HYDROTHERMAL ALTERATION AND GOLD MINERALIZATION OF THE PATROCÍNIO AREA - TAPAJÓS MINERAL PROVINCE

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INTRODUCTION

The Amazon craton is a mainly proterozoic domain with an Archean nuclei, located at northern Brazil, interpreted as the result of several colisional orogenies. According to some authors (e.g. Tassinari and Macambira 1999) the craton went through a continuous process of juvenile material accretion from the Archean to the early Proterozoic, the latter playing the most important role considering volume of crust produced. Based on isotopic data, Santos et al. (2000), proposed the division of the Amazon craton into seven tectonic provinces: Central Amazon, Carajás, Transamazonian, Tapajós-Parima, Rondônia-Juruena, Rio Negro e Sunsás (Fig. 1).

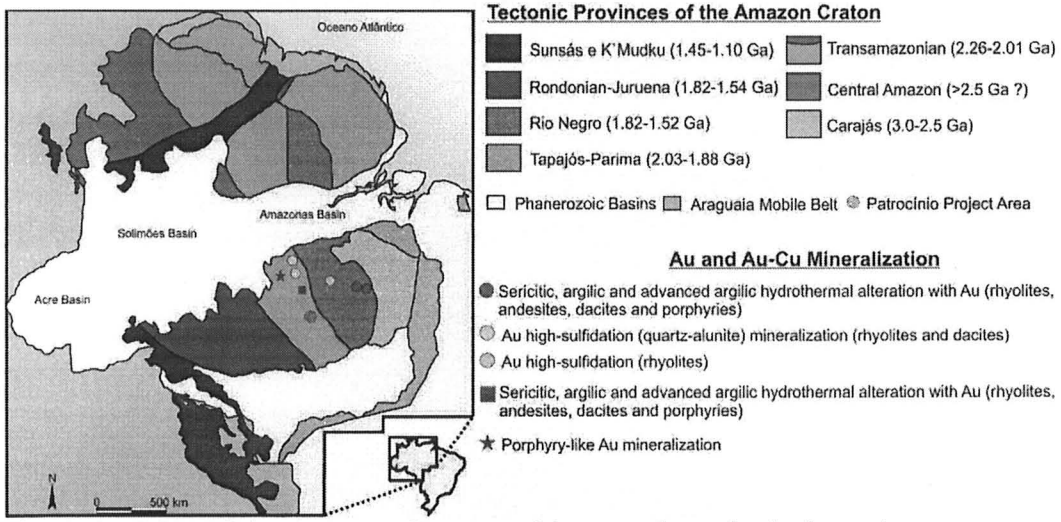

Figure 1 - Map of the Amazon Craton and its geochronological provinces as proposed by Santos et al. (2000), with the Paleoproterozoic hydrothermal systems related to the Uatumã Magmatism (after Juliani et al. 2005, 2009).

In this context, the Tapajós-Parima tectonic province was formed after the 2.10-1.87 Ga orogenies, with expressive plutonic and volcanic rocks formation. Among the igneous manifestations related to this event the formation of calc-alkaline magmatic arcs represented by the granitoids of the Cuiú-Cuiú Complex (2.01-1.90 Ga) and the post-orogenic/anorogenic volcanic and plutonic rocks of the Uatumã Supergroup should be emphasized. The Uatumã rocks show paleoproterozoic ages and cover an area of approximately 1,100,000 km². The importance of the Uatumã magmatism has been demonstrated on many papers that have verified the existing relation between the occurrences of gold deposits and the plutonic and volcanic units of this event. This is the tectonic setting where the Tapajós Mineral Province (TMP) is located. The TMP is one of the most important mineral provinces in Brazil, it has already been responsible for the production of more than 750 tons of gold since the late 50's. Despite this potential only a few number of research projects were developed on the area aiming the characterization of the primary gold occurrences.

On the central portion of the TMP, on the surroundings of the Patrocínio Village (Fig. 2), many artisanal miners are currently producing gold without any previous study. During the year of 2013 the Canadian junior company Belo Sun Mining performed an exploratory drilling campaign on this area aiming gold target recognition and agreed to gently provide the drill cores for this research.

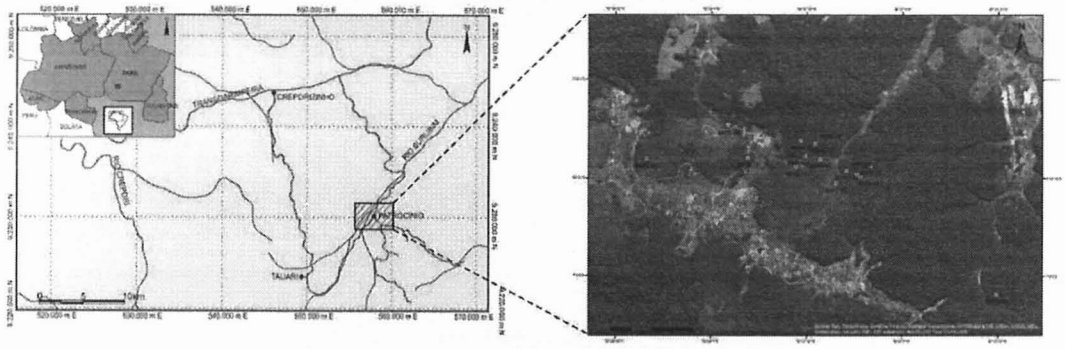

Figure 2 - Central portion of the Tapajós Mineral Province with the main roads and location of the Patrocínio Village (shaded area).

METHODS

The results presented on this abstract are the product of fieldwork carried out on the drilled area located on the surroundings of Patrocinio Village. Drill cores description and sampling, together with petrography and preliminary geochemical data consist on a first round approach to the gold occurrences of this area of the Tapajós Mineral Province.

RESULTS

During geological mapping, strong sericitic alteration, represented by the paragenesis quartz + sericite + pyrite, was recognized in mineralized rocks, as well K-feldspar metassomatism, propilitization and silicification in several rocks in and around the target. These kind of hydrothermal alterations are very suggestive that magmatic-hydrothermal metallogenetic systems similar to porphyries were responsible for the generation of the gold mineralizatio. Macroscopic description of the drill cores, together with preliminary geochemical analyses on major elements, show that porphyritic monzogranites, alkali-granites and syenites of calc-alkaline affinity are the dominant host rocks associated with the gold occurrence (Figs. 3 and 4).

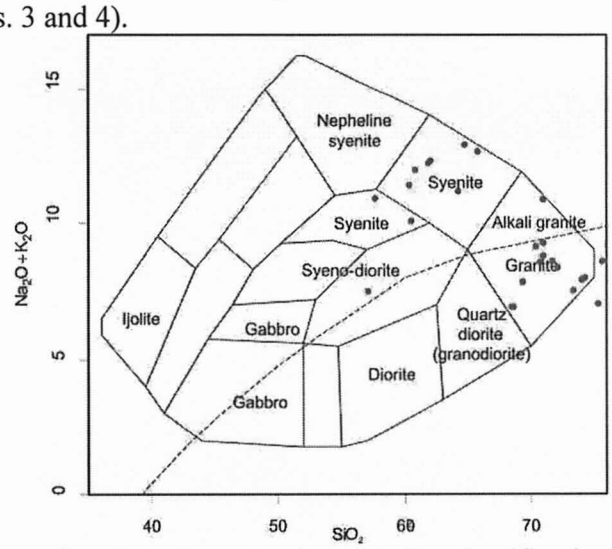

Figure 3 - TAS diagram for plutonic rocks showing the classification of the mineralization host rocks.

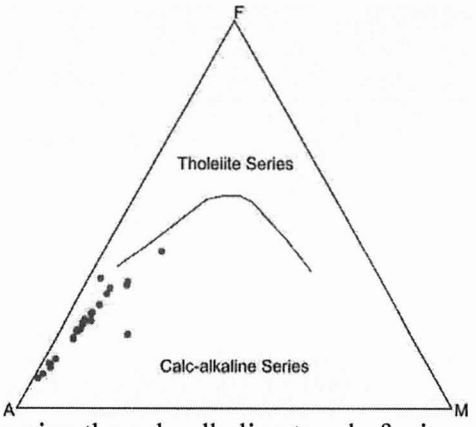

Figure 4 - AFM diagram showing the calc-alkaline trend of mineralization the host rocks.

These lithotypes host dikes of andesites and rhyolites that are probably related to the Uatumã magmatism. The monzogranites and alkali-granites commonly show hydrothermal alteration represented by a well-developed alteration-metasomatism characterized by the formation of K-feldspar + biotite (Fig. 5) and a strong, sometimes pervasive, propylitic alteration with epidote + chlorite + quartz, ± albite, ± calcite. The former alteration commonly shows intersections of pyrite rich, quartz bearing Au mineralized veins and veinlets. Under optical microscope these alterations are recognized by the replacement of igneous plagioclase by hydrothermal K-feldspar and veinlets of chlorite, epidote, quartz with minor albite and calcite.

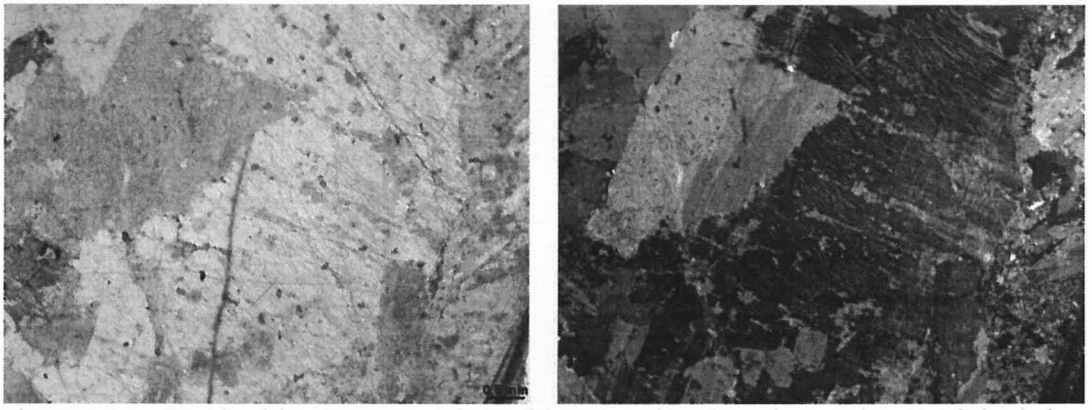
Figure 5 - Porphyritic monzogranite with potassic alteration, where original igneous plagioclase (upper left portion of the photo) is being replaced by secondary, hydrothermal K-feldspar.

Another type of mineralization on the target is associated with syenitic affinity rocks which show disseminated pyrite with good grades of Au (Fig. 6). These rocks are intrusive on the monzo- and syenogranites and typically show disseminated pyrrhotite and Fe-carbonates (possibly ankerite and siderite). When compared to the Au grades observed on the other lithotypes the syenites present a less erratic distribution.

DISCUSSION

Two different styles of Au mineralization were observed in the drill cores. One of them is hosted in quartz-pyrite veins and veinlets, often found in highly hydrothermalized monzo- and alkali-granites. The usual hydrothermal alteration associated with the best Au grades is represented by well-developed K-metassomatism. Another type of mineralization is genetically associated with the syenites, which shows disseminated pyrite, pyrrhotite, Fe-carbonates and constant, but not high, grades of Au.

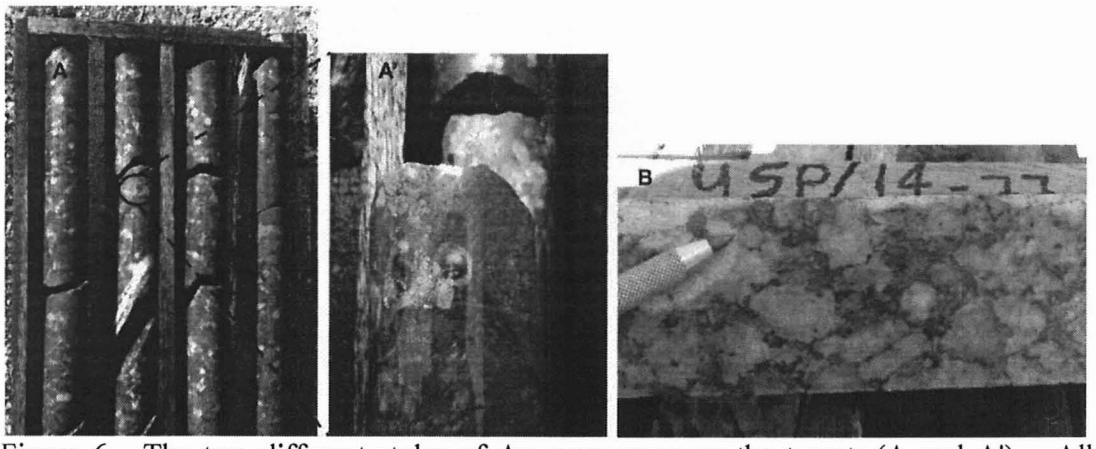

Figure 6 - The two different styles of Au occurrence on the target. (A and A') – Alkali-granite, with intense alteration-metassomatism, with small deformed pyrite-rich veins and veinlets with visible gold. (B) Porphyritic syenites with disseminated pyrite, pyrrhotite and Fe-carbonates.

When compared to the assemblage observed in the monzogranites, this particular association requires CO_2-rich and fairly reduced fluids. This may imply in different fluid sources and possibly tectonic setting for the Au occurrence of Patrocínio. Further investigation is required in order to elaborate a more precise metallogenetic model for the gold mineralization of this portion of the Tapajós Mineral Province.

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