

Mineralogy and sulfur isotopic compositions of the Mowana vein-type copper deposit, Northeastern, Botswana

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The Mowana deposit is located in the southern part of the Zimbabwe Craton which extends into the north of Botswana. It contains approximately 72,000 kt of measured and indicated mineral resources at 0.8% average copper grade and 0.25 % cut off grade. The deposit has since discovery received little study and documentation. Therefore, this study presents the preliminary documentation of the mineralization and associated alteration characteristics on the basis of petrography and sulfur isotopic analyses.

The Mowana copper deposit is hosted within the north-northeast striking and nearly vertical dipping sliver known as the Bushman Lineament of carbonaceous and argillaceous metasediments of the Paleoproterozoic Matsitama Metasedimentary Group formed in a large sedimentary basin in the Southern African Shield. The Matsitama Metasedimentary Group is enclosed within foliated granitoids of the Moseitse Complex. The contact between the granite-gneiss and the overlying sediments is tectonic. These units are overlain by the Phanerozoic Karoo Supergroup sequence of conglomerates and siltstones.

The Cu mineralization occurs in quartz \pm calcite \pm alkali feldspar vein and breccias which are near or in contact with the silicified limestone and argillite host rocks. Moreover, appreciable amounts of galena and sphalerite are hosted in the quartz \pm calcite \pm fluorite veins. The granitic gneisses occur as country rocks. The graphitic schists occur as irregularly distributed lenses or patches between the mineralized breccia and carbonate rocks as well as the mineralized breccia and the argillite. The host rocks are characterized by silicification, chloritization, epidotization, sericitization, and carbonate alterations. The principal metallic minerals are chalcopyrite, pyrite, galena, and sphalerite. Supergene mineralization is categorized by the significant presence of chalcocite, native copper and bornite. The upper part of the deposit is oxidized as indicated by the presence of supergene malachite and chrysocolla. Gangue minerals are mainly quartz, calcite, sericite, epidote, and chlorite.

Sulfur isotopic ratios were determined on the sulfides; chalcopyrite and pyrite from the mineralized quartz veins. The $d^{34}\text{S}$ of five chalcopyrite samples from the mineralized veins range from -0.8 to +3.3‰ while the $d^{34}\text{S}$ of two pyrite samples are higher, +15.4 and +18.0 ‰. The contrasting sulfur isotopic ratios from the chalcopyrite and pyrite suggest different sulfur sources for the two minerals. The high $d^{34}\text{S}$ of pyrite can be attributed to closed system reduction of seawater sulfate of the Paleoproterozoic era.