Defining the style of mineralisation at the Cairn Hill magnetite-sulphide deposit, Mount Woods Inlier, Gawler Craton, South Australia

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DEFINING THE STYLE OF MINERALISATION AT THE CAIRN HILL MAGNETITE-SULPHIDE DEPOSIT; MOUNT WOODS INLIER, GAWLER CRATON, SOUTH AUSTRALIA

HYDROTHERMAL EVOLUTION OF THE CAIRN HILL IOCG DEPOSIT

ABSTRACT

The Cairn Hill Fe-(Cu-Au) deposit is located within the World-class 1.6 Ga Olympic iron oxide-copper-gold (IOCG) Province of the Gawler Craton, South Australia. Cairn Hill deposit formation was penecontemperaneous with regional orogenesis, and is interpreted as a deep-level, 'magnetite-rich' end-member IOCG system hosted by an upper-amphibolite quartzofeldspathic ortho-gneiss and Mesoproterozoic (1600 – 1575 Ma) Hiltaba-equivalent Balta-suite granites and granodiorites. U-Pb zircon SHRIMP dating of a representative host rock and cross-cutting foliated granitic dyke, constrains the timing of mineralisation between ~1587 Ma and ~1525 Ma, respectively; suggesting an affinity to Hiltaba-age granitoids. The deposit strikes E-W over a distance of 1.3 km and is up to 40 m wide. It is characterized by two mineralised zones: the North- and South- Lodes, coincident with subsidiary structures within the transpressional Cairn Hill Shear Zone (CHSZ), and concordant with the strike of the encompassing magnetic anomaly. Progressive exhumation resulted in temperature and pressure decreases under high-fluid pressure causing the CHSZ to cross the brittle-ductile transition. This occurred relatively late in the hydrothermal-metamorphic evolution, resulting in a contractional duplex in a restraining bend suggestive of a positive flower structure providing an optimal conduit for hydrothermal fluid-flow. Early Na-Ca alteration has affected the host rocks predominantly characterised by albite + scapolite + diopside ± actinolite/titanite. Extensive K-Fe metasomatism has affected the host rocks overprinted by localised zones of intense, texturally-destructive high-temperature magnetite-biotite alteration that is typical of a transitional-style IOCG system. Associated hypogene iron mineralisation predominantly consists of magnetite, with extensive zones of a superimposed texturally-complex sulphide assemblage (pyrite-pyrrhotite-chalcopyrite). Definition of the IOCG deposit clan remains a contentious issue, primarily due to mis-classification and poor understanding of some individual deposits. Nevertheless, the general consensus is that IOCG deposits sensu-stricto represent a spectrum between high-temperature, deeper magnetite-rich end-member systems, such as Cairn Hill, and lower-temperature, shallower hematite-rich end-members.

KEYWORDS

Cairn Hill, Olympic IOCG Province, Mount Woods Inlier, Hiltaba Suite, Hydrothermal Alteration, Regional Orogenesis

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