Re-examination of Endogenic and Exogenic Granophane Mineralization at the Kedron Stock and its relation to Sn-W-Zn-In mineralized leucogranite systems in southwestern New Brunswick

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Figure 1: Location of Mount Pleasant (red star) and the similar Kedron Stock (yellow star) on a map of significant tungsten (W) deposits in New Brunswick (NBGSB).

Figure 2. Regional Geology of southwestern New Brunswick showing the granitic intrusive series north of the St. George Batholith. Note the location of the Kedron Stock along the Pleasant Ridge and the Beech Hill granites. Also, note the Mount Pleasant (Fire Tower Zone – W-Mo-Bi & the North Zone (Sn-Zn-Cu-In)) deposits (modified after Lentz and Gregoire, 1995).

Figure 3. Late Devonian Kedron Stock Granite with host Silurian metasedimentary rocks. The alteration, thorium and uranium anomalies outlined and regional magnetic signatures. Drill hole locations are also illustrated. Regions of magnetic anomaly, tin, indium soil anomaly, and bismuth soil anomaly are shown differently coloured zones (modified from Martin, 2011).

Figure 4. A) Contact between Silurian metasediments and Kedron granites is shown. The Kedron granite intruded in the Late Devonian, and hardened the surrounding Silurian sediments. B) Section of core showing the transition from coarse-grained alkali feldspar and quartz-rich pegmatite to fine-grained aplite granite, including granophytic features. Additional, stockwork veins can be seen cutting all textures. C) Photomicrograph of aplite section of drill core. Quartz (with varying interference colors), altered plagioclase with albite twinning, and muscovite can be seen. D) Photomicrograph of granophytic texture. Quartz intergrowths within intensely altered alkali feldspar. Alkali feldspar in this thin section does not show interference colors typical of alkali feldspars due to alteration. High interference color zircon can be seen within granophyre.

Introduction

Southwestern New Brunswick houses numerous of intrusion-related porphyry tin, tungsten, molybdenum, and indium deposits with the most notable of them being the Mount Pleasant deposits. The Mount Pleasant (MP) deposits hosts numerous styles of mineralization; tungsten/ molybdenum mineralization within breccias which amount to nearly 22.5 million tonnes at 0.21% W, 0.10% Mo, and 0.08% Bi (Parriott and Tully, 1978) in the Fire Tower zone (Fig. 1). Tin/indium mineralization also occurs in the Mount Pleasant North Zone, with mineralization near 4.8 million tonnes grading 0.82% Sn and 1.29 g/t In (Sinclair et al., 2006). Tin/indium mineralization is also found in the Fire Tower zone, with grades of indium reaching nearly 300 g/t in some areas (Sinclair et al., 2006). The Kedron Stock, which occurs to the west of the Mount Pleasant deposit, shares many characteristics with the surrounding intrusive granophyric porphyry systems and their mineralization.

Geological Setting

The Kedron Stream Granite stock, named for its proximity to the Kedron Lakes, is located in southwestern New Brunswick and was previously known as the Honey River Granite (Fig. 2). The Kedron Granite along with the Mount Pleasant granite and the other granitic intrusive bodies in the area (True Hill, Beech Hill, Pleasant Ridge, Sorrel Ridge) are commonly referred to as the Late Devonian granitic series (McLeod, 1990; Whalen et al., 1996). The granite intrusive units related to this area are characterized by their extreme fractionation and association with Sn-W mineralization.

Petrography and Mineralization

The Kedron Granite, which contains quartz, intensely altered alkali feldspar and plagioclase, and muscovite, varies in size throughout the intrusion from being aplite to pegmatic in texture. Mineralization at Kedron is found within endogenic and exogenic zones of intense alteration (greisenization, chloritization, silicification, fluorspar alteration), with various sulphide, i.e., pyrite, galena, sphalerite, chalcopyrite, cassiterite, arsenopyrite, and bismuthinite in association with hydrothermal veins and stringers. The various styles of mineralization and alteration occurring at MP are also present within the Silurian metasediments in and around the Kedron Granite (Fig. 4).

Geochemistry

According to the classification made by Azadbakht (2019), the Kedron granite along with other muscovite bearing granites such as Tower Hill were determined to be S-type granites because the ratio of A/CNK is greater than 1.1. In these S-type granites, the abundance of P2O5 increases gradually with fractional crystallization. The high abundance of lithium, beryllium, and fluorine in Kedron act as fluxes which suppress the temperature of crystallization of the magma, resulting in high rates of fractionation (Strong, 1981).

Conclusion

The Kedron granite phases have characteristics of typical S-type granite within the K-calc alkaline series, intruded into Silurian metasediments during the Late Devonian along with other similar intrusions in the same granitic series. Tin, zinc, silver, copper, and indium mineralization occurs within stockworks and hydrothermal veins and stringers, which are present throughout the intrusion and the metasediments. Various prospecting efforts have been done on Kedron in the past to give context to mineralization and determine economic viability, however thus far mining has not been conducted.

References


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