THE GEODYNAMICS SEMINAR Nº 533

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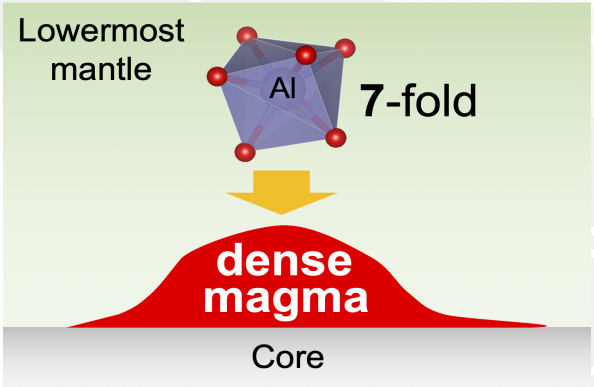
Venue: Zoom
A link will be sent @grc-all within 30 minutes before the beginning of the seminar.



Ultrahigh pressure structures of amorphous oxides investigated by the opposed type double-stage cell apparatus.

The presence of silicate melt (magma) near the CMB has been suggested by seismological studies. However, the gravitational stabilities of silicate melts at the CMB conditions (~135 GPa, ~4000 K) is still poorly understood due to experimental challenges. The XRD measurements up to ultrahigh pressure conditions can reveal the pressure-induced structural changes in silicate glasses, structural analogs of silicate melts, which can provide new insight into the discussion about the densification mechanism of the melts formed near the CMB. However, in situ XRD measurement on silicate glass under >100 GPa is still challenging because of the very weak signal from a tiny compressed-glass. To overcome this issue, the opposed-type double-stage large volume cell with multi-angle energy dispersive XRD technique has been developed at the 16-BMB, the Advanced Photon Source, USA. By using this cell, we successfully obtained the pair distribution functions g(r) of 60 mol% Al_2O_3 – 40 mol% SiO_2 glass up to 131 GPa. The first peak (r_1) in the g(r), assigned to T–O bond length (T = Al, Si), linearly decreases in the pressure range of 25–110 GPa, while it becomes nearly constant above ~110 GPa. This change of dr_1/dP near 110 GPa is likely explained by the change in Al–O distance associated with the Al–O CN increase from 6 to >6. This result implies that AlO_x units (x>6) can be formed ian aluminosilicate melts at the CMB region and contribute the densification of the melts. In this seminar, I will also discuss the structural similarity of silicate glasses in simple and complex compositions under ultrahigh pressure conditions.

Keywords: 1. Aluminosilicate glass 2. Pair-distribution function 3. Ultra-high pressure

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