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Introduction

Presented herein are *in situ* electron microprobe (EMPA: Table 1) and laser ablation inductivity coupled plasma mass spectrometer (LA-ICPMS: Table 2) analysis of magmatic biotite grains from Acadian-related granites of New Brunswick. All analyses were undertaken at the University of New Brunswick, Fredericton, New Brunswick.

Methodology

The biotite data were obtained using archived polished thin sections from earlier studies in New Brunswick (McLeod, 1990; Whalen, 1993; Yang, 2005; Beal et al., 2010; Shinkle, 2011; White, 2013). Petrographic examination was used to select the thirty -five polished thin sections used in this study. Target biotite grains were selected by detailed petrographic analysis and backscattered electron imaging with microprobe (EMPA-BSE) studies at the University of New Brunswick. Small (300μm × 300 μm) to large (> 1.5 mm) biotite grains with the least alteration and mineral inclusions were selected for analysis. Among the selected grains variable degrees of secondary hydrothermal alteration occur along the cleavage planes where biotite is commonly replaced by chlorite, muscovite, and/or epidote. A total of eight hundred and ninety EMPA were performed on biotite from these intrusions (Table 1). Major elements and halogen analysis were obtained on carbon-coated polished thin sections using wavelength-dispersion mode on a JXA-JEOL-733 Superprobe, equipped with dQant32 and dSpec automation from Geller Microanalytical Laboratories. The target biotite grains were analyzed at a few points (average of 5) along the cleavage plane from core to rim using 15 kV accelerating voltage, 30 nA beam current, the beam size of 2 μm, the maximum counting interval of 120s for Ca and Mn. The biotite chemical formula was recalculated based on 22 oxygen, water content was calculated by stoichiometry (Yang and Lentz, 2005) and OH= 4-(F-+Cl-). Ferric/ferrous ratios were computed in terms of charge balance. X_F, X_{Cl}, and X_{OH} are mole fractions of F, Cl, and OH in the hydroxyl site of biotite, respectively. X_{phl}, X_{sid}, and X_{ann} are mole fraction of phlogopite, siderophyllite, and annite in biotite, respectively. Calculation of halogen enrichment [IV (F), IV (Cl), and IV (F/Cl)] are based on the method developed by Munoz (1984). The halogen fugacities (fH_2O, fHF, $fHCl$) are based on partition coefficients of F, Cl, and OH between biotite and the hydrothermal fluid.

The mineral grains were then ablated for trace elements at the same spots using a Resonetics M-50-LR 193nm Excimer laser ablation system coupled to an Agilent 7700X quadrupole ICP-MS at the University of New Brunswick (Table 2). The K content of each spot as measured by EMPA was used as the internal standard for biotite with internally standardized data reduction scheme to obtain the most precise trace element data. The NIST SRM 610 glass was used for external calibration, whereas the BCR2-G glass was analyzed as a quality control check in runs. Unknown and standards were analyzed using 24 μm diameter beam size, 4 Hz pulse rate, and 3 J/cm^2 energy. Typical ablation time was 35 s, with 35 s background collection.

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