

Petrography and geochemistry of granitoids in the Misaw Lake area, northeastern Saskatchewan, with a focus on rare metals

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Regional mapping by the Saskatchewan Geological Survey has identified the northeastern corner of Saskatchewan as prospective for rare metals. Archean (Ennadai Group) and Paleoproterozoic (Hurwitz Group) gneisses are cross-cut by granitic and pegmatitic intrusions, including younger fluorine-bearing granites, that are considered to be equivalent in age to the Nueltin, Hudson, or Enekatcha intrusive suites in Nunavut. This study investigates the petrographic and geochemical characteristics of 25 representative samples of granitoid suites collected from five areas in the Misaw Lake area, which includes two areas in which LCT-type rare metal-enriched pegmatites have been identified. Pegmatites enriched in Li (up to 3950 ppm), Rb (<2130 ppm), and Cs (<70.9 ppm) and Ba (<7820 ppm) in some cases, contain lepidolite and spodumene, the latter partially replaced by a fine-grained aggregate of eucryptite and albite, and blocky feldspar crystals which likely host the elevated Rb, Cs and Ba. Pegmatites enriched in beryllium (up to 157 ppm) contain beryl crystals, some of which have sericite or bertrandite alteration. The subsolidus alteration is typical of LCT pegmatites, and provides constraints on the uplift path of these rocks. Major and trace element analyses of these rocks will be used to determine their affinities with the Nunavut granitoid suites. They appear to be geochemically similar to A-type granites, although the elevated Li, Rb, and Ga concentrations are likely enriched during crystal fractionation rather than being an indicator of primary melting processes. High resolution satellite imagery will be processed to determine locations of boulders or outcrops as targets for future field work.