understood but requires up to a ~100-fold increase in HFSE in the mineralized dykes compared to the HFSE-enriched granite. A prominent role for REE-partitioning into Na-Fe-F-rich hydrothermal fluids of magmatic origin is suspected. Support for this interpretation is found in the correlation between REE, Na, and Fe that occurs within intensely Na-altered rhyolites of the Byers Brook Formation immediately overlying the Hart Lake granite in the Debert Lake area.

Nature and setting of Late Devonian-Early Carboniferous rare earth element mineralization in the northeastern Cobequid Highlands

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The most prominent geological feature of northern mainland Nova Scotia is the Cobequid Highlands, a ~150 km long and up to ~20 km wide crustal block consisting predominantly of Late Neoproterozoic and Late-Devonian-Early Carboniferous volcanic and plutonic rocks. The crustal-scale, Cobequid-Chedabucto Fault Zone defines the southern boundary of the highlands and its northern margin is unconformably overlain by Late Carboniferous sedimentary rocks of the Cumberland Basin. Bimodal Late Devonian to Early Carboniferous mafic and felsic plutonic and volcanic rocks dominate the geology of the central and northeastern highlands. From southwest to northeast these rocks constitute four distinctive lithological units: the Folly Lake Pluton (mafic), Hart Lake-Byers Lake Pluton (felsic), Byers Brook Formation (felsic), and Diamond Brook Formation (mafic).

Significant rare earth element (REE) and associated Y, Zr, Nb, and Th mineralization has recently been discovered in the Debert Lake area along the contact zone between granitic rocks of the Hart Lake-Byers Lake Pluton and overlying cogenetic felsic volcanic and volcaniclastic rocks of the Byers Brook Formation. REE mineralization is represented by fine- to coarse-grained magmatic/hydrothermal granitic dykes that range in thickness from <1 to >50 cm. The dykes often display well-developed mineralogical banding and sinuous intrusive contacts with their hosts, which include overlying felsic volcanic rocks, earlier granite phases of the Hart Lake pluton, and late diabase dykes. Chemically, the mineralized dykes are characterized by elevated SiO_2 (up to 75 wt.%), $Fe_2O_3^T$ (~7–13 wt.%), F (0.06–1.4 wt.%), exceptional heavy rare earth (HREE) and high-field-strength (HFSE) element enrichments (e.g. Y >6000 ppm, Yb >1000 ppm, Zr >10000, Nb >1000 ppm), and anomalous Sn (200–800 ppm), W (20–200 ppm), Sb (2–8 ppm), and Zn (200–800 ppm).

The origin of the dykes is interpreted, in part, to be related to differentiation of a high-level, unusually HFSE-rich, (Na-Fe)-amphibole-bearing alkali-feldspar granite phase of the Hart Lake pluton. The mechanism of differentiation is still not full

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