Whole-rock and mineral geochemistry as exploration tools for rare-element pegmatites in Manitoba: examples from the Cat Lake–Winnipeg River and Wekusko Lake pegmatite fields

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Summary

Feldspar was conducted in the Cat Lake–Winnipeg River pegmatite field in southeastern Manitoba and the Wekusko Lake pegmatite field in central Manitoba. Both Li-bearing pegmatites are endowed with Li mineralization, but their geologic settings and ages are different. Country rocks surrounding the pegmatites in both fields were analyzed for major and trace elements, revealing trends that are distinct from those in the rest of the region. This has led to the development of a mineralogical and geochemical signature using which rare-element pegmatites can be identified. These trends have been applied to data from the Cat Lake–Winnipeg River and Wekusko Lake pegmatite fields, resulting in the identification of novel rare-element mineralization and K-feldspar from Dike 1 that indicates it is possible to track pegmatite fractionation using these trends.

References

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Economic considerations

The results from this work contribute to the growing number of rare-element deposits and a better understanding of country rocks in stable and relatively inactive terrains to explore for rare-element pegmatites (Hedley et al., 1986; Linnen et al., 2013). This is valid for metamorphic rocks, but has not been sufficiently tested for other types of wallrock and should therefore be used with caution.

For both examples, the maximum concentrations for each element occur mostly in the country rock adjacent to the pegmatite contacts. However, the increase in concentration approaching the contact might not always be a direct result of pegmatite intrusion. This is evident in the case of Cs, Rb and Li in the Cat Lake–Winnipeg River and Wekusko Lake pegmatite fields, where the maximum concentration occurs at a distance of 20 m from the contact. This suggests that other factors, such as alteration and hydrothermal activity, may also contribute to the increase in concentration.

Proposed future work

Examine the mineralogical and chemical characteristics of the pegmatite dikes in the area to understand the processes that led to the formation of the rare-element mineralization. This will provide valuable information for the exploration and mining of these deposits.

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