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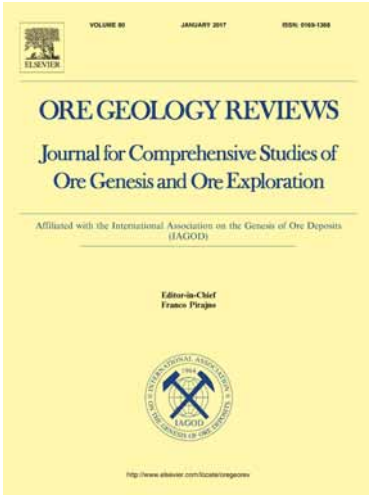

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Multistage Mineralization at the Hypozonal São Sebastião Gold Deposit, Pitangui Greenstone Belt, Minas Gerais, Brazil

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Abstract

São Sebastião is a recently discovered Archean gold deposit at the northwesternmost part of the Quadrilátero Ferrífero (QF), southern São Francisco craton, Brazil. The gold ore is strata-confined in two levels of banded iron formation (BIF) of the basal stratigraphic unit in the Pitangui greenstone belt (2.8 Ga). Pitangui is correlated to the widely known Rio das Velhas greenstone belt, which hosts several orogenic gold deposits such as the world-class Cuiabá. The gold mineralization at São Sebastião is associated to replacement-style sulfidation over magnetite, where the main developed phases are: pyrrhotite, chalcopyrite, arsenopyrite, pyrite and arsenian-pyrite. Native Au occurs as inclusions in pyrrhotite formed at dilatation domains (e.g., breccias, fold hinges) during compressional events (Rio das Velhas Orogeny at 2.8 – 2.75 Ga), but mainly as inclusions in late- to post-kinematic pyrite and arsenopyrite, as fracture infills in arsenopyrite and in contact with gangue minerals. Electron-microprobe analyses in arsenopyrite reveal a 465 – 560°C precipitation temperature interpreted from As atomic percentage and indicate that high-temperature fluids were active after the deformational event. The temperature increase caused the incorporation of LA-ICP-MS-detected lattice-bound Ni and Co in arsenian-pyrite and arsenopyrite, related to the mafic-ultramafic signature of boundary rocks. High temperature conditions are supported by pyrite and ISS (intermediate-solid solution in the Cu-Fe-S system) formation at 600°C and melting-derived textures resulting from the precipitation of Bi- and As-melts, typical of amphibolite-facies environments with high fS_2. Whole-rock geochemical assays of drill core samples display two clear trends on Ag, Bi, Cu vs. Au binary plots and on principal component analysis results. The trends are a product of the heterogeneous spatial distribution of melts and high-temperature fluids. Melting features and superposition of mineralization styles are common in hypozonal gold deposits experiencing higher heat influx. At São Sebastião, the thermal effect is likely related to the 2.7 Ga granitic intrusions that surround the Pitangui belt. São Sebastião shows distinct characteristics than those described for the mesozonal gold deposits in the Rio das Velhas greenstone belt and may depict the deeper roots of the QF gold system.

1) Introduction

In the southern São Francisco craton (**Fig.1**), the Quadrilátero Ferrífero (QF) region is one of the most important metallogenetic provinces in the world and has been the target of extensive gold production since colonial times. In the eighteenth century, Brazil became the world's largest gold producer due to mining activities in the QF. The QF is likewise famous for its giant iron ore deposits hosted in the