Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

SIT05-11 Room:303 Time:May 27 10:30-10:45

Evolutional process of fast-spreading lower oceanic crust: an example of troctolites at the Hess Deep Rift

AKIZAWA, Norikatsu[1*] ; GODARD, Marguerite[2] ; ILDEFONSE, Benoit[2] ; ARAI, Shoji[1]

[1]Department of Earth Sciences, Kanazawa University, [2]Geosciences Montpellier, Universite Montpellier & CNRS

Troctolites were recovered during IODP Expedition 345 at Hess Deep Rift (Dec 2012 - Feb 2013), which targeted plutonic rocks from fast-spread lower ocean crust. The troctolites are divided into two groups based on textural differences; fine-grained troctolite (including a skeletal olivine-bearing troctolite sample),and coarse-grained troctolite.

The major-element compositions of olivine, plagioclase and clinopyroxene in coarse-grained troctolites are intermediate between those in olivine gabbros/olivine-bearing gabbros and peridotites recovered from the Hess Deep Rift. Fo content and NiO of olivine range from 87 to 89, and 0.2 to 0.3 wt.%, respectively. An content of plagioclase ranges from 85 to 90. Mg# and Cr_2O_3 of clinopyroxene range from 0.88 to 0.91, and 0.5 to 1.2 wt.%, respectively. In contrast, fine-grained troctolites partly overlap with olivine gabbros/olivine-bearing gabbros in mineral chemistry. Fo content and NiO of olivine range from 83 to 86, and 0.08 to 0.2 wt.%, respectively. An content of plagioclase ranges from 77 to 84. Mg# and Cr_2O_3 of clinopyroxene range from 0.82 to 0.89, and nearly nil to 1.0 wt.%, respectively. Trace-element analyses of olivine and plagioclase show progressive enrichment in REE from coarse-grained to fine-grained troctolites. In contrast, clinopyroxenes show scattered trace-element compositions in the fine-grained troctolites, even in a single thin section.

The changes in chemical composition of olivine and plagioclase from coarse-grained to fine-grained (and skeletal olivine-bearing) troctolites may be ascribed to variable degrees of reequilibration with crystallizing melts during cooling. Fine-grained troctolites possibly record melt/rock interactions that would be responsible for the variable chemical compositions of clinopyroxenes. At Hess Deep, lower crustal troctolites possibly underwent several stages of evolution, combining fractional crystallization of MORB (mid-ocean ridge basalt) melts, combined with melt/troctolite interaction during migration. Melt migration processes in the lower oceanic crust would result in enhanced regional diversity of MORB chemistry.

Keywords: Troctolite, Fast-spreading ridge, Melt/troctolite interaction, Hess Deep, Trace-element composition