

## **Accessory Phases in the Archean Kidd Creek VMS Deposit – Fingerprints to unravel a complex deposit history**

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Volcanogenic massive sulphide (VMS) deposits contain exploitable metal contents of high economic importance (e.g., Cu, Pb, Zn) and are actively mined globally. One of the world's largest VMS deposits is the Kidd Creek deposit, located in the Archean Abitibi Greenstone Belt, Canada. Three main orebodies comprise Cu-Zn-Pb-Ag mineralization hosted by felsic rhyolitic rocks within the bimodal Kidd-Munro-assemblage [1].

The mineralisation was caused by multiple influxes of hydrothermal fluids related to several magmatic events, which caused different mineralisation styles [1]. The host rocks to the deposit have undergone a complex geological history, including syn- and post-mineralization hydrothermal alteration and metasomatism at greenschist-facies metamorphic conditions [1,2].

Previous studies on the ore and host rock mineralogy revealed the presence of accessory phases throughout the deposit's lithologic succession such as rare earth element (REE)-bearing phosphates (florencite, monazite, xenotime), TiO<sub>2</sub>-polymorphs and zircon [1,2,3]. These phases can preserve distinct trace elemental and REE patterns indicative of hydrothermal and metamorphic processes [4] and. Therefore, they bear the potential to be used as tracers to distinguish between the different processes affecting sulphide mineralisation.

Based on a detailed petrographic study of thin sections from Kidd Creek, we identified bastnäsite, florencite, monazite, TiO<sub>2</sub>-polymorphs, xenotime, and zircon in the altered hanging wall and footwall rhyolites, as well as in the stringer-mineralisation host rocks. Their relationships to the ore minerals, as well as to other alteration phases (chlorite, plagioclase, quartz, sericite), were evaluated. Distinct geochemical patterns indicating their origin and their role in the deposit alteration history were obtained by combining scanning electron microscopy (SEM) and electron microprobe analyses (EMPA). Identifying well-defined distinct chemical and paragenetic trends of accessory minerals has great potential to be used to trace alteration processes in other VMS deposits worldwide.

[1] Hannington, M. D., et al. (1999) Econ. Geol. Monograph 10, 163-224

[2] Koopman, E., et al. (1999) Econ. Geol. Monograph 10, 267-296

[3] Schandl, E. S., et al. (1999) Econ. Geol. Monograph 86(7), 1546-1553