Mineralogical Characterization of Potential Source, Aquifer and Trap Rocks in the Central African Copperbelt Using the TESCAN TIMA® Automated SEM Mapping System

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The Central African Copperbelt (CACB) is the world's largest repository of sediment-hosted copper and cobalt, which are critical metals for electricity transmission and the production of batteries needed to help decarbonise society. Key knowledge gaps regarding this mineral system include the scale and nature of alteration mineral assemblage zoning and alteration mineral major- and trace-element chemistry patterns. A detailed characterization of samples from the CACB can address these gaps and help guide exploration for technology metals across different sedimentary basins. Here, we report TESCAN TIMA® automated mineral mapping results on (meta)sedimentary rocks from contrasting geological domains in the CACB. Our initial findings confirm higher metamorphic grades and metamorphic textures in rocks from the Domes region and the Kansanshi Cu-Au mine and in Muva Group rocks from the Fishtie Cu deposit. Initial results also suggest a dominantly Mg-rich (±Na, ±Ca) metasomatism in the Domes region and Kansanshi mine, whereas in the Classical Zambian Copperbelt, a dominant K-rich (± Ca, ±Mg, ±Na) alteration is recognized. At Fishtie, alteration is principally characterized by Fe-Mg metasomatism. It is clear that the alteration-mineralisation characteristics in the different regions are sufficiently different for the regions to be considered separate mineral systems from a hydrothermal processes perspective. Future work will include conventional multielement whole-rock geochemistry; mineral chemistry of key alteration and accessory mineral phases using analytical SEM, microprobe, and LA-ICP-MS; and data interrogation and development of discrimination tools through supervised and un-supervised multivariate statistical techniques.