In situ X-ray observation of SiO2 at high pressure and high temperature

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Recent experimental works suggest breakdown of MgSiO3 (perovskite) to a mixture of SiO2 and MgO (periclase) in the lower mantle (Saxena et al., 1996). Thus SiO2 may be one of the major phases expected to exist at the base of the lower mantle.

We made in situ X-ray diffraction study of the phase transition of SiO2 up to 80GPa and 900K. We used the Mao-Bell type diamond anvil cell combined with the external heating system made of Pt wire. The sample was heated by the YAG laser or external heating system. The CaCl2-like phase was observed after laser heating at about 60GPa and was stable up to about 80GPa. The crystallographic properties observed in this work were consisted with those reported by Dubrovinsky et al., 1997.

Recent experimental works suggested a possibility of breakdown of MgSiO3 (perovskite) to a mixture of SiO2 and MgO (periclase) at the base of the lower mantle (Saxena et al., 1996). Therefore, SiO2 may be one of the major constituents in the deeper put of the lower mantle, especially in the D"layer at the base of the lower mantle.

We studied the phase transition of SiO2 up to about 80GPa and 900K by in situ X-ray observation method at high pressure and temperature using the diamond anvil cell. We used the Mao-Bell type diamond anvil cell with a culet size of 0.25mm and the external heating system made of Pt wire. The X-ray diffraction experiments were carried out using monochromatic synchrotron radiation of a 0.03mm square beam at Photon Factory (PF). The sample was heated by the YAG laser or the external heating system. The CaCl2-like phase was observed at pressures from 60GPa to 80GPa after laser heating. Although the analytical errors in this study were relatively large, the compression behavior and the variation of axial ratio were consistent with those of Dubrovinsky et al., 1997 rather than those of Andrault et al., 1998.