Application of High Resolution XRF Core Scanning in Early-Stage Mineral Exploration to Characterize the Distribution of Critical Metals

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While XRF continuous core scanning instruments have been available since the early 2000's their, application in early-stage mineral exploration has been limited, especially in comparison to the adoption of hyperspectral core scanners with the use of VNIR-SWIR cameras to map alteration mineralogy as a vector to ore. However, not all mineralised systems are alteration driven, for which geochemical gradients should be considered instead as a vector to ore. Nowhere is this truer than in exploration for critical minerals such as lithium, vanadium, nickel, niobium and the rare earth elements (REE) where the petrogenetic evolution leading to metal concentration is complex, and the current mineral deposit models for formation are not as well developed as they are for metals such as copper and gold. The aim of this presentation is to use the Cu-Au exploration project of VR Resources at the Hecla-Kilmer multiphase alkaline intrusive system with carbonatite in northern Ontario to illustrate the application of the Minalyze high resolution XRF core scanning unit, and the utility of its multiple outputs in early-stage exploration. The initial results from the Minalyze system illustrate the internal details of broad zones of REE and critical metal mineralization, including niobium and lithium, hosted within an extensive sulfide-bearing hydrothermal breccia system and calc-potassic alteration facies (fenitization).