High pressure relation of the MgSO4-H2O system and its applications to the internal structure of icy objects

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In the outer region of our solar system such as, asteroid-belts and Jovian and Saturnian systems, H2O plays essential roles for the evolution of their internal structure or tectonics. Based on the observed data of Galilean satellites or CI chondrite materials, it has been proved that three-quarters of the volatiles are sulfates, and 73wt% of them is the magnesium sulfate,MgSO4(Fredriksson et al.1988). It has been suggested that the asteroids or Galilean satellites are composed of a mixture of H2O and CI chondrites (Kargel 1991).

In this study, we investigated the sulfate(MgSO4)-H2O system relation as a function of pressure. We adopted MgSO4 as a sulfate and we studied the pressure-composition ranged from 0 to 30wt% for MgSO4 in the MgSO4-H2O system.

We used a diamond anvil cell for the high pressure experiments. The laser-raman spectrometer and X-ray diffractometer has used for the identifications of the phases. The eutectic point determined to be 14wt% of MgSO4 at 1.99GPa and 300K. We observed only hepta hydrates(MgSO4 7H2O) as MgSO4 hydrate which is stable under pressure at room temperature. We discussed the internal structure of the icy satellites based on the present phase relation of the MgSO4-H2O system.