

2011 GSA Annual Meeting in Minneapolis (9–12 October 2011)

Presentation Time: 2:20 PM-2:35 PM

MANTLE EVOLUTION RECORDED IN CR-SPINEL FROM THE BAY OF ISLAND OPHIOLITIC COMPLEX, NORTHERN APPALACHIANS

[STERN, Fabio](#)¹, HATTORI, Kéiko H.¹, and BÉDARD, Jean H.², (1) Department of Earth Sciences, University of Ottawa, Ottawa, ON K1N 6N5, Canada, fster095@uottawa.ca, (2) Geological Survey of Canada, 490 rue de la Couronne, Quebec, QC G1K 9A9, Canada

Cr-spinel (FeCr_2O_4) is a useful petrogenic indicator of mafic-ultramafic rocks since it is not susceptible to alteration. Proposed origins of the Ordovician age Bay of Island Ophiolitic Complex (BOIC) in Newfoundland are diverse including the oceanic lithosphere formed at a ridge and arc lithosphere.

We studied mantle harzburgite and overlying cumulate dunite in the BOIC. Cr-spinel in harzburgite is subhedral to anhedral ranging from 0.2 to 1mm in size. The cores of Cr-spinel have low YFe^{3+} (0.02- 0.09). They show a continuous variation in Cr# from 0.20 to 0.78 and XMg from 0.50 to 0.72. Olivine contains fosterite (Fo) contents ranging from 89 to 92 and NiO from 0.29 to 0.44 wt%, and plots in the olivine-spinel mantle array (OSMA) of Arai (1994). The wide variation in Cr# reflects a change from a moderately fertile mantle to a more refractory mantle. In Cr# vs. Mg# diagram, the former plot in an area overlapping the fields for abyssal peridotite and subarc mantle and the latter in the forearc mantle field. The contents of TiO_2 vary from 0.02 to 0.16 wt% and plot in subarc field in Ti-Al diagram of Kamenetsky (2001).

In dunite Cr-spinel is subhedral to anhedral ranging from 0.5 to 1.2mm in size. They have Cr# ranging from 0.19 to 0.71, XMg from 0.44 to 0.67 and low YFe^{3+} (<0.09). The Fo contents (88 to 90) in olivine are lower than those of harzburgite. Most samples plot outside the OSMA and the Cr# of the primitive spinel projected to OSMA range from 0.4 to 0.8. The platinum group elements (PGE) in dunite show slightly positively sloped primitive-mantle normalized pattern with low Os and Ir, confirming that dunite is a cumulate of a mafic melt. The overall PGE contents are high, 44 ppb, suggesting the melt formation at high temperatures.

Values observed and projected for Cr# in dunite suggests that the source mantle for its parental melt was refractory, similar to forearc mantle, indicating the progressive depletion in the mantle during the evolution of the BOIC. Therefore the compositional variation of spinel reflects a change in the tectonic settings during the BOIC formation and a progressive depletion in the mantle through melt extraction in subduction setting.

Session No. 203

[Ophiolites, Ultrahigh Pressure Minerals, and the Origin of Podiform Chromitites: Implications for Mantle Heterogeneity](#)

Minneapolis Convention Center: Room 102D-F

1:30 PM-5:30 PM, Tuesday, 11 October 2011

Geological Society of America *Abstracts with Programs*, Vol. 43, No. 5, p. 493