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The purpose of this report is to document a large dataset (almost 4000 analyses) of electron microprobe analyses collected over a six-year period from tantalum-bearing minerals found in the Separation Lake area. In total, over 200 samples of granite and related aplites and pegmatites were examined.

The Separation Lake area is host to the most important rare-element pegmatites in Ontario. They include the Big Whopper and Big Mack petalite pegmatite systems, which potentially represent the world's second largest lithium deposit (of this type). The Separation Rapids pluton is considered to be the source of the rare-elements and the pegmatites occur in two distinct clusters adjacent to it. Beryl-type and complex-type, petalite-subtype pegmatites are the most common, and a few pegmatites have characteristics similar to the lepidolite-subtype. This study has revealed a wide range of tantalum mineral species that include; ferrocolumbite, ferrotantalite, manganocolumbite, manganotantalite, ferrotapiolite, ixiolite, strilverite, wodginite, ferrowodginite, titanowodginite, ferrotitanowodginite, microlite, bismutomicrolite, stibiomicrolite, stibiobetafite, uranmicrolite, ytropyrochlore, cassiterite and a potentially new species a tungsteniferous variety of wodginite. Zonation patterns seen in backscattered electron images show crystallization of these minerals was not a simple process and many reactions, overgrowths and exsolution phenomena have been documented. These variations are interpreted as primary magmatic features, as secondary features related to extreme fractionation involving the late stage development of albitic units, and as evidence for interaction of hosts rocks with the pegmatite magma. In some cases, these processes elevated the tantalum content of individual minerals to extreme compositions. Evidence is presented that indicates the Separation Rapids pluton is the source of the tantalum (and other rare elements). Both pluton and pegmatites outcrop within the Bird River-Separation Lake metavolcanic belt, the extension of which contains the world-famous Tanco pegmatite, in Manitoba. Limited data is also presented from the Treelined Lake Complex, a S-type granite located nearby in the English River Subprovince. By far the bulk of the data are from the pegmatites themselves and these are broadly divided into beryl pegmatites and petalite pegmatites. Generally, beryl-type pegmatites are found closer to their parent granite and are less fractionated than their complex-type, petalite subtype petalite counterparts. At Separation Lake, the situation is more complex and, although petalite pegmatites do have very evolved compositions, it is a beryl-type pegmatite (at location 93-265) that is considered the most fractionated. This is thought to be due to localized concentrations of volatile species, particularly fluorine, in the pegmatite melt.

This data is to accompany Open File Report (OFR) 6022.

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