2011-2012

Graduate Seminar Series

The Department of Mechanical Engineering – Engineering Mechanics

Proudly Presents

Dr. Yun Hang Hu
Department of Materials Science and Engineering
Michigan Technological University

Dr. Yun Hang Hu is an associate professor of Materials Science and Engineering, Michigan Technological University (MTU). Dr. Hu received a Ph.D. in Physical Chemistry from Xiamen University. Before joining MTU, he was a research professor with State University of New York at Buffalo, a senior engineer with ExxonMobil Research & Engineering Company, and an associate professor with Xiamen University. His current research is focused on hydrogen storage materials, CO_2 conversion to novel solid materials, nanomaterials for solar energy, and catalysis. He has published more than100 refereed journal articles.

Thursday, Jan. 19, 2012 **4:00 – 5:00 p.m.** **Room 112, ME-EM Bldg.**

Li-N Compounds for Energy Applications

The critical issues of fossil fuels are their limited natural sources and contribution to the increase of atmospheric greenhouse gases. To solve those problems, hydrogen is being developed as a promising alternative fuel, and the conversion of CO_2 into valuable materials is considered as an effective approach to control the emission of greenhouse gases. In recent years, we have made an effort to develop hydrogen storage materials and to convert CO_2 into novel solid materials.

Lithium nitride (Li_3N), which is only one metal nitride that can be formed at room temperature, is an active material. This compound can be used to store hydrogen via its hydrogenation into lithium amide ($LiNH_2$) and lithium hydride (LiH), which contain about 10wt% hydrogen. However, a potential issue regarding the N-based material for hydrogen storage is the generation of NH_3, which consumes some H_2 and also constitutes a poison for the downstream processes. The second issue is that the reversible hydrogen capacity of Li_3N is about 5.5wt%, which is below 6.0wt% required for an effective on-board hydrogen-storage technique. This presentation will demonstrate that the ultra-fast reaction between NH_3 and LiH can eliminate NH_3 during the hydrogen storage process of Li_3N. Furthermore, it will show the reversible hydrogen capacity for Li_3N can be remarkably enhanced by pre-doping $LiNH_2$.

The conversion of CO_2 represents a great challenge due to its high stability and low reactivity. Very recently, we explored lithium nitride for the CO_2 conversion. It was demonstrated that Li_3N can rapidly react with CO_2 into two important types of solid materials—carbon nitrides and lithium cyanamide. Different from current processes of CO_2 conversion that are endothermic, this reaction is exothermic. Therefore, it constitutes not only a novel process for CO_2 sequestration, but also a unique approach for synthesis of carbon nitrides and lithium cyanamide. This presentation will discuss this novel process.

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