Calc-alkaline lamprophyric dykes around the Lake George antimony deposit, New Brunswick: age constraints and petrogenetic aspects

D.R. Lentz[1], N. Trenholm[1], and D.A. Archibald[2]
1. Department of Geology, University of New Brunswick, Fredericton, NB E3B 5A3, Canada <dlentz@unb.ca> ¶
2. Department of Geological Sciences and Geological Engineering, Queen's University, Kingston, ON K7L 3N6, Canada

Several east-west trending, very steeply south-dipping narrow (<4 m wide) early Devonian lamprophyre dykes (414.4 ± 2.4 Ma; plateau $^{40}Ar/^{39}Ar$ phlogopite ± hornblende) are found on the Lake George property and many more occur along the southern boundary of the Pokiok Batholith (10 samples). The dyke (DDH 76-1OA-29.3m – sample 80-12) dated at Lake George is cogenetic with the Hawkshaw Granite in the multiphase Pokiok Batholith. These very fine-grained lamprophyric to coarse-grained dykes are hornblende and phlogopite phyric with abundant interstitial plagioclase and K-feldspar, and minor apatite, titanite, and Fe-Ti oxides with later carbonate, quartz, and pyrite (± chalcopyrite). Granophyric texture is common in the interstices. Argillic to sericitic alteration in these dykes is related to various episodes of Au-W-Mo and later Sb-Au mineralization in the area. Emplacement of the dykes seemed to immediately precede the Lake George granodiorite, based on cross-cutting relationships and earlier K-Ar dates. Based on this study (n=2 1) and an earlier compilation (n=3), these lamprophyric dykes are trachybasaltic to basaltic trachyandesitic in composition; they also have ultrapotassic geochemical characteristics with high MgO (4.7 to 13.4 wt. %), K (1.1 to 5.4 wt. %), and K (0.78 to 11.6), i.e. potassic to ultrapotassic (shoshonitic). The high LOI and CO_2 are consistent with secondary alteration rather than a primary feature, although the dykes are enriched in H_2O and CO_2. Their composition is consistent with chemical fractionation with decreasing Mg#, MgO, and FeO^t with compatible siderophile elements such as Cr and Ni, and increasing incompatible elements (Zr, Th, REE, Y). The Cr varies considerably from 170 up to 1100 ppm in the most primitive parts of these dykes. There is considerable evidence of host rock contamination with sedimentary xenoliths evident locally, especially near their margins. The Nb/Y ratio is also consistent with alkalic parentage. Overall, they have immobile-element geochemical characteristics consistent with within-plate tholeiitic to alkalic mafic magmas that have arc geochemical associations (low Ti, Y, Nb, and high U, Th, La, Ce) similar to lamprophyric dykes of calc-alkaline affinity associated with

continental arcs, although transitional to a within plate signature. Typically, these magmas are derived from low degrees of partial melting of phlogopite-bearing metasomatized mantle in a suprasubduction zone setting. The emplacement of these magmas as dykes reflects the existence of mantle-tapping structures with a local extensional geodynamic setting.