IEA HIA Task 32:
Hydrogen-based energy storage

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WHEC 2014, Gwangju, Korea, June 16, 2014
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History of Hydrogen Storage in IEA HIA

IEA HIA Task 22
“Fundamental and applied hydrogen storage materials development”

2006-2012
Operating Agent: Bjørn C. Hauback

1596 articles in peer-review journals

Final report
(available soon)
IEA HIA Task 32
“Hydrogen-based energy storage”
January 2013 – December 2015
Operating Agent: Michael Hirscher

17 countries, 52 experts
Task 32 Description

Goals and objectives

I. Develop reversible or regenerative hydrogen storage materials fulfilling the technical targets for mobile and stationary applications

II. Develop the fundamental and engineering understanding of hydrogen storage materials and systems that have the capacity to fulfil Target I

III. Develop materials and systems for hydrogen-based energy storage including hydrogen storage for use in stationary, mobile and portable applications, and electrochemical storage
Task 32 Working Groups

- Porous materials
- Magnesium-based hydrogen and energy storage materials
- Complex and liquid
- Electrochemical storage of energy
- Heat storage - concentrated solar thermal using metal hydrides
- Hydrogen storage systems for mobile applications
Porous materials and storage by physisorption

Metal-organic frameworks (MOFs)

Surface area
At 77 K and 50 bar
Total uptake 12 - 15 wt%

5 wt% system capacity can be easily reached, however only at 77 K!
Many more materials well characterized and converging toward the DOE system targets

Ned Stetson, DoE, 2011 Annual Merit Review Proceedings

At present no material fulfills the targets for automotive application!

Fundamental research needed!
The combination of LiBH$_4$ and ZrCoH$_3$ has a beneficial effect in the enhancement of kinetics. ZrCoH$_3$ favours pulverisation and absorption. LiBH$_4$ facilitates the desorption → faster kinetics than single component.

- XRD/EXAFS: No changes in lattice parameters and edge positions of ZrCoH$_3$ caused by H$_2$ cycling.
Electro-chemical properties of Borohydrides
Sodium superionic conduction in $\text{Na}_2\text{B}_{12}\text{H}_{12}$

Heat storage - concentrated solar thermal using metal hydrides
Heat storage tank system - Andasol

28,500 t molten salt for storage of 1,000 MWh

1,100 t MgH₂
Thank you for your attention!

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