Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.20841

Interpreting the Neoproterozoic metasedimentary succession of the Central African Copperbelt: geochemical applications to aid deciphering sedimentary environments

AILEEN L. DORAN[1], KOEN TORREMANS[2], MURRAY W. HITZMAN[3], VICTOR IKECHUKWU VINCENT[2] AND JON STACEY[4]

[1]SFI Research Centre in Applied Geosciences (iCRAG),
[2]SFI Research Centre in Applied Geosciences (iCRAG), University College Dublin, Belfield, Dublin 4, Ireland
[3]University College Dublin/iCRAG
[4]Tangila Exploration, Lusaka, Zambia

Presenting Author: aileen.doran@icrag-centre.org

The Neoproterozoic Katangan Supergroup sedimentary succession of the Central African Copperbelt (CACB) host globally important copper-cobalt deposits, providing crucial resources for the green transition. The CACB Katangan Supergroup consists primarily of carbonate and siliciclastic metasedimentary rocks; a full sedimentary sequence (Lower Roan to Kundulungu Groups) is rarely observed in individual drill cores. Past research has traditionally focused on the lower part of the Katangan Supergroup, where many ore deposits are hosted, with less study of overlying intervals. Consequently, a number of questions remain around the succession's geological evolution, original depositional environments and post-depositional alteration.

Mineral chemistry and isotope studies have long been utilized to decipher past sedimentary environments and gain understanding of ore deposit formation. There are however significant challenges in undertaking geochemical studies of CACB Neoproterozoic sedimentary successions due to post-depositional alteration (e.g., diagenetic, hydrothermal, metamorphic). This complexity means that detailed studies to characterize rock-forming minerals are required to produce data that can allow such questions to be accurately addressed.

We present a comparison of several geochemical and petrographic methods (Raman, Tescan TIGER MIRA3 FEG-SEM, μXRF, CL) on samples from a +1.5km deep drill hole at the Lubambe Extension Project (247 Mt @ 3.64% TCu) at the Lubambe Copper Mine. This drill core intersects an apparently continuous sequence extending from the Upper Roan into the lower portion of the overlying Nguba Group. Based on initial logging, representative samples of key lithologies and other major features were selected for petrographic work, prior to undertaking geochemical analysis. This characterization was crucial to test the capabilities each geochemical technique (e.g., automated mineralogy, heavy mineral/mineral polymorph identification).

While this work in ongoing, initial studies have indicated several key observations, including; several generations of the same phase (e.g., carbonates/feldspars) may be closely associated, with differences observable only through geochemical mapping; multiple phases of dissolution/reprecipitation obscured the original sedimentary record, with complex pseudomorphs and mineral overgrowths; the role of evaporitic units in rock formation was more significant than previously thought. This presentation will discuss these observations, along with comparing the capacity of each geochemical method, to begin unravelling the history of formation of these rocks.