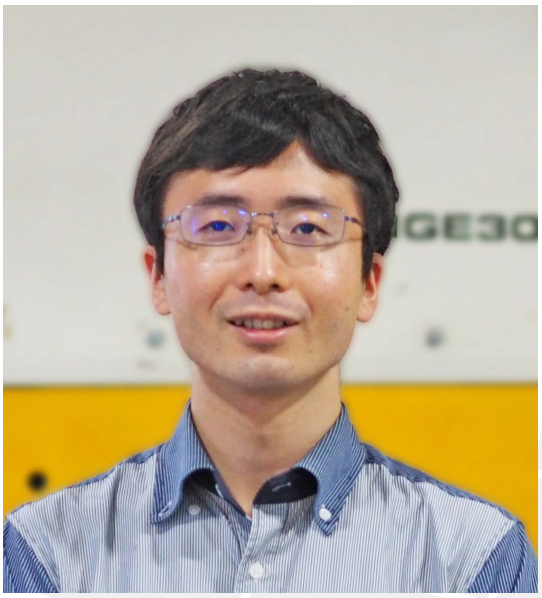
THE GEODYNAMICS SEMINAR Nº 591



Dr. Ko Fukuyama
JSPS Post-doctoral fellow
Geodynamics Research Center

2023.06.16 (Fri.) 16:30 ~

Venue: Meeting Room #486
Science Research Bldg. 1, 4th floor.
Ehime Univ.

Keywords:
1. "Missing" nitrogen
2. Lower mantle
3. Nitrogen storage capacity

Nitrogen solubilities in the lower-mantle minerals and revaluation of nitrogen storage capacity in the lower mantle.

Nitrogen is a geochemically important element, but its behavior in the deep Earth remains unclear. The abundance ratio of nitrogen normalized by chondrite composition in the bulk Earth is one order of magnitude less, compared to other volatile elements (Marty et al., 2012). This is the so-called "missing" nitrogen and one of the hypotheses explaining this "missing" nitrogen is the existence of a nitrogen reservoir in the deep mantle (Li et al., 2013; Yoshioka et al., 2018).

To investigate the existence of nitrogen reservoir in the lower mantle, we experimentally examined nitrogen solubilities in lower-mantle minerals such as bridgmanite and ferropericlase, using multi-anvil apparatus and secondary ion mass spectrometers. Experimental P-T conditions were 28 GPa and 1400 °C-1700 °C.

From the series of experiments, we reported that the nitrogen solubility in bridgmanite increased with increasing temperature recently (Fukuyama et al., 2023). In addition, nitrogen solubilities in bridgmanite and ferropericlase were found to increase with increasing the FeO content. Based on these results, we suggest that bridgmanite and ferropericlase can form a nitrogen reservoir in the lower mantle through the solidification of the magma ocean. Especially, there have been no reports on nitrogen solubility in ferropericlase and the lower mantle can store more nitrogen.

In this seminar, I would like to discuss the necessity on the revaluation of nitrogen storage capacity in the lower mantle with looking back at previous our data and to introduce perspectives.