Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

SMP48-03 Room:102A Time:May 23 14:15-14:30

Phase change of hydrogen hydrate under low temperature and high pressure

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Low temperature and high pressure experiments of filled ice Ic structure of hydrogen hydrate were performed using diamond anvil cell and He-refrigerator cryostat. The temperature and pressure ranges were at 30 to 300K and 5 to 55GPa, respectively. X-ray diffractometry revealed that the cubic structure changed to a tetragonal structure at high pressure and low temperature region as expected by a theoretical study. Phase boundary between cubic and tetragonal structures was estimated. Raman spectroscopy also showed change in frequency of vibron of hydrogen molecules at the phase boundary.

Keywords: hydrogen hydrate, phase change, low temperature, high pressure