

Lithium and its analytical challenge from exploring to mining

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ABSTRACT

Mineral exploration can be regarded as a scale-reduction process, which relies significantly on high-quality data and its availability. Knowledge about the presence and quantity of the commodity of interest in samples, whether from drillholes, outcrops, or mining operations is quintessential for timely decision making. While exploration for base metals benefited from the emergence of handheld XRF instruments, the technology cannot be utilised to analyse for lithium. In order to quantify lithium in pulp material from drillhole samples, we utilised a handheld Fourier Transformed Infrared (FTIR) spectrometer. This infrared spectroscopical method analyses the mineralogical content of samples rather than lithium itself. In this study we developed a workflow and calibration on samples from a spodumene deposit. Prior mineralogical investigation using Micro-XRF and QEMSCAN revealed that spodumene is the only major lithium-hosting mineral in the deposit and it occurs with quartz, albite, K-feldspar and muscovite. Approximately 150 samples were analysed and used in developing the calibration, which incorporated Partial Least Square (PLS) modelling. Since the material only contains one lithium-bearing mineral (spodumene), the PLS model was trained by using the chemically analysed lithium values available for those samples. The resulting model proved to be very robust, with an average error below 10%. Additional investigation into petalite-bearing samples demonstrated the potential application of handheld FTIR instruments for samples with varying mineralogy.