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Geology of the Kinsevere Cu Deposit, Democratic Republic of the Congo

Saleem, A.[1], Tomkinson, M.J.[2] and Northcott, M. [2]

[1]MMG Limited, Melbourne, Australia, ahmads.personal.email@gmail.com
[2]MMG Limited, Melbourne, Australia

The Kinsevere Copper deposit (Haut-Katanga Province, Democratic Republic of the Congo) is hosted within the Katangan Supergroup, a ca. 880-600 Ma sequence of Neoproteozoic metasedimentary rocks deposited in a series of intracratonic rift basins that comprise the Central African Copper Belt (CACB). Current interpretation suggests the deposit is hosted within the Mines Series of the Roan Group. The absence of two distinctive siliceous marker horizons in the Mines Series (i.e. the RSF and RSC), and the anomalously thick package of carbonaceous host strata further suggests a localised depo-center or sub-basin setting for the deposit. An alternate interpretation: the deposit is hosted in the stratigraphically higher Dipeta (R3) or Mwashya Sub-Groups (R4) based on the lack of distinctive Mine Series marker horizons and an ambiguous relationship between the interpreted hanging wall upper stratigraphic units and the Mine Series lithologies. The Kinsevere deposit consists of a supergene oxide deposit (2014 total resource of 19.7Mt at 3.4% Cu, [1]) and a hypogene sulfide deposit (2014 total resource of 24.6Mt at 2.5% Cu, [1]). Both styles of mineralisation occur as three fault offset orebodies (from NW to SE: Mashi, Central and Kinsevere Hill) interpreted to sit along a locally extensive structural corridor called the Kinsevere fault. Hypogene mineralization occurs largely as quartz ± carbonate ± apatite veins with chalcopyrite ± bornite ± carrollite emplaced into carbonaceous shales, siltstones and dolomites. Additionally, disseminations of sulfides are present either parallel to bedding laminations or replacing former evaporitic nodules. Dominant vein orientations are either parallel or orthogonal to bedding planes. Lack of a consistent relationship between vein orientations and tectonic regimes or deformational fabrics likely eliminates a structural emplacement of the veins. Sulphide vein mineralisation is localised around a N-S trending corridor at Central with vein densities decreasing away from the corridor axis. Geometry of the hypogene mineralization is controlled by the basal footwall RAT contact, the location of the carbonaceous strata (i.e. the SD) and the N-S to NW-SE striking corridor correlated to the Kinsevere fault. Depending on whether upper stratigraphic units (Dipeta, Mwashya) are interpreted to exist at Kinsevere, the stratigraphy is hosted with a steeply dipping (with complex local deformation) megaclast (ecaille) surrounded on all sides by coarse-grained halokinetic breccias or is a consistent stratigraphic package moving up-stratigraphy to the west. The oxide orebody is interpreted to form as a result of two processes. In the carbonaceous shale/siltstones, in situ weathering of the sulfidic vein system occurs preserving vein textures but altering the sulfides to malachite, chrysocolla, cuprite, chalcocite, and locally native copper. In the dolomitic/carbonate portion of the stratigraphy, precipitation of predominantly Cu carbonates (malachite, minor azurite) occurs within large voids and fractures. Malachite often forms spectacular botryoidal infills, stalagtites and speleothems in these zones. Supergene mineralisation is likely derived from oxidation of the deeper hypogene sulphide mineralisation but is localised strongly along the N-S to NW-SE corridor and along

faults and bedding planes which all likely acted as conduits for oxidation and localised development of oxides. The boundary marking the hypogene and supergene mineralization, i.e. the oxidation front, is highly complex. Fresh hypogene sulphide zones (mainly chalcopyrite) exist at high elevations within predominantly oxide material with either “mixed” or transitional ore zones marking the interface between the two.

References:

[1] MMG Annual Report (2014): 24-29