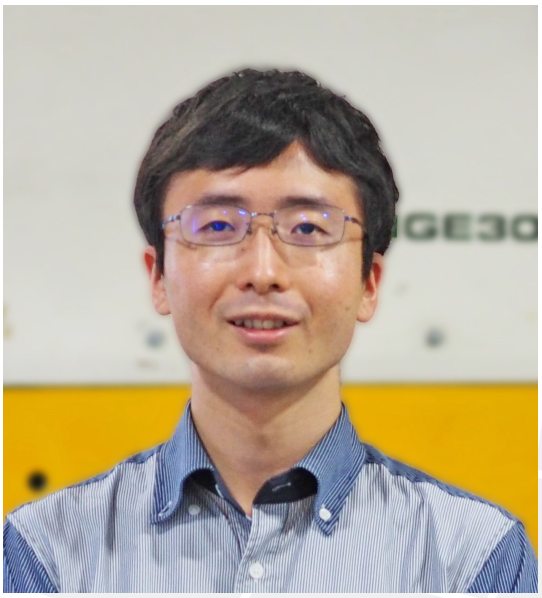
THE GEODYNAMICS SEMINAR Nº 573



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2021.06.10 (Fri.) 16:30 ~

Venue: Zoom
A link will be sent @grc-all within 30 minutes before the beginning of the seminar.

Ultrahigh-temperature and high-pressure experiment for determination of nitrogen isotope fractionation during Earth's core formation

Nitrogen occupies approximately 78% of the Earth's atmosphere and its isotope is important to understanding early Earth's evolution process. Although previous studies investigated nitrogen isotope fractionation during Earth's core formation (Li et al., 2016; Dalou et al., 2019), these previous experimental P-T conditions have been limited up to 7 GPa and 1800 °C, which do not reach those of the shallow magma ocean (e.g., Andrault et al., 2011). In contrast, isotope fractionation between metallic iron melt and silicate melt depends on temperature (e.g., Bigeleisen and Mayer, 1947; Urey, 1947). From these backgrounds, ultrahigh-temperature and high-pressure experimental methods are strongly needed to determine the isotopic fractionation.

Here, we will report an ultrahigh-temperature and high-pressure experimental method for the determination of nitrogen isotope fractionation during Earth's core formation by using Kawai-type multi-anvil apparatus (ORANGE-3000). The temperature was measured by a W-Re (W3%Re-W25%Re) thermocouple inserted in the octahedron and attached to the MgO single crystal sample capsules. Rhenium was used as a heater and the duration time was up to 70 seconds. In this research, we succeeded in conducting ultrahigh-temperature and high-pressure experiments under 7 GPa and 2500 °C corresponding to the shallow magma ocean. In the future, smaller nitrogen isotope fractionation is expected to be unraveled because the isotope fractionation decreases with increasing temperature (e.g., Bigeleisen and Mayer, 1947; Urey, 1947).

Keywords:
1. Ultrahigh-temperature
2. Rhenium heater
3. Earth's core formation

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