Varieties of ore and gangue mineral assemblages in Western Australian pegmatites

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ABSTRACT

CSIRO Mineral Resources evaluates optical sensing technologies for cost-effective exploration and ore body characterisation of a wide range of critical metals deposits, such as pegmatite-hosted Li-deposits. This paper presents varieties of ore and gangue mineral assemblages of five drill cores from the Greenbushes and King Col LCT pegmatites, located in the Yilgarn and Pilbara Cratons of Western Australia, respectively. The mineralogical drill core data collected by the Geological Survey of Western Australia (GSWA) using a hyperspectral drill core scanner, HyLogger3, which is part of AuScope's National Virtual Core Library research infrastructure program. The HyLogger3 data are publicly available through the AuScope portal (http://portal.auscope.org.au/) and GSWA's GeoView portal (GeoVIEW.WA).

The thermal infrared hyperspectral data collected by HyLogger3 allow cost-effective mapping of Li-host minerals, such as spodumene, petalite, holmquistite and amblygonite. Spodumene represents the main Li-host at Greenbushes, whereas considerable amounts of petalite can be found at King Col in addition to spodumene. Holmquistite and amblygonite are minor Li-host minerals. A range of spectral signatures of spodumene and petalite can be observed in both mineral deposits and are potentially due to variations of chemical composition of the Li-host minerals, including Fe:Al and Li:Na ratios. Feldspars are common gangue minerals in both deposits and show different Na:Ca ratios down hole, indicating zoning of the ore body. The HyLogger3-derived shortwave infrared hyperspectral data highlight compositional differences in alteration minerals (e.g. white mica) associated with different spodumene content. The two case study sites demonstrate the potential for advanced but cost-effective Li-resource characterisation by means of reflectance spectroscopy, helping to assess the economic value of different ore bodies quickly.