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Geology, Hydrothermal Alteration and Ore Geochemistry of Prospect-47, Alta Floresta Gold Province, Brazil: The First Insights into a New Cu ± Au ± Mo Prospect

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The Alta Floresta Gold Province, located in the southwestern sector of the Amazonian Craton (State of Mato Grosso, Brazil), is mainly composed of Paleoproterozoic plutonic, volcanic, and volcano-sedimentary units interpreted to have originated in magmatic arc to postorogenic settings from 2.1 to 1.7 Ga. Particularly in its eastern sector, relatively oxidized (magnetite-bearing) I-type, calc-alkaline to subalkaline, medium- to high-K, meta to peraluminous granitic rocks and volcanic sequences host a number of gold and polymetallic deposits. Gold usually occurs as inclusions in pyrite, the main ore mineral, with subordinate chalcopyrite, galena, sphalerite, molybdenite, hematite, and magnetite. Most gold-rich deposits are interpreted as similar to porphyry-epithermal systems. Despite being a primarily Au-rich province, several mining companies have put efforts into greenfield exploration campaigns aimed at discovering Cu occurrences. This is the case of Prospect-47, a new Cu ± Au ± Mo prospect in the eastern sector of the Province.

Logging of seven drill cores from Prospect-47 revealed that mineralization is hosted by (i) very fine- to fine-grained porphyritic quartz monzodiorite, (ii) medium- to coarse-grained quartz monzodiorite, (iii) fine- to coarse-grained porphyritic granodiorite (intrusive in the previous rock types), and (iv) quartz-feldspar porphyry of rhyolitic composition (intrusive in all rock types). These rock types were temporally subjected to (1) pervasive potassic alteration, characterized by K-feldspar, biotite, or both replacing igneous minerals; (2) pervasive sericitic alteration that overprints the potassic alteration and affects mostly igneous plagioclase; and (3) pervasive chloritic alteration characterized by hydrothermal chlorite, epidote, and carbonate overprinting previous hydrothermal alterations. All rock and hydrothermal alteration types are crosscut by syn- to late-mineralization quartz-carbonate veins and epidote- or chlorite-rich veinlets. Mineralization is mainly associated with potassic alteration zones and is characterized by disseminated pyrite, chalcopyrite, bornite, and molybdenite, but it also occurs within quartz-carbonate veins and epidote- and chlorite-rich veinlets. Hydrothermally brecciated zones are uncommon but also mineralized. Preliminary ore geochemistry data reveal Cu values ranging from <50 to 9500 ppm, Mo values ranging from <1 to 996 ppm, and Au values ranging from <0.01 to 0.17 ppm. The highest Cu, Au, and Mo values are usually related to potassic alteration zones in the granodiorite and the porphyry. Cu and Au values display a positive linear correlation, whereas Cu and Mo and Au and Mo show no correlation. Ag (<1 to 14 ppm), Zn (<1 to 1619 ppm), and Pb (<3 to 237 ppm) values show no correlation with Cu, Au, and Mo, nor with each other.

These preliminary results suggest that the prospect may be genetically related to a magmatic-hydrothermal system. Further work, such as (i) petrography of host rocks and ore zones; (ii) whole-rock geochemistry of host rocks; and (iii) zircon U-Pb (SHRIMP) geochronology will provide better insights into the geological, tectonic, and metallogenetic history of the prospect.

Fig. 1. Location map of Prospect-47 and nearby mineral deposits, Amazonian Craton.