The first experiment for high-P powder diffraction using Paris-Edinburgh cells on JRR-3

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For the forward planning of high-pressure neutron diffraction study, it is meaningful to consider the use of Paris-Edinburgh (PE) high pressure cells. We conducted a first experiment for high-P powder diffraction using PE cells on the high resolution powder diffractometer (HRPD) in the reactor neutron source: JRR-3.

Lead particle (Nilaco Co., 99.9999%), which has a relatively high scattering length and low absorption for neutron, was used as a sample in order to obtain the intensity data as efficient as possible. A couple of cubic BN anvils and a TiZr null metal gasket were used in order to avoid scattering from surrounding materials.

The intensities of a 111 reflection, which is the strongest peak in lead sample, are 250 counts/h at ambient pressure and 80 counts/h at 30 tonnes. A significant decrease of background intensity was observed at high pressure. It might be due to a shielding of incident beam which causes background intensity by scattering from the air. The pressure estimated by the obtained lattice constants at 30 tonnes was 2.9(1) GPa. These results allows us to estimate how long beam time is necessary for the potential experiments.