GSA Annual Meeting in Indianapolis, Indiana, USA - 2018

Paper No. 233-7
Presentation Time: 9:55 AM

ACCESSORY PHASES AS TRACERS OF MAGMATIC PROCESSES IN PLUTONIC ENVIRONMENTS: INSIGHTS FROM APATITE

BRYDON, RJ[1], MCLEOD, Claire[1], SHAULIS, Barry[2], HALEY, Maureen Y.[1] and TRONNES, Reidar[3], (1)Department of Geology & Environmental Earth Sciences, Miami University, 250 S. Patterson Avenue, 118 Shideler Hall, Oxford, OH 45056, (2)Department of Geosciences, University of Arkansas, 340 N. Campus Dr., 216 Gearhart Hall, Fayetteville, AR 72701, (3)Centre for Earth Evolution and Dynamics, University of Oslo, Sem Sælands vei 2A, Oslo, N-0315, Norway

Earth's continental crust is a rich archive of our planets geological history with approximately 86% of the Earth's upper continental crust composed of granitoid and granite-related rock suites. These are therefore important mineralogical and chemical recorders of Earths differentiation history and evolution.

A number of recent studies have demonstrated the utility of apatite as a reliable recorder of processes inherent to the chemical evolution of felsic, intrusive igneous suites. In this study, the occurrence and elemental signatures of apatite in a suite of lithologically diverse (alkali-)granites from the Oslo Rift (OR) in Norway are used to 1) chemically trace the petrogenesis of evolved, felsic magmas and 2) evaluate the petrogenesis of granitoids within the context of magma generation during continental rifting.

Two granitic batholiths, the Finnemarka (336km^3) and the Drammen (1811km^3), within the central OR form the basis of this study. Bulk rock major elemental signatures classify these granites as weakly alkaline to subalkaline (6.5-11 wt. % Na_2O+K_2O at 57-78 wt. % SiO_2) and weakly metaluminous to peraluminous (Al/Na+K-Ca from 0.95 to 1.1 at Al/(Na+K) from 1.0 to 1.55).

Apatite is a ubiquitous phase throughout the batholiths. Chondrite-normalized REE apatite profiles are characteristically LREE enriched (reflecting melt-crystal elemental partitioning) and exhibit prominent Eu-anomalies illustrating prior and/or complementary fractionation of feldspar. While overall patterns are similar, the absolute REE abundances in apatites differ between lithologies, likely indicating the variable availability of REEs during their crystallization. With respect to inter-element ratios, apatite $(La/Yb)_N$ vs. $(La/Sm)_N$ signatures are entirely consistent with values expected for I-type granites and demonstrably distinct from S-type granites (e.g. $(La/Yb)_N>3$ at $(La/Sm)_N>1$). In addition, La/Ce at >3 and La/Sm > 1 support the derivation of the apatites from an oxidized magmatic environment.

At present, the variation in the absolute elemental abundance of the OR granite apatites is interpreted as reflecting the construction of these batholiths through the amalgamation of distinct magma batches, which were ultimately derived from common source(s) at depth during continental rifting.

Session No. 233

T114. Apatite, from Magma to Medicine: In Honor of John M. Hughes
Wednesday, 7 November 2018: 8:00 AM-12:00 PM

Room 242 (Indiana Convention Center)

Geological Society of America *Abstracts with Programs.* Vol. 50, No. 6
doi: 10.1130/abs/2018AM-320310

Back to: T114. Apatite, from Magma to Medicine: In Honor of John M. Hughes

<< Previous Abstract | Next Abstract >>