Report for the Joint Use/Research of the Institute for Planetary Materials, Okayama University for FY2024

Month/Day/Year

Category: ☐International Joint Research ☑General Joint Research ☐Joint Use of Facility ☐Workshop

Name of the research project: Superionic states of H-bearing minerals in Earth's interior: Implications for electrical and thermal conductivity in the lower mantle

Principal applicant: Qingchun Zhang

Affiliated institution and department: Department of Earth and Planetary Sciences, Institute of Science Tokyo

Collaborator Name: 1) Takayuki Ishii ; 2) Kenji Ohta

Affiliated institution and department: 1) Institute for Planetary Materials, Okayama Universit

2) Department of Earth and Planetary Sciences, Institute of Science Tokyo

Research report:

My research aims to explore the superionic states of hydrogen-bearing minerals under high-pressure and high-temperature conditions, contributing to both geophysical science and solid-state ionics. Superionic phases in the Earth's interior could help explain phenomena such as the high electrical conductivity observed in the D" layer and the mechanisms of water transport within the mantle and core. To achieve this, I synthesized FeOOH-AlOOH solid solutions using the Kawai-type multi-anvil apparatus at IPM, Okayama University. Following synthesis, I conducted high pressure-temperature experiments with laser-heated diamond anvil cells (LHDACs) to investigate the phase boundary and equations of state of these samples. Up to now, I have determined the EOS of synthesized samples under ~81 GPa and ~1600 K. Next, I will continue to do other high-pressure experiments to determine their physical properties.