Bridging the Gap: Rapid Geochemical and Mineralogical Characterization at the Hand-Specimen Scale

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With increasing challenges to deposit discovery, there is a corresponding increased need for rock characterization across scales. These challenges will be best addressed through the successful integration of multiple analytical techniques, but with a view to balancing the desire for high-spatial-resolution analysis against rapid turnaround time for use in near-real-time decision-making—and cost. All analytical tools come with a cost. However, data that supports decision-making throughout the mining life cycle from discovery to remediation improves the value proposition. A key area that needs to be addressed is the transition from meso-scales (outcrop or drill core) to micro-scales (thin section, crushed sample), where detailed mineral-textural relationships are used to interpret mineralization processes and deposit viability, and decide on approaches to mineral processing, behavior of materials in waste piles, and much more.

Micro-XRF provides rapid geochemical and mineralogical data at the scale of microns but on hand-specimen-sized samples. With beam sizes of <20 µm and detection limits that allow measurement of trace elements, micro-XRF spectrometers yield fast results on samples that require no polishing or conductive coating, such as cut pieces of drill core. Data generated from the micro-XRF may be integrated back into broader-scale data sets (visual logging, hyperspectral scans) to provide ground truthing and assistance with ongoing exploration and provide context for down-sampling to higher-spatial-resolution and more costly techniques such as SEM.

This presentation will use case studies on Au-bearing, Co-bearing, Exotic-Cu– and REE-bearing deposits to demonstrate the full potential of data produced by the micro-XRF spectrometer. These case studies highlight the role micro-XRF data may play in brownfields and greenfields exploration projects in the initial early understanding of mineralization, through to its potential for early planning of mineral processing requirements and benefits throughout the life cycle of an economic deposit.