Cobalt and Copper Mineralisation in the Fungurume 88 Deposit

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The Fungurume 88 deposit is located in the Tenke-Fungurume mining precinct in the Congolese copperbelt, and hosts high grade Cu (up to 4 wt.%) and Co (up to 3 wt.%) in an anomalous stratigraphic position in the usually-barren SD-1b subunit of the lower Shales Dolomitique Formation of the Mines Subgroup. The unit has experienced at least two episodes of fluid flow, giving rise to early stratabound styles of mineralisation (disseminated, stratiform and ‘jack’ veins) and later cross-cutting veins. The separate timing of the latter style of mineralisation is discerned both by macroscopic field observations and by trace element signatures measured in the contained sulphides, which comprise predominantly carrollite, chalcopyrite and bornite. Detailed optical and electron microscopy work, combined with bulk rock chemistry investigations, revealed that the host rock (a dolomitic shale/mudstone) represents a local facies variation relative to SD-1b units elsewhere in the copperbelt, which are typically coarser-grained dolomitic siltstones or sandstones. This local variant has the required physical and chemical properties to represent an ideal trapping environment for sulphide mineralisation, and its identification opens up exploration opportunities for similar fine-grained SD-1b subunits formed in sub-basins experiencing lower energy regimes during deposition.

The analyses further revealed a decoupling and zonation of the Cu and Co tenors within the SD-1b subunit of the Fungurume 88 deposit. These trends were interrogated further using in situ mineral chemistry analyses and thermodynamic modelling in the software CHNOSZ, coupled with new thermodynamic data for the dominant Co mineral carrollite. These results suggest that pulsed fluid flow may account for the zonation and paragenetic sequencing observed in the Fungurume 88 deposit, and the new thermodynamic data is expected to greatly improve our capacity to understand Cu and Co mineralizing systematics in the greater Copperbelt as well as elsewhere in the world.