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

05/13/2025

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

Name of the research project: The viscosity of carbonate melts to the lower mantle conditions

Principal applicant: Longjian Xie

Affiliated institution and department: Department of Earth sciences, University College London

Collaborator:

Name: Takashi Yoshino; David Dobson

Affiliated institution and department: IPM; Department of Earth sciences, University College London

Research report:

Carbonate-rich magma exists inside the deep Earth and plays an important role in the formation of superdeep diamonds and the origin of kimberlite. The viscosity of the melt is a key parameter to understanding the migration of superdeep diamond-related carbonate melts and the eruption kinetics of kimberlite.

I have proposed to measure the viscosity of CaCO3, which is a major endmember component of carbonate melts near solidus, to the lower mantle conditions. During the joint use program, I did the testing experiments with the multi-anvil presses and also the preparation of cell assemblies for the beamtime at IPM.

We have successfully measured the viscosity of CaCO3 at pressures of of 5, 10, 15, 20, and 25 GPa. During the beamtime, we have done 12 experiments to measure the viscosity of CaCO3 composition to the lower-mantle conditions. We have succeeded in observing and recording the sphere falling from 5-25 GPa in run S3698, S3699, S3702, S3703, S3704, S3706, S3707, S3709. The data is still under treatment to obtain the melt viscosity.