



2004 Annual Report

IEA Agreement  
on the  
Production and  
Utilization of  
Hydrogen

# IEA AGREEMENT ON THE PRODUCTION AND UTILIZATION OF HYDROGEN



independent  
**Analyses**

collaborative  
**RD&D**



participation  
**Industry**

country  
**Membership**

with hydrogen  
**Confidence**



## 2004 ANNUAL REPORT

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## MEMBER UPDATE: LITHUANIA

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While Lithuania has not developed a hydrogen energy policy in the past year, its hydrogen R&D activities are growing as a reflection of the national interest in hydrogen and commitment to alternate energy sources.

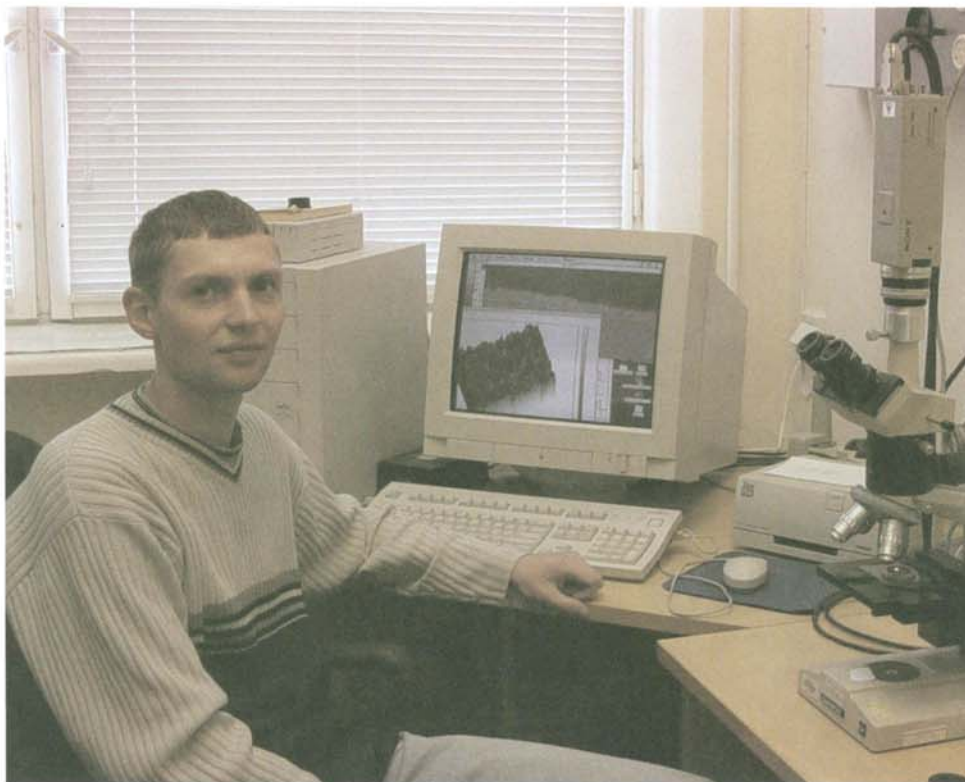
### RESEARCH IN THE FIELD OF HYDROGEN STORAGE

The joint project of the Lithuanian Energy Institute (LEI) and Sandia National Laboratories, "Compositional and structural investigation and evaluation of hydriding/dehydriding properties of catalyzed magnesium alanate films fabricated by physical vapour deposition technologies," was successfully completed. This project was funded by the Lithuanian government and and the U.S. DOE. Main results include:

- 2-5  $\mu\text{m}$  thick magnesium alanate films have been synthesized by magnetron sputter deposition of Ti-doped MgAl films on silicon wafers and stainless steel foils and the following non-equilibrium plasma immersion hydrogen ion implantation.
- The maximum efficiency of hydrogenation is achieved when incident hydrogen ions have energies sufficient to overcome surface barrier without destroying it. At the same time, the surface barrier inhibits the reemission of implanted hydrogen. The model based on the "trapping" of hydrogen between the symmetric and asymmetric potential walls on the boundaries of thin film material has been considered to optimize processes of hydrogen retention and its thermal release. The 2  $\mu\text{m}$  thick Ti-doped MgAl film is transformed in 7 min into nanocrystalline magnesium alanate with mean grain size 24-32 nm.

**"[H]ydrogen R&D activities are growing** as a reflection of the national interest in hydrogen and commitment to alternate energy sources."

"The joint project of the Lithuanian Energy Institute (LEI) and Sandia National Laboratories... was successfully completed."



- A tentative explanation of the processes driving a long-range motion of atoms and synthesis of magnesium alanate compounds in MgAl films under high-flux low-energy plasma immersion hydrogen ion implantation is proposed on the basis of consideration of highly non-equilibrium processes on the surface emphasizing restructuring and relaxation as dominant.

## EDUCATION & TRAINING ACTIVITIES

Lithuanian Energy Institute and Vytautas Magnus University received European Structural funds for preparing programmes and training specialists in the field of hydrogen technologies in 2005-2008. The training targets master magistrate and doctoral studies. As the second stage of its education program, the Lithuania Energy Institute will apply for funds in order to acquire hardware for education and training purpose.

In this way, Lithuania Energy Institute and Vytautas Magnus University seek to establish a center for training specialists in hydrogen energy technologies. Later, such center will be able not only to train high-level specialists, but also to educate society in general and disseminate knowledge about hydrogen technologies. This vision of a training center is completely consistent with the Europe-wide education and training program strategy, as laid down by the Initiative Group on Education and Training of the European Hydrogen and Fuel Cell Technology Platform.

Since 2004, the Lithuanian Energy Institute has participated in the Marie Curie Research Training Network HYTRAIN (Hydrogen Storage Research Training Network). HYTRAIN aims to integrate European hydrogen storage research activities, assimilating expertise with a view to making a significant contribution to the world-wide research effort and the creation of Europe as a key international player in the field.

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