

世界トップレベル研究拠点プログラム(WPI)と超高压物性
WPI Program and the Materials Property at Ultrahigh Pressure

廣瀬 敬
Kei Hirose

東京工業大学地球生命研究所
Earth-Life Science Institute (ELSI), Tokyo Institute of Technology

Earth-Life Science Institute (ELSI) was launched in December 2012 based on the World Premier International Research Center Initiative (WPI) program. We have a grand aim to explore the origin of the Earth and the origin of life. These two fundamental questions are closely related to each other, because the life emerged on Earth relatively soon after its formation. We will therefore focus our research on addressing the unique environments on the early Earth that gave birth to life and their subsequent changes, with the main aim to study the origin and early evolution of life and persistent ecological systems in their geological context. We will also approach the primordial environment of the Earth through explorations of deep-sea microbial ecosystems and extraterrestrial primitive asteroids. In addition, we will critically examine the universality of these processes, to determine the uniqueness of our planet, with implications for the search for extraterrestrial life, both in the solar system and beyond.

Our group has been working on the static ultrahigh-pressure and -temperature (P - T) experiments by using a laser-heated diamond-anvil cell (DAC). The P - T range of the DAC experiments has rapidly expanded in recent years. We have recently succeeded in the experiment up to 412 GPa and 5900 K, which is beyond the P - T condition corresponding to the center of the Earth (Tateno et al., 2010 Science). With such high P - T experimental techniques combined with synchrotron X-ray measurements, our understandings of the deep interior of the Earth has advanced greatly. The nature of the deep Earth is strongly related to the formation of the Earth and its early evolution. In particular, the knowledge of

materials differentiation inside the Earth is key to understand the primordial atmosphere, ocean, and crust, which controlled the surface environments at the beginning of the Earth.