Group 14 clathrates constitute prototype systems for the study of host-guest interactions at the nanoscale [1]. Type-I clathrates are made of the crystalline assemblage of silicon nanocages of 24 and 20 atoms having the possibility for the endohedral inclusion of guest atoms. The high pressure evolution of group 14 clathrates includes a number of intriguing phase transitions including an homothetic isostructural volume collapse or a pressure induced amorphisation [2]. One method to better understand the importance of host-guest interaction in their pressure evolution is to consider the study at partial nanocage filling. The type I clathrate Rb$_{13}$Si$_{104}$ with partly empty cages has been studied up to 36 GPa using Raman spectroscopy, synchrotron x-ray diffraction in diamond anvil cells, and ab initio total-energy and lattice-dynamics calculations. A first phase transition is observed at 13±1 GPa, and a “volume collapse” transition within the clathrate structure is then observed at 24±1 GPa. Pressure-induced amorphisation into a high-density amorphous (HDA) state occurs above P = 33±1 GPa. The HDA form transforms into a low-density amorphous polymorph (LDA) during decompression. During the compression study using angle dispersive synchrotron x-ray diffraction techniques we measured bulk modulus parameters for rocksalt-structured TaO for the first time, included adventitiously in the clathrate sample (K$_0$ = 293(3) GPa and K$_{0}'$ = 5.4(3)).

**References**


**Keywords:** high pressure; clathrates

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**Effect of Sign Reversal by Misorientation Vector along Block Boundaries and its Detection.**

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Studies performed in the field of nanotechnologies necessitate exploration and testing of nanomaterials. Similarly to microscale materials, nanomaterials can be in the elastodeformed state [1]. Such nanomaterials include flat nanothin diamond-shaped crystals of hexagonal selenium growing in amorphous films at crystallization temperatures of 180–160°C. The lattice of these crystals has a nonuniform rotational distortion about the C-axis whose direction coincides with the short diagonal of the diamond-shaped crystal. Relaxation of the elastodeformed state in some area of the diamond-shaped nanothin crystal results