

An Implementation of Hydrogen Fuel on Future Ride

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ABSTRACT: On Board Car :Electrolysis of water by using photo-catalyst which results in the production of hydrogen fuel. Hydrogen is an ideal clean fuel of the future. Photo-catalytic production of hydrogen from water was discovered by Fujishima and Honda. Photo-catalytic water splitting has been widely studied as a potential method to produce H₂ from solar energy. They demonstrated that water splitting achieved by using a TiO₂ as a anode and a Pt as a cathode.

KEYWORDS: Hydrogen, Water, Photo-catalytic

I.INTRODUCTION

Energy needs of this society increases due to increase in the population which results in Global warming. It is the major threat for the human resources and other living organisms in this universe. Greenhouse gases are the major cause for the global warming. To reduce the greenhouse effect, alternate energy sources like renewable energy resources are utilized. Hence, HYDROGEN FUEL gained importance due to global warming. The usage of fossil fuels are replaced by cleaner fuel such as Hydrogen. It is produced from resources such as fossil resources (natural gas and coal) and renewable resources (biomass and water) by using energy input from sunlight, wind, wave and hydrogen power. When compare to other sources the rate of hydrogen production is more in using sunlight as a energy input. Hydrogen is efficiently produced from electrolysis of water using sunlight. The splitting of water is also done by semiconductor photo-catalysts by the process called photo-catalysis. The energy for water splitting is obtained from the absorbed photon energy by the semiconductor photo-catalysts.

In photo-catalysis water is reduced to H₂ at cathode and oxidized to O₂ at anode. It is efficiently employed due to light harvesting, charge separation, charge transport, charge utilization and surface adsorption on photo-catalyst used. The various photo-catalyst used are titanium dioxide, graphene, g-C₃N₄, CdSe, CdS, Fe₂O₃, WO₃, BiVO₄, Cu₂O, SiC, etc.

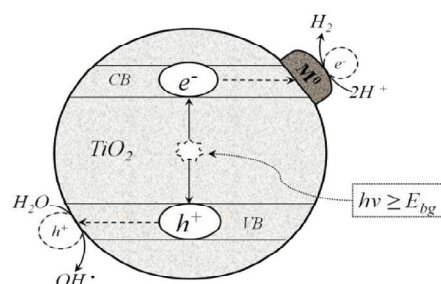


Photo-catalytic production of Hydrogen

II.RELATED WORKS

At 2016, 3 hydrogen cars are produced. Toyota Mirai, Hyundai ix 35FCEV and Honda Clarity. Rockets use liquid hydrogen as a fuel and liquid oxygen as an oxidizer. LH₂/LOX were also used in the [Space Shuttle](#) to run the

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fuel cells that power the electrical systems. The byproduct of the fuel cell is water, which is used for drinking and other applications that require water in space. Honda FCX Clarity launched hydrogen fuel cell demonstration vehicle 2008.



Hyundai ix35FCEV vehicle



Hydrogen bicycle

HISTORY

1820- Rev. W. Cecil developed hydrogen fueled engine¹

1876- Nicolaus Otto invented 4 cylinder engine³

1885- Gottlieb Daimler invented modern ICE¹

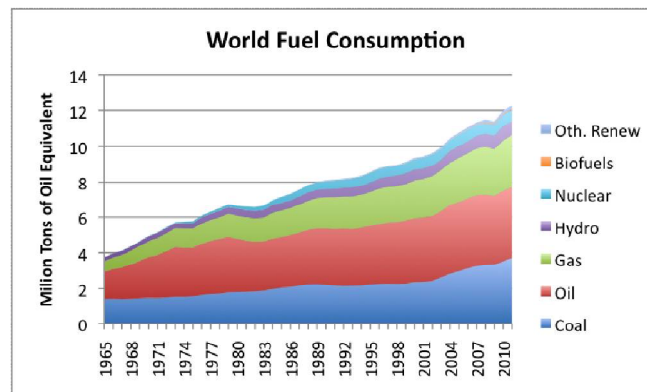
1920- First testing of hydrogen ICE

20th century- Rudolf Erren used hydrogen ICE in Submarines and land vehicles and General motors introduced HYDROGEN ECONOMY at fuel crisis at 1970's.²

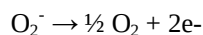
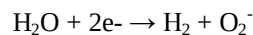
III. PROPOSED WORK

ON BOARD FUEL PRODUCING CAR

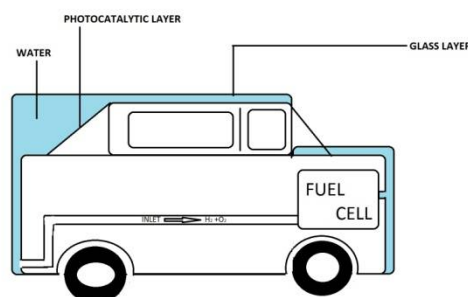
Fuel is the essential source of transportation. The vehicle consists of photo-catalyst, fuel cell, glass covering and electric engine. The photo-catalyst is added with paint which is to be painted on the car. The fuel cell and electric engine are fixed to the car. When sunlight falls the photo-catalyst gets excited and ejects out electrons, it has valence and conduction bands which acts as cathode and anode for the production of hydrogen and oxygen.



WORLD FUEL CONSUMPTION



The fuel cell is regenerative which regenerates water H_2O when the energy is produced during the reaction of hydrogen and oxygen.



Assumption of the fuel required and generated, Surface area of car = 5.574183m^2

1L of H_2O produces 1235L of H_2 and 622L of O_2

ADVANTAGES OF HYDROGEN FUEL

- No pollution is produced by engines that burn hydrogen.
- Hydrogen is environmentally friendly and highly efficient energy source has to become urgent mission for sustainable development.
- It's a renewable energy source and bountiful in supply.
- Hydrogen energy is non-toxic.
- It's far more efficient than other sources of energy.
- Hydrogen energy used as ideal fuel for space ships.

DISADVANTAGES OF HYDROGEN FUEL

- Hydrogen energy is expensive.
- Produced hydrogen is difficult to store. It's not the safest source of energy(i.e.,) it is highly flammable.
- Tricky to move around.
- Hydrogen energy cannot sustain the population.

IV.CONCLUSION

In conclusion, hydrogen is a renewable source of energy which can be produced from water, organic and inorganic substances. Hence, hydrogen can be efficiently produced from water by electrolysis using photo-catalysts (TiO₂, CdS, Graphene, Iron oxide, etc). These semiconductor photo-catalysts are efficiently used for fuel production by doping with metals, metal oxides, etc. Recent advancements are performed in photo-catalysts for improving their activity of hydrogen production such as cost, stability, toxicity, recyclability, corrosion resistance at red-ox environment and high quantum yield of hydrogen production¹.

Let's rise hands to reduce warmth of our global mother.

REFERENCES

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2. HISTORY OF HYDROGEN POWERED CARS.
3. Encyclopedia Britannica Nikolaus August Otto.