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

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The Kinsevere copper deposit (Democratic Republic of the Congo) is hosted within the Katangan Supergroup, Central African Copperbelt. Current interpretation suggests the deposit is hosted within the Mines Series of the Roan Group. An alternate interpretation is that the deposit is hosted in the stratigraphically higher Dipeta (R3) or Mwashya subgroups (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 19.7 Mt at 3.4% Cu) and a hypogene sulfide deposit (2014 total resource of 24.6 Mt at 2.5% Cu). Both styles of mineralization occur as three fault offset orebodies (from northwest to southeast: 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. Sulfide vein mineralization is localized around an 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 mineralization is likely derived from oxidation of the deeper hypogene sulfide mineralization but is localized strongly along the N-S to NW-SE corridor and along faults and bedding planes—which all likely acted as conduits for oxidation and localized development of oxides. The boundary marking the hypogene and supergene mineralization, i.e., the oxidation front, is highly complex. Fresh hypogene sulfide zones (mainly chalcopyrite) exist at high elevations within predominantly oxide material with either “mixed” or transitional ore zones marking the interface between the two.