Advertisement for Incubation of Technology

Title of the technology	DEVELOPMENT OF TITANIUM BASED HYDROGEN STORAGE MATERIAL FOR TRANSPORT APPLICATIONS

Current state of Technology

In-situ storage of 150 l of hydrogen has been successfully demonstrated using Ti based solid state hydrogen storage material with 4 wt.% hydrogen storage capacity, at room temperature and sub atmospheric pressure.

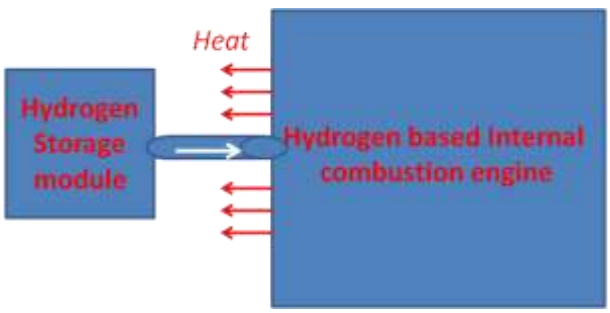
General Information

- Ti based hydrogen storage material is prepared by arc melting method.
- The alloy stores around 4 wt. % of hydrogen at room temperature and sub-atmospheric pressure.
- The material has been tested for long term stability up to 1 year under positive pressure of hydrogen and found to show similar hydrogen storage properties.
- Desorption starts from 80 ^{o}C.
- Before initial absorption, material requires activation.

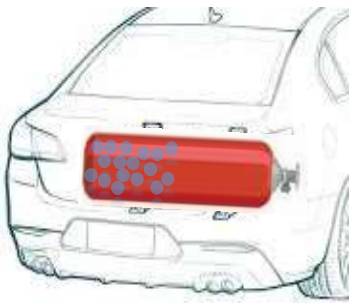
Features/Specification of system

Parameters	*For Current System*	*For Target System*
Material requirement	350 g	In kg scale
Vessel	230 cc	Depends on type of vehicle
Temperature of hydrogen	353 K	Up to 573 K
Demonstration	In-situ hydrogen storage at different hydrogen flow rates	Demonstration of hydrogen storage for vehicular applicaion
Long term stability	Stable under positive hydrogen pressure	Same as current system
Cyclic stability	Tested up to 50 cycles	500 cycles

Working of the System (with schematic block diagram)



(a)



(b)

Fig. 1: Schematic diagram showing (a) Hydrogen storage module connected to hydrogen based internal combustion engine (b) Hydrogen storage module for vehicular application.

Applications of the System

Metal Hydride based hydrogen storage materials and modules are source of pure hydrogen and are replacement candidates for heavier and bulky hydrogen gas cylinders currently used in hydrogen driven vehicles. Such an approach is expected to increase fuel efficiency of vehicle.

Picture/Photo of the System –

(a)

(b)

(c)

Fig. 2: (a) 320 gm of hydrogen storage material (b) hydrogen storage vessel or module (c) System integration and testing at lab scale

Whether the parent product/ technology/ process is patented: No

If yes, provide the details – Not Applicable

Deliverables –

1. Optimized preparation method for Ti based alloy in bulk scales with 4 wt.% hydrogen storage capacity under ambient conditions
2. Modules based on Ti based alloys for testing in labs and also under vehicle running conditions.
3. General Guide lines, protocols and SOPs to be followed while using hydrogen storage materials for transport applications.

Justification for Incubation:

Different types of hydrogen storage materials and hydrogen storage modules have been developed in BARC and its functioning has been successfully demonstrated in sufficiently large scales under different experimental conditions. One of the applications of hydrogen storage materials is to deploy them (instead of heavy cylinders containing pressurised

Hydrogen) for transport applications in vehicles. For this it is essential that the storage modules need to be tested in vehicles under actual running conditions. Hence incubation of the technology under an automobile industrial partner is required.

Facility and Infrastructure requirements:

1. Development of materials in kilogram scale

2. Designing of hydrogen storage vessel with optimised quantity of storage materials (in kg scales).

3. Facilities for integration of hydrogen storage module with vehicle and extensive testing

Facility and Infrastructure to be provided by Incubatee/BARC:

Manpower/ expertise Expertise on Ti based hydrogen storage materials for different applications and designing of hydrogen storage modules of different capacities
Machinery and Equipment ➢ Facilities for large scale preparation of alloys ➢ Structural and morphological characterisation of alloy ➢ Modification of hydrogen storage properties as per the user requirement ➢ Hydrogen storage capacity measurement system ➢ Hydrogen absorption demonstration at different hydrogen flow rates ➢ Hydrogen desorption and cyclic stability study ➢ Testing facilities for Hydrogen storage materials and modules
Others
Any special requirements for plant, industry, location utilities, handling storage, safety etc._

Note: As per in-house technology incubation policy, the incubatee should be a licensee of the existing technology. Alternatively, the applicant will be required to take the license of the existing technology before entering incubation agreement.

If interested in Incubation, kindly ***download -> fill -> scan -> send*** the application form to -

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