MATERIALS

HYDROGEN STORAGE

GEMS
German Engineering Materials Science Centre
Helmholtz-Zentrum Geesthacht

Characterisation of Hydrogen Storage Materials and Systems using Neutron Radiography

THE PROBLEM to solve: Storage of gas

Hydrogen is a promising energy carrier for the future, for both mobile and stationary applications. One important issue in the design of rogen-driven devices is the storage of the gas. For example, it can be stored safely and reversibly at high volumetric densities in hydrogen storage tanks filled with light metal hydrides.

A step towards THE SOLUTION

Due to their high sensitivity to hydrogen, neutrons are ideal for investigations into how hydrogen interacts with other materials.
Studies have been carried out using neutron radiography (NR) and neutron computerised tomography (NCT) on hydrogen storage tanks filled with metal hydride powder or pellets. The Helmholtz-Zentrum Geesthacht has developed a special tank for in situ NR and NCT experiments.

THE RESULT

In these studies the changes in powder structure were characterised, together with the hydrogen distribution in the tank volume. The information obtained on the in-situ behaviour of the hydride powder material have enabled the design of the storage tank to be optimised.

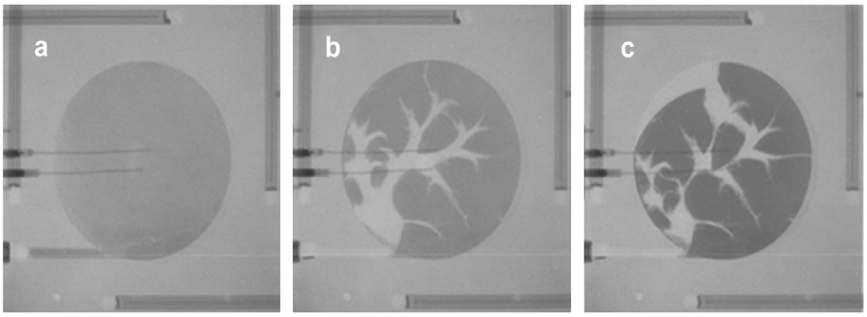

Figure 1

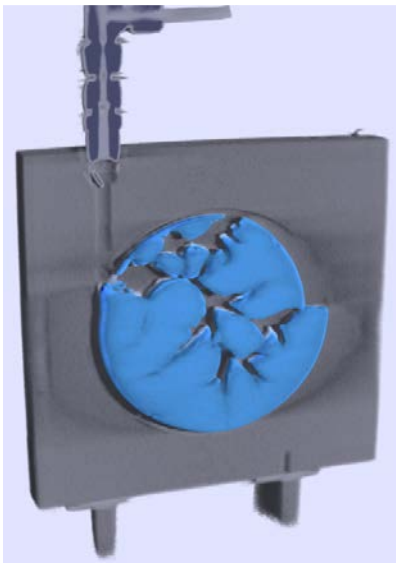

Figure 2

(1) Neutron radiography images of a sodium alanate hydrogen storage tank.
a) initial state without hydrogen,
b) filled with H2 during the first absorption,
c) filled with H2 after dehydrogenation and renewed hydrogenation

(2) NCT image showing the development of the structures inside the tank

REFERENCE

P. Pranzas et. al., Advanced Engineering Materials, Volume 13, Issue 8 (2011), 730.

Neutrons for Industry

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Proof-of-concept experimental beam time is being offered to Industry!

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Industrial R&D professionals in collaboration with experienced specialists from European neutron centres.

PARTNERS FROM:

Czech Republic, France, Germany, Hungary, Netherlands, United Kingdom.

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ILL NEUTRONS FOR SOCIETY

HZB Helmholtz Zentrum Berlin

MLZ Heinz Maier-Leibnitz Zentrum

GEMS German Engineering Materials Science Centre Helmholtz-Zentrum Geesthacht

Orphée Laboratoire Léon Brillouin

TU Delft Delft University of Technology

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