Hydrogen Storage for Automotive Fuel Cells

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About one hundred representatives from DOE, the national laboratories, industry and universities attended a workshop to discuss hydrogen storage technology that was held at Argonne National Laboratory on August 14-15, 2002. The plenary session featured an automaker's perspective by General Motors and overview presentations on advanced/ complex hydrides, chemical storage, carbon storage, and advanced concepts for hydrogen storage. The opening talk presented the results of an analysis by General Motors that indicated the current DOE weight and volume targets for hydrogen storage fell below that required by GM for hydrogen fuel cell vehicles. The speaker challenged the participants to look at all possibilities for increasing hydrogen storage capacity. Following the plenary session, the participants divided into the four groups that were identified above to discuss the state of technology and recommend research topics to be considered by DOE. The advanced /complex hydride group recommend continued study of sodium alanates as a model system while identifying other hydride materials that have the potential to achieve 8 weight percent or greater hydrogen storage capacity. The chemical storage group recommended additional analysis to define viable processes for the off-board regeneration of the hydrogen-depleted fuel that is removed at refueling stations. Primary energy use, emissions, resource depletion, and cost of the delivered fuel are to be considered. The carbon storage group recommended definitive experiments (including sharing of samples and independent verification of results) to show where and how hydrogen is stored in single-walled nanotubes and other forms of carbon. The group also recognized the need for a better theoretical understanding of the mechanism of hydrogen uptake, storage, and desorption from carbon materials. The advanced concepts group identified ten storage concepts that may have potential for hydrogen storage, including crystalline nanoporous materials, polymer micro spheres, metal-organic complexes, other forms of nanotubes, and mesoporous and bulk amorphous materials. Research needs are to determine the maximum storage capacity, life cycle energy balance, hydrogen absorption/desorption kinetics, and cost. The workshop proceedings and a 5-year R&D plan are being prepared to guide future DOE solicitations in this area.