Departmental Seminar

Seminar Title	: INVESTIGATING THE CYCLING PERFORMANCE OF LITHIUM HYDRIDE-POROUS SILICON ALLOYS FOR SOLID-STATE HYDROGEN ENERGY STORAGE
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Abstract : Hydrogen stands out as a promising option, owing to its substantial energy storage capabilities, adaptability in production methods, and carbon emission-free characteristics during utilization. However, the existing unsafe and expensive hydro-gen storage methods are unable to meet the necessary standards for on-board applications. Due to offering safe, compact, and significant gravimetric storage density, the advanced solid-state hydrogen storage technique possesses extensive research interest [1]. The primarily used solid-state material includes large surface area porous materials, metal-organic frameworks, metal hydrides, and complex and chemical hydrides [2,3]. Lithium emerges as a notable alternative for energy storage in solid-state hydrogen storage applications compared to other metal hydrides [4]. Combining lithium with hydro-gen forms a stable ionic hydride, resulting in a gravimetric hydrogen storage capacity of about 12.6 wt.% H2. However, high thermodynamic stability, high formation energy (~182 kJ mol-1 H2), and dehydrogenation temperature of ~700 °C restrict the use of individual Li for practical usage in hydrogen storage [5]. The derivatives of bulk Si (i.e., Si nanostructures (SiNSs)) possess large surface area, significant porosity, and elevated surface energy, enabling numerous active sites for compelling hydrogen attraction. After evaluating morphology and absorption-desorption characteristics, Muduli [6] identified porous Si (PS) as the suitable SiNS for hydrogen storage. In the prior investigation of the LiH and PS alloy for hydrogen storage, the reported absorption capacity was ~3.5 wt.% within the temperature range of 400 °C to 500 °C [5]. A comprehensive investigation is necessary for the LiH-PS alloy to explorits cyclic storage behavior, paving the way for potential applications in cyclic hydrogen storage. The novel integration of light metal hydride (i.e., LiH) alloying with a porous material (i.e., PS) in cyclic hydrogen energy storage holds the potential to open avenues for practical on-board applications.