

Superconducting Superhydrides: Synthesis, Structure and Stability

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Room-temperature superconductivity was first predicted in metallic hydrogen and then postulated in a number of hydrogen-rich materials at very high pressures /1,2/. The search for these superconductors led through hydrogen and related molecular hydrides culminating in the exciting discovery and concomitant theoretical simulations of superconductivity in H_3S /3-5/. The field practically exploded with this successful synergy between theory and experiment culminating in the discovery of superconductivity in YH_x , LaH_{10-x} at temperatures as high as 265 K /6-10/. The pressures of synthesis make these compounds (as yet) unsuitable for neutron diffraction and therefore one relies on spectroscopy and x-ray diffraction to correlate with theoretical models and hypothesize the structures /8/. Our experiments reveal a very nebulous pathway to synthesis and stability and correlation between T_c and hydrogen stoichiometry. This talk will focus on the structure and stability aspects of these interesting class of compounds that need to be well understood to have a reproducible pathway to synthesis and validation of other properties including Meissner effect.

Acknowledgements: The synchrotron x-ray diffraction measurements were carried out at 16-ID-B of HPCAT at the Advanced Photon Source, a U.S. Department of Energy (DOE) Office of Science User Facility operated for the DOE Office of Science by Argonne National Laboratory under Contract No. DE-AC02-06CH11357. Funding is acknowledged from DOE-BES, DOE-NNSA and NSF-DMR.

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