

Understanding High-grade Mineralization in the Khoemacau Zone 5 Cu-Ag Deposit, Kalahari Copperbelt, NW Botswana, using μ XRF Techniques

Mpho KEEDITSE^{1,2*}, Hannah BUAMONO³, Yasushi WATANABE¹, Antonio ARRIBAS³,
Takuya ECHIGO¹ and Shogo AOKI¹

¹Graduate School of International Resource Sciences, Akita University, 010-0852, Japan

²Department of Earth and Environmental Sciences, BIUST, Botswana

³Department of Earth, Environmental and Resource Sciences, The University of Texas at El Paso, TX, USA

E-mail: keeditm@gmail.com

The Zone 5 Cu-Ag deposit is the most consistently (for ~ 4.2 km) mineralized deposit in the Khoemacau district in northwestern Botswana, with an underground mineable resource of ~ 100 Mt grading 2% Cu and 21 g/t Ag. The deposit consists of a redox-buffered metal-zoned ore body hosted preferentially by chemically reduced meta-sediments overlying oxidized hematite-bearing arkosic sandstone. Ore-grade mineralization is typically hosted in variably deformed quartz-calcite veins, along metamorphic cleavage, along bedding, in shear fabric, and in folds. Geochemical assay data established during exploration indicates widespread significant concentrations of Ag, correlating positively with Cu. In this study, we apply a Bruker M4 TORNADO micro-X-ray fluorescence (μ XRF) scanner for multi-element mapping in selected high-grade drill core samples, with particular focus on Ag partitioning. Collection of μ XRF data was followed by microscopic and SEM-EDS observations to validate results. The μ XRF data coupled with petrographic results indicate: i) μ XRF multi-elemental mapping on the Zone 5 drill core samples was very effective and can be applied as a first order geochemical analytical tool for characterizing mineralization and targeting important sections of the core, ii) silicification contributed to cleavage formation, which later became important ore trap site, and iii) Ag is closely associated with Cu and Fe. SEM-EDS results show that native silver and stromeyerite in part co-precipitated with hematite post Cu-(Fe)-sulfide deposition.

Keywords : Micro-X-ray fluorescence, elemental mapping, Khoemacau metallogenic district, Ag partitioning, Zone 5