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Witwatersrand-type palaeoplacers in Brazil: Preliminary results of a comparative study between the Jacobina and Moeda gold deposits

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At least two Witwatersrand-type palaeoplacer deposits have been mined intermittently in Brazil since the 18th century, the Jacobina and the Moeda gold deposits. Both deposits share important genetic similarities but also show differences that reflect a distinct geological history. In this comparative study we look at the mineralogy and the gold composition in mineralized zones of both deposits using petrography and electron microprobe analyses.

Similarly to the Witwatersrand, in both deposits heavy mineral layers, predominantly comprising rounded pyrite, uraninite, rutile and gold, indicate that placer fluvial processes played an important role in concentrating these minerals in quartzose conglomerates and sandstones [1]. The presence of detrital rounded pyrite and uraninite also implies deposition under an essentially O₂-deficient atmosphere prior to the Great Oxidation Event [2]. For the Moeda Formation a maximum depositional age of 2.68 Ga is indicated by U-Pb age data on detrital zircon derived from evolved continental material [3]. The Jacobina sediments were derived almost exclusively from a 3.2-3.5 Ga juvenile source with only very minor crustal contamination [4].

In contrast to most of the Witwatersrand rocks, the Moeda and Jacobina deposits went through a complex orogenic history after deposition, during which deformation, metamorphism and hydrothermal activity modified the sediment package. Thrusting, folding, strike-slip and reverse faulting caused duplication and disruption of strata [5][6] and as a result of late- to post-tectonic igneous activity, hydrothermal processes modified the ore mineral assemblages [7]. The intensity and extent to which these processes took place differ, however, between the two deposits. Gold remobilization in the Moeda does not seem to have been significant, as evident from only limited gold mineralization in quartz veins, whereas at Jacobina, gold remobilization is noticeable in veins and fractures within, and externally to, the reef boundaries.

The composition of gold particles differs distinctly between Moeda and Jacobina. The Moeda gold contains 4-17% Ag and 2-8% Hg, similar to Witwatersrand gold [8]. In contrast, Jacobina gold has a lower Ag content (0-7%), small amounts of Cu (up to 0.5%) and no Hg. Furthermore, the Ag and Cu contents of Jacobina gold appear strongly dependent on stratigraphic position (reef), which cannot be easily reconciled with an epigenetic hydrothermal introduction of gold but instead is most likely a provenance feature, thus supporting a (hydrothermally modified) paleoplacer model.

References:

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