Retrograde, Shear-Related Copper Mineralization at the Onganja Mining District, Namibia

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The Onganja mining district is located on an antiformal dome in the southern zone of the Pan-African Damara orogenic belt. The district comprises several surface and underground workings that targeted Cu-mineralised breccias and massive sulfide ore bodies, which were hosted in a sequence of amphibolites, biotite-plagioclase schists, and pelitic schists. The breccias are associated with a N- to NE-trending quartz-albite vein system but are only mineralised where black-mica schists form the wall rock to the veins. The massive sulfides are parallel to the schistosity within the black-mica schists. They are dominated by chalcopyrite and secondary chalcocite with subordinate pyrite, magnetite, and hematite and an enrichment Au-U-Mo±REE. Albite and biotite are the dominant alteration phases associated with Cu mineralisation.

The black-mica schists comprise typically well-aligned greasy black phlogopite that defines the strong schistosity. Veins and lenses of albite and quartz may be aligned to this schistosity. The black-mica schists are interpreted as shears in the host amphibolites with differing mineral assemblages representing the varying degrees of hydrothermal alteration and mineralisation of the wall rocks. Although similar mica-rich, coarse-grained schists with a strong schistosity occur throughout the district, the amphibolites and subsequent black-mica schists appear to have acted as a redox boundary, whereas the higher Fe content favoured the deposition of the Cu sulfides and associated elements.

The ore and alteration assemblages as well as the subvertical orientation of the breccias bear some similarity to the iron oxide-copper-gold (IOCG) mineralisation style, however, field observations in conjunction with whole-rock and mineral chemistry data suggest that the mineralisation at the district is unlikely to be representative of an IOCG. Rather, the mineralisation at the district is comparable to other retrograde, shear-related Cu-Au-U-Mo mineralisation in the Damara-Lufilian orogenic belts such as at Omitiomire, Lumwana, and Kansanshi.