THE Cu–Au–(Ni) MINERALIZATION EVENTS IN THE IOCG MAGMATIC-HYDROTHERMAL SYSTEM OF THE CARAJAS MINERAL PROVINCE

Dutra, L.F., Monteiro, L.V.S.
Programa de Pos-Graduacao Recursos Minerais e Hidrogeologia – Universidade de Sao Paulo, Instituto de Geociencias.

ABSTRACT

The Carajas Mineral Province (CMP), in the southeastern part of the Amazonian craton, hosts several iron oxide-gold-copper deposits (IOCG), which were formed during multistage hydrothermal events in the Neoarchean (ca. 2.72–2.68 and 2.60–2.45 Ga) and Paleoproterozoic (ca. 2.06 and 1.90–1.88 Ga). Regional to local hydrothermal alkali alteration was formed by the ascent of high-temperature hypersaline ore-forming fluids that evolved to low-temperature conditions through fluid-rock reactions and mixing with low-temperature diluted fluids (superficial fluid and formational water). Regional shear zone systems structurally control the ore bodies and may have served as hydrothermal fluid conduits during the development of the hydrothermal system. In the southern CMP, the IOCG deposits are in spatial association with the Canaa shear zone, which defines the contact between (meta)volcano-sedimentary sequences (Sequeirinho Group and Itacaiunas Supergroup) and Meso- to Neoarchean granitoids (Bacaba Tonalite, Serra Dourada Granite, Sequeirinho Granite and Sossego Granite). This deposit cluster includes Sossego-Sequeirinho, Castanha and Jatoba, which present hydrothermal facies similar to those of intermediate to deeper zones of the IOCG mineral system. The Bacuri deposit exhibits a Paleoproterozoic alteration overprinting over the Neoarchean metasomatic facies. The alteration facies in these deposits encompasses early distal Na–Ca (Alb, Scp, Fprg) and K–Fe (Kfs–Qz–Bt, Qz–Bt–Mag–Ap) alteration followed by K–Ca–Fe (Bt–Hs, Act–Mag, Hs), Fe (Mag–Ap, Mag), K (Kfs–Bt, Bt–Chl) facies and minor Chl and Cal–Ep alterations. The mineralization comprises Ccp, Py, Po ± Pn, Sn, which may be spatially related to massive Mag–Ap–Act bodies and has Ni–(Zn) and Co enrichment (i.e., Jatoba and Castanha). This mineral system may also encompass the Jaguar deposit, a hydrothermal Ni-sulfide deposit, which shares several similarities with the Carajas IOCG deposits, such as structural control by regional discontinuities (i.e., Canaa shear system, McCandless fault and related structures), sub-vertical ore bodies associated with brittle and ductile structures, and complex hydrothermal systems (i.e., Bt–Chl, Amp–Bt and Mag–Ap–Qz alteration zones). The Jaguar mineralization style also includes vein, disseminated, massive, breccia zones, in which the main Ni- and Cu-bearing sulfides are Py, Mlr, Pn ± Ccp, Po and Sp. This deposit is hosted by subvolcanic rocks (Itacaiunas Supergroup?) and granitoid (Xingu Complex and Plaque Suite). Thus, this study aims to reconstruct the history of fluid-rock interaction, analyzing the nature of the host rocks and the physicochemical parameters that play major roles in metal transport and precipitation in the hydrothermal systems. This will provide a framework for explaining the spatial and temporal evolution of the Cu–Au–(Ni) mineralization in the CMP and its relationship with the magmatic and tectonic events already registered in the province, based on the identification of chemical signatures related to the different phases of mineralization of these deposit set (i.e., Sequeirinho-Sossego, Castanha, Jatoba, Bacuri and Jaguar).

Keywords: Metallogenesis; Geochronology; Mineral chemistry; Copper; Nickel.