

A3

Development of water electrolysis system running at low temperature for high pressure hydrogen production

The objective of this research is to develop water electrolysis system using the PEM for high pressure hydrogen production. To achieve the objective;

- Analysis of the electrolyzer structure using general-purpose CFD and development of the suitable components for electrolyzer structure under 100 bar hydrogen production pressure condition.
- Improvement of the durability of hydrocarbonic PEM.
- Application of the new current distributor using hollow sphere electrode.
- Development of the new electrode catalyst with high Performance and low Cost.

Goal

Development of water electrolysis system running at low temperature for high pressure hydrogen production using PEM.

- Development of water electrolysis stack with 100 bar operating pressure.
- Enhancement of the stack efficiency(>90%)
- Study on new electrode catalyst for reducing precious metal catalyst consumption.
- Life time extension and application of hydrocarbonic membrane(life time : 5,000 hours)
- Long term durability test of the stack having 1 Nm³ H₂/hr over 5,000 hr or more.

Objective

■ 1st year

- Development of the electrolysis system with 50 bar hydrogen production pressure.
- Numerical analysis of the stack for high pressure hydrogen production
- Development of the stack with the efficiency level of 78%.
- Improvement of the durability of PEM
- Development of the electrode catalyst using inexpensive non-precious metal

■ 2nd year

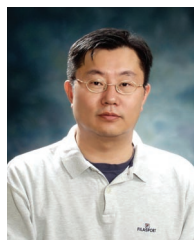
- Development of the electrolysis system with 100 bar hydrogen production pressure.
- Numerical analysis of the stack for high pressure hydrogen production
- Development of the stack with the efficiency level of 84%.
- Improvement of the durability of PEM
- Development of the electrode catalyst using inexpensive non-precious metal

■ 3rd year

- Stabilization study for the system applying 100 bar hydrogen production pressure and improvement of the stack structure.
- Numerical analysis of the improved stack structure.
- Development of the stack with the efficiency level of 90%.
- Improvement of the durability of PEM.
- Development of the electrode catalyst using inexpensive non-precious metal.

■ 4th year

- Stabilization study for the system applying 100 bar hydrogen production pressure and improvement of the stack structure.
- Numerical analysis of the improved stack structure.
- Development of the stabilized stack with the efficiency level of 90%.
- Improvement of the durability of PEM.
- Development of the electrode catalyst using inexpensive non-precious metal.



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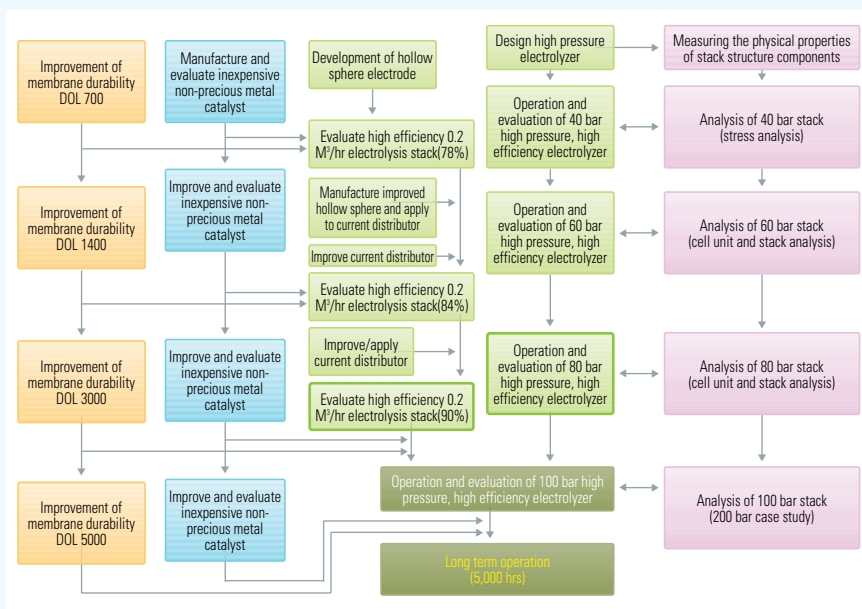
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Researchers : 20 (Industry 10, Univ. 10)

Strategy



Outcomes & benefits

- Establishment of infrastructure for hydrogen business.
- Applicable to fuel cell system below 10kw for home & distributed as fuel supplying device.
- Applicable to medium small hydrogen industry. (electronics and semiconductor manufacturing processes, metal processing, fine chemical and pharmaceutical industry)
- A key material gas for industries and an alternative energy.
- Achievement of the confirmed a greenhouse gas reduction technology including carbon dioxide by hydrogen energy.
- With hydrogen fuel supply system, expand the domestic markets for fuel cells and hydrogen-driven-cars and promote the international competitiveness.
- Cost reduction by using non-precious metal catalyst.
- Cost reduction by developing hydrocarbonic membrane.

Publications (2nd stage)

Patent		Theses							Proceedings		
		domestic			foreign			total sum			
domestic	foreign	SCI	Non SCI	sum	SCI	Non SCI	sum		domestic	foreign	sum
5/4	1/0	1	5	6	2		2	8	7	2	9

■ Publications

1. A.S.Kang, J.Y.Jang, O.H.Kwon, K.O.Kim, K.J.Hwang, S.B.Moon, "Covalently cross-linked sulfonated polyc / tungstophosphoric acid composite membranes for water electrolysis application", J Power Sources, 181, 2008
2. Elchem Tech Co., Ltd., "MEMBRANE ELECTRODE ASSEMBLY HAVING POROUS ELECTRODE LAYERS, MANUFACTURING METHOD" 11/506,496, 2006.