

Technical development for neutron diffraction at very high pressure

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We have been developing new experimental techniques for measuring neutron diffraction patterns of hydrogen-bearing materials at ultra high-pressure conditions. In general, large volume is required for measuring neutron diffraction in comparison with X-ray diffraction measurements. Our research project aims to develop new types of high-pressure cells with large sample volume, to develop an elliptical supermirror guide for obtaining high-flux neutron beam, and to investigate pressure-response of hydrogen bonds.

Nano-polycrystalline diamond (NPD) was applied as an anvil material for a new type high-pressure cell. A proto-type cell was tested on the engineering materials diffractometer beam line (TAKUMI, BL-19) at the J-PARC neutron facility and neutron diffraction patterns from a sample loaded in the cell were obtained.

A palm cubic anvil cell was developed for neutron diffraction measurements at low temperature and high pressure. Recently, this cell was applied for observing hydrogen-ordered ice phase at high pressure.

The development of a supermirror guide also strongly contributes to the construction of high-pressure dedicating beamline, PLANET, BL-11 at J-PARC. We will introduce our recent research activities from our group in the presentation.

Keywords: neutron, high pressure, hydrogen, neutron diffraction