Goldschmidt 2025 Abstract
https://doi.org/10.7185/gold2025.32217

Voluminous lithium mineralization in the Cat Lake-Winnipeg River pegmatite field, Manitoba, Canada: insights for its origin and tectonic processes

TANIA MARTINS[1], CHRIS RM MCFARLANE[2], CLAUDE NAMBAJE[2], JAMES ROUSH[2] AND LEE A GROAT[3]

[1]Manitoba Geological Survey
[2]University of New Brunswick
[3]University of British Columbia

Lithium is currently considered one of the most important strategic and critical raw materials for the energy transition. Canada is a producer of hard-rock lithium with extensive reserves, and also holds important resources associated with brines.

The Archean age Tanco pegmatite located in Manitoba, Canada is one of the most famous pegmatites in the world, and a current producer of hard-rock lithium. This pegmatite is part of a large pegmatite field, the Cat Lake-Winnipeg River, which intrudes metavolcanic and metasedimentary rocks of the Superior Province's Bird River domain. The Tanco pegmatite has been the target of multiple studies including definition and description of zonation, deep understanding of mineral chemistry systematics (e.g., micas, feldspars, tourmaline, columbite group minerals, phosphates, spodumene), fluid inclusions, metasomatism, geochronology, structural emplacement controls, and its lithium mineralization.

The pegmatite field itself has been the target of extensive mineral exploration by industry and ongoing government and academia research projects. All this helps to have a better understanding of Tanco and the Cat Lake-Winnipeg River pegmatite field. However, many questions remain unresolved at Tanco and at the regional scale: what is the source of the lithium enrichments; is there a parental granite to the pegmatites; what is the relative timing of the different lithium-bearing pegmatites in the pegmatite field; what were the tectonic processes at play in order to generate such lithium-rich pegmatite melts in the area, to mention a few.

The Bird River domain is characterized by important S-type granitic and rare-element-bearing pegmatite magmatism at 2660-2645 Ma. During this time period, we had emplacement of several lithium-bearing pegmatites in the Cat Lake-Winnipeg River pegmatite field, including the Tanco pegmatite, and S-type granites. During this talk we will present and discuss the timing of granite and pegmatite formation in the Cat Lake-Winnipeg River pegmatite field, compare it to other pegmatite fields in the Superior Province, and the tectonic processes at play for the lithium endowment of the area.