

## Ultra-high pressure generation in the Kawai-type high pressure apparatus using the 6-8-2system

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The maximum pressure achieved by Kawai-type high pressure apparatus (KHA) has been limited to about 30 GPa when tungsten carbide (WC) is used for the second anvil material, while the use of sintered diamond (SD) anvils enabled to expand the pressure limit up to about 50 GPa. The author has been developed a 6-8-2 system for higher pressure generation using KHA. This system is based on a concept of combining the characteristics of KHA and diamond anvil cell (DAC). A Pair of single crystal diamonds (the third stage '2' anvils) are used for the pressure intensifier, which is placed in the pressure medium of KHA. The pressure calibration was first carried out at room temperature using pressure standard materials (ZnS, GaAs and GaP) and WC anvils with a truncated edge length (TEL) of 3.0 mm. Then in situ X-ray diffraction experiments were conducted at SPring-8, using a KHA 'SPEED-1500' at BL04B1. The generated pressures were calculated from the unit cell volume of Au on the basis of the equation of state (EOS) proposed by Anderson et al. (1989). As a result, the pressure generation of over 65.5 GPa at room temperature has been achieved with a press load of 13 MN, using the present 6-8-2 system. However, the pressure substantially dropped with increasing temperature above 400-600 Degree C, and finally fell down to about 20 GPa at 1000 Degree C. By introducing thermal insulators on the culets of the third-stage diamond anvils, the pressure drop was significantly reduced, and pressure of about 60 GPa was maintained at temperatures up to about 900 Degree C. Inspection of the recovered diamond anvils revealed that the pressure drop was presumably due to significant plastic deformation of the cullet surface of the single crystal diamonds.