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Lithium mineralization and remobilization at the Tanco pegmatite, Manitoba

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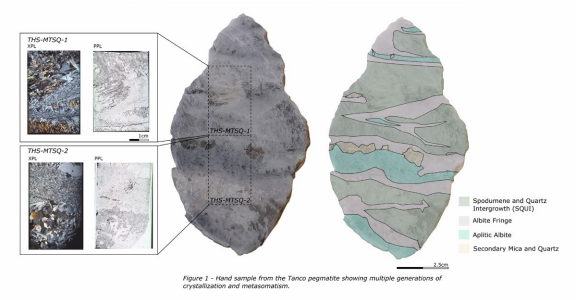

Figure 1 - Hand sample from the Tanco pegmatite showing multiple generations of crystallization and metasomatism.

The Lithium-Caesium-Tantalum (LCT) type Tanco pegmatite, part of the Winnipeg River-Cat Lake pegmatite field in Manitoba, presents an exceptional example of pegmatite evolution, fractionation, and zonation on all scales, from regional to micro. The Tanco pegmatite hosts zones of significant lithium mineralization and is the only current lithium producing mine in Canada. Understanding the nature of lithium distributions between mineral phases and assessing its mode of remobilization is key in analyzing enrichment patterns and drawing conclusions regarding deposit scale mineralization. This study investigates the mineralization of lithium bearing mineral phases in the pegmatite, primarily spodumene, petalite, lepidolite, and lithium phosphates. At this locality, the bulk of lithium mineralization occurs as spodumene and quartz intergrowths (SQUI), which are hypothesised to have formed from the breakdown of petalite with an anticipated ratio of 60% spodumene to 40% quartz. Preliminary observations show a variety of SQUI textures observed in drill core and in hand sample, with variable proportions (up to 79% spodumene: 19.1% quartz) and micro- to megacrystic SQUI sizes. This particular composition varies notably from expected proportions, hosting an elevated spodumene content. Results also show the breakdown of petalite leading to secondary mineral growth trends along relic cleavage planes. Previous studies observed crystals up to 10cm in size within SQUI. Analysis of these samples can elucidate the influence of post crystallization alteration and provide insights on geochemical mineral breakdown processes.

This study also presents textural and geochemical evidence of lithium remobilization as a result of metasomatism within the pegmatite. Abundant veins of aplitic albite contain Li minerals and thus are interpreted to have had a role in lithium remobilization. Thin section petrography reveals a dissolution and reprecipitation sequence of spodumene and quartz intergrowths and amblygonite into a secondary micaceous assemblage. Geochemical analyses reveals similar mica assemblages between this breakdown and the lepidolite zone. This process is hypothesised to have contributed to the formation of the late stage lepidolite zone mineralization in the pegmatite, which shows fine micaceous rims around primary mica crystals and strong zonation indicating prominent textural disequilibrium.