

Report for the Joint Use/Research of the Institute for Planetary Materials, Okayama University for FY2023

5/28/2024

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

Name of the research project: Phase relations in MgO-SiO₂-H₂O system up to uppermost lower mantle conditions: Towards understanding precise water cycle and distribution in the mantle.

Principal applicant: Jintao Zhu

Affiliated institution and department: School of Earth and Space science, Peking University

Collaborator

Name:

Affiliated institution and department:

Research report:

Purpose:

To determine the phase relations of MgO-SiO₂-H₂O under water-undersaturated conditions.

Actually conducted research:

High pressure experiments under 8-26 GPa and 800-1400 °C;

X-ray diffraction analysis;

Back-scattered electron images observations;

FTIR measurement of the synthesized samples.

Research outcomes:

- (1) Combined with forward and reverse methods, phase relations of MgO-SiO₂-H₂O systems under water-undersaturated condition (2wt% H₂O) were obtained.
- (2) System of higher Mg/Si ratio has higher stability of SuB, PhA but decreased stability of PhE. Generally the subducting slabs with higher Mg/Si ratio are more capable to transport water.
- (3) Despite having lower dehydration temperature under water-undersaturated conditions, the hydrous phases PhA/PhE/SuB/PhD in the cold slabs can still keep stable coexisting with relatively dry NAMs. The dehydrations in hot slabs under 12-14 GPa, 24-26 GPa may contribute to the low velocity anomaly at corresponding depth.