[EE] Evening Poster | S (Solid Earth Sciences) | S-IT Science of the Earth's Interior & Tectonophysics

# [S-IT22]Interaction and Coevolution of the Core and Mantle in the Earth and Planets

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Recent observational and experimental investigations have significantly advanced our understanding of the structure and constituent materials of the deep Earth. Yet, even fundamental properties intimately linked with formation and evolution of the planet, such as details of the chemical heterogeneity in the mantle and light elements dissolved in the core, remained unclear. Seismological evidence has suggested a vigorous convection in the lower mantle, whereas geochemistry has suggested the presence of stable regions there that hold ancient chemical signatures. The amounts of radioactive isotopes that act as heat sources and drive dynamic behaviors of the deep Earth are also still largely unknown. We provide an opportunity to exchange the achievements and ideas, and encourage persons who try to elucidate these unsolved issues of the core-mantle evolution using various methods, including high-pressure and high-temperature experiments, high-precision geochemical and paleomagnetic analyses, high-resolution geophysical observations, geo-neutrino observations, and large-scale numerical simulations. Since this session is co-sponsored by geomagnetism, paleomagnetism and rock magnetism division of the SGEPSS, contributions in geomagnetism and geodynamo simulation are also encouraged.

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# [SIT22-P04]High pressure generation up to 24 gigapascals using a D-DIA apparatus combined with jacketed anvils

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Keywords:D-DIA, jacketed anvil, x-ray transparent anvil

Rheological properties of high-pressure polymorphs of olivine are important to understand the cause of seismic anisotropy, viscosity structure, deep-focus earthquakes in the deeper part of the Earth’s mantle. Three types of deformation apparatus, namely, the D-DIA type (Wang et al., 2003), the rotational Drickamer apparatus (RDA: Yamazaki and Karato, 2001), and the Kawai-type apparatus for triaxial deformation (KATD: Nishihara, 2008) have been developed to deform high-pressure polymorphs of olivine. Although recent studies by Girard et al. (2015) and Tsujino et al. (2016) succeeded to deform bridgmanite at lower mantle pressures and temperatures using a RDA and a KATD respectively, in-situ D-DIA experiments are still limited to the conditions of lower part of the mantle transition zone (Kawazoe et al., 2016). The main cause disturbing further pressure generation using an in-situ D-DIA apparatus is relatively low toughness of the x-ray transparent anvils made from sintered diamond or cubic BN. In the geometry of cubic-type multianvil apparatus, the available press load needs to be low (usually <0.6 MN) to avoid the breakage of the x-ray transparent anvils. The advantages of D-DIA apparatus are as follows: i) compatible with acoustic emission monitoring (i.e., many transducers are available) and ii) temperature can be monitored by using a thermocouple. To explore the quantitative deformation experiments at lower mantle conditions, we adopted the ‘jacketed’ 6-6 type anvils (Yamada et al., 2016) and optimized the cell assembly using preformed gaskets (e.g., Kawazoe et al., 2010). Combining these techniques, I succeeded to generate 24 GPa at room temperatures using a D-DIA apparatus (in the case of truncation edge length = 3 mm). Pressures higher than 20 GPa are also

available using the ‘jacketed’ x-ray transparent anvils. Optimization of the design of ‘jacketed’ x-ray transparent anvil and cell assembly would lead to quantitative deformation experiments at lower mantle conditions in near future.