Multiple IOCG-forming events in the Carajás Province, Brazil

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World-class iron oxide-copper-gold (IOCG) deposits (e.g., Sossego, Salobo, Igarapé Bahia) comprise the most important Cu resources in the Carajás Province, Brazil. The deposits are hosted by: i) Mesoarchean granites, gneisses and greenstone belts; and ii) Neoarchean metavolcanic-sedimentary units, bimodal intrusive rocks and gneisses.

Isotope data combined with field evidence suggest a multistage evolution of IOCG mineralization in the Carajás Province, with recurrence of ore-forming systems during the Neoarchean and the Paleoproterozoic. These included:

i) Syngenetic to diagenetic chalcopyrite associated with rhythmites at the Igarapé Bahia deposit, and fluid circulation at the Bacuri deposit at 2.76 Ga;

ii) A major episode of IOCG formation at 2.72-2.68 Ga related to basin inversion coupled with Neoarchean magmatism (e.g., Sequeirinho-Pista ore bodies at the Sossego deposit; Bacaba, Castanha, Bacuri, Visconde and Cristalino deposits);

iii) A ca. 2.5-2.4 Ga hydrothermal and/or remobilization events synchronous with shear zone reactivation and responsible for the Sabolo and Igarapé Bahia deposits;

iv) Paleoproterozoic (1.90-1.87 Ga) IOCG mineralization related to the emplacment of A-type granites and represented by the Sossego-Curral ore bodies (Sossego deposit) and the Alvo 118 deposit.

The deep-seated Neoarchean IOCG systems are characterized by breccia and replacement bodies associated with albite–scapolite, biotite–scapolite–tourmaline or almandine–grunerite, and magnetite– (apatite–actinolite) formation. Shallow-emplaced Paleoproterozoic IOCG systems, formed under brittle-dominated regime, have characteristic potassic and chlorite alteration zones. The reccurence of hydrothermal systems in time and space contributed to the complex hydrothermal overprint observed in the Neoarchean deposits, as well as Cu enrichment in the Paleoproterozoic.