FACHSTELLE SEKUNDÄR ROHSTOFFE

UNIVERSITÄT BERN

MSc	Samuel Andreas Gilgen
Supervisor	PD Dr. Urs Mäder
	Dr. Urs Eggenberger
	Prof. Thomas Nägler
Projectpartner	Avalon Rare Metals Inc. , Canada

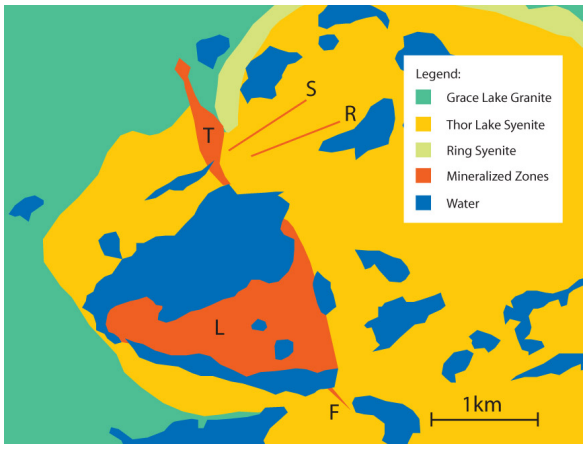
Mineralogical and isotopic studies on the Nechalacho REE-deposit, Thor Lake, Northwest Territories, Canada

The Nechalacho rare earth element (REE) deposit is located at the very south end of the large Archean Slave Province in the Northwest Territories in Canada. The REE deposit is hosted by the Grace Lake Granite and the Thor Lake Syenite and underlaid by an aegirine-nepheline syenite. This units form the center of the subcircular Proterozoic Blachford Lake Intrusive Suite. In this study new Sm-Nd isotopic data and mineralogical investigations using shortwave infrared (SWIR) spectroscopy of different rocks associated with the REE deposit are presented.

Measurements of the different intrusive units and ore zones reached εNd values of +0.5 to +1.7 which indicates domination by juvenile crust. Age calculation give an isochrone age of 2068±57 Ma for the ore zones and an apparent age of 2418±95 Ma for the intrusives. We suggest that this latter age is incorrect and that this Sm- Nd age results from mixing depleted mantle with old continental crust. This *slight* contamination must have happened *before* fractionation of the magma in an early stage of the ascent, because simple binary mixing could be excluded. Nevertheless, it is shown that two distinct intrusion events are separable. A first intrusion of the granite and syenite followed by the layered ore-bearing syenite intrusion. The timing of the prominent hydrothermal alteration can not be resolved. But the remobilization was not very intense, so that it did not disturb the Sm-Nd isotopic system significantly.

Epithermal or epimagmatic alteration minerals and their distribution in the Necha- lacho deposit have been characterized using SWIR spectroscopy. Over 740 analysis have been made, in 82% of the measurements the major mineral phase could be identified. Comparison with other techniques show that the identification of the major secondary minerals are reliable (93%). The minerals identified are predominately phengite, mus- covite, (Mg,Fe)-biotite and (Mg,Fe)-chlorite. The variation of mineral assemblages result most likely from the variation in the primary mineralization being nepheline, sodalite, aegirine and arfvedsonite in addition to feldspar. These results support the hypothesis that the Nechalacho deposit is an altered equivalent of the Ilimaussaq lay- ered complex. Therefore, it was shown that the SWIR spectroscopy is able to give general insights in the hydrothermal alteration of the REE deposit.

It could be shown that the SWIR technology can be used for the identification of REE-fluorocarbonates. Bastnaesite group minerals have characteristic spectra with a prominent absorption band at 1550nm. It was pointed out that the PIMA actually detects variable contents of these minerals. But quantification attempts revealed that the use is limited due to the high limit of detection (LOD), which is around 2.5% mineral abundance.



This simplified lithological map shows the different ore zones of the Thor Lake deposit.

The PIMA SP measuring an eudialyte from Ilimaussaq, Greenland.

Institut für Geologie
Fachstelle Sekundärrohstoffe
Baltzerstrasse 1+3
CH-3012 Bern

Tel. +41 031 631 87 98
rohstoff@geo.unibe.ch
www.rohstoff.unibe.ch