Onganja, Namibia: to Be or Not to Be an IOCG?

Matthew P. Hales[1], Judith Kinnaird[1, 2], Paul Nex[1, 3]
1. University of the Witwatersrand, Johannesburg, South Africa, 2. NRF/DSI Centre of Excellence (CIMERA), Johannesburg, South Africa, 3. Economic Geology Research Institute (EGRI), Johannesburg, South Africa

The Onganja Mining District, ~60 km northeast of Windhoek, Namibia is a world-renowned gem cuprite deposit. Cuprite, however, has only contributed to a small portion to the life-of-mine as exploitation dates back several centuries.

Formal mining began in 1904 and targeted several high-grade (2-6% Cu), low tonnage (<10000t) orebodies. These orebodies comprised subvertical breccias, consisting of chalcocite and chalcopyrite, associated with a N-S striking, sheeted-vein complex and subhorizontal, stratabound lenses, consisting of chalcopyrite, within the Kuiseb Schist Formation of the Damara Orogeny Southern Zone. Locally, gold and molybdenite are present but do not show a strong correlation to copper mineralization. Gangue minerals include quartz, albite, biotite, chlorite, calcite, magnetite and hematite with minor rutile, apatite and scapolite being locally present. These assemblages have led to the hypothesis that the district represents an IOCG system.

Alteration assemblages mimic conventional IOCG assemblages with albite and biotite representing Na^+ and K^+ alteration, respectively, but neither are regionally extensive. Rather, these minerals form in distinct horizons or as subhedral crystals within unmineralized breccias. Likewise, magnetite and hematite are locally prevalent, however, the formation of these minerals appears to have been controlled by the country-rock composition and degree of albitization; the same is true for chlorite with the added complexity that chlorite is also a product of retrograde metamorphism within the country schists. Scapolite is regionally extensive throughout the Southern Zone but regionally is more meionitic as compared to that at Onganja.

Furthermore, there are no known intrusions near the district, and the high-P, low-T conditions of the Southern Zone are the opposite of the conditions favourable to metamorphic IOCG systems.

Given these complexities, the Onganja mining district may represent an IOCG, however, the interplay between orogenic processes and ore-forming processes means that alternatives, such as remobilised VMS, cannot yet be discounted.