

Hydrogen Storage Materials based on Boron

A major new direction in Professor Trenary's research group is in the development of alternative energy sources. The long-term goal of using hydrogen powered fuel cells as a replacement of gasoline engines in automobiles will only be realized if the crucial problem of on-board storage of hydrogen can be solved. One strategy promoted by the Department of Energy is to use complex hydrides of elements of low atomic mass. Many such hydrides have volumetric hydrogen densities higher than that of liquid hydrogen itself. Among the elements lighter than carbon, only boron forms a wide range of compounds of high hydrogen content. On-going work related to this problem involves three types of experiments. The first type entails investigating the catalytic dehydrogenation of boron-containing hydrides by model platinum catalysts. The second area entails the growth and characterization of novel nanostructured boron[33] and boride materials[34] and studying their hydrogen storage characteristics. These materials are grown by a low pressure chemical vapor deposition process using diborane (B_2H_6) gas as a precursor. The third and final type of experiment involves using transmission infrared spectroscopy to study compounds such as $LiBH_4$ [35] and $Ca(BH_4)_2$ [36] as a function of temperature to gain a better understanding of the hydrogen loss mechanism from these complex hydrides. Experiments of this latter type would be most suitable for an REU student.

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