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High pressure generation over 4 megabar II

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Venue: Zoom

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

The internal pressure of planets such as gas/icy giant and super earths far exceeds the Earth's central pressure. Such extreme environments are frontiers for high-pressure material science, high-pressure experiments at multi-megabar are important to find the new phenomenon in deep part of those planets. When we perform high-pressure experiments, the equation of state (pressure scale) of the reference material is necessary to determine the pressure of the experiment. Many pressure scales have been proposed, but they are inconsistent, especially in the multi-megabar region, especially above the Earth's central pressure. First-order pressure scales have been proposed from first-principles calculations and/or shock compression experiments, but recently, pressure scales based on dynamic compression (ramp compression) experiments without shock waves have been reported. These are promising pressure standards in the extreme high-pressure region because they provide a more accurate isothermal equation of state since the effect of adiabatic compression is less and thus the contribution of thermal pressure is smaller. Although scales based on ramp compression have been proposed for Cu, Pt and Au, simultaneous compression experiments by static way are necessary to confirm their mutual consistency. The pressure generated routinely by conventional diamond anvil cells is limited about 300 GPa, and ds-DAC and t-DAC have been developed as new alternative techniques to break through this limit. We have conducted simultaneous compression experiments in the 400 GPa region using t-DAC for various pressure scale materials such as Cu, Re, Pt, W, Au, Mo, Fe, and MgO. In this talk, we will verify the mutual consistency of the equations of state for these materials.

Keywords:
1. Pressure scale
2. toroidal diamond anvil cell (t-DAC)

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