



**University
of Victoria**

Graduate Studies

**Notice of the Final Oral Examination
for the Degree of Master of Science**

of

DUNCAN MACKAY

School of Earth and Ocean Sciences

2012

Simon Fraser University

BSc

**“Development of Mineralogical and Geochemical Exploration Techniques for
Carbonatite-Related Nb (\pm Ta) and REE Deposits in the Canadian Cordillera”**

**Friday, March 27th, 2015
9:00 A.M.**

**BWC
A319**

Supervisory Committee:

Dr. George Simandl, School of Earth and Ocean Sciences, University of Victoria (Co-Supervisor)
Dr. Dante Canil, School of Earth and Ocean Sciences, UVic (Co-Supervisor)
Dr. Laurence Coogan, School of Earth and Ocean Sciences, UVic (Member)

External Examiner:

Dr. Paul Bédard, Université du Québec à Chicoutimi

Chair of Oral Examination:

Dr. Michael McGuire, Department of Electrical & Computer Engineering, University of Victoria

A copy of the dissertation will be available for viewing in the General Office of the Department of Political Science at least one week prior to the oral examination.

Dr. David Capson
Dean, Faculty of Graduate Studies

Abstract

Niobium and rare earth elements are considered as strategic metals in industrialised countries. These specialty metals are mainly derived from carbonatite-related deposits. An indicator mineral based method customised for carbonatite-related deposits incorporating the use of portable XRF and Quantitative Evaluation of Materials by Scanning electron microscopy (QEMSCAN®), shows great promise in exploration for Nb and REE. Portable XRF analysis of stream sediments identified the ideal size fraction for detailed indicator mineral studies as 125-250 µm for the British Columbia alkaline province. QEMSCAN® provides detection and characterisation of indicator minerals from carbonatite deposits with no additional processing when found in high concentrations. Preconcentration using a Mozley C800 separator is recommended for samples with low concentrations of indicator minerals. Discrimination diagrams based on the major element composition of pyrochlore supergroup and columbite-tantalite series minerals provides information on the deposit type from which these indicator minerals were derived.