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**2024.05.24 (Fri.) 16:30 ~**

**Venue: Meeting Room #486**  
Science Research Bldg. 1, 4th floor.  
Ehime Univ.

**Keywords:**

1. X-ray absorption spectroscopy
2. nano-polycrystalline diamond
3. X-ray magnetic circular dichroism

## **Applications of Nano-Polycrystalline Diamond Anvils to X-ray Absorption Spectroscopy under High Pressure**

X-ray absorption spectroscopy (XAS) has long been a useful technique for investigating local structure and electronic structure of crystalline and amorphous materials. X-ray magnetic circular dichroism (XMCD) is defined as a difference spectrum of XAS between left and right circular polarized X-rays, which enables us to probe their magnetic state. Recently, nano-polycrystalline diamond (NPD) anvils have been widely applied to high pressure research using XAS and XMCD, because the nanometer-sized polycrystallization in NPD anvils allows us to obtain glitch-free X-ray absorption spectra. Consequently, quality of the spectrum under high pressure is nearly comparable to those measured at ambient pressure.

My talk reviews technical developments of XAS and XMCD measurements under high pressure, which have been achieved at SPring-8 after the first use of NPD. Furthermore, recent applications of XAS with NPD anvils are presented. First topic is flipping of Sm magnetic moments induced by dense hydrogenation of  $\text{SmCo}_5\text{H}_x$  compound, ranging up to  $x \approx 13.5$ . Consequently, the magnetic coupling of Sm  $4f$  with Co  $3d$  moments changes to ferrimagnetic from the conventional ferromagnetic coupling. This topic is a good demonstration of XMCD for investigating magnetic structures. Second topic is XAS measurements of rhenium metal with double stage anvils. This is our first challenge of XAS measurement at multi megabar conditions ( $> 300$  GPa). Pressure estimation by using XAS and pressure dependence of Re  $5d$  electronic states are presented.