K038-002 Room: 101B Time: May 28 9:13-9:26

Compression mechanism of polyhedra of the minerals in the system brucite-forsterite

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Single crystal X-ray diffraction study on humite, Mg7Si3H2O14, were performed using a diamond anvil cell at ambient temperature with synchrotron radiation in Photon Factory, KEK, Tsukuba. The specimen of humite is from Tilley Foster Mine, U.S.A.. Single crystal of humite (0.05x0.04x0.03mm in size) was used for all X-ray diffraction study (l=0.6958A for 2.7 GPa, l=0.6955A for 5.2 GPa). Cell parameters and X-ray diffraction intensities were measured at 2.7 GPa and 5.2 GPa using an automated four-circle diffractometer located in the beam line BL-10A of Photon Factory in KEK, Tsukuba. The linear compressibilities of each axis of humite were ba=1.78, bb=2.88 and bc=2.45 (x10-3/GPa), respectively. The isothermal bulk modulus of humite determined from Birch-Murnaghan equation of state, was 127 GPa (assuming K'=4). These values are almost same as those of natural chondrodite. The crystal structure refinement results under high pressure conditions yielded R=9.6% for 2.7 GPa and 6.1% for 5.2 GPa. In humite structure, the variations of mean T-O distances in Si-tetrahedron are unchanged in this pressure range. In contrast, the mean M-O distances in M-octahedron are changed and controlled bulk compression. The compression ratio of each mean M-O distance up to 5.2 GPa is 0.994 for M1, 0.988 for M3, 0.982 for M25 and 0.985 for M26, respectively. The compression ratios of M1 and M3 octahedra which have oxygen coordinated with H or fluorine were smaller than the others. This trend is the same as that of natural chondrodite. This phenomenon is caused by many fluorine contents in this humite.