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

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ABSTRACT: 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 N040E 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. The 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 normal 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. Orebodies 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. Petrographic and field observations suggest formation in four phases for the orebodies: phase 1 [quartz 1 + fluorite], phase 2a [quartz 2 + pyrite 2a ± gold ± chalcopyrite ± aikinite ± fluorite ± sphalerite ± muscovite], phase 2b [quartz 2 + pyrite 2b + gold + chalcopyrite + aikinite + ankerite ± sphaleryte ± fluorite ± muscovite] and phase 3 [quartz 3 + ankerite + calcite + molybdenite ± aikinite ± muscovite ± fluorite]. Gold occurs as invisible gold and as native grains within fractures that affect pyrite, commonly associated with chalcopyrite and aikinite. Alteration related to mineralization include muscovite + quartz + pyrite and sericite + chlorite alteration assemblages. Fluid inclusion petrography and microthermometry suggest a fluid with H_2O-CO_2-NaCl and H_2O-NaCl compositions, with moderate salinities (0.2 to 12.84 %wt.NaCl.eq.) and homogenization temperatures from 400 to 150ºC. Additionally, within drill holes and underground mine, evidences of magmatic-transition conditions were encountered, such as pegmatites, quartz veins with adularia border, UST's, barren quartz veins and aplite veins. These features suggest a magmatic-hydrothermal transition, confirmed by U-Pb zircon (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) and ^{40}Ar-^{39}Ar muscovite dating (veins with adularia border: 612.9±2 to 608.8±2 Ma; mineralized veins: 611.7±2 to 608.8±2 Ma; barren vein: 608.4±2 Ma) that indicate a granite emplacement, a magmatic-hydrothermal fluid releasing and a formation of gold-bearing quartz veins during a time laps of approximately 5 Ma, between 613 and 608 Ma. Mineralization (611 to 608 Ma) coeval to granite crystallization (612 to 610 Ma), association of gold with Bi minerals, structurally controlled veins and magmatic-hydrothermal transition features at the roof of a small granitic intrusion suggest that the Passa Três gold deposit shares several similarities with intrusion-related gold deposits, more specifically with granite-hosted gold deposit type.

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