

D111-type guide block for high-pressure deformation experiments

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For accurate understanding of material and heat transports in the Earth's interiors, knowledge of rheological property under high-pressure and high-temperature is indispensable. To study rheological property of materials at high-pressure quantitatively, deformation experiments has been carried out using various deformation devises including rotational Drickamer apparatus and deformation-DIA apparatus. Recently a new type apparatus, deformation T-Cup (DT-Cup), which is based on Kawai-type multi-anvil apparatus was developed by Hunt et al. (2014). In the DT-Cup, by driving two second-stage anvils using differential actuators, well-controlled deformation experiments can be conducted up to confining pressure of 18 GPa. However, more improvement is needed to achieve deformation at the condition of the Earth's lower mantle (>23 GPa).

To study the rheological property at the lower mantle condition experimentally, we are planning to install a “D111-type guide block” on a synchrotron beamline NE7A at PF-AR, KEK, Tsukuba. By combining D111-type guide block with the MAX-III press, it acts as a deformation apparatus (D111-type deformation device) that is improved version of DT-Cup. The our D111-type device can be used under higher press load (max. 700 tonf) which enables us to conduct quantitative deformation experiments at the lower mantle pressures. Stress and strain during deformation can be measured in situ using the monochromatized synchrotron X-ray. The installation of the D111-type guide block is planned on March 2017. We expect fruitful results on the deep Earth rheology based on experiments using the D111-type device in near future.

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