Petrographic and geochemical variations in aplite dykes from an outcrop in the Halifax Pluton, Nova Scotia

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A suite of samples were collected from nine aplite dykes (10-200 cm wide) in a single biotite-cordierite monzogranite outcrop (200 x 400 m) near the northeastern margin of the zoned Halifax Pluton. The dykes display a wide range in AFM mineral assemblages but for this study have been classified as: Group I) biotite-dominated series including Bt≥Ms and Bt>Ms≥Cdt; and Group II) muscovite-dominated series including Ms>Bt≥Cdt and Ms=Cdt≥Grt>>Bt. No distinction can be made between the two groups on the basis of orientation with strikes and dips for all dykes ranging from NW-NE and 25 to 70° respectively.

Microprobe analyses indicate that Fe/(Fe+Mg) for biotite in Group I mostly range from 0.640 to 0.680, i.e., similar to values in the host Bt monzogranite, whereas values in Group II are much higher (0.730-0.780) and resemble the levels in the more chemically evolved Ms-Bt leucomonzogranitic rocks. Similarly, plagioclase compositions for Group I (An_{3-20}) are similar to compositions in the host Bt monzogranite whereas Group II compositions (An_{1-10}) are similar to evolved leucomonzogranite.

Concentrations of HFS and other "compatible" elements are higher in Group I (e.g., Ba 294-646; Sr 51-117; Ti 720-1740; Zr 57-141; La 12-36; Sc 2.8-4.9; Th 4.3-12.0 ppm) than Group II (Ba 58-248; Sr 19-50; Ti 0-720; Zr 34-70; La 3-14; Sc 0.6-3.4; Th 1.7-6.3). Conversely, the concentrations of LIL and other "incompatible" elements in Group I (e.g., Rb 230-300; Ta <0.5-1.4; Li 25-64; F 160-350; Sn 4-21 ppm) are similar to the levels in Group II (Rb 230-320; Ta <0.5-2.1; Li 37-68; F 50-273; Sn 14-22). The observed variation for HFS and "compatible" elements in Groups I and II are similar to, or exceed, the elemental ranges for average biotite granodiorite to muscovite±topaz leucogranite from the entire South Mountain Batholith. Conversely, concentrations of LIL and "incompatible" elements in both groups are similar to, or lower than, the least evolved biotite granodiorite of the batholith.

This study has revealed large mineralogical and chemical diversities for aplite dykes from a single outcrop. Therefore, caution should be used when making inferences regarding the evolution of granite bodies based solely on aplite/host compositions.

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