

International Advanced Research Centre for Powder Metallurgy & New Materials (ARCI)

Balapur P.O., Hyderabad – 500005, Telangana, India



Electrochemical Methanol Reformation (ECMR) for Hydrogen Generation

Overview

The successful commercialization of Fuel cell technologies requires steady hydrogen supply. Steam Reformation of hydrocarbons and electrolysis of water are commonly available methods to produce hydrogen. However steam reformer works best in higher capacity systems, while the electrolysis requires more energy input for splitting water to hydrogen and oxygen due to its high over potentials. CFCT has now developed a method which combines aspects of both the processes to produce hydrogen from methanol - water mixture. The Centre has developed and demonstrated of a hydrogen generator of 1 Nm³ hydrogen per hour capacity. Currently, the development of 2.5 Nm³/hr PEM based ECMR with improved performance and reduced cost is under progress.

Key Features

- Energy consumption for Hydrogen production was found to be low, about 1/3rd of water electrolyzer.
- Hydrogen can be produced at much lower temperature and pressure, unlike methanol reformer.
- The hydrogen produced is highly pure and Hydrogen separation steps are not required.
- Carbon based materials can be used for stack fabrication

Potential Applications

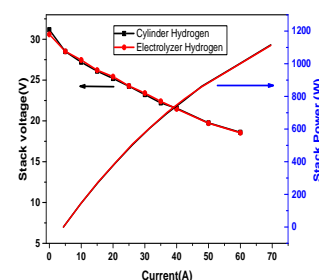
- ECMR can be integrated with renewable energy sources like wind, solar to store the energy in the form of hydrogen and it can be used in fuel cells.
- In Power station as coolant
- In Semiconductor industry as a reducing agent
- Meteorological Department (hydrogen as a lift gas to fill weather balloons).

Intellectual Property Development Indices (IPDI)

- Scaled-up from single cell to stack and prototyp system developed and demonstrated
- Performance was tested for extended duration at laboratory
- (Arial Narrow 10 pt – Not more than 3 bullet points of one line)



Operation of ECMR integrated with PEM fuel cell



Performance of Fuel cell integrated with ECMR

IPDI Status	1	2	3	4	5	6	7	8	9	10

Major Publications

1. A Polymer Electrolyte Membrane (PEM) cell and a method of producing hydrogen from aqueous organic solutions in pulse current mode”
K.S.Dhathathreyan, R.Balaji, K.Ramya, N.Rajalakshmi.
Indian Patent Application no. 3313/DEL/2012
2. Studies on development of Titanium oxide Nano Tube (TNT) based ePTFE–Nafion–composite membrane for electrochemical methanol reformation, N.Manjula, R.Balaji, K.Ramya, K.S.Dhathathreyan,A.Ramachandraiah
Int. J.Hydrogen Energy, 41 2016, 8777- 8784.
3. Palladium Nanoparticles as Hydrogen Evolution Reaction (HER) electrocatalyst in Electrochemical Methanol Reformer
K. Naga Mahesh, R. Balaji, K.S. Dhathathreyan.
Int.J.Hydrogen Energy 41, 2016, 46-51

Centre for Fuel Cell Technology (CFCT)

ARCI, IITM Research Park, Taramani Chennai, India

Tel : +91 44 6632708 / 66632707; Fax : +91 44 66632702

Email:rbalaji [at] arci [dot] res [dot] in / rajalakshmi [at] arci [dot] res [dot] in / gopy [at] arci [dot] res [dot] in