METALLOGENIC EVOLUTION OF THE EASTERNMOST SEGMENT OF THE PALEOPROTEROZOIC ALTA FLORESTA GOLD PROVINCE, AMAZONIAN CRATON (BRAZIL)

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RESUMO:

The Alta Floresta Gold Province (AFGP), located between the Ventuari-Tapajós (2.0 – 1.8 Ga) and Rio Negro-Juruena (1.8 – 1.55 Ga) geochronological provinces (Amazonian Craton, Mato Grosso state, Brazil) consists of Paleoproterozoic (1.95 – 1.75 Ga) plutonic-volcanic sequences generated in continental arc settings and hosts a significant number of gold deposits. In its easternmost segment, these deposits are distributed along a NW-SE striking belt and are hosted by granitic systems, and, to a lesser degree, by volcanic/volcaniclastic sequences. Its gold systems can be grouped into three main groups: ***(1)*** disseminated and structurally-controlled vein-type Au ± Cu (Bi, Te, Ag, Mo) deposits; ***(2)*** structurally-controlled vein-type Au + Zn + Pb ± Cu deposits; and ***(3)*** disseminated Cu + Mo ± Au deposits. This work provides main geological characteristics of the first two mineralization groups.

Regardless the typology of gold systems, they are mainly hosted by tonalite to syeno/monzogranite intrusions (1.98 Ga, 1.90 Ga and 1.87 Ga), quartz-feldspar porphyries (1.77 Ga), and, to a lesser degree, basement rocks (2.0 Ga to 1.98 Ga) and volcanic/volcaniclastic sequences (2.0 Ga). In some deposits, aplite and mafic intrusions of unknown ages frequently contain gold mineralization.

The vein-type gold deposits are controlled by NNW-, NW- and E-W-striking shear zones. These veins commonly display massive to banded textures (e.g. Paraíba deposit), whereas open-space filling (e.g. comb, crustiform, zonal, colloform, cockade), recrystallization (e.g. flamboyant or feathery), platy and vuggy textures are typically found in the Au + Zn + Pb ± Cu group (e.g. Francisco, Luiz and Pezão). Stockwork veins and hydrothermal breccias are also found in these deposits.

In all groups, gold mineralization occurs associated with pervasive phyllic alteration and silicification enveloped by widespread potassic (K-feldspar or biotite) alteration. However, disseminated gold mineralization associated with early pervasive sodic (albite) alteration is locally recognized at the Pé Quente deposit. Outwards from the ore zones, carbonatization, silicification, potassic (K-feldspar), propylitic and late veinlets with variable composition are important hydrothermal alteration types, whereas argilic alteration is also found in distal zones at the Francisco and Bigode deposits. The gold ore paragenesis in the Au ± Cu group consists mainly of pyrite and variable concentrations of chalcopyrite and, to a lesser degree, magnetite, whereas in the Au + Zn+ Pb ± Cu group is represented by pyrite and significant amounts of sphalerite, galena, and minor chalcopyrite and digenite. In both groups, gold occurs as inclusions mainly in pyrite and, to a lesser degree, in base metals (e.g. galena) or as free gold.

Deposits belonging to group (1) revel the coexistence between two-phase aqueous with variable salinity and homogenization temperature, H_2O-CO_2 of low salinity and higher temperatures and high saline aqueous fluid represented by halite-bearing fluid inclusions, whereas those from group (2) dominated by aqueous fluids of low to moderate salinity and variable temperatures. These data suggest a combination of heterogeneous entrapment by immiscibility processes and fluid mixing during the evolution of the hydrothermal systems (group 1), besides boiling process (group 2). Moreover, stable isotopic data point to a predominant contribution of magmatic H_2O (group 1), whereas external fluids (meteoric) may have interacted with magmatic fluids in the case of the vein-type Au + Zn + Pb ± Cu systems (group 2).

The group (1) exhibit pyrite and molybdenite Re-Os isochron ages from 1782 Ma to 1792 Ma, whereas sericite ^{40}Ar-^{39}Ar plateau ages from the sericitic alteration halo of the Francisco deposit (group 2) yielded ages between 1779 and 1777 Ma, suggesting that at least part of the ore-forming processes may have been correlated with the third felsic magmatism, with the emplacement of the Colíder (1.78 Ga) and Teles Pires (1.79 – 1.75 Ga) suites.

Collectively, all these data suggest that the disseminated and vein-type Au ± Cu and Au + Zn + Pb ± Cu deposits represent magmatic-hydrothermal systems that developed at different crustal levels and/or distance from the magmatic source. The Au ± Cu deposits tend to form at deeper crustal levels at pressures of 1 kb to 3.6 kbar, whereas the Au-base metal deposits may have been emplaced at epizonal levels (~ 0.7 kbar). The geological characteristics of the Au ± Cu systems fit neither those of deep-seated porphyry-style mineralization nor of intrusion related gold systems, but the Au + Zn + Pb ± Cu systems show many similarities to intermediate sulfidation polymetallic and (high-sulfidation?) gold-copper-bearing epithermal systems.

PALAVRAS-CHAVE: Alta Floresta Gold Province, intrusion-hosted systems, gold-base metals mineralization.