The 414th Geodynamics Seminar

Applications of nano-polycrystalline diamond to anvil materials for multianvil apparatus

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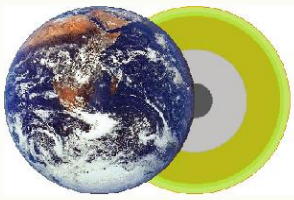

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Abstract

Pressure, like temperature, is one of the most fundamental external factor governing the state of materials and their physical and chemical properties. High-pressure technologies are now successfully applied to physics, chemistry, biology, and geoscience. In the case of geoscience, our investigable area is restricted by the potential of the high-pressure limitation of device. So, the impact of expansion of attainable pressures by high-pressure devices is an influential factor.

Several high-pressure devices have been used to high-pressure studies. Among these, Kawai-type multianvil apparatus (KMA) and diamond anvil cell (DAC) have been widely used as devices to study of the Earth's interior. KMA has advantage in producing homogeneous temperature and pressure in larger sample volumes compared with DAC, which makes it possible to measure accurate physical and chemical properties of minerals. The maximum pressure achieved by KMA has been limited to about 30 GPa when tungsten carbide (WC) is used for the second-stage anvil material (Kubo and Akaogi, 2000). However, introduction of sintered diamond with KMA and improvements in cell design dramatically expanded the pressure limit to 100 GPa (Irifune et al., 2004, Ito et al., 2007; and Yamazaki et al., 2014). Moreover, we know a 6-8-2 or 6-2 type cell assembly, which specialized cell for high-pressure generation. Endo and Ito (1982) firstly developed 6-8-2 and 6-2 type system, where a pair of opposed sintered diamond anvil was inserted in the pressure medium as the pressure intensifiers. We also have been optimized the cell assembly for 6-8-2 system with nano-polycrystalline diamond (NPD). Thereby, we were able to achieve pressures as high as 125 GPa (Kunimoto and Irifune, 2010).

Most recently, we are engaged in development of a cell assembly for 6-6-2 type as an extension of 6-8-2 type. In this process, we developed a newly designed pressure medium and gasket for MA6-6 system. Then, we have been conducted pressure generation test for 6-6-2 type. In this presentation I will report the results of preliminary experiments.

詳細は当センターホームページ：http://www.grc.ehime-u.ac.jp/ をご覧ください
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