The Geological Setting and Hydrothermal Alteration of the Tucano Gold Deposit, Guiana Shield, Brazil

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The Tucano gold deposit in the southeastern Guiana Shield, northern Brazil is currently operated by Great Panther Mining. Total mineral reserves are estimated to be 9.7 Moz at 2.00 g/t Au (www.greatpanther.com/operations/producing-mines/tucano-mine/). The deposit is hosted in regionally metamorphosed Paleoproterozoic supracrustal rocks, dominantly of metasedimentary origin. Stratigraphic units include banded iron formations (BIF), metacarbonate, calc-silicate and metapelitic rocks. Gold-related hydrothermal alteration is structurally controlled by a N-S striking, steeply dipping brittle-ductile shear zone controlling orebody geometry and location. Alteration mineralogy varies with host rocks, but in most metasedimentary rocks serpentine, talc, chlorite, mica, carbonate and minor amphibole define a distal alteration zone. The proximal zone is characterized by mica, carbonate, amphibole, clinopyroxene and locally garnet. Hydrothermally altered BIF lack clinopyroxene, whereas metacarbonate rocks almost ubiquitously contain coarse grained clinopyroxene. Green mica is characteristic in altered BIF and vector high-grade (> 3 g/t) gold zones. Hydrothermally altered rocks may contain either one or both of the following amphiboles: a Ca-poor (cummingtonite-grunerite) and a Ca-bearing (tremolite-Fe-actinolite) species. The former is closely associated with silicification processes, typically involving Fe addition, whereas the latter is typical in the hydrothermal alteration of the metacarbonate rocks. Overall, hydrothermal alteration zones are characterized by sharp transition from least altered to intensively altered rocks in the ore zones. Locally, granite dikes display thin (< 5 cm) garnet-rich hydrothermal alteration haloes. Sulfides in all host rocks comprise mainly pyrrhotite, which is locally overprinted by pyrite, and rare chalcopyrite and arsenopyrite. In BIF, magnetite bands are replaced by pyrrhotite, which may also be observed as irregular masses. The replacement of magnetite by pyrrhotite typically marks the transition from distal to proximal hydrothermal alteration zone in BIF. The hydrothermal alteration zoning in the Tucano deposit is compatible with other observed high-temperature orogenic gold systems in Brazil and in granite-greenstone belts worldwide.