This study focuses on the petrography, composition, and origin of tourmaline in these rocks. At least two generations of tourmaline have been documented from petrographic and electron microprobe work; early tourmaline may be detrital while later grains and outer rims are interpreted as hydrothermal or metamorphic. Tourmalines range in colour from clear to light brown, locally with darker cores that may have been inherited from originally detrital grains. Distinctive diamond-shaped aggregates, possibly psuedomorphs after tremolite, consist of medium-grained muscovite + tourmaline ± sillimanite cores with finer-grained albite + tourmaline rims. Tourmaline compositions are Mg-rich (dravite) with variable Ti and Mg/(Mg + Fe) contents. Dravitic tourmalines are commonly associated with submarine fumarole and massive sulphide exhalative deposits, where boron is derived from exhalative hydrothermal fluids. In the study area, late-stage tourmaline may have been derived from boron that was remobilized during metamorphism from boron-bearing minerals deposited within the original sedimentary host rocks.

Origin of tourmaline in a potential SEDEX-type deposit, Penrhyn Group, Melville Peninsula, Nunavut

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A suite of metamorphosed and hydrothermally altered sedimentary and chemogenic rocks was sampled from an area on the northern flank of Barrow River, Melville Peninsula (N 67°24'08.44", W 82°35'43.23"), Nunavut. The study area is in the Proterozoic Penryhn Group which lies within the Foxe Fold Belt of the Trans-Hudson orogen. On a regional scale, the Penryhn Group consists of interlayered pelitic and psammitic gneiss, amphibolite, marble, and calc-silicate rocks, all intruded by continental arc and syn-collisional plutons and pegmatites.

In order to identify the nature and extent of superimposed hydrothermal and metamorphic processes, samples were collected from 19 outcrops spanning an area of about 400 × 100 m. Sampled lithologies include amphibolite, granite, tourmalinite, greywacke, and sulphide-rich rocks, typically with abundant fine-grained, euhedral tourmaline crystals. The presence of fibrolitic sillimanite within tourmaline cores suggests upper amphibolite-facies metamorphism. Sulphide-rich layers contain pyrrhotite, pyrite, sphalerite, and chalcopyrite; however their abundance is highly variable throughout sampling area.

The study area has been the focus of several mineral exploration projects, including those by Aquataine (1970), Borealis Exploration Limited (BEL; 1985–87), and BEL-BHP (1994–1996). Assays indicated concentrations of 2000–7000 ppb Au, with Zn concentrations locally over 9%. The area was classified as a "black shale" environment.

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