

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

05/Day/2024

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

Name of the research project: Elastic anisotropy of hydrous phases of the deep Mantle

Principal applicant: Dr. Sergio Speziale

Affiliated institution and department: GFZ German Research Centre for Geosciences

Collaborator: Prof. Dr. Ishii

Name: Takayuki

Affiliated institution and department: Institute for Planetary Materials (IPM), Okayama University

Research report:

The purpose of our scientific collaboration is the characterization of the elastic and structural anisotropy of H-bearing candidate phases of the deep mantle. The complete characterization of the acoustic velocity and the elastic anisotropy of H-bearing minerals in the mantle is important to identify their possible presence at specific locations based on seismic models. A deep understanding of the relationship between elastic anisotropy of these minerals and the features associated with the location of H in their crystal structure will help developing approaches to identify the key features required to incorporate hydrogen and carry it to extreme conditions of pressure, with an impact on our systematic understanding of fluids capture and recycling in the solid earth throughout its evolution as well as in other terrestrial planetary bodies.

Synthesis, characterization, and the study of the elastic, structural and mechanical behavior of Fe-bearing delta-AlOOH, Al-bearing epsilon-FeOOH, phase-D and phase-H are the target materials of this project.

The current status is that a set of Fe-bearing delta-phase crystals of requested size (above 100 microns) have been synthesized and selected by Dr. T. Ishii at IPM (Figure 1), and are now being prepared by Dr. S. Speziale at the GFZ (in Potsdam, Germany) to performing elastic tensor measurements by Brillouin scattering. The crystals will be also further characterized by other spectroscopic techniques at the GFZ. High pressures studies are planned after a series of preliminary experiments will be completed ambient conditions. The ambient pressure Brillouin scattering measurements will start in the summer because of building renovation work that is

currently affecting the already planned experimental schedule of our laboratory in Potsdam.

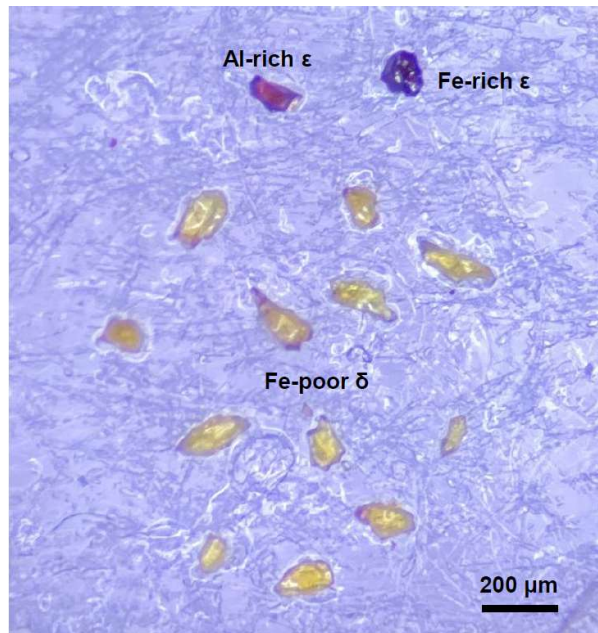


Figure 1. A selection of high-quality crystals of the prescribed dimensions (wider than 100 μm average width) ideal to perform the spectroscopic work at the GFZ.