

A STUDY ON NEED OF HYDROGEN AS AN ALTERNATIVE FUEL

Sangeeta Khandagle

Department of General Science,

Fabtech Technical Campus College of Engineering and Research Sangola

D. H. Bhoite

Department of General Science,

Fabtech Technical Campus College of Engineering and Research Sangola

ABSTRACT

As energy is very important in day today's life also it is known as lifeblood of today's all community. All traditional fossils fuels are limited and rate of the fuels are also going to increases day by day and pollution is the very big issue by combustion of traditional fuel so it is very basic need to search a alternative fuel option because demand of energy is growing up day by day and we have to take it granted traditional fuels are limited because stocks of crude oil is very limited. So it's very basic need to take a option of alternative fuel this calls to promote such a alternative fuel to reduce environmental pollution from renewable energy resources it should be used for transport by increasing efficiency.

Hydrogen and bacon cells are observed by many as important solutions for the coming days, enabling clean efficient production of power and heat from a range of primary energy sources.

This paper discusses about how hydrogen can be a good alternate fuel –the methods of production of hydrogen, storage, transportation of hydrogen, hydrogen for the efficient production of power using fuel cells and also modifications required in vehicles to adjust to this alternative and finally the challenges faced in realization of hydrogen as fuel.

Keywords: Renewable energy, alternative fuels.

Introduction:

As we know that many more hydrocarbons and lot of emissions are coming out from the IC engines and environment get polluted by fossil fuels for emissions free power generation Hydrogen fuel is very important and it helps to improve efficiency of engine by producing electric power.

Hydrogen can be generated by using sources of renewable energy such as biomass, Wind energy, Solar Energy, geothermal, Hydroelectric power, Nuclear, coal, gas.

The production of hydrogen (H₂) by steam amend process or by product of refining petroleum process and chemical production process. Steam amend process uses heat energy to differentiate H₂ from carbon components in Marsh gas or Methyl hydride (CH₄) & Methyl alcohol (CH₃OH)

Production of Hydrogen:

1. Electrolysis:

There are various methods to generate hydrogen some of the methods are given below,

As we know that pure water is a good conductor of electricity by adding NaCl into water the efficiency of conducting electricity is going to increase so we have to use the Electrolysis method to generate hydrogen from water and by adding electrolyte in water with an electric current it separates the H – Particle and O- Particle by increasing the temperature of water with the help of electric current

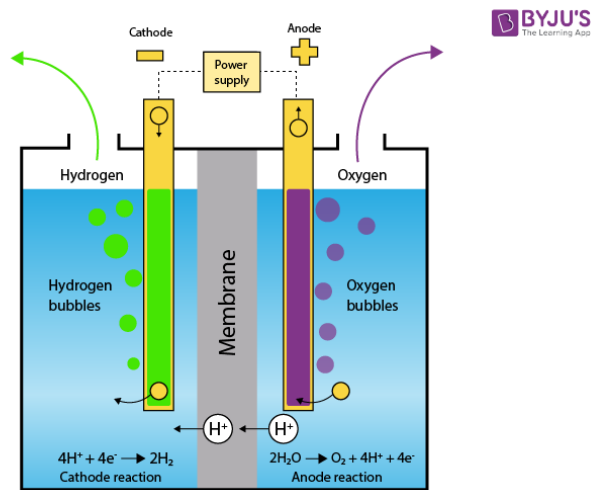
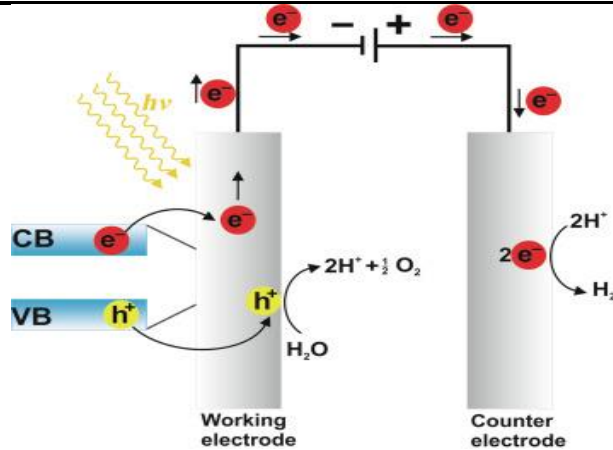


Fig. Generation of Hydrogen

In the above figure, the ions from two poles, positively charged Anode & negatively charged cathode. The chemical bond between H_2 and O_2 breaks by charge and atomic components differentiate separately by preparing charged particles known as ions. H_2 particles attract towards the cathode and O_2 particles attract towards the anode for this process 1.24 volts voltage and $77^\circ F$ temperature required.

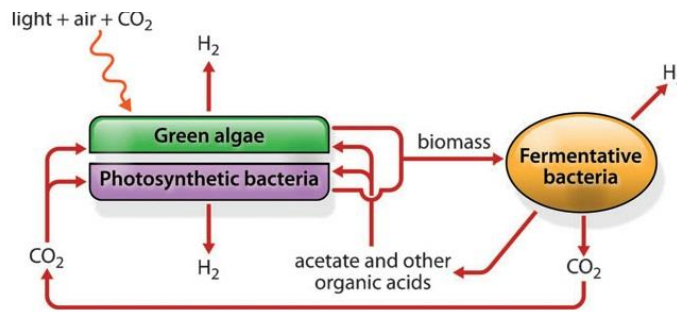
2. PHOTO ELECTROCHEMICAL PROCESS:

It consists of 3 main parts, working electrode, semiconductor and reference electrode which are usually made up of platinum and electrolyte water. Both electrodes are connected with each other through a metal wire. One light falls on the working electrode, the electrons are excited and flow through the wire reference electrode leaving behind positive charges named holes. The holes combined with oxygen ions on water forming oxygen gas and the reference electrode the electrons combine the hydrogen ions forming hydrogen gas as shown in figure.



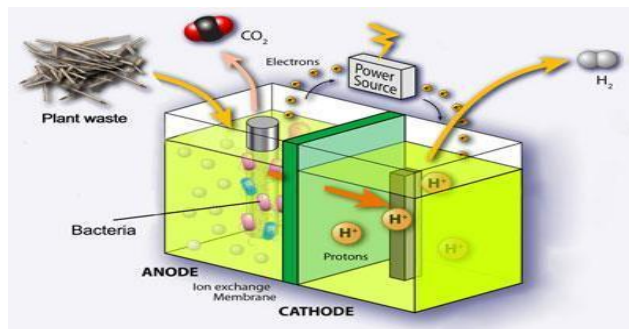
3. BIOLOGICAL AND PHOTOBIOLOGICAL PROCESSES:

Hydrogen can be produced by using green algae and photosynthetic Bactria. In anaerobic Bactria the production of fermentative Bactria will enzyme active and the hydrogen will be produced as shown in fig.

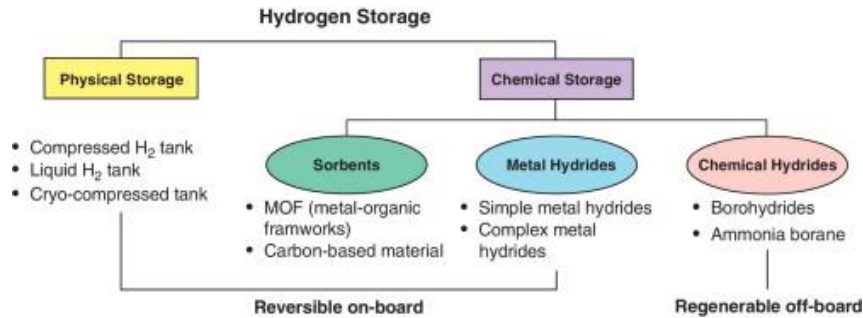


4. ANAEROBIC BACTERIA:

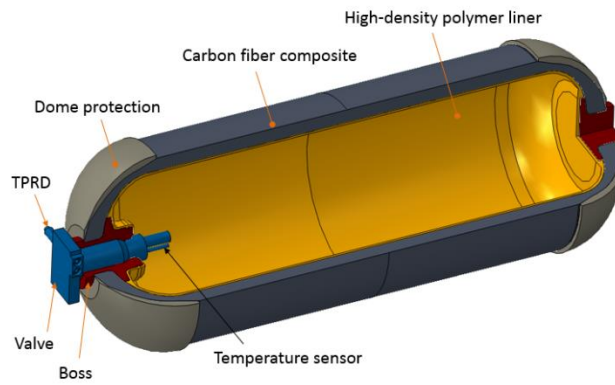
By doing natural process on CH₄ and ethanol is a product of "biogas" that will prepare by anaerobic bacteria. The process of making hydrogen is as shown in fig.



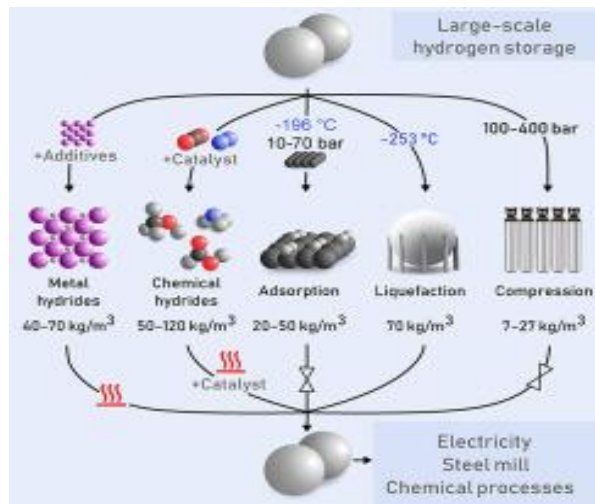
HYDROGEN STORAGE:



Hydrogen can be stored by two ways Physical Storage and Chemical storage in physical storage H2 tank as a liquid tank in that compresses hydrogen is stored and in chemical storage three ways to store hydrogen sorbents, Metal Hydrides and chemical hydrides.to store hydrogen in the form of liquid large tank as used as shown in fig.



TPRD = Thermally Activated Pressure Relief Device
 Credit: Process Modeling Group, Nuclear Engineering Division, Argonne National Laboratory (ANL)



How can hydrogen be used to generate power?

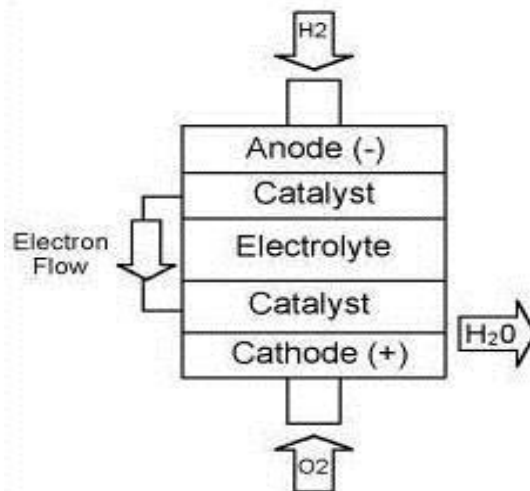
Hydrogen can be directly used in I.C.engines in the process burn it to generate power like conventional fuels. The second process is to use it in fuel cell to generate electricity and in turn generate the necessary driving torque which is twice as efficient as use of hydrogen directly into the I.C.engines.

Bacon cell :

Battery is working on which principle on same principle bacon cell is working only difference is it does not shut down or requires recharging .Electricity and heat energy will produce by supplying fuel.

The bacon cell is very simple device it produces electrical energy by using chemical energy in this case the chemical energy in the form of hydrogen and oxygen and hydrogen is used as a fuel and oxygen will take from atmospheric air.

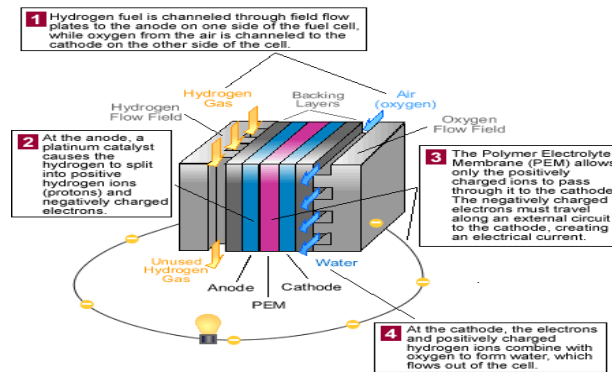
Although hydrogen is majorly used as fuel but in some cases CH_4 and methanol also used as a fuel



In this case two electrodes are used known as cathode and anode combined by electrolyte and encouraged by a catalyst from negatively charged electrode known as anode hydrogen is passed as a fuel and from positively charged ion known as cathode oxygen is entered from the air and it is going to entered protons and electrons are separate from hydrogen, electron which takes different paths to the cathode and through electrolyte protons passes and electrons makes a separate current that can be utilized before coming return to cathode and hence electricity will produce.

PRINCIPLE OF OPERATION:

The diagram below shows how these fuel cells work.



APPLICATIONS

Cars

Buses

Other Vehicles

BENEFITS OF FUEL CELLS:

- ✓ No Greenhouse Gases
- ✓ Free from air pollution
- ✓ Higher national energy power
- ✓ Efficiency is more
- ✓ Design of fuel cell is Simple

CHALLENGES

- In Traveling storage of hydrogen
- In winter season operation problem
- Getting Hydrogen to Consumers:
- It is costly.
- It should be handled with most of care.

CONCLUSION:

In today life it is very important to reduce the pollution which is very harmful to human being so it very important to use the ecofriendly fuel to reduce the pollution so this H₂ is one of the best option as a alternative fuel also the stock of crude oil is limited so H₂ we can prepare ecofriendly and by storing it we can use for the all IC engines to produce power as per consumer requirements so as per the knowledge this is the best option for a traditional fossil fuels which are limited in stock and produced harmful pollutant in environment

Hydrogen is the best option as an alternative fuel for fuel cell but for storing hydrogen, distribution of hydrogen there is a problem of infrastructure and it is needful to produce hydrogen on site for all applications which may be stationary or mobile. Some hydrocarbons and alcohols are also used as alternative fuel by producing it onsite and such fuels having many more advantages so it is a need of todays society and economy.

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