



PALEOPROTEROZOIC AGE OF TURMALINA GOLD DEPOSIT, PITANGUI-MG.

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INTRODUCTION

The Quadrilátero Ferrífero region (“Iron Quadrangle-IQ”) in the south of the Minas Gerais state, is a major metallogenic provinces of Brazil where several types of gold mineralization exist. The most common deposits are hosted in banded iron formations in the Rio das Velhas Supergroup, such as the Cuiabá, São Bento and Morro Velho deposits. Other important gold deposits occur disseminated in metapelites of the metasedimentary and metavolcano-sedimentary sequences in the Nova Lima group, such as Córrego do Sítio and Turmalina. In the IQ the main gold mineralization event it is related to the end of the Achaean tectonic event whose ages are between 2.7 and 2.6 Ga. After that, subsequent remobilization had been associated with the Brazilian and Rhyacian tectonic events (Lobato et al. 2001 a, b, c; Silva 2006; Velásquez 2006).

In the Córrego do Sítio gold deposit, Velasquez (2006) demonstrated that the Rhyacian and Brazilian orogenies produced the circulation of hydrothermal fluids in the rocks of the Rio das Velhas greenstone belt, remobilizing the gold from the iron formations and depositing it widespread in metasedimentary rocks.

GEOLOGICAL SETTING

In the Turmalina gold deposit the mineralization occurs in sericite-(chlorite/biotite)-quartz schist, embedded in metapelites and chloritic metatuffs Archaean age, correlated to Rio das Velhas greenstone belt. A band with strong silicification it is associated with arsenopyrite, pyrite, pyrrhotite and disseminated fine free gold (15 µm). Gangue minerals as quartz, carbonates, graphite and oxides (ilmenite, hematite, rutile, and magnetite) occur. A NW trend shear zone cross cut the Archaean sequence and support the ore mineral occurrence (Figure 1).

Geochronological ages of mineralization and post-mineralization events obtained in the Turmalina Deposit are useful to determine the tectonic-metamorphic evolution of the area and suggest some implications for metallogenic regional evolution.



Petrographic studies, structural geology and geochemical isotopic analyses support the geochronological data. The gold mineralization origin was associated with the formation of garnet during regional metamorphism (greenschists-facies) of the country rock.

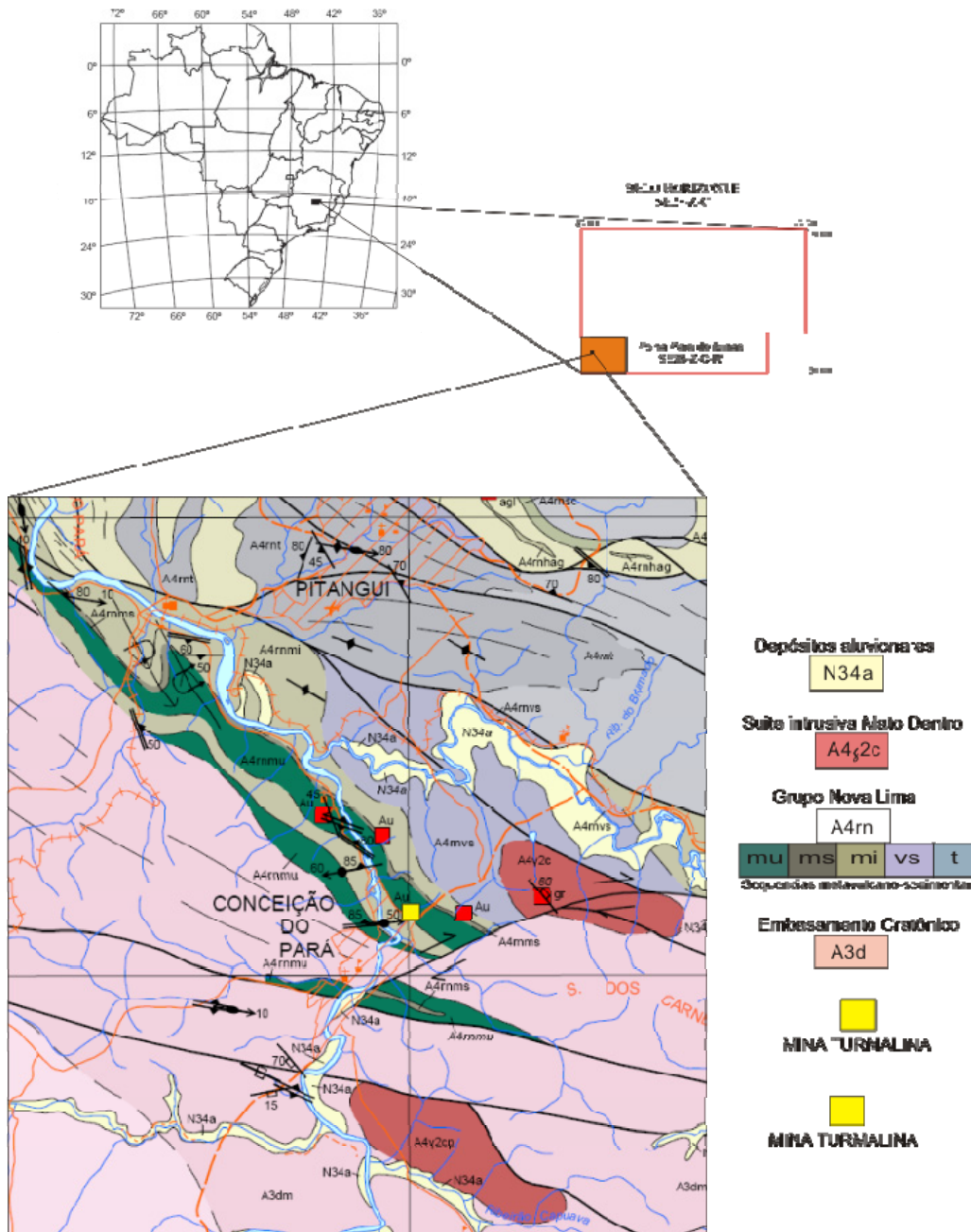


Figure 1 - Geological map and location of study area. After Romano (2006).



RESULTS

Whole rock and garnet Sm-Nd analyses plots yield an age of 2184 ± 78 Ma. (Figure 2), that are related to garnet formation around $550-600^{\circ}\text{C}$. The Sm-Nd TDM model age for this metamorphic rock is between 3.1 and 3.0 Ga. These data suggest an Archaean age for the sources of sediments that originated the greenschists studied.

Analytical data of Pb-Pb leaching stages of arsenopyrite with gold have yielded an age of *ca.* 2150 Ma. Five samples of pyrrhotite associated with silicified zone have yielded a model Krammers & Stacey (1975) Pb-Pb age of 2770 Ma. In addition, whole rock and sericite samples were analyzed by Rb-Sr method which indicates that the hydrothermal alteration occurred at 1929 ± 34 Ma with a $Ri_{(^{87}\text{Sr}/^{86}\text{Sr})}$ of 0.71267 ± 0.0008 , (Figure 2), this represents the age of hydrothermal paragenese at $\approx 300^{\circ}\text{C}$.

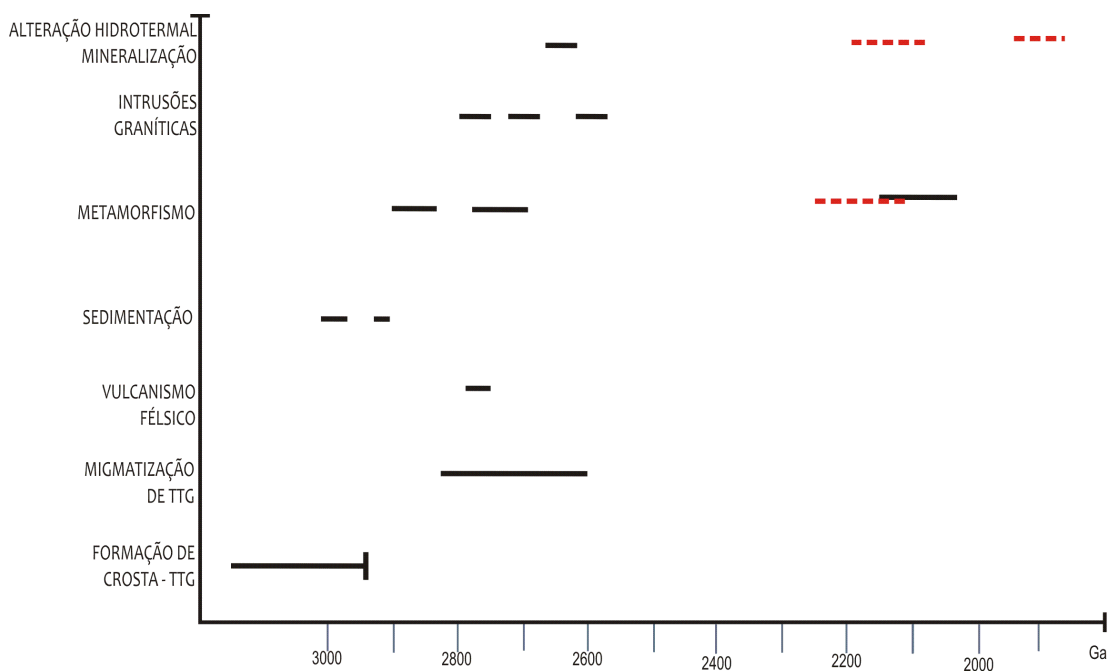


Figure 2. Chronology of geological processes in rocks of the Rios das Velhas greenstone belt (Lobato *et al.* 2001 b). in red, isotopic data this paper.

FINAL CONSIDERATIONS

The isotopic data obtained support the view that the main source-area for the Rios das Velhas sediments were formed at of 3.1 to 3.0 Ga and reworked in the Late Archaean, around 2.9 to 2.8 Ga. These rocks were affected by greenschist to amphibolite facies metamorphism, around of 2180 Ma. At 1930 Ma. occurred the lower heat flow circulation of hydrothermal fluids responsible for the gold mineralization. A K-Ar age



of 1760 Ma. obtained in biotite from granitic rock that cut the gold deposit indicates the regional cooling at temperature of 250°C. These ages suggest that Turmalina gold deposit was submitted at slow cooling rates of about 1,2°C/Ma. At the end of the Paleoproterozoic. The geochronological data presented here characterize the occurrence of Archaean continental rocks in the region that were affected by Paleoproterozoic metamorphic events responsible for the formation of hydrothermal convection cells that originated the development of mineralization studied. This location does not record any evidence Neoproterozoic metamorphic event, indicating that the Turmalina deposit area was not perturbed by the Brazilian orogeny. This pattern is consistent with regional geochronological ages reported by other authors (Carneiro, 1992, Olivo et al. 1996; Schrank & M 1996b; Noce 1995) for the Quadrilátero Ferrífero region.

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