Structure and Equation of State Study of Mantle Minerals Through in situ X-ray Observation

T. Yagi (0003358), T. Uchida, K. Oguri, M. Yamashita, T. Kondo

Institute for Solid State Physics. University of Tokyo

An equation of state study of CaSiO₃ perovskite was performed up to about 20 GPa and 1400 K. Experiments were peroformed at BL04B1 using SPEED1500 high pressure apparatus.

CaSiO₃ perovskite is regarded to be one of the important constituent of the Earth's lower mantle. Since it is unquenchable to ambient condition, only very limitted studies have been made on its equation of state. In the present experiment, crystalline CaSiO₃ with suidowolastonite structure was compressed to about



Fig. 1. Sample assembly for high pressure and temperature experiment.

20 GPa using double stage high pressure apparatus. Sample assembly used for the present experiment is shown in Fig. 1. The trancation length of the second stage anvil was 2mm. The sample was then heated to about 1400 K and transformed into perovskite structure. After it was completely converted into perovskite structure, its unit cell volume was measured precisely using powdered xray diffraction technique by changing both temeprature and pressure. An example of the diffraction profile obtained by these measurements are shown in Fig. 2, More than 50 measurements under different pressure and temperature conditions were made for both perovskite sample and pressure marker. Detailed analysis is in progress and these data will be useful to construct reliable equation of state, which will play important role for the discussion of the Earth's lower mantle.



Fig. 2. An example of the diffraction pattern of CaSiO₃ perovskite obtained at about 23 GPa and 1300 K.