STORHY FINAL EVENT
HYDROGEN STORAGE SYSTEMS FOR AUTOMOTIVE APPLICATION
PSA POISSY, JUNE 3-4, 2008

Subproject Cryogenic Storage: Biaxial Tensile Tests

Objectives

- Search and selection of appropriate composite materials for cryogenic liquid hydrogen (L-H_2) tank shells
- Demonstration of L-H_2 tightness of selected composite tank shell materials
- Verification of material properties for combined load cases – multiaxial tensile testing
- Development of a representative load introduction set-up for sample testing

Description

- Development of a biaxial tensile test method
- Development of a test set-up with homogeneous load introduction and a combined load case (biaxial) in the core area of the sample needed for tightness / permeation measurements
- Measurement of the permeation rate of gaseous helium through the original composite material before cryogenic loading. Measured value between 1,5e-7 and 3.e-7 Scc/sec (Standard cubic centimetre per second)
- Nominal load for 60 mm wide sample section is 15400 N in the main fibre direction and 5250 N in the perpendicular direction. Applied load levels range from 50% to 125% of this nominal load
- Measurement of permeation and leak rate after cryogenic L-H_2 immersion and loading with various load levels. Measured values of 1.e-3 Scc/sec after loading of 75% to 100% of nominal for raw composite material
- Selection of leak barrier material (note: without metallic hydrogen permeation liner) and demonstration of L-H_2 tightness of the tank shell material for nominal load conditions under L-H_2 cryogenic immersion
- Measurement of permeation and leak rate after cryogenic loading with various load levels on the composite with a leak barrier. Leak rates are 7.e-8 Scc/sec before loading and after loading at 100% of nominal load

Test set-up configuration

Sample with mounted load introduction clamps

Raw sample including leak barrier

Sample mounted on spectrometer for permeation measurement

Future Perspectives

- Testing of material for multiple L-H_2 immersion and mechanical load cycles
- Quantitative validation of permeation performance of samples with metallic permeation barrier for different load cases and after thermal and mechanical load cycling

Partners

- Air Liquide
- Austrian Aerospace GmbH
- BMW Forschung und Technik GmbH
- Institut für Verbundwerkstoffe GmbH
- Linde AG
- MAGNA STEYR Fahrzeugtechnik AG & Co KG
- MT Aerospace AG
- Oerlikon Space AG
- Prochain e.V.
- Volvo Technology Corporation

Website

www.storhy.net

The project partners wish to thank the European Commission for financial support of the Integrated Project StorHy– Hydrogen Storage Systems for Automotive Application (Contract No.: SES6-CT-2004-502667) within the 6th RTD Framework Programme.