

Geochemistry of sedimentary-hosted Pb-Zn mineralization in the Paleoproterozoic Karrat Group, Greenland

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Recent work in the Paleoproterozoic Karrat Group (~2.0-1.9 Ga) of west Greenland has led to the discovery of new Pb-Zn mineralization targets. The most notable target is found in both the Marmorilik Formation (carbonate-hosted), which hosts the historical Black Angel Mine, and the newly discovered Qaarsukassak Formation (shale-carbonate-hosted). These two sedimentary units were deposited directly on crystalline basement rock and may be of similar age, however, because they are not in contact with one another and are separated by a basement topographic high, their stratigraphic correlation cannot be confirmed presently. If it can be shown that the mineralization is epigenetic or structurally controlled, then it can be inferred that both units host mineralization from a single event, regardless of their depositional relationship. The focus of this study is to geochemically and isotopically characterize regional sulfide ore samples to better understand the origin of Pb-Zn mineralization in both formations. Petrographic and sulfur isotope analyses of pyrite and ore minerals coupled with lead isotopic analysis of galena will help determine possible source fluids of mineralization in the two host formations. Preliminary sulfur isotope analyses of pyrite grains by conventional IRMS show a range of $\delta^{34}\text{S}$ values between +0.2‰ and +7.2‰ (n=14). Sulfur isotope analyses by SIMS is expected to yield a wider range in $\delta^{34}\text{S}$ values, which suggests the ore-forming sulfur is sedimentary in origin. Petrographic work on the Marmorilik mineralization shows porphyroclastic pyrite with sphalerite inclusions in a matrix of sphalerite and galena infilling between pyrite and gangue minerals. Cataclastic and partial annealing textures are present in some of the pyrite grains, and there are remobilization textures in the sphalerite and galena grains, which suggests that there was a late stage remobilization/ deformation event after the emplacement of sphalerite and galena. Observations in the field show Pb-Zn mineralization concentrated along southeast-trending antiformal hinge lines in the Qaarsukassak Formation, which is analogous to the mineralization in the Marmorilik Formation. The results of this project will be integrated into the Karrat Zinc Project, led by the Geological Survey of Denmark and Greenland and the Ministry of Industry and Minerals, and will be used to strengthen the broader research program that focuses on reconnaissance mapping, including stratigraphy, structural geology and geochronology, and mineral potential in the Karrat Group.