Applications of Chemical Staining and Ultraviolet Light for Rapid Drill Core Characterization

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With the mining industry currently undergoing an economic downturn, rapid and cost-effective techniques for drill core characterization are required for deposit-wide geological analysis from the earliest life-of-mine stages (e.g., exploration). Early identification of geometallurgical or environmental liabilities that could be economically detrimental later in the mine life will influence the overall prospectivity of advanced exploration projects. Typically, drill core characterization focuses on assay data for resource development, geotechnical properties for mine design and geometallurgical parameters for optimized processing. Rarely is drill core routinely characterized for specific environmental characteristics such as domaining for acid rock drainage (ARD) or metal leaching (ML) potential. Despite the economics of the global mining industry and associated budget cut backs, the necessity for acquiring total deposit knowledge that incorporates geological, metallurgical, geotechnical, and environmental characterization, remains imperative.

Advanced core-scanning instruments (including hyperspectral scanners and ITRAX) are capable of routine mineral and chemical mapping of drill core. However, due to their high cost and the requirement for dedicated data processing staff, these technologies cannot be ubiquitously available throughout all mine sites and exploration projects. Here we emphasize how two low-cost analytical techniques, chemical staining and ultraviolet fluorescence, can be used as proxies for more advanced mineral identification techniques. Chemical staining techniques are diagnostic for specific carbonate-group and feldspar-group minerals and can be applied in exploration (i.e., resolving alteration assemblages), geometallurgical (i.e., indicate ore grindability and flotation cell pH), and environmental (i.e., domaining primary neutralizing capacity) work groups. Correlation of staining responses to UV fluorescence colours provides a further proxy that can be used in the field or core shed to enhance accurate drill core logging and mineralogical domaining.

This project documents the results of staining and corresponding UV fluorescence of carbonate and feldspar minerals from porphyry Cu-Au and VHMS deposits highlighting the implications for deposit-scale mineralogical domaining. Results are validated using XRD and electron microprobe analyses and compared to results from SWIR and LWIR techniques.

The distribution of carbonate and feldspar minerals in and around an ore deposit has significant exploration, environmental, and geometallurgical implications. Considering that VHMS deposits constitute one of the most acid forming deposit-classes, any inherent neutralization potential from carbonates minerals can improve the waste management strategies and reduce costs associated with imported additional neutralizing materials (e.g., quarried limestone, quick lime).