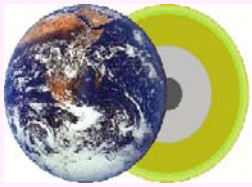
Geodynamics Seminar

第306回ジオダイナミクスセミナー

Neutron powder diffraction at high pressure using compact opposed anvil cell at J-PARC

Dr. Takuo Okuchi
Associate Professor, ISEI (Misasa) Okayama University

主催：愛媛大学地球深部ダイナミクス研究センター
日時：10/21（金）午後 4時30分～
場所：総合研究棟 4F 会議室



EHIME UNIVERSITY GRC GEODYNAMICS RESEARCH CENTER

Abstract

Neutron plays complementary role to x-ray in the broad field of material sciences, especially as the unique probe for structural analysis of hydrogen-bearing materials. J-PARC (Japan Proton Accelerator Research Complex) has now become one of the strongest pulsed neutron sources which give us the opportunity to apply this unique probe into high-pressure material sciences. Here we present our recent neutron powder diffraction results using compact anvil cells, which were all conducted at TAKUMI beamline (BL19) at J-PARC Materials and Life Science Experimental Facility. For this purpose we have developed a new-type cell and anvil designs suitable for time-of-flight neutron diffraction at 90-degree scattering geometry. The anvil cell has wide openings at 90±15-degree scattering angle. The opposed anvils are made of sapphire, moissanite, sintered polycrystalline diamond (SD), and nano-polycrystalline diamond (NPD). The NPD anvils were precisely cut and shaped into double-conical geometry by laser-machining scheme developed for this super-hard material. Shapes of these anvils were optimized for full lateral support to accept >100 kilonewtons of compressive force. Using these anvils and screws, sample volume of 4 mm3 was compressed to 9 GPa while that of 0.7 mm3 was compressed to 14 GPa. High transparency of the anvils (except for SD) both for neutron and visible lights helps to increase the signal-to-background ratio of diffraction from these small sample volume and also to enable in-situ optical scattering and/or fluorescence spectroscopy. Powder diffraction patterns of moderate quality with ~1.0 % resolution of deuterated brucite (Mg(OD)2), lead (Pb), etc, were obtained within several hours of accumulation, which demonstrated that the compact anvil cells will become useful apparatuses for neutron scattering at high pressures in near future.

詳細は当センターホームページ: http://www.ehime-u.ac.jp/~grc/をご覧ください
問い合わせ先：桑山 靖弘（TEL:089-927-8408,e-mail:kuwayama@sci.ehime-u.ac.jp）