

Textural and Mineralogical Characterization of Gold Deposits of the Vumba Greenstone Belt of Northeastern Botswana

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The ca. 2.7 Ga Vumba Greenstone Belt (VGB), located in the southwestern part of the Zimbabwe Craton in northeastern Botswana, is endowed with various commodities, such as gold and base metals found in the Somerset, White Pidgeon, Eldorado, and Arab deposits. The VGB has been affected by several episodes of metamorphism, with metamorphic grades spanning from greenschist to granulite facies. Previous geological studies have not revealed the mineralization characteristics, timing of the gold mineralization, and relationships among the gold deposits. This study focusses on textures and mode of occurrences of ore minerals among the gold deposits mentioned above using optical microscopy, SEM-EDS and EPMA. In the White Pidgeon deposit, sulfides occur as disseminated along the foliation in the biotite schist and amphibolite, and gold occurs as inclusions of electrum in arsenopyrite and native gold in quartz-siderite veins. The Somerset and Arab deposits show some similarities in terms of the mineralization styles, and they are characterized by arsenopyrite that is rich in inclusions of chalcopyrite, pyrrhotite, galena, ilmenite, rutile, and electrum. The sulfides occur in different textural positions: (1) disseminated, (2) vein-hosted, (3) distributed along the foliation in the biotite-garnet schist, garnet-mica schist, amphibolite, and garnet amphibolite, and (4) occasionally as inclusions in garnet, and as fracture-filling in host rocks. The Eldorado deposit contains gold-bearing sulfides in quartz veins and disseminated in the amphibolite along the foliation. Native gold and bismuth telluride occur as inclusions in arsenopyrite. Hydrothermal ilmenite and rutile are coeval with pyrrhotite, arsenopyrite, electrum and chalcopyrite in all deposits. Ilmenite is partially replaced by titanite at the edges and is variably enriched in MnO from 0.97wt% to 8.28wt% and lesser amount of MgO (up to 0.68wt%), Al₂O₃ (up to 0.12wt%), and CaO (up to 1.10wt%).