B3
Development and demonstration of chemical hydrogen storage system

Chemical hydrogen storage offers options with high energy densities and potential ease of use. This study aims at development of compact hydrogen storage system using sodium borohydride (SBH, $NaBH_4$) and ammonia borane (AB, NH_3BH_3). In addition, fuel cell power pack combined with the chemical hydrogen storage system will be developed and applied for portable or mobile applications including unmanned aerial vehicle (UAV).

Goal

Improvement of hydrogen storage capacity and development of fuel cell power pack combined with chemical hydrogen storage

- Improvement of hydrogen storage capacity
  - Hydrogen storage density > 4.5 wt% (system basis)
- Demonstration of hydrogen storage system combined with small fuel cell
  - Continuous operation of 100W fuel cell system > 10 hours
- Development of unmanned aerial vehicle powered by fuel cell system
  - Demonstration of fuel cell UAV > 6 hours

Objective

- 1st year
  - Hydrogen storage density > 3.0 wt% (system basis)
  - Continuous operation of 100W fuel cell system > 6 hours
  - Improvement of hydrogen storage density using SBH and AB
  - Development of fuel chemical hydrogen storage system for UAV
- 2nd year
  - Hydrogen storage density > 3.5 wt% (system basis)
  - Continuous operation of 100W fuel cell system > 8 hours
  - Development of compact hydrogen storage system
  - Optimization of hydrogen storage system in UAV
- 3rd year
  - Hydrogen storage density > 4.0 wt% (system basis)
  - Continuous operation of 100W fuel cell system > 10 hours
  - Optimization of hydrogen storage system combined with small fuel cell
  - Demonstration of fuel cell UAV > 4 hours
- 4th year
  - Hydrogen storage density > 4.5 wt% (system basis)
  - Continuous operation of 100W fuel cell system > 10 hours
  - Application of hydrogen storage system for mobile fuel cell power pack
  - Demonstration of fuel cell UAV > 6 hours

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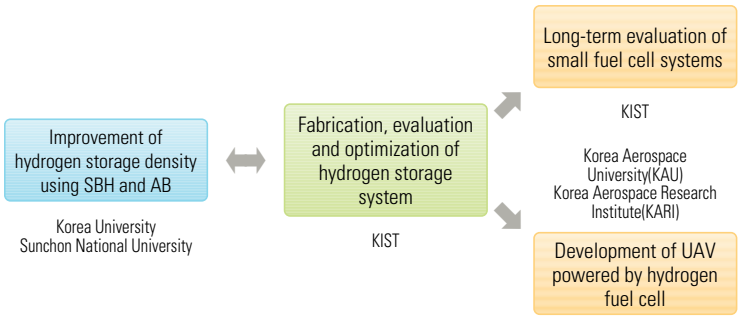
Strategy



Outcomes & benefits

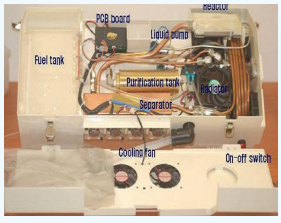
- Realization of chemical hydrogen storage system having storage density higher than 4.5 wt%
- Commercialization of small fuel cell power pack with chemical hydrogen storage system for portable or mobile applications
- Development of unmanned aerial vehicle powered by fuel cell

Publications (2nd stage)

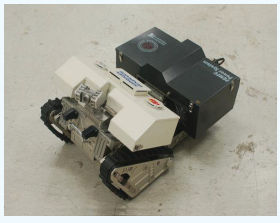
Patent		Theses							Proceedings		
		domestic			foreign			total sum			
domestic	foreign	SCI	Non SCI	sum	SCI	Non SCI	sum		domestic	foreign	sum
7/4			1	1	6		6	7	9	8	17

- Publications

1. S.J. Kim, J.Y. Lee etc., "Hydrogen generation system using sodium borohydride for operation of a 400W-scale polymer electrolyte fuel cell stack,"Journal of Power Sources, 170 (2007) 412-418.
2. J.Y. Lee, S.W. Nam etc., "A porous structured Co-B catalyst for hydrogen generation using borohydride solution", Korean Patent 0785043, 2007-12-05.



SBH hydrogen storage system (KIST)


A robot ROBHAZ equipped with SBH hydrogen storage system (KIST)


A small UAV equipped with hydrogen storage system (KAU)