
IV.J.1 Hydrogen Absorption in Gamma Irradiated Carbon and Other Materials

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Objectives

To investigate a novel approach for enhancing the physi-/chemi-absorption of hydrogen on selected materials with the goal of meeting the DOE 2010 guidelines for hydrogen storage.

Technical Barriers

This project addresses the following technical barriers from the Storage section (3.3.4.2) of the Hydrogen, Fuel Cells and Infrastructure Technologies (HFCIT) Program Multi-Year Research, Development and Demonstration Plan:

- (A) System Weight and Volume
- (P) Lack of Understanding of Hydrogen Physisorption and Chemisorption

Technical Targets

This project will explore a novel approach for modifying adsorbent materials by gamma irradiation prior to and/or during exposure to pressurized hydrogen gas at ambient temperatures. Insights gained from these studies will be applied toward the design and synthesis of hydrogen storage materials that meet the following DOE 2010 hydrogen storage targets:

- System gravimetric capacity: 0.06 kg H₂/kg of system mass
- System volumetric capacity: 0.045 kg H₂/L of system volume

Approach

This project proposes a novel approach for modifying adsorbent materials by gamma irradiation prior to and/or during exposure to pressurized hydrogen gas at ambient temperatures. The electronic environment at surface and interior sites is excited and activated by penetrating radiation which prepares them for quasi-bonding of hydrogen. Gamma radiation of solids creates non-equilibrium conditions via a Compton recoil mechanism. These effects, accompanied by lattice energy absorption, imply bond breakage and the formation of internal active sites, and conditions expected to enhance hydrogen absorption. The goal of this research is to investigate, correlate and understand the adsorption/absorption of hydrogen gas in gamma irradiated adsorbent materials.

Accomplishments

This is a new project with no funding this year and therefore no accomplishments to report.