

Rapid Field Identification of Mineral Phases in LCT Pegmatites: The Application of Raman Spectroscopy

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ABSTRACT

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Rapid field identification of mineralogy is often a challenge in lithium-caesium-tantalum (LCT) pegmatite exploration. The common lithium bearing alumina-silicate minerals are visually similar to each other (various shades of white) and to other LCT pegmatite mineral phases such as the feldspar group. These minerals are anhydrous and are blind to commonly used in field spectroscopic techniques such as shortwave-infrared (SWIR) and if they contain lithium, blind to portable XRF.

The discovery, delineation and development of the Sinclair Caesium Deposit^{1,2}, Australia's first commercial pollucite mine, provided the opportunity to investigate the application of field portable Raman spectroscopy to identify the dominant minerals associated with a caesium bearing LCT pegmatite. A key objective was to verify the presence of and distinguish between the white lithium alumina-silicate minerals of petalite, eucryptite and spodumene.

Field portable Raman spectroscopy proved versatile, requiring no sample preparation and can be applied to wet samples. Mineral identification was conducted through spectral matching to a custom LCT pegmatite mineral library along with the extraction of characteristic spectral features. The direct analysis of drill core, chips and powders provides the ability to identify minerals and mineral mixtures in the field and to aid real-time decision making.

Over 10 000 samples were measured using portable Raman spectroscopy which enabled the development of mineral zonation maps. Results from high density grade control sampling will be used to augment geological mapping and mineral zonation definition ahead of further exploration. Results of mineral mapping of an entire ore-body using field portable RAMAN spectroscopy will be presented.

[1] Pioneer Resource Limited. 2016. Lithium-caesium discovery at Pioneer Dome. <http://www.pioneerresources.com.au/downloads/asx/pio2016100401.pdf>

[2] Pioneer Resource Limited. 2018. Pioneer commences mining operations at Sinclair caesium mine. <http://www.pioneerresources.com.au/downloads/asx/pio2018091301.pdf>