
Post 380 Ma granophile mineralization in southwestern Nova Scotia, Canada: evidence from the Clayton Hill and Gardners Meadow mineralized centres

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The southwestern Meguma terrane contains several Sn-Cu-Zn-Ag mineralized centres collectively referred to as the southwestern Nova Scotia Sn domain. It has previously been assumed that mineralization occurred during a single metallogenic event at 380 Ma and is synchronous with widespread felsic plutonism in the Meguma terrane. However, the presence of a younger magmatic event at about 360 Ma is represented by the Seal Island and Wedgeport granites. The latter intrusion is located south of the Dominique Sn-Cu deposit and suggests that this mineralization is similar in age to the granite. This study adds two new mineralized centres to this younger magmatic event, thereby expanding its areal extent and significance.

The Clayton Hill pluton (<1 km²) is a medium-grained leucomonzogranite (<2% biotite, muscovite) containing

miarolitic cavities and transecting aplite-pegmatite dykes. The pluton intrudes the Meguma Supergroup and has a well defined contact aureole. Chemically, the granite is silica-rich (73–76 wt.% SiO₂), depleted in CaO, MgO, and FeO, has K₂O/Na₂O near unity, A/CNK = 1–1.05, Rb = 180–226 ppm, Ba = 133–360 ppm, Sr = 65 ppm, and REE abundances and patterns typical of meta- to peraluminous granite. The intrusion is characterized by the presence of sulphide-bearing miaroles (py-cpy-sph) and molybdenite-bearing quartz-muscovite-sulphide greisens enriched in Cu, As, Zn, Bi, and Au. In addition, near the intrusion are skarn horizons with anomalous Sn-W-Cu-Ag-Zn. The age of the intrusion and mineralization are constrained at 361 Ma by concordant ⁴⁰Ar/³⁹Ar and Re-Os ages for muscovite and molybdenite, respectively, whereas a magmatic reservoir is inferred for the mineralization based on both oxygen ($\delta^{18}\text{O}_{\text{H}_2\text{O}} = 7\text{‰}$) and sulphur ($\delta^{34}\text{S}_{\text{H}_2\text{S}} = 5\text{‰}$) isotopic data.

Mineralization (Sn-Cu-Zn-Mo) at Gardners Meadow occurs as quartz-carbonate ± fluorite veins and garnet-rich horizons within quartz-rich metasiltstone of the Meguma Supergroup. Absence of hornfels and dyke rocks preclude direct evidence for a causative intrusion. Stable isotopic data on vein assemblages indicate that (at 400°C) $\delta^{18}\text{O}_{\text{H}_2\text{O}} = 3.6$ to 10.5‰ and $\delta^{34}\text{S}_{\text{H}_2\text{S}} = 5$ –6‰, whereas fluid inclusion data for aqueous fluid inclusion assemblages indicate homogenization temperatures of 125–220°C and salinities of 5–20 wt.% equivalent NaCl. The data are interpreted to reflect ascent and mixing of magmatic-derived fluids with a second fluid of possibly meteoric origin. Mineralization is constrained to ca. 350 Ma based on Re-Os dating of vein molybdenite.

This study is important in providing additional evidence for a post-380 Ma granophile metallogenic event of significant extent in the southwestern Meguma terrane. Furthermore, both the ages and elemental associations suggest correlation with the Mt. Pleasant mineralized (Sn-W-In-Zn) centre of southern New Brunswick, and suggest that this is a contiguous metallogenic domain.