high reactive energy carrier require safe storage
High Density Hydrogen Storage in Metal Hydride Composites with Air Cooling

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- Space Research and Technology
- Transport
- Energy

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7400 employees across 32 institutes and facilities at 16 sites.

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Thermochemical Systems

Reaction Principle

\[ AB_{(s)} + \Delta H \rightleftharpoons A_{(s)} + B_{(g)} \]

endothermal

exothermal

Heat released during absorption (charging)
Heat required during desorption (discharging)
$\lambda < 1 \text{ W/(mK)}$
Metal Hydride-Graphite Composites

thermal conductivity in two-digit range

composites show stability of structure and hydrogen performance for 1000 cycles (paper in review process)
High Density Hydrogen Storage

fluctuating renewable energy sources

storage in form of hydrogen:

surplus electricity → electrolysis → storage → fuel cell → meet of energy demand

- high volumetric storage density
- safe: low pressure
- moderate temperature
- low-maintainance
- simple construction

High Density Hydrogen Storage
High Density Hydrogen Storage

- composite diameter: 21mm
- vantilator cooling ($1.7 \, W_{el}$)
- charging with electrolysis at 30bar
- discharging with mass flow to feed FC with $P_{el} = 0.6 \, kW$ for 100min
  $\rightarrow$ upscalable
First Measurement Results – Absorption

fully charged in 2h below 30 bar
First Measurement Results – Desorption

→ provides hydrogen for FC for more than 100min

→ Storage meets requirements
Summary

• H₂-storage in metal hydrides
• long-term cycle stable composites with high thermal conductivity
• Development of simple and safe storage for domestic application
• High diameter (21mm) with only ventilator cooling
• Charchargeable below 30bar (electrolysis)
• Dischargeable to run FC with 0.6 kW for 100min
  (power and time are upscaleable)
Thank you!

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