.39 g/t Au). The host lithology, the Vickers complex, occurs in the northern portion of the Neoarchean Kaminak greenstone belt (2.72-2.65 Ga), an area that has been interpreted to lie within the Pistol Bay Corridor, a brittle/ductile deformation zone with an east-west orientation. Mapping indicates the intrusive complex is slightly elliptical with a 900 m strike length and is surrounded by a quartz arenite unit. Lower greenschist grade metamorphism dominates and quartz-carbonate veining is abundant in the map area. Exploration drilling indicates the mineralized envelope, located at the NW contact zone of the intrusion, is 150 m thick, extends to 250 m depth, and dips 70^{o} to the south; the zone remains open to the east. Several gradational alteration assemblages occur in the ore zone and throughout the surrounding area: Chlorite Facies 1+2(CF1+CF2), Silica Facies 1+2 within the intrusive (SF1I + SF2I), and Silica Facies 1 within footwall rocks (SF1FW). The Au mineralization is most prolific in the SF alteration assemblages where pyrite +/- arsenopyrite is present as disseminated sulphide and/or confined to narrow quartz-carbonate +/- chlorite veins. Infusion of secondary silica, sulphide abundance >3 % and presence of Fe-carbonate veins are ubiquitous to the SF alteration assemblage. In contrast, CF alteration assemblages are defined as containing abundant (>35 %) disseminated and stringers of chlorite but only contain <2 % sulphides. Preliminary petrographic observations to further characterize each alteration assemblage reveals that the primary assemblage of amphibole, calcic plagioclase, and Fe-Ti oxides records progressively more alteration towards the ore zones (i.e., actinolite, chlorite, carbonate), in addition to having pyrite and arsenopyrite. The proposed working model involves both chemical (Fe-rich nature of the host) and rheological contrasts (contact between units) which resulted in the precipitation of Au and sulphide in fractures due to infiltration of the mineralizing fluid. The presence of auriferous quartz-carbonate veins, the related alteration styles and pervasive lower greenschist metamorphism support affinities toward a mesothermal orogenic gold deposit model. Further characterization of the nature and origin of this alteration and the mineralizing fluid, currently in progress, will include integration of whole-rock and mineral chemistry, stable isotopes (O, C, S), fluid inclusion studies.