

Hydrogen Fuel Cell Car

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ABSTRACT

Water is among the natural resources that needed by living organisms such as human. Rapid development through human activities leading to the water pollution existed in river, for example Malacca River. Therefore, a literature review has been conducted to identify the effectiveness of using remote sensing towards water quality in Malacca River. Various research studies conducted by scientists and researchers stated that data from the satellite like Landsat, IKONOS, SPOT, IRS, CZCS, and SeaWiFS may be applied in assessing water quality parameters including suspended matter, turbidity, phytoplankton, and dissolved organic matter. The measurement for water quality parameters can be carried out through in-situ measurement, as experimental examination may be done through on-site studies and inside laboratories. Water quality assessment is extremely needed to strengthen the result produced through analysis of remote sensing data to determine the impacts and factors that contributed to the river pollution. As a result, remote sensing data from Landsat, IKONOS, Quickbird and SPOT may be applied to determine water quality parameters such as suspended matter, phytoplankton, turbidity, dissolved organic matter, and other parameters in the Malacca River. As conclusion, remote sensing has become a tool in monitoring and solving water quality issues, serving as a basis for management activities and planning activities in terms of river water quality.

Keywords: Hydrogen, Fuel Cell, PEM, PEMFC, AFC, PAFC, MCFC, SOFC

I. INTRODUCTION

Energy Resources

Types of Energy Resources

Conventional Energy Resources

Fossil fuels
Hydro resources
Nuclear resources

Non-conventional Energy Resources

- Solar energy
- Wind energy
- Biomass energy
- Geothermal energy
- Ocean tidal energy
- Ocean wave energy
- Ocean thermal energy conversion

What is a Fuel Cell?

Fuel cells are electrochemical devices that convert the chemical energy of a reaction directly into Electrical energy. The basic physical structure or building block of a fuel cell consists of an Electrolyte layer in contact with a porous anode and cathode on either side.

Classification of Fuel Cells:

Fuel Cells can be classified in several ways

Based on type of electrolyte:

- Phosphoric Acid Fuel Cell (PAFC)
- Alkaline Fuel Cell (AFC)
- Polymer Electrolyte Membrane Fuel Cell (PEMFC)
- Molten Carbonate Fuel Cell (MCFC)
- Solid Oxide Fuel Cell (SOFC)

Based on the types of the fuel and oxidant

- Hydrogen (pure)-Oxygen (pure) fuel cell
- Hydrogen rich gas – air fuel cell
- Hydrazine – oxygen/hydrogen peroxide fuel cell
- Ammonia –air fuel cell
- Synthesis gas – air fuel cell
- Hydrocarbon gas – air fuel cell
- Hydrocarbon (liquid)-air fuel cell

II. METHODS AND MATERIAL

Based on Operating Temperature

- Low temperature fuel cell (below 150⁰c)
- Medium temperature fuel cell (150⁰c-250⁰c)
- High temperature fuel cell (250-850⁰c)
- Very high temperature fuel cell (800-1100⁰c)

Based on the Chemical Nature of Electrolyte

- Alkaline electrolyte type
- Neutral electrolyte type
- Acidic electrolyte type

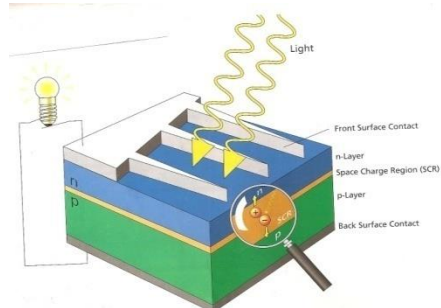
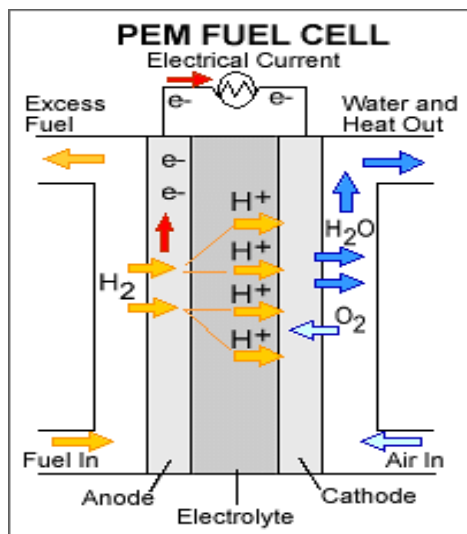


Figure 1 : Schematic diagram of photo voltaic cell

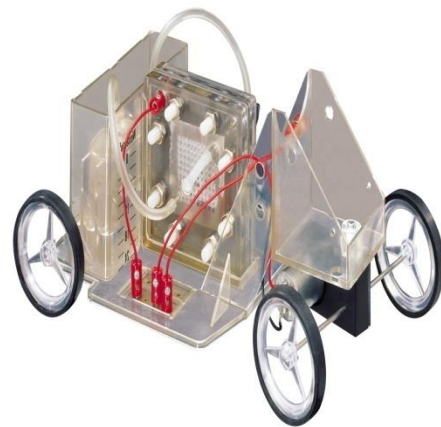


Figure 2 : My Proto Type Model

EXPERIMENTS ON SOLAR CELLS

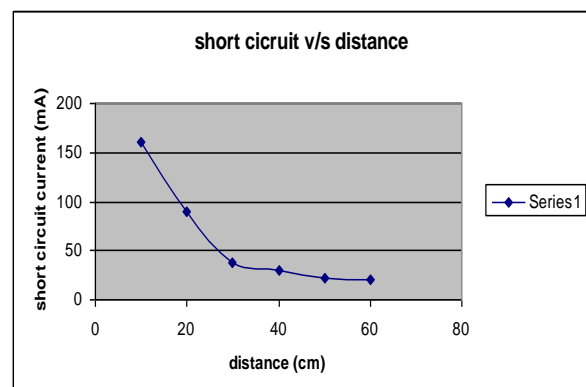
Measurement of short circuit current and no load voltage

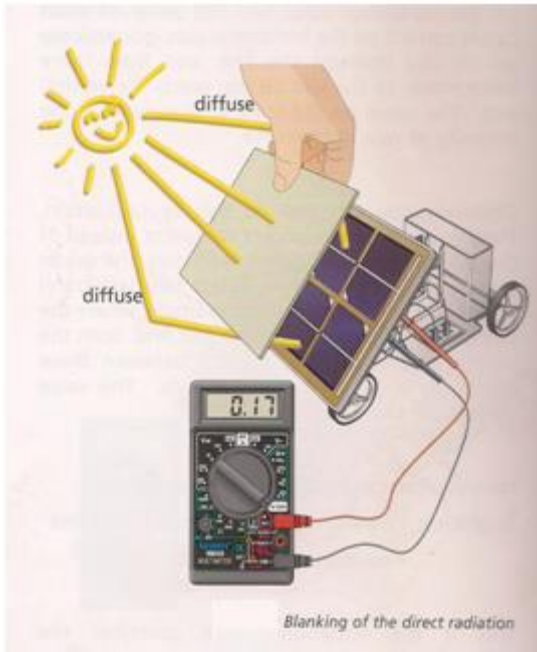
- Short circuit current
- no load voltage
- Calibration of radiation meter
- Direct and diffuse radiation
- Efficiency of solar panel

ELECTROLYSIS AND EXPERIMENTS ON FUEL CELLS

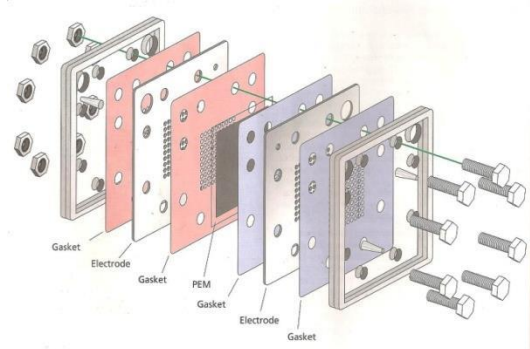
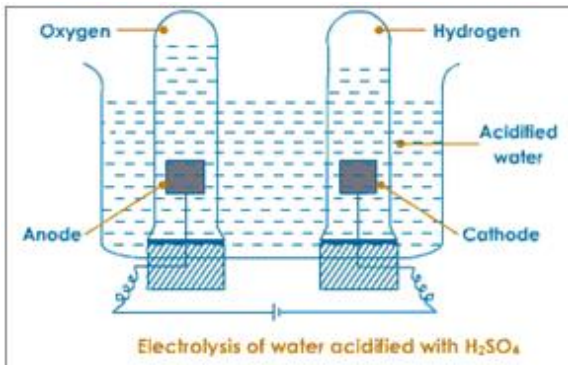
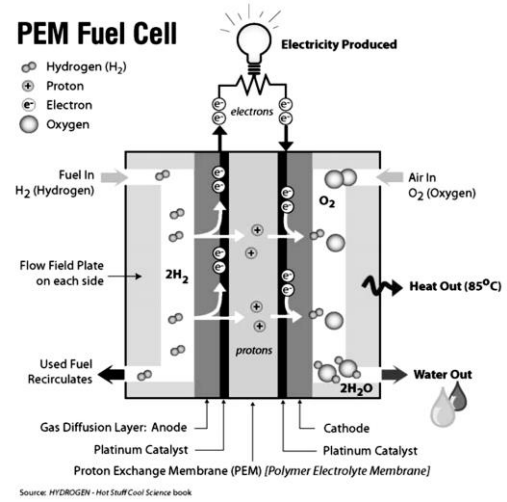
Different methods of producing hydrogen

- Thermo-chemical methods
- Electrolysis of water
- Thermolysis of water
- Biophotolysis
- Electrolysis of Water Using Solar Panel





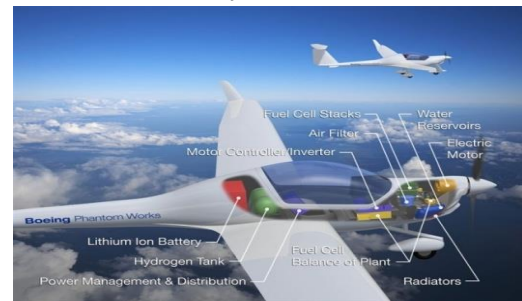
generates heat. So, the output of a hydrogen PEM fuel cell includes 1) electricity, 2) Heat, and 3) pure, clean water.



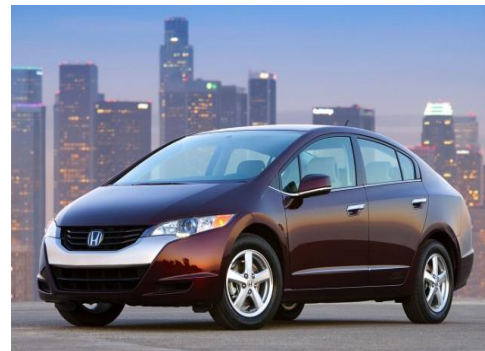
Disassembly of PEM fuel cell

Working of PEM Fuel Cell :

A PEM Fuel Cell converts the chemical energy of hydrogen and oxygen into electrical energy. The fuel cell itself has no moving parts. The heart of a PEM Fuel Cell is a polymer (perfluorinated sulfonic acid polymer) called a Proton Exchange Membrane (also known as Polymer Electrolyte Membrane) which acts as an electrolyte. Platinum attached to the membrane as a catalyst. When a hydrogen molecule with one negative electron and one positive proton is introduced to the membrane, the platinum along with the membrane creates an environment that allows the positive proton to pass through the membrane, but the negative electron does not pass through. The electrons begin to move along a path creating electricity that is captured as the electron moves around the circuit through a current collector to the other side of the fuel cell. The electron rejoins a proton and the newly formed hydrogen atoms join Oxygen to produce water. This reaction also



Boeing phantom works two seater air craft (Cessna)



Honda FCX clarity



Inner layout of Honda FCX clarity



Toyota FCHV-BUS



Honda Solar Hydrogen Station

III. CONCLUSION

1. The fuel cell is reversible. That it can be used for electrolysis as well as production of electricity.
2. The fuel cell has no moving parts.
3. The efficiency of fuel cell is 41% which is greater than gas turbine, steam turbine and diesel motor.
4. The efficiency of solar panel 7.4% which is less when compared to fuel cell.

5. The efficiency of fuel cell working as a electrolytic cell is 83%.
6. From the above results and comparison between the efficiencies gas turbine, steam turbine and diesel motor we can say that PEM fuel cell is best suited for composite drive shaft.

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