

Lithostratigraphic, Structural Controls and Exploration Tools on Cu-Ag Mineralization of the Kalahari Copperbelt, Botswana

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The Kalahari Copperbelt (KCB) concealed beneath the kalahari sands, is a major metallogenic province and a globally significant mining hotspot that straddles the border between Namibia and Botswana. It is characterized by a series of sedimentary rock-hosted Cu-Ag deposits within NE-trending 1000 km long and up to 250 km-wide Meso-to Neoproterozoic volcano-sedimentary basins that were inverted during the Damaran Orogen (~600-480 Ma). Here, we review key aspects of basin development that gave rise to metal endowment in the Ghanzi-chobe basin of the KCB. The Cu-Ag deposits are characterized by redox-buffered metal-zoned mineralization trapped preferentially at the stratigraphic contact between the hematite-bearing oxidized red beds and chemically reduced metasedimentary rocks. The deposits are located along regional fold limbs and fold hinges that can be traced for hundreds of kilometers. Locally, the ores are concentrated along structurally-controlled quartz-carbonate veins, bedding and foliation planes, and metamorphic cleavage. Despite the cover that obscures bedrock, Zn and Pb anomalies have proved to be instrumental exploration tools, as they form hallos over high Cu shoots. Exploration is also targeting the fold limbs and fold hinges. The most economically significant deposits are proximal to basin highs cored by competent basement rocks, and therefore, basin highs have also become an important exploration tool. Upon reviewing aspects of the basin, it is evident that sulfide mineralization occurred in specific stratigraphic and structural positions, and precipitation was fundamentally due to redox change.