

Retrograde Overprint of the MEM2 Gold Deposit: Evidence for Polyphase Mineralization Along the Antimony Line, Murchison Greenstone Belt, South Africa

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The Antimony Line is a 35 km-long shear zone in the central parts of the Murchison Greenstone Belt of South Africa. It exhibits both gold-only and antimony-gold polyphase mineralization, which is uncommon within most Archean greenstone belts. Despite this atypical mineral endowment, the conditions under which this polyphase mineralization developed are still poorly constrained, as previous studies have exclusively focused on its world-class antimony-gold mineralization.

This study characterizes the disseminated, gold-only mineralization of the MEM2 deposit, which is located along the eastern extent of the Antimony Line. The 3D modelling, structural mapping and petrographic analyses of the wallrocks and mineralization reveal that mineralization developed as vein-hosted gold-sulphide mineralization during higher-temperature ($T > 500\text{ }^{\circ}\text{C}$) amphibolite-facies conditions. Hosted within discrete muscovite-biotite-quartz-carbonate schists within a larger, unmineralized talc-chlorite-quartz-carbonate schist package, the vein-hosted gold mineralization has subsequently been deformed, transposed and overprinted by greenschist-facies shear bands which reflect the pervasive greenschist facies ($T \sim 450\text{-}350\text{ }^{\circ}\text{C}$) retrogression of the host rocks of the Central Murchison Unit. The intensity of this structural overprint is such that, on a micro- to deposit-scale, gold mineralization has been completely remobilized and attenuated into the pervasive greenschist-facies subvertical foliation and steeply plunging lineation fabrics of the Antimony Line.

The recognition of this higher-temperature, amphibolite-facies gold-only mineralization and its subsequent greenschist-facies overprint, allows for a better temporal contextualization of the gold-only and antimony-gold polyphase mineralization along the Antimony Line. This study suggests that the gold-only mineralization along the Antimony Line occurred earlier within the metamorphic evolution of the Central Murchison Unit with antimony-gold mineralization developing during later, lower-temperature, greenschist-facies conditions.