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Investigating the 3D mineralogical and textural variability of lithium-bearing minerals in LCT pegmatites using spectral computed tomography.

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Many chemical elements are critical for our green energy transition (e.g., for the production of lithium-ion batteries). Many of these critical elements are associated with a type of magmatic deposit: lithium-cesium-tantalum (LCT) pegmatites. These LCT pegmatites have been studied in detail, but different schools of thought still exist on the formation conditions [1, 2]. Especially the potential role of the fluxing components in the concentration of these critical elements remains a puzzling phenomenon [3]. A detailed three-dimensional (3D) characterization of LCT pegmatites is paramount in improving our knowledge of their formation history. Applying a methodology where a 2D microbeam imaging technique-based automated mineralogy system is combined with X-ray computed tomography (µCT) allows to investigate the 3D mineral distribution throughout individual pegmatite dykes [4]. We present the identification of lithium-bearing minerals in 3D using (spectral) X-ray computed tomography. It will allow to pinpoint the crucial stages that enable critical element mineralization during LCT pegmatite formation. Ultimately this will allow the verification of proposed petrogenetic models and experimental simulations [5, 6].

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Figure 1. Differentiation between spodumene, quartz-spodumene intergrowth and K-feldspar using spectral computed tomography.