Hydrothermal Alteration and Gold Occurrence at the Paleoproterozoic Piaba Orogenic Gold Deposit, Maranhão State, Brazil

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The Piaba orogenic gold deposit, located in the São Luís cratonic fragment (Maranhão State, Brazil), is associated with the development of a subvertical strike-slip fault that cuts across Rhyacian metavolcano-sedimentary rocks (carbon-bearing schists, andesite/dacite, ultramafic rocks and felsic tuffs), quartz-diorite and granitoids (fine-grained, subvolcanic, granophyrice). The host metavolcano-sedimentary sequence formed in a subduction related setting, previously interpreted as the early-arc stage of an accretionary orogen (2240–2214 Ma) that was followed by voluminous subduction-related calc-alkaline arc magmatism (2168–2145 Ma) and by a collisional phase (2100 ± 15 Ma) that produced several peraluminous granite bodies.
This petrographic study was conducted on select diamond drill core samples, primarily quartz diorite ore host rocks from the Piaba deposit. Study goals include: (i) identify the mineral phases; (ii) describe the lithologic and mineralogical textures; (iii) estimate mineralogical composition; and (iv) characterize the associated hydrothermal alteration zone. Even though rocks are commonly intensively hydrothermally altered, primary features such as granophyric texture (in this study, an intergrowth of quartz and alkali feldspar) are present in most samples.
Hydrothermal alteration of the host rocks produced recognizable temporal and spatial zonations that include: 1. Early, distal to intermediate
carbonate-chlorite-muscovite, commonly disseminated from veins-veinlets and with associated pyrite and which locally forms a stockwork texture and bleached zones; and 2. A proximal, ore-related, chlorite–sericite–carbonate–sulfide alteration. Pyrite is the dominant sulphide.
Gold occurs in: 1. Thin (millimetre to centimetre-scale), quartz-carbonate ± sulphide ± tourmaline bearing shear veins; and 2. Sub-horizontal, quartz-carbonate extensional veins. Native gold is rarely observed at wall rock-vein contacts. Increased vein density and sulphide abundance are the best indicators of gold mineralization.