INVESTIGATING THE EFFECTS OF METAMORPHISM ON THE SEDIMENT-HOSTED Cu-Co DOLOSTONE ORE FORMATION, NAMIBIA, USING GEOCHEMISTRY OF COEXISTING IRON-SULFIDES

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The Dolostone Ore Formation (DOF) is a sediment-hosted Cu-Co mineralization in the Kunene Region, northwestern Namibia. The DOF is hosted in Neoproterozoic calcareous siltstones and carbonates of the Ombombo Subgroup (MILLER, 2008). The main ore minerals of the DOF are sphalerite, chalcopyrite, linnaeite, pyrite and pyrrhotite; with subordinate, galena and cobaltite. These sulfides occur in six major mineralization styles: mono-sulfide disseminations, poly-sulfide clusters and nodules, clasts with prominent strain shadows, veins, and the so-called "events". The "event" mineralization style resemble slump-like structures with both brittle and ductile components, but may also be some sort of crack-seal veins.

Trace element analyses were carried out by LA-ICP-MS to better understand the geochemistry of the sulfides of this sediment-hosted mineralization. Pyrite and pyrrhotite coexist exclusively within the "events", where euhedral to subhedral pyrite is surrounded by anhedral pyrrhotite. The "event" pyrrhotite is associated with anhedral and intergrown sphalerite, chalcopyrite, and galena. Trace element analyses show that the "event" pyrite is enriched in Cu, As, Sb, Tl, and Pb, compared to the "event" pyrrhotite. Whilst concentrations of elements such as Co, Ni, and Se are relatively similar between the coexisting "event" iron-sulfides.

LARGE et al. (2007) demonstrated that trace elements such as Cu, Zn, Ag, Au, Te, and Pb would be depleted in greenschist facies recrystallized pyrite, compared to the unmetamorphosed pyrite. During metamorphism, the depleted elements would be liberated from the pyrite crystal lattice and form new separate phases, e.g. sphalerite and chalcopyrite. Elements that typically are more tightly incorporated into the crystal lattice of the iron-sulfides (e.g. Co, Ni, and Se) remain at similar concentrations after metamorphism (HUSTON et al., 2017; LARGE et al., 2007). These trends are what we observe in the DOF "event" iron-sulfides. Textural relationships between the "event" pyrite and the pyrrhotite, along with their trace element trends, propose the possibility that early pyrite was a source for Zn, Cu, and Pb that lead to the precipitation of sphalerite, chalcopyrite, and galena that are associated with the pyrrhotite during metamorphism. Preliminary EMPA results indicate that early framboidal pyrite is enriched in, at least, Zn, suggesting framboidal pyrite being a possible source of the metals of the DOF mineralization.

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