Carboniferous lamprophyres in the central Cobequid Highlands, Nova Scotia: Precipitation of REE minerals

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A series of late Paleozoic A-type granite plutons was intruded along an active shear zone in the Cobequid Highlands. The majority of these granites host primary REE minerals, and present evidence of several events of hydrothermal REE remobilization. Granites of the West Moose River Pluton, however, contain exclusively secondary REE minerals. The West Moose River Pluton is located in a stepover zone between two major late Devonian faults, and just north of the Carboniferous Cobequid fault. It intrudes Horton Group rocks and has been dated at 361 +5/-3.5 Ma (U-Pb on zircon). Small mafic dykes and sills in the area post-date the granite (ca. 334 Ma $^{40}Ar/^{39}Ar$ on whole-rock, biotite), and some mineralogically resemble minette (biotite- rich lamprophyre). These minettes contain mineralized veins of different relative age and mineralogy. Based on cross-cutting relationships, the types of veins from oldest to youngest include albite, chlorite and calcite-fluorite-filled fractures. Rare late pyrite-barite veins are also present. Re- opening of old fractures led to the formation of composite veins. The only REE mineral found in the minettes is synchysite-(Ce) which occupies late cross-cutting veins. The remobilization of REE was enhanced by fluorine-carbon- rich fluids, which caused the simultaneous precipitation of fluorite, calcite and synchysite-(Ce). The precipitation of synchysite-(Ce) in the minettes was governed by the interaction of REE-bearing fluids with the Cl-bearing biotite of the host-rock. This study underlines the importance of halogens during fluid-rock interactions for the precipitation of REE, and identifies minettes as possibly important hosts of hydrothermal REE-minerals.

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