

## Geochemistry of the Kansanshi Cu-Au deposit, Zambia

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The Kansanshi Cu-Au deposit occurs within the prolific Central African Copperbelt. It contains 12Mt Cu and 7 Moz Au and hosts the largest copper mine in Africa. Yet, as a late metamorphic, gold-rich, vein-controlled deposit, Kansanshi is unique within the district. Moreover, its complex structural setting, high metamorphic grade, and uncertain genesis have made it a challenging exploration target, in spite of its large areal extent. From 2011 to 2014, First Quantum Minerals completed over 83,000 meters of exploratory drilling in and around the mine and collected bulk rock (drill core) geochemical data comprising 48 major and trace elements by ICP-MS/AES. This research integrates this invaluable geochemical dataset with revised structural and stratigraphic interpretations to define lithologic units, recognize alteration patterns and vectors, and map key fluid flow pathways.

At Kansanshi, Cu occurs as chalcopyrite in subvertical vein sets consisting of quartz, calcite and pyrite commonly with strongly albitized alteration halos. Disseminated stratiform Cu mineralization occurs in carbonaceous siliclastic rocks (predominately phyllites) in proximity to the veins and along a low angle calcareous shear zone. Comparison of mineralized to un-mineralized phyllites reveals significant enrichment in Cu, Te, Au, Mo, U, Ag, In, Bi, W, Re, Co, Se, Ni, and Na in the mineralized zones. These enrichments correspond well to observed mineral assemblages of chalcopyrite, molybdenite, brannerite, and gold in association with Ni and Bi tellurides in pyrite [1,2,3]. The most significant metal depletion occurs in Cs, Tl, Ba, Rb, K, Zn, Ti, Li, Nb, and Sr related to de-carbonization reactions [4] and albite alteration of micas. Notably Ti is strongly leached from albitized zones and occurs locally in veins as coarsely crystalline rutile. Work is ongoing to map the full extent of Kansanshi's geochemical footprint.

[1] Broughton *et al.* (2002) *SEG Spec. Pub.* **9**, 141-153. [2] Torrealday *et al.* (2000) *Econ. Geol.* **95**, 1165-1170. [3] Goodship (2010) *Univ. of Exeter, MSc Thesis*, 73 p. [4] Kribek *et al.* (2005) *SGA Conf. Proceedings.*, 277-280.