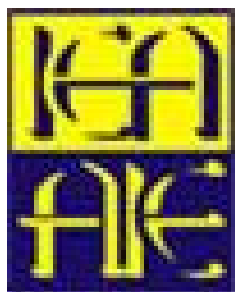


Solid and Liquid State Hydrogen Storage Materials IEA Hydrogen Implementing Agreement Annex 17



HYDROGEN IMPLEMENTING AGREEMENT

Final Report Approval Request



Bjørn Hauback for Gary Sandrock
T17 Operating Agent for US DOE
810 Hacienda Ave.
Davis, CA 95616 USA
gary.sandrock@sbcglobal.net

Presented at Executive Committee Meeting
7-9 November 2006, Petten, THE NETHERLANDS

Annex 17 **Targets and **Results****
SOLID AND LIQUID STATE HYDROGEN
STORAGE MATERIALS

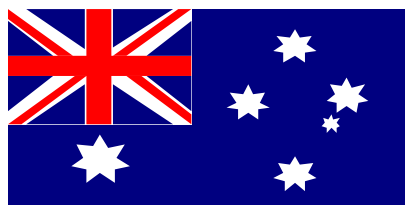
Duration: June 2001 - May 2006

Targets (Results):

1. Develop a reversible hydrogen storage medium with 5 wt.% H₂ recoverable at <80°C and 1 atm absolute pressure, with charging and discharging rates suitable for practical use. (Gravimetric target met with several materials, but not release temperature target).
2. Develop a low-cost, reversible hydrogen storage medium that can be rapidly charged and discharged at near-ambient temperatures, is tolerant to impurities in the H₂ used, and discharges hydrogen of ultra high purity for use directly in a PEM fuel cell. (Good progress made with Mg and classic hydrides and but more work needed to lower operation temperatures and develop impurity resistance.)
3. Develop the fundamental and engineering understanding of hydrogen storage by advanced hydrogen storage media that have the capability of meeting Targets 1 and 2. (Excellent progress made on many fundamental and engineering details!).

Conclusion: Much progress, but storage problem not fully solved. IEA HIA needs to continue international collaborative progress via a new storage materials annex!

IEA HIA Task 17 Participation



Australia

C. Buckley, Curtin U.
E. Gray, Griffith U.



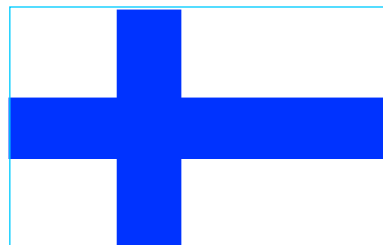
Canada

R. Chahine, U. Québec T.R.



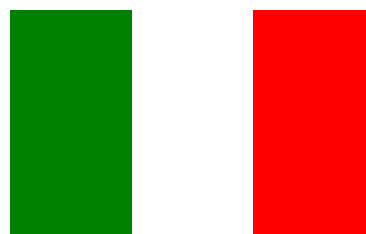
European Commission

C. Filiou, JRC Petten



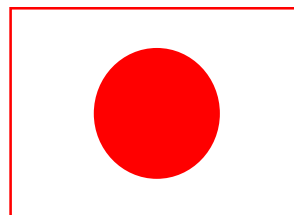
Finland

M. Gasik, Helsinki UT



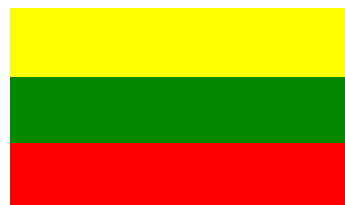
Italy

A. Albinati, U. Milan
R. Cantelli, U. Rome
M. Conte, INEA Casaccia



Japan

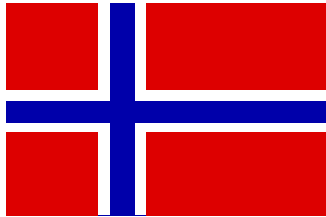
E. Akiba, EEI-NIAIST
H. Fujii, Hiroshima University
N. Kuriyama, GLT-NIAIST
S. Orimo, Tohoku University
S. Suda, Kogakuin University
H. Takeshita, Kansai U.



Lithuania

D. Milcius, Lithuanian En. Inst.

IEA HIA Task 17 Participation



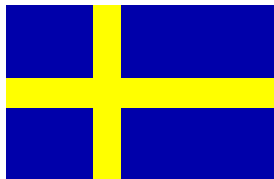
Norway

B. Hauback, IFE
V. Yartys, IFE
M. Lang, ESA



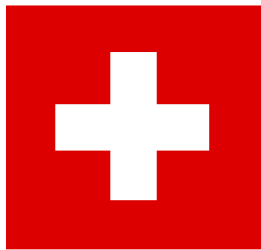
Spain

M.T. Martinez, CSIC



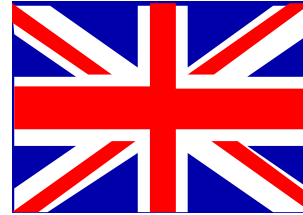
Sweden

D. Noréus, Stockholms U.



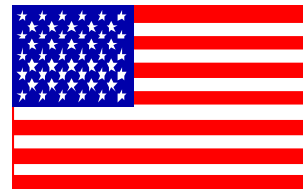
Switzerland

K. Yvon, U. of Geneva
A. Züttel, U. of Fribourg



United Kingdom

D. Book, Birmingham Univ.
Z.X. Guo, University of London
K. Ross, University of Salford
G. Walker, Univ. of Nottingham



United States

D. Anton, Savannah River NL
D. Chandra, U. Nevada, Reno
D. Dedrick, Sandia Nat'l Labs
N. Gallego, Oak Ridge NL
K. Gross, Sandia Nat'l Labs
M. Heben, NREL
A. Imam, NRL
C. Jensen, U. of Hawaii
W. Luo, Sandia Nat'l Labs
G. Sandrock, DOE/Sandia NL
J.C. Zhao, GE Global Research
R. Zidan, Savannah River NL

National Participation in Task 17

| <i>Country</i> | <i>Experts</i> | <i>Level, py/y</i> |
|----------------|----------------|--------------------|
| Australia | 2 | 1.0 |
| Canada | 1 | 1.0 |
| European Comm. | 1 | 1.0 |
| Finland | 1 | 1.0 |
| Italy | 3 | 2.5 |
| Japan | 6 | 4.0 |
| Lithuania | 1 | 1.0 |
| Norway | 3 | 3.0 |
| Spain | 1 | 1.0 |
| Sweden | 1 | 1.0 |
| Switzerland | 2 | 3.0 |
| United Kingdom | 4 | 9.0 |
| United States | 12 | 15.5 |
| Total | 38 | 44 |

Final Report Content
FR Dated September 2006

| Chapter | Pages |
|--|--------------|
| Table of Contents | 1 |
| Introduction to Task 17 and Summary of Progress 2001-2006 (recommended as quick executive summary) | 7 |
| List of Projects | 3 |
| Project Final Reports | 195 |
| List of Publications, Presentations and Patents (2001-2006) | 84 |
| Total Pages | 290 |

Missing Final Report Contributions

| Expert | Country | Default Document Used |
|-----------|-------------|-----------------------|
| A. Imam | USA | 2005 Annual Report |
| M. Lang | Norway | 2004 Annual Report |
| D. Noréus | Sweden | 2004 Annual Report |
| A. Züttel | Switzerland | 2004 Annual Report |

Specific Task 17 Actions Requested of the Executive Committee

- Approval of Final Report.**
- Approval for public release on HIA website. (M-R DeV has final CD copy)**
- Approval for (optional) additional publication on Task 22 website. (BH has final CD copy)**

Epilogue: I hereby express my thanks to the IEA and IEA HIA for their very generous long-term support and enthusiastic encouragement of Tasks 12 and 17, and new Task 22. Good luck for the future of hydrogen R&D! Please keep in contact. GS