Spectroscopic analysis of alkali feldspar from the Georgeville Granite, Nova Scotia: Evidence for pervasive metasomatic alteration

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The late Proterozoic Georgeville Granite is an A-type granite situated about 20 km north of Antigonish, Nova Scotia. The bulk granite composition is characterized by high SiO_2, Th, Nb, Y and Zr and low CaO, TiO_2, MgO, FeO and MnO. Cathodoluminescence (CL) images, obtained from several thin sections of the granite, show that most feldspars display red luminescence. However, the inner regions of some plagioclase grains display a blue colour. These grains with blue inner regions and red rims are optically continuous and show no obvious signs of alteration when observed with a petrographic microscope. Previous studies of feldspars in other igneous intrusions have attributed the red CL colour to the presence of ferric iron introduced by late-stage fluids. In order to understand the metasomatic modification of the feldspars in the Georgeville Granite, the structure and chemistry of the red and blue CL regions was characterized using X-ray Excited Optical Luminescence (XEOL), X-Ray Absorption Spectroscopy (XAS), Synchrotron X-Ray Fluorescence (SRXF) and electron microprobe analyses. The XEOL results show that blue CL is strongly correlated with a UV feature at *ca.* 290 nm, and red

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CL is strongly correlated with an IR feature at *ca*. 720 nm. Both the 290 and 720 nm features are visible when the XEOL source was tuned below the excitation energy of the Fe K-edge. Using the XEOL spectra as a guide, XAS and SXRF spectra were recorded from red and blue CL regions. The XAS spectra indicate no change in either the coordination or the valance state of Fe between the red and blue CL regions. The SXRF data show that the red CL regions have higher concentrations of Fe^{3+} and Mn and lower Ca, Ti, and K than the blue CL regions. The blue CL regions within individual grains may therefore represent relicts of original plagioclase. Fe^{3+}-enriched metasomatic albite is wide spread and readily identified by red CL.