

## The 502nd Geodynamics Seminar

# Technical development of double-stage diamond anvil cell and equations of state at multi-megabar condition

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2018.9.28 (Fri.)

Meeting Room #486, Science  
Research Bldg. 1, Ehime Univ.



The pressure conditions of deep interior of super-Earths much higher than that of the center of the Earth, and reach several hundreds of gigapascal (GPa). Above 500 GPa, a lot of phase transitions are predicted by theoretical studies for oxides, silicates. Although diamond anvil cell is widely used as an experimental tool to generate very high pressure, its pressure is usually limited up to about 300 GPa. In order to beyond the limit of conventional diamond anvils, the double stage diamond anvil cell (ds-DAC) technique was invented by Dubrovinsky et al. (2012), and it is thought as a promising technique to generate ultra-high static pressures. We have also developed a ds-DAC technique by precisely fabricating 2nd stage anvils using a focused ion beam system. Using ultra-fine ( $< 10$  nm) nano-polycrystalline diamond as 2nd stage micro-anvils, we succeeded to generate a pressure above 400 GPa based on the equation of state of rhenium (Re-EoS) proposed by Anzellini et al. (2014), while it is about 630 GPa according to the Re-EoS reported in Dubrovinsky et al. (2012). In order to explore the consistency of the EoSs of rhenium and those of platinum (Pt), we performed additional experiments using a conventional DAC. MgO+Pt and Pt+Re samples were compressed up to about 300 GPa, respectively. The consistency of the EoSs of these materials at multi-megabar condition will be discussed.

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