Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Pressure-Induced Intercalation of Solid Hydrogen into Graphite[1]

JINHYUK LIM, MINSEOB KIM, YOUNG-JAY RYU, CHOONG-SHIK YOO, Washington State University — Carbon-based nanomaterials such as graphene, carbon nanotubes and fullerenes have attracted many researchers as the promising candidates for hydrogen storages. However, the attempts have not been successful for graphite, presumably because of a limited space between graphitic layers. Here, we present pressure-induced intercalation of solid hydrogen into graphite, as evident in Raman spectroscopy and x-ray diffraction. Upon the solidification of hydrogen above 5.5 GPa, we found that hydrogen vibron becomes asymmetrically distorted and develops two distinct side bands which are greatly blue-shifted. Furthermore, synchrotron x-ray diffraction data also show an abrupt increase of the c-axis of graphite at 5.5 GPa, underscoring the intercalation of solid hydrogen into the graphite. These results have significant implication for development of 2D hetero-layered materials at high pressures, as well as hydrogen storage in graphite at low temperature and ambient pressure.

[1]The study was performed in support of NSF (Grant No. DMR-1203834) and NNSA (Grant No. DE-NA0002929).

Jinhyuk Lim
Washington State University

Date submitted: 09 Nov 2016 Electronic form version 1.4