**Hyperspectral core imaging applied to geometallurgy: Improving fundamental alteration mineralogy characterisation in porphyry systems**

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High quality, consistent and continuous mineralogical data support development of robust geometallurgical models, resource models, and life of mine planning through blasting, mining, processing, and waste management. Traditionally, geological logging methodologies supported by a range of geochemical and geotechnical analytical data provide the foundational geoscience data to support these products and activities. However, visual logging, in particular across multiple drilling campaigns and geologists, presents significant barriers to the collection of accurate, consistent and quantitative alteration mineralogical and associated textural data. In porphyry copper deposits multistage hydrothermal alteration events and/or supergene weathering overprints challenge mineralogical and textural identification and can compromise the quality of geological data required to underpin downstream models and decisions.

A range of field and lab-based analytical technologies can improve rock characterization and address many of the challenges in visual mineralogical identification. For example, hyperspectral infrared core imaging (HCI) can improve the quality and consistency of mineral identification for many alteration minerals and some rock-forming minerals common to the porphyry environment. When included in resource drilling workflows these data support geological logging, semi-quantitative mineral abundance estimates and textural classification. Once integrated with a suite of complementary analytical data (e.g. quantitative XRD, XRF, lithogeochemistry), significantly improved geometallurgical models can be developed, which map the 3D distribution of key physical and/or chemical rock properties that influence metallurgical performance from bench to mill and beyond.

Introduction of HCI into drilling and modelling workflows requires planning to optimize efficiencies, to design appropriate validation strategies and to realise full value from the data. HCI was implemented on recent drilling programs at Teck's HVC mine (Canada) and the QB2 project (Chile). Adoption of this technology enabled improvements in core processing workflows and development of enhanced mineralogical models underpinned by consistent mineralogical data. At both sites, spatial identification of key mineralogical drivers of metallurgical performance will enable development of strategies to maximize orebody value. Robust, integrated geological models are foundational to orebody knowledge and sustainable resource extraction. Addition of HCI in drill program workflows supports improved geometallurgical model development and a roadmap that embraces modern rock to mineral to elemental analysis. This will modify traditional workflows, permit better-informed geometallurgical decisions and ultimately enable improved mine planning and mining.