University of Hawai`i at Mānoa

Hawai`i Natural Energy Institute

School of Ocean & Earth Science & Technology

Advanced Complex Hydrides: Development and Fundamental Studies of Promising New Hydrogen Storage Materials

The development of high-capacity hydrogen storage materials that can be recharged under moderate conditions is a key barrier to the realization of a hydrogen economy. Aluminum- and boron-based complex hydrides have many of the critical properties that are required for practical onboard hydrogen storage applications. In order, to obtain guiding principles for the design and synthesis of higher performance materials, we and others have probed the fundamental basis of the enhanced hydrogen cycling kinetics of Ti-doped $NaAlH_4$ through kinetic studies; tunneling and scanning electron microscopy; X-ray and neutron diffraction; as well as infrared, electron paramagnetic resonance, nuclear magnetic resonance, X-ray absorption and anelastic spectroscopy. Results of these studies will be presented and discussed in terms of the mechanism of the hydriding and dehydriding process that has emerged that apparently involves highly mobile, hydrogen-containing point defects. Recent extensions of our fundamental studies to alane, AlH_3 and a novel class of high performance borohydride complexes will also be presented.

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