Structural feature of hydrous ringwoodite at high pressure and estimated maximum hydrogen content

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Sets of X-ray diffraction intensities up to 7.9 GPa of a single crystal of 35x35x24 micron hydrous ringwoodite Mg1.97SiH0.06O4, synthesized by Ohtani and Mizobata (1998) using a multi-anvil apparatus at conditions of 1680 C and 22 GPa were measured using synchrotron radiation at the beam line BL-10A, Photon Factory, High Energy Accelerator Reasearch Organization, Tukuba, Japan. The modified Merrill-Bassett type diamond anvil pressure cell was used. The 4:1 fluid mixture of methanol and ethanol was used for pressure medium and SUS301 stainless steel plate was used for gasket. The pressure was calibrated using the ruby fluorescence method. The compression of the unit cell axial length was 1.3 % at 7.9 GPa. The compressibility of the unit cell is close to the compressibility of the MO6 octahedron. This fact indicate that the compression of the crystal structure is governed by the compression of MO6 octahedron. Based on the consideration about possible sites of hydrogen, the maximum contents of H2O were estimated to be 3.3 wt% and 0.78 wt% for ringwoodite and forsterite, respectively.