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Venue: Zoom

A link will be sent @grc-all within 30 minutes before the beginning of the seminar.

Strength of diamond under high-temperature determined by in situ X-ray diffraction measurements

Diamonds are widely used as various products for cutting, drilling, polishing, and are also important material as parts of instruments for high-pressure research like a diamond anvil cell and multianvil apparatus with sintered diamond anvils. In these cases, diamonds are generally used under high-stress environment, these applications require an information of the strength of diamond. However, yield strength of diamond under room temperature remain unknown because diamond is so difficult to deform and brittle material. So, the strength of diamond has been generally shown in hardness determined by using indentation. Therefore, to investigate the yield strength of diamond, we have been conducted the strain measurements on diamond powder under high-pressure and temperature.

Our experiments were carried out using Kawai-type multianvil apparatus with in situ X-ray diffraction measurements at SPring-8, BL04B1. We used the experimental method described in Weidner et al. (1994a and b) to estimate the strain in the sample chamber. We observed changes in width of X-ray diffraction peak of diamond up to 35 GPa and 1300 °C. As a results, we succeeded in determining the yield strength of diamond above 600 °C, and it decreased with increasing temperature from 55 GPa at 600 °C to 25 GPa at 1000 °C.

We hope that the present works also have implications on the developments of high-pressure generation techniques with the use of diamond materials.

Keywords: 1. Yield strength, 2. Diamond, 3. High-pressure and temperature