
The evolution of late intrusive phases in the Georgeville Granite, Nova Scotia

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New exposures of the post-orogenic Georgeville granite reveal the presence of three distinct late-stage differentiates of the granite. The Neoproterozoic pluton is exposed in Georgeville, Nova Scotia, along the Northumberland Strait. Its intrusive age is inferred from a 579.8 ± 2.2 Ma date obtained by Ar/Ar analysis of muscovite in a related pegmatite (Cormier pegmatite). The new outcrops provide the opportunity to investigate the late-stage evolution of a highly fractionated A-type granite by examining the temporal, textural and chemical relationships of the different intrusive phases. The different phases can be subdivided based on texture and mineralogy into: (I) coarse-grained pegmatite (pegmatite I) composed almost entirely of quartz and microcline; (II) amazonite-bearing pegmatite-aplite dykes (pegmatite II); and (III) relatively fine-grained green, amazonite-zinnwaldite-bearing granite. The pegmatites occur as dykes and irregular shaped pods. The dykes are generally less than 50 cm in width, whereas the pod-shaped pegmatites may be up to a few meters in their maximum dimension. Pegmatite II crosscuts pegmatite I, but the temporal relationship of the green granite relative to the pegmatites is uncertain due to faulting. Pegmatite II and the green granite have similar major element compositions. However, trace element data show that the green granite is enriched in the rare alkalis Rb and Cs (Rb = 851 ppm, Cs = 41 ppm) compared to pegmatite II (Rb = 214 ppm and Cs = 4 ppm). The green granite is also enriched in Pb (113 ppm versus 72 ppm in pegmatite II) and depleted in Ba (52 ppm compared to 166 ppm in pegmatite II). The remainder of trace elements analyzed show similar values for each of the units. Pegmatite I is mainly composed of microcline, quartz, and clinocllore and is the volumetrically dominant pegmatite in the pluton. Thorite, zircon, and pyrite occur as accessory phases. Pegmatite II contains albite, microcline, quartz, and accessory clinocllore, zircon, and pyrite. The green granite is microporphyritic. It contains microcline (var. amazonite), quartz, albite, and accessory zinnwaldite, zircon and pyrite. Microcline in all units exhibits perthitic textures. The green granite is similar in composition to the niobium-, yttrium- and fluorine-enriched Cormier pegmatite that is located several hundred meters north of the study area. However, the granite is not as enriched in Nb and Zr. The highly fractionated green granite is interpreted to be the latest phase in the Georgeville pluton. This study shows that pegmatite-forming melts were generated at different times during the solidification of the Georgeville pluton. Textural variations within the pluton can be attributed to different melt compositions and degrees of undercooling.