SEG 2023 Conference: Resourcing the Green Transition

ID: **5236** | Submission Type: **Abstract** | Requested Presentation: **Poster** | Subject: **Advances in Mineral Deposit Geoscience**

Investigating metamorphosed VMS mineralization from the Archean Yilgarn Craton, Western Australia: preliminary results from the King Zn deposit

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Abstract
Most ancient VMS deposits have been subjected to metamorphism particularly those Archean in age. Although metamorphism may lead to protolith misinterpretation and increased complexity for exploration, it can also bring several benefits including ore body thickening, coarsening of sulfides, and precious metal upgrading. Here we present the early results of a detailed mineralogical study of both the ore body and host rocks of the King Zn deposit as a precursor to better understanding the mechanisms of metal remobilization during metamorphism. In addition, representative lithogeochemical data of the footwall and hanging-wall stratigraphy were used to identify the protolith of the volcanic host rocks and associated alteration footprints. Mineralogical and geochemical data suggested that the footwall stratigraphy consists of several basaltic volcanic rocks that have been metamorphosed into garnet amphibolite and various types of schist (muscovite-biotite, quartz-chlorite-magnetite, chlorite-muscovite). Intermediate to felsic rocks stratigraphically overly these units and are capped by massive sulfide mineralization. The immediate hanging-wall stratigraphy consists of BIF (likely meta-exhalite) and argillaceous metasedimentary rocks. The massive ore lens consists of a diverse suite of sulfides (i.e. pyrite, pyrrhotite, chalcopyrite, sphalerite, galena, with lesser marcasite, arsenopyrite, and rare gudmundite [FeSbS] and ullmannite [NiSbS]) and sulfosalts (i.e. tetrahedrite, boulangerite, rare canfieldite [Ag_8SnS_6]), as well as silver amalgam (Ag_9Hg). The underlying stringer sulfides include pyrite, chalcopyrite, pyrrhotite, sphalerite and rare pentlandite. Textural evidence suggest that the formation of sulfosalts and silver amalgam is likely attributed to the sulfide recrystallization during amphibolite facies metamorphism. Magnetite and ilmenite is abundant and disseminated within footwall rocks, typically along the foliation, but minor in the massive ore lens. Titanite occurs late in the footwall stratigraphy, replacing earlier formed ilmentite and rutile, both as coarse crystals and veins, indicative of extensive Ti remobilization during metamorphism.