THE PASSA TRÊS LODE GOLD DEPOSIT (PARANÁ STATE, BRAZIL): AN EXAMPLE OF MINERALIZATION FORMED AND HOSTED DURING GRANITE FORMATION

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SUMMARY: The Passa Três Granite is situated in the southern portion of Brazil (Paraná State) and presents an elongated shape according to a NNE-SSW direction. This intrusion is emplaced within metapelites of the meso to neoproterozoic Açungui Group, between the Morro Agudo and Lancinha faults, constituting the N040ºE trending Lancinha Shear Zone. Gold mineralization within the Passa Três Granite is composed of huge quartz veins with fluorite, sulfides and carbonates, forming orebodies with different internal textures, including massive, banded, sheared and brecciated ones. Main objectives include to understand the geometry and structural evolution of the deposit, the relations between magmatism, hydrothermalism, deformation and mineralization in space and in time; ore fluids characterization; and, a metallogenic model construction for this deposit. Structural data indicate the existence of two major fault systems, one N-S and the other one E-W, with dips of 60-75ºW and 45-70ºS, respectively. Both systems are interpreted to be contemporaneous and conjugate. Normal motions are everywhere suspected and main mineralized veins are located at opening sites at these fault systems, such as pull-aparts. The structural model suggests that the normal motion could be initiated by shearing along fault planes (forming a system), in which sulfides and clay minerals are concentrated. This configuration can be observed at several scales, such as field, hand samples and thin section. Petrographic and field observations suggest that the formation of the orebodies occurred in four phases: phase 1 [quartz 1 + fluorite], phase 2 [quartz 2 + pyrite 1 + ankerite ± **gold** ± chalcopyrite ± aikinite ± fluorite ± sphalerite ± muscovite], phase 3 [quartz 2 + pyrite 2 + **gold** + chalcopyrite + aikinite + ankerite ± sphalerite ± fluorite ± muscovite] and phase 4 [quartz 3 + ankerite + calcite + molibdenite + aikinite + muscovite + fluorite ± chalcopyrite ± pyrite 1 ± pyrite 2]. Gold occurs as invisible gold and as native grains within fractures that affect pyrite, commonly associated with chalcopyrite and aikinite. Additionally, quartz veins are sometimes bordered by aplites and some of the veins can exhibit a very thin margin of adularia crystals that seem to represent the early stage of vein formation. These observations and the presence of unidirectional solidification textures (UST) favor the link between late-magmatic fluids and orebodies formation. In order to constrain this assumption, zircons from granite (magmatic facies) and muscovite grains (hydrothermal veins) were analyzed by U-Pb and Ar-Ar methods, respectively. U-Pb (zircon) analyses establish the age of 612 ± 4.6 and 610 ± 5.8 Ma for “medium grained granite” facies (GEM) and “microgranite” facies (GEF), and 592 ± 7.1 Ma for “white granite” facies (GEB). Transitional veins present Ar-Ar (muscovite) ages of 612 ± 1.95 to 608 ± 1.99 Ma and mineralized veins range from 611 ± 2.1 to 608 ± 2.1 Ma. Therefore, the existence of a magmatic-hydrothermal transition is confirmed by geochronological data, which indicate a penecontemporaneous formation for granite and orebodies, during the interval of 617 to 604 Ma.

KEYWORDS: GOLD MINERALIZATION, INTRUSION-HOSTED GOLD DEPOSIT, PASSA TRÊS GRANITE.